2017 Air Quality Annual Status Report (ASR)

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

June 2017

Local Authority Officer	Joseph Dutfield
Department	Neighbourhood Services
Address	Woking Borough Council, Civic Office, Gloucester Square, Woking, Surrey GU21 6YL
Telephone	01483 743658
E-mail	Joseph.dutfield@woking.gov.uk
Report Reference number	
Date	June 2017

Report for	Joseph Dutfield Woking Borough Council Civic Office Gloucester Square, Woking Surrey GU21 6YL
Main contributors	Ellénore Calas Rachel Hicks
Issued by	Ellénore Calas
Approved by	Ben Warren
Amec Foster Wheeler Floor 12 25 Canada Square Canary Wharf London E14 5LQ Doc Ref H:\Projects\39711 STH AQ Woking 2017 ASR\D Design\Report\2017\39711 Woking 2017 ASR_Final_i1.docx	**Document revisions** No. | Details | Date 1 | Draft | 25/05/2017 2 | Issued | 15/06/2017 **Draft report disclaimer** **This report has been prepared in a working draft form and has not been finalised or formally reviewed. As such it should be taken as an indication only of the material and conclusions that will form the final report. Any calculations or findings presented here may be changed or altered and should not be taken to reflect Amec Foster Wheeler's opinions or conclusions.** Third-party disclaimer Any disclosure of this report to a third party is subject to this disclaimer. The report was prepared by Amec Foster Wheeler at the instruction of, and for use by, our client named on the front of the report. It does not in any way constitute advice to any third party who is able to access it by any means. Amec Foster Wheeler excludes to the fullest extent lawfully permitted all liability whatsoever for any loss or damage howsoever arising from reliance on the contents of this report. We do not however exclude our liability (if any) for personal injury or death resulting from our negligence, for fraud or any other matter in relation to which we cannot legally exclude liability. Management systems This document has been produced by Amec Foster Wheeler Environment & Infrastructure UK Limited in full compliance with the management systems, which have been certified to ISO 9001, ISO 14001 and OHSAS 18001 by LRQA.

Executive Summary: Air Quality in Our Area

Air Quality in Woking Borough Council (WBC)

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].

WBC have completed all past rounds of Review and Assessment. This ASR considers all new monitoring data and assesses the data against the Air Quality Strategy Objectives (AQOs). It also considers any changes that may have an impact on air quality. Progress on measures to improve air quality are identified, as well as WBC's approach to reducing emissions and/or concentrations of fine particulates ($PM_{2.5}$), which has increased focus in the ASR as a result of emerging evidence of the health impacts.

Dispersion modelling in the 2012 Detailed Assessment identified predicted exceedances of the annual mean NO_2 AQO at the façade of properties at the top of Anchor Hill. Contour plots showed that concentrations at the three main housing blocks at the top of Anchor Hill exceeded the objective or were within 10% of the objective. Due to the historical trend of high pollution levels at this location and the modelled exceedances it was recommended that WBC declared an AQMA as a result of exceedances of the annual mean NO_2 AQO at Anchor Hill.

Based on the results of the Anchor Hill Further Assessment in January 2015 it was recommended that the AQMA should remain in place as both monitoring and modelling results show that although in some places the objective was being achieved, concentrations in some places were above the AQO.

An Air Quality Action Plan (AQAP) was produced for the Anchor Hill AQMA in July 2015. The plan determined that the upgrade of signals at the Anchor Hill junction are likely to reduce NO_2 concentrations so that the annual mean AQO is no longer exceeded in the AQMA. The progress towards compliance is currently being tracked using monitoring data collected by WBC and being reported in the ASRs. In line with DEFRA guidance, WBC will need to consider measurements carried out over several years or more, national trends in emissions, as well as local factors that may affect the AQMA, including measures introduced as part of the Action Plan, together with

[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

information from national monitoring on high and low pollution years, before the AQMA can be revoked. The AQMA will be revoked when monitoring results from three consecutive years show no exceedances of the AQO, so that a permanent improvement in air quality can be demonstrated, and actions implemented around Anchor Hill are considered to be effective. As shown in this report, 2016 NO_2 levels complied with the AQO at every Anchor Hill site.

The 2015 Updating and Screening Assessment determined that monitoring and analysis of concentrations at all locations included in the monitoring programme should continue, with specific consideration on Anchor Hill and Guildford Road.

Exceedances of the annual mean AQO for NO_2 have been recorded in 2012, 2013, 2014 and 2015 at diffusion tubes located at Guildford Road. Additional monitoring in the area around Guildford Road commenced in 2014 and recorded exceedances of the AQO at five locations in 2015. A Detailed Assessment was carried out in November 2016 at the junction between Guildford Road, Constitution Hill and Mount Hermon Road. This assessment indicated that concentrations at some receptor locations with relevant exposure were exceeding the AQO because of road traffic emissions around Guildford Road. It was recommended that an AQMA should be declared on Guildford Road. Further monitoring was recommended around the junctions where Guildford Road meets York Road and Station Approach, to confirm if the NO_2 annual mean AQO is exceeded where there is relevant exposure. Consequently, the AQMA for Guildford Road was declared in May 2017.

Bias adjusted annual mean NO_2 concentrations at four sites around Guildford Road were exceeding the AQO in 2016. However, following distance correction to estimate concentrations at locations of relevant exposure, concentrations at relevant locations are below the AQO. The highest annual mean NO_2 concentration was 36.2 μgm^{-3} at diffusion tube CH in 2016 following distance correction. Local Highways have advised that the particularly high NO_2 concentrations monitored in the Guildford Road area in 2015 were likely to be due to roadworks in the Town Centre causing diversions in the area, which resulted in increased traffic along Guildford Road. WBC have confirmed that there is likely to be increased development occurring in the Town Centre over the next few years and therefore concentrations around Guildford Road are likely to vary, but may increase during times of traffic diversion. In line with DEFRA guidance, before the AQMA can be revoked, WBC will need to consider measurements carried out over several years, national trends in emissions, as well as local factors that may affect the AQMA, including measures introduced as part of the Action Plan, together with information from national monitoring on high and low pollution years. The AQMA will be revoked when monitoring results from three consecutive years show no exceedances of the AQO at relevant locations, so that a permanent improvement in air quality can be demonstrated, and actions implemented around Guildford Road are considered to have been effective.

Actions to Improve Air Quality

The Further Assessment of the Anchor Hill AQMA included recommendations to improve air quality at the junction. As a result of the recommendations, Surrey County Council (SCC) have updated the Traffic Signals in operation at the junction of Anchor Hill and High Street, Knaphill. In August 2016, a Microprocessor Optimised Vehicle Actuation (MOVA) scheme was introduced on Anchor Hill, no data on the effects that this has had is available yet.

An AQAP for WBC is currently being prepared for the Guildford Road AQMA. This is due to monitored NO_2 concentrations along Guildford Road in 2015, and the subsequent Detailed Assessment, identifying exceedances of the AQO at locations representative of residential receptors. WBC have confirmed that there is likely to be increased development occurring in the Town Centre over the upcoming years, therefore the Action Plan will focus on measures that can be implemented to manage increased influxes of traffic diverted down Guildford Road.

Conclusions and Priorities

WBC has declared two AQMAs at Anchor Hill and Guildford Road as a result of exceedances of the annual mean NO_2 AQO. Although 2016 monitoring results indicate that the AQO is not exceeded at relevant locations in the AQMAs, these remain the main priority locations for improving air quality.

The priorities for WBC following this ASR are as follows:

- Continue monitoring of NO_2 to confirm if concentrations remain below the annual mean AQO at locations of relevant exposure.
- Prepare an AQAP for the Guildford Road AQMA.

Local Engagement and How to get Involved

The following sources of information are available on WBC's website for improving air quality in the borough and seeking further information:

- List of Air Quality Management Areas (AQMAs) in the borough, where health based air quality standards are not expected to be met: https://www.woking.gov.uk/airquality#air_quality_management_areas
- The Air Quality Action Plan for the Anchor Hill AQMA: http://aqma.defra.gov.uk/action-plans/woking-borough-council_aqap_final.pdf
- Overview of the air quality in Surrey and a range of articles about problems, solutions and how pollution affects the public: http://www.woking.gov.uk/planning/envhealthservice/control/airquality/surreyair

- airAlert service warning local residents who have respiratory problems of whenever the air pollution in Woking is going to be high. This is a free subscription service which individuals, who suffer from asthma, COPD, emphysema or other respiratory illnesses, can sign up to, and they will receive either an email, text message or voicemail giving an advanced warning of high pollution levels: http://airalert.info/Surrey/Default.aspx

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in Woking 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 Woking 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 (AQO). 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 compliance with the objectives.

A summary of AQMAs declared by Woking can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at http://uk-air.defra.gov.uk/aqma/local-authorities?la_id=317. Alternatively, see Appendix D: Maps of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA(s).

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	
Anchor Hill AQMA	Declared 1st February 2014,	NO_2 Annual Mean	Knaphill, Woking	A small area covering a 4 way junction at the top of a steep hill.	N	41.5	36.0 (with distance correction)	Anchor Hill Air Quality Action Plan: http://aqma.defra.gov.uk/action-plans/woking-borough-council_aqap_final.pdf
Guildford Road AQMA	Declared 15th May 2017	NO_2 Annual Mean	Woking	A small section of the road where Guildford Road meets Constitution Hill and Mount Hermon Road	N	42.2 (modelled)	32.6 (with distance correction)	Currently being prepared (expected publication in 2017)

☐ **Woking 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 Woking

Defra's appraisal of last year's ASR highlighted that monitoring results showing exceedances of the AQO on Guildford Road needed to be distance corrected before considering the declaration of a second AQMA. The distance corrections were applied to the results and there were still exceedances of the AQO predicted at receptor locations, based on the distance of the flats on the corner of Guildford Road and Constitution Hill from the roads. The distance corrected results supported the Detailed Assessment in to the extent of exceedances at receptor locations and helped determine the extent of the proposed AQMA at Guildford Road.

WBC has taken forward a number of direct measures during the current reporting year of 2016 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in WBC's Anchor Hill AQAP and the Surrey Transport Plan: Air Quality Strategy (Surrey County Council, 2011). An AQAP is currently being prepared for the Guildford Road AQMA. WBC have confirmed that there is likely to be increased development occurring in the Town Centre over the upcoming years, therefore the Action Plan will focus on measures that can be implemented to manage increased influxes of traffic diverted down Guildford Road.

WBC works from the Surrey Transport Plan (LTP3). A twin-track strategy is proposed to address air quality in Surrey County Council (SCC), which focuses on AQMAs and synergies with other strategies to deliver countywide air quality improvements. Measures to improve air quality are included in a "Strategy Toolkit" within the Air Quality Strategy.

Key completed measures are:

- Installation of a MOVA system in August 2016 at the junction between Anchor Hill and High Street. This measure will likely have an impact on NO_2 levels from road traffic in the Anchor Hill AQMA.
- Improvement of cycling and walking infrastructure. These measures will likely reduce road traffic congestion and improve air quality.

Additionally, eleven local authorities across Surrey and the SCC, including public health professionals, have set up an Air Quality Alliance. The Surrey Air Alliance will produce a Surrey Action Plan by the end of 2017. The alliance is also planning a dispersion modelling of $PM_{2.5}$ and NOx levels across the borough, which will identify the sources of these pollutants. This will help develop target measures to reduce pollution from the relevant sources.

WBC anticipates that the measures stated above and in Table 2.2 will help to achieve compliance in the Anchor Hill and Guildford Road AQMAs.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, WBC anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of the Anchor Hill and Guildford Road AQMAs.

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
1	Urban Traffic Management and Control (UTMC)	Traffic Management	UTC, Congestion Management, Traffic Reduction	SCC / WBC	2015	2015	Restrain or reduce traffic volumes in AQMA	Y	MOVA installed and in operation since August 2016 at the busy junction in the Anchor Hill AQMA	August 2016	N/a
2	New and/or improved cycle lane	Transport Planning & Infrastructure	Cycle Network	SCC / WBC	N/a	2008 - 2011	Restrain or reduce traffic volumes in AQMA	Y	Shared cycle and pedestrian path, West Byfleet recreation ground. Additional bicycle pump stands and cycle parking in Woking Town Centre and cycle stands donated to other local premises (leisure centre, the Mosque, day centres). Footpath link created between the Hoe Valley Scheme path and the playground at Willow Reach (the former Westfield Tip development site). Disabled ramp to fishing platform at Goldsworth Park. Existing shared path 19, Horsell has been widened, surfaced and landscaping and low level lighting added. Surrey County Council's website provides information on cycle and walking improvements in Woking completed by March 2016 (www.travelsmartsurrey.info/achievements/cycling-and-walking-improvements-in-Surrey). In addition, a new	Ongoing	N/a
3	New and/or improved cycle track	Transport Planning & Infrastructure	Cycle Network	SCC / WBC	N/a	2008 – 2011	Restrain or reduce traffic volumes in AQMA	Y		Ongoing	N/a

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
									cycle path will link the Broadway, Albion Square, High Street and the new link road in Woking. Town Centre Engineering team have fitted additional stainless steel cycle racks on Gloucester Walk and Commercial Way.		
4	Cycle parking	Transport Planning & Infrastructure	Cycle Network	SCC / WBC	N/a	2008 - 2011	Restrain or reduce traffic volumes in AQMA	Y	Various improvements made under Cycle Woking 2008 – 2011. In 2015 the Cycle Hub was installed at Woking station providing storage for over 200 cycles and encouraging cycle / rail integration. New cycle storage compound implemented at Brookwood station in 2016. These storage facilities have been funded by Department for Transport funding secured by South West Trains together with WBC S106 funding contributions.	August 2016	N/a
5	Park and ride	Alternatives to Private Vehicle Use	Bus based Park & Ride	SCC / WBC	N/a	2012	Restrain or reduce traffic volumes in AQMA	Y	Following on from Cycle Woking, Surrey County Council's TravelSmart initiative won further Department for Transport Local Sustainable Transport Fund monies for the period from 2012 until 2015, with over £18 million to spend on schemes like improving and installing cycle lanes, investing in interactive and live travel information and encouraging and supporting	Cancelled	Not suitable or relevant for Woking
6	Park and stride	Alternatives to Private Vehicle Use	Other	SCC / WBC	N/a	2012	Restrain or reduce traffic volumes in AQMA	Y		Cancelled	Not suitable or relevant for Woking

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
									more people in travelling sustainably. To deliver its programme of improvements, Travel SMART worked closely with borough councils, residents, community groups and businesses (https://www.travelsmartsurrey.info/about).		
7	Infrastructure to support the use of hybrid/electric vehicles	Traffic Management	Other	SCC / WBC	N/a	2015	Reduce tailpipe emissions in AQMA	Y	WBC trialled an electric car for six months as part of our car club arrangements for staff business use (CarShare). The trial ended in October 2015. WBC have recently installed a further six electric vehicle charging points in the Yellow Car Park. This is in addition to the eight existing points.	Ongoing	N/a
8	Car clubs	Alternatives to private vehicle use	Car Clubs	SCC / WBC	N/a	N/a	Restrain or reduce traffic volumes in AQMA	Y	The Council has a car club arrangement with Enterprise Rent A Car Ltd for staff business use – the CarShare scheme – see more info on 'ewokplus: . Enterprise recently acquired City Car Club who recently won the contract to operate Surrey County Council's car club scheme that is also available for the public. In Woking, there are cars available in Guildford Road and at Quadrant Court.[4 5]	Ongoing	N/a

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
9	Workplace travel planning	Promoting Travel Alternatives	Personalised Travel Planning	SCC / WBC	N/a	N/a	Restrain or reduce traffic volumes in AQMA	Y	The Council has its own Staff Transport Plan including various initiatives to encourage alternative modes of transport to the car. Criteria has been applied to lease cars in order to lower emissions and air pollution associated with this fleet. Environmental standards also apply to cash alternative vehicles.	Ongoing	N/a
10	Differential parking charges	Traffic Management	Emission based parking or permit charges	SCC / WBC	N/a	N/a	Reduce tailpipe emissions in AQMA	Y	Differential parking charges.[6] The cost of a season ticket is based on a vehicle's CO2 emission rating (determined by the Vehicle Certification Agency). A 50% discount is applied for vehicles that produce the lowest emissions (CO2 band A) and a 25% discount for band B vehicles. Those with a band G rating (the highest band) pay a 25% surcharge.	Ongoing	N/a
11	Encourage boroughs and districts to consider adopting minimum emissions standards	Promoting Low Emission Transport	Taxi Licensing conditions	SCC / WBC	N/a	2014	Reduce tailpipe emissions in AQMA	Y	With effect from the 4th of January 2014, WBC have required all Private Hire Vehicles and all non-wheelchair compliant Hackney Carriages to meet the Euro Emissions V (five) Criteria. As wheelchair accessible vehicles tend to be larger and more van-like, it is	Ongoing	N/a

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
	or vehicle age restrictions into taxi licensing procedures								unrealistic for us to expect them to meet the low emissions criteria. However – there are at least 540 private hire vehicles in Woking – all of which are at least Euro Emissions V (five). Some even are Euro Emissions VI (six). Euro Emission Standard VI (six) has been applied to manufactures of new vehicles from September 2014 and they are given 12 months to comply. This means that from September 2015 no new vehicle (passenger car) should be being produced that is not Euro VI. Our policy is stating that as Euro Emissions VI (six) is to be applied to manufacturers from September 2014, it will therefore apply to new and renewal vehicles presented to Woking Borough Council from 20th of January 2022. With effect from the 20th of January 2022 there will be no Euro Emissions V (five) vehicles licenced by Woking Borough Council.		

[4] http://www.woking.gov.uk/transport/parking/carparks/chargepoints
[5] https://www.travelsmartsurrey.info/driving/car-clubs
[6] http://www.woking.gov.uk/transport/parking/season

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.

WBC is working to address $PM_{2.5}$ through implementation of the measures to improve air quality detailed in Table 2.2.

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

There are no continuous monitoring sites located within Woking Borough.

3.1.2 Non-Automatic Monitoring Sites

Woking undertook non-automatic (passive) monitoring of NO_2 at 30 sites during 2016. Table A.1 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) for the diffusion tubes, including bias adjustments, are included in Appendix C.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

Table A.2 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2016 dataset of monthly mean values is provided in Appendix B.

After bias adjustment, exceedances of the annual mean 40 µg/m^3 objective limit were recorded at five locations in 2016, as shown in bold in Table B.1. However, after distance correction, only an exceedance at the M25 site was recorded.

The monitoring site at the M25 is located on a bridge over the motorway. The site has recorded high concentrations of NO_2 as would be expected close to a motorway. Previous rounds of Review and Assessment have determined this site is not representative of relevant exposure (Woking Borough Council, 2014). This site is still not representative of relevant exposure in 2016. The monitoring site at Victoria Way has also recorded exceedances of the NO_2 AQO over a number of years and has been confirmed to be non-representative of relevant exposure as the properties in the locality are all commercial. In 2016 the annual mean didn’t exceed the AQO.

The Anchor Hill monitoring sites are located on a steep hill leading to a traffic light controlled junction. This site had a Detailed Assessment carried out in 2012 and a Further Assessment carried out in 2015. The results in the 2015 Further Assessment highlighted the need to consider options to reduce exposure of nearby residential receptors (Amec Foster Wheeler, 2015). Due to exceedances of the AQO at diffusion tubes AH and AH6 along Anchor Hill, it was recommended that the AQMA remain in place until further monitoring consistently records concentrations below the AQO. In 2016 there were no exceedance of the AQO at any of the sites within the Anchor Hill AQMA (AH, AH1, AH2, AH3, AH4, AH5, AH6 and LGR).

Before distance correction all four diffusion tubes along Guildford Road, recorded exceedances of the AQO in 2016 and 2015. The site Cott1 located at the end of Constitution Hill recorded exceedances in 2015. Monitoring has been undertaken at the site CH since 2012 and has records of exceedances for every year except 2014. After distance correction to nearest exposure, all sites on Guildford Road recorded NO_2 levels under the AQO in 2016.

LAQM (TG.16) guidance suggests that declaration of an AQMA should be provided in the ASR if the monitoring results are deemed sufficient to conclude on the risk of exceedance and the area likely to be affected. A Detailed Assessment in November 2016 indicated that concentrations at some receptor locations with relevant exposure were exceeding the AQO when contour plots were mapped. Consequently, this part of Guildford Road was declared an AQMA in May 2017. A map of the Guildford Road AQMA is included in Appendix D.

Analysis of UK continuous NO_2 monitoring data has shown that it is unlikely that the hourly mean NO_2 objective, of 18 hourly means over 200 µg/m^3, would be exceeded where the annual mean objective is below 60 µg/m^3. There was one exceedance of 60 µg/m^3 in 2015 at the diffusion tube located near the M25, which is not representative of human exposure. In 2016 no exceedances of 60 µg/m^3 have been recorded.

3.2.2 Particulate Matter (PM_{10})

No PM_{10} monitoring is undertaken in the Woking Borough Council area.

3.2.3 Particulate Matter ($PM_{2.5}$)

No $PM_{2.5}$ monitoring is undertaken in the Woking Borough Council area.

3.2.4 Sulphur Dioxide (SO_2)

No SO_2 monitoring is undertaken in the Woking Borough Council area.

Appendix A: Monitoring Results

Table A.1 – 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)
Cott1	Constitution Hill 1	Kerbside	500437	158120	NO_2	NO	3.0	1.0	NO	-
Cott2	Constitution Hill 1	Kerbside	500453	158100	NO_2	NO	15.0	1.0	NO	-
M25	M25	Other	505611	161180	NO_2	NO	N/a	0.0	NO	-
Church	Church Road	Kerbside	506401	160504	NO_2	NO	6.0*	1.0*	NO	-
RC	Rosebery Crescent	Kerbside	500946	157110	NO_2	NO	10.0	1.0	NO	-
AH	Anchor Hill 1	Kerbside	496618	158699	NO_2	YES	69.0	1.0	NO	-
AH2	Anchor Hill 2	Roadside	496615	158696	NO_2	YES	0.0	5.0	NO	-
AH3	Anchor Hill 3	Roadside	496646	158750	NO_2	YES	0.0	5.0	NO	-
AH4	Anchor Hill 4	Roadside	496679	158767	NO_2	YES	6.0	2.0	NO	-
AH5	Anchor Hill 5	Roadside	496594	158698	NO_2	YES	0.0	5.0	NO	-
AH6	Anchor Hill 6	Roadside	496587	158668	NO_2	YES	0.0	2.0	NO	-
LGR	Lower Guildford Rd	Roadside	496601	158668	NO_2	YES	0.0	3.0	NO	-
LD	Lincoln Drive	Kerbside	503244	159659	NO_2	NO	12.0	1.0	NO	-
VW	Victoria Way	Kerbside	500510	159030	NO_2	NO	N/a	1.0	NO	-

BD	Bitterne Drive	Roadside	498025	158949	NO_2	NO	6.0*	2.0*	NO	-
BR	Bagshot Road	Kerbside	495821	157793	NO_2	NO	15.0	1.0	NO	-
BR1	Bagshot Road	Roadside	495852	157188	NO_2	NO	21.0	1.5	NO	-
PR	Dartnell Avenue (previously Parvis Road)	Kerbside	504926	161063	NO_2	NO	12.0	1.0	NO	-
WL	Woodham Lane	Kerbside	502854	161062	NO_2	NO	31.0	1.0	NO	-
GR	Goldsworth Road	Kerbside	499952	158545	NO_2	NO	6.0	1.0	NO	-
MR	Monument Road	Roadside	501611	159645	NO_2	NO	4.0	2.0	NO	-
MR2	Monument Road	Roadside	501613	159646	NO_2	NO	18.0	2.0	NO	-
CW	Cavell Way	Roadside	496214	157989	NO_2	NO	5.0*	2.0*	NO	-
BW	Broadway	Kerbside	495874	157971	NO_2	NO	18.7	1.0	NO	-
CH	Constitution Hill 4	Roadside	500417	158102	NO_2	YES	4.0	1.5	NO	-
CH2	Constitution Hill 5	Kerbside	500367	158073	NO_2	YES	12.0	1.0	NO	-
CH3	Constitution Hill 6	Roadside	500330	158012	NO_2	YES	14.0	1.5	NO	-
CH4	Constitution Hill 7	Kerbside	500332	157983	NO_2	NO	17.0	1.0	NO	-
TC	The Cedars	Roadside	506731	161229	NO_2	NO	24.0*	4.0	NO	-
OR	Oriental Road	Roadside	501649	159148	NO_2	NO	26.0*	3.0	NO	-

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.

* Distances estimated from online mapping sources.

Table A.2 – 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 (µg/m³) (3)				
					2012	2013	2014	2015(4)	2016(4)
Cott1	Kerbside	Diffusion Tube	83	83	34.8	36	31	**40.7** (34.7)	23.6 (22.2)
Cott2	Kerbside	Diffusion Tube	100	100	24.9	27.4	17.8	24.9 (21.8)	33.9 (25.3)
M25	Other	Diffusion Tube	100	100	**50.4**	**52.1**	**50.3**	**61.0**	**51.4**
Church	Kerbside	Diffusion Tube	92	92	**41.1**	**43.9**	19.9	24.7 (22.1)	23.9 (21.2)
RC	Kerbside	Diffusion Tube	92	92	18.6	21.4	17.7*	16.5 (15.6)	16.6 (15.3)
AH	Kerbside	Diffusion Tube	100	100	35.1	**41.5**	37.1	**44.1**	36.0
AH2	Roadside	Diffusion Tube	100	100	**42.8**	36.5	29.1	36.7	34.9
AH3	Roadside	Diffusion Tube	100	100	30.4	30.7	20.7	27.1	23.3
AH4	Roadside	Diffusion Tube	100	100	33.3	32	24.6	34.5 (28.1)	31.6 (25.9)
AH5	Roadside	Diffusion Tube	100	100	15.5	32	26.3	34.0	29.4
AH6	Roadside	Diffusion Tube	100	100	-	32	33.5	**40.9**	34.7
LGR	Roadside	Diffusion Tube	100	100	-	32.3	25.2	32.0	26.2
LD	Kerbside	Diffusion Tube	100	100	21.7	19.8	16.3	20.7 (17.8)	18.7 (16.5)

VW	Kerbside	Diffusion Tube	100	100	37.8	**40.4**	27.4	**43.2**	35.7
BD	Roadside	Diffusion Tube	100	100	20.8	17.8	13.9	17.0 (16.0)	18.0 (16.5)
BR	Kerbside	Diffusion Tube	100	100	30.6	30.6	24.5	31.6 (21.4)	28.4 (19.7)
BR1	Roadside	Diffusion Tube	100	100	-	-	23.1*	26.2 (18.6)	24.4 (17.5)
PR	Kerbside	Diffusion Tube	100	100	25.7	26.8	23.3	28.4 (22.6)	25.9 (21.0)
WL	Kerbside	Diffusion Tube	92	92	31.7	33.3	26.4	29.0 (18.9)	30.5 (19.0)
GR	Kerbside	Diffusion Tube	100	100	30	32.2	23.6	26.8 (22.4)	27.3 (22.5)
MR	Roadside	Diffusion Tube	83	83	32.5	33.3	27.1*	35.0 (30.2)	37.8 (32.1)
MR2	Roadside	Diffusion Tube	100	100	-	34	29.3	35.7 (25.3)	32.5 (23.5)
CW	Roadside	Diffusion Tube	100	100	22.6	28.1	21.5	23.5 (20.5)	22.3 (19.5)
BW	Kerbside	Diffusion Tube	83	83	22.8	28	19.2	21.9 (16.8)	20.1 (15.7)
CH	Roadside	Diffusion Tube	100	100	**41.1**	**43.9**	34.2	**48.8 (40.4)**	**43.3** (36.2)
CH2	Kerbside	Diffusion Tube	100	100	**-**	**-**	**40.6***	**51.6** (34.9)	**47.6** (32.6)
CH3	Roadside	Diffusion Tube	100	100	**-**	**-**	37.9*	**51.5** (35.0)	**45.4** (31.6)
CH4	Kerbside	Diffusion Tube	100	100	**-**	**-**	34.5*	**42.4** (26.6)	**40.0** (25.2)
OR	Roadside	Diffusion Tube	100	100	**-**	**-**	**-**	**-**	27.6 (22.6)

TC	Roadside	Diffusion Tube	92	92	-	-	-	-	29.9 (21.6)

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

☒ **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.

(4) If applicable, annual means in brackets are distance corrected to nearest exposure.

*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.

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)														
													Annual Mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (0.94) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
Cott1	41	26	44	18	20	20	18	18	18	28			25.1	23.6	22.2
Cott2	30	32	47	32	32	34	34	32	35	34	45	46	36.1	33.9	25.3
M25	65	44	68	47	57	54	43	55	48	56	59	60	**54.7**	**51.4**	N/a
Church	31		36	22	23	20	18	22	21	26	31	30	25.5	23.9	21.2
RC	24	17	26	16	15	14	13	11	13		23	22	17.6	16.6	15.3
AH	58	26	48	34	45	36	33	28	24	34	44	50	38.3	36.0	N/a
AH2	47	43	47	31	33	38	40	24	25	34	39	44	37.1	34.9	N/a
AH3	32	19	25	25	23	21	20	23	20	21	31	38	24.8	23.3	N/a
AH4	41	22	32	22	28	26	23	42	44	47	48	29	33.7	31.6	25.9
AH5	34	32	38	30	29	28	27	25	33	27	36	36	31.3	29.4	N/a
AH6	51	44	39	34	43	32	33	25	35	30	41	36	36.9	34.7	N/a
LGR	36	32	31	25	26	28	34	20	10	24	34	34	27.8	26.2	N/a
LD	23	17	33	17	14	8	16	17	16	25	28	25	19.9	18.7	16.5
VW	45	35	38	28	43	38	34	35	33	41	44	42	38.0	35.7	N/a
BD	25	21	26	21	10	12	11	12	29	17	23	23	19.2	18.0	16.5

BR	38	25	39	29	29	24	25	27	21	34	45	27	30.3	28.4	19.7
BR1	30	22	31	22	24	16	20	18	28	30	30	41	26.0	24.4	17.5
PR	30	20	32	29	24	28	23	24	24	33	32	31	27.5	25.9	21.0
WL	37	30	40	32	28		30	29	24	32	42	33	32.5	30.5	19.0
GR	37	33	36	26	30	23	21	14	25	36	28	40	29.1	27.3	22.5
MR	45			26	45	40	30	35	36	54	48	43	40.2	37.8	32.1
MR2	50	30	45	30	32	30	30	30	26	41	30	41	34.6	32.5	23.5
CW	28	28	32	20	20	14	16	18	20	30	30	29	23.8	22.3	19.5
BW	28	24	28	16	15		15	12	16		31	29	21.4	20.1	15.7
CH	49	36	48	40	54	51	37	35	43	56	54	50	**46.1**	**43.3**	36.2
CH2	69	37	59	64	48	50	39	44	42	51	46	59	**50.7**	**47.6**	32.6
CH3	66	42	49	39	57	47	47	43	43	54	43	50	**48.3**	**45.4**	31.6
CH4	60	46	35	40	36	51	33	38	36	33	48	54	**42.5**	**40.0**	25.2
OR	37	35	41	24	29	29	19	22	18	31	37	30	29.3	27.6	22.6
TC		33	45	30	31	36	22	29	26	31	38	29	31.8	29.9	21.6

☐ **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 **bold and underlined.**

(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 factors

The diffusion tubes for 2016 were supplied by Lambeth Scientific Services, and prepared using a 50% triethanolamine (TEA)/Acetone method.

The bias adjustment factor has been taken from Defra's UK national bias adjustment spreadsheet (03/17 V2) and is based on the results of one study in the UK. As only one study was used, caution should be taken when using the bias correction factor produced. The bias adjustment factor for 2016 monitored data is 0.94. Table 3 below details the bias adjustment factors for the period 2012 through 2016 used to adjust the Woking monitoring data.

Table C1 – Bias adjustment factors

Year	National Bias Adjustment Factor
2012	0.91
2013	0.87
2014	0.80
2015	1.07
2016	0.94

QA/ QC of diffusion tube monitoring

Lambeth Scientific Services are a UKAS accredited laboratory, complying with the requirements of ISO/IEC 17025

Appendix D: Maps of Monitoring Locations and AQMAs

Figure 1 Location of non-automatic monitoring sites - West

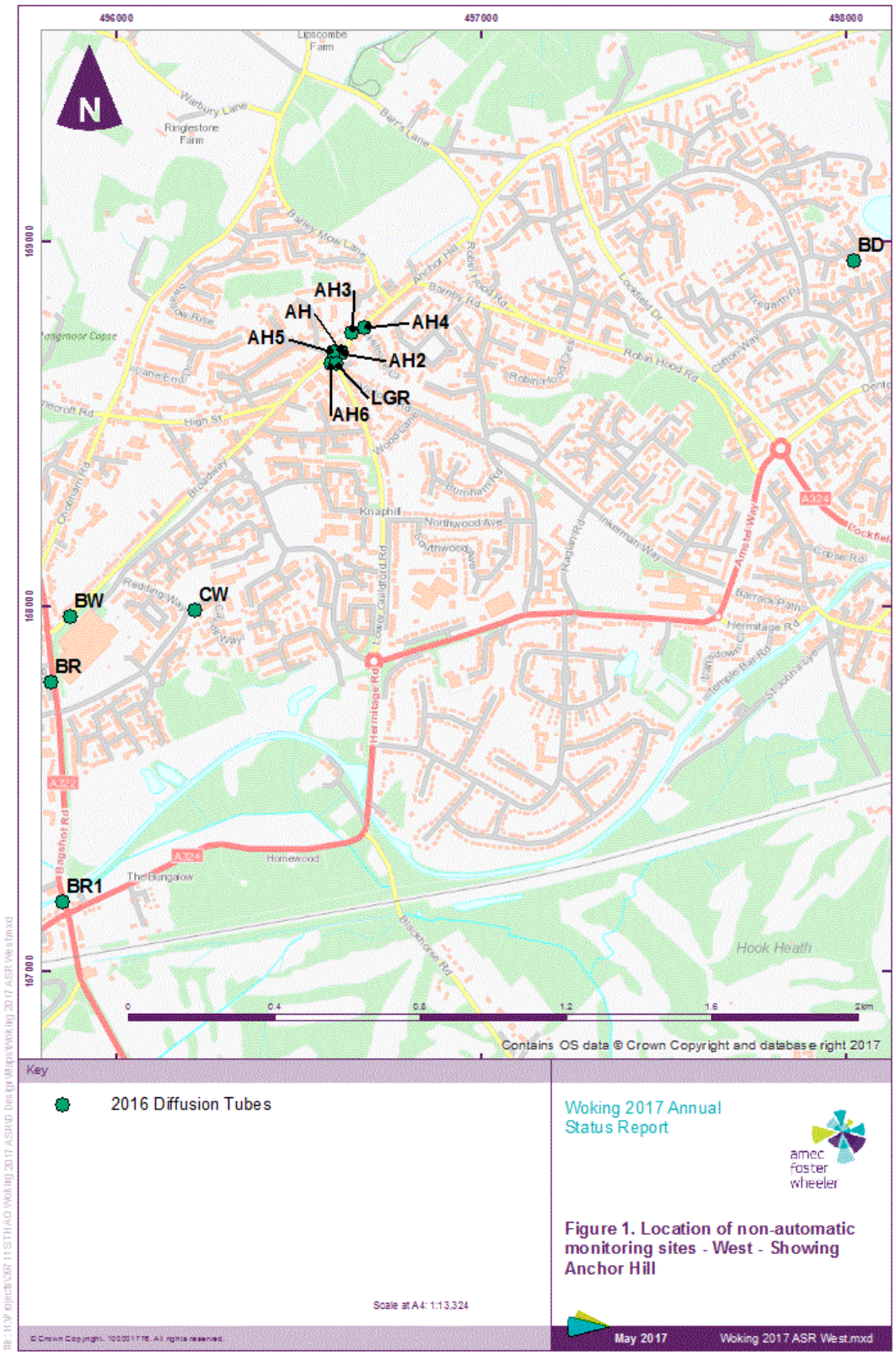


Figure 2 Location of non-automatic monitoring sites - East

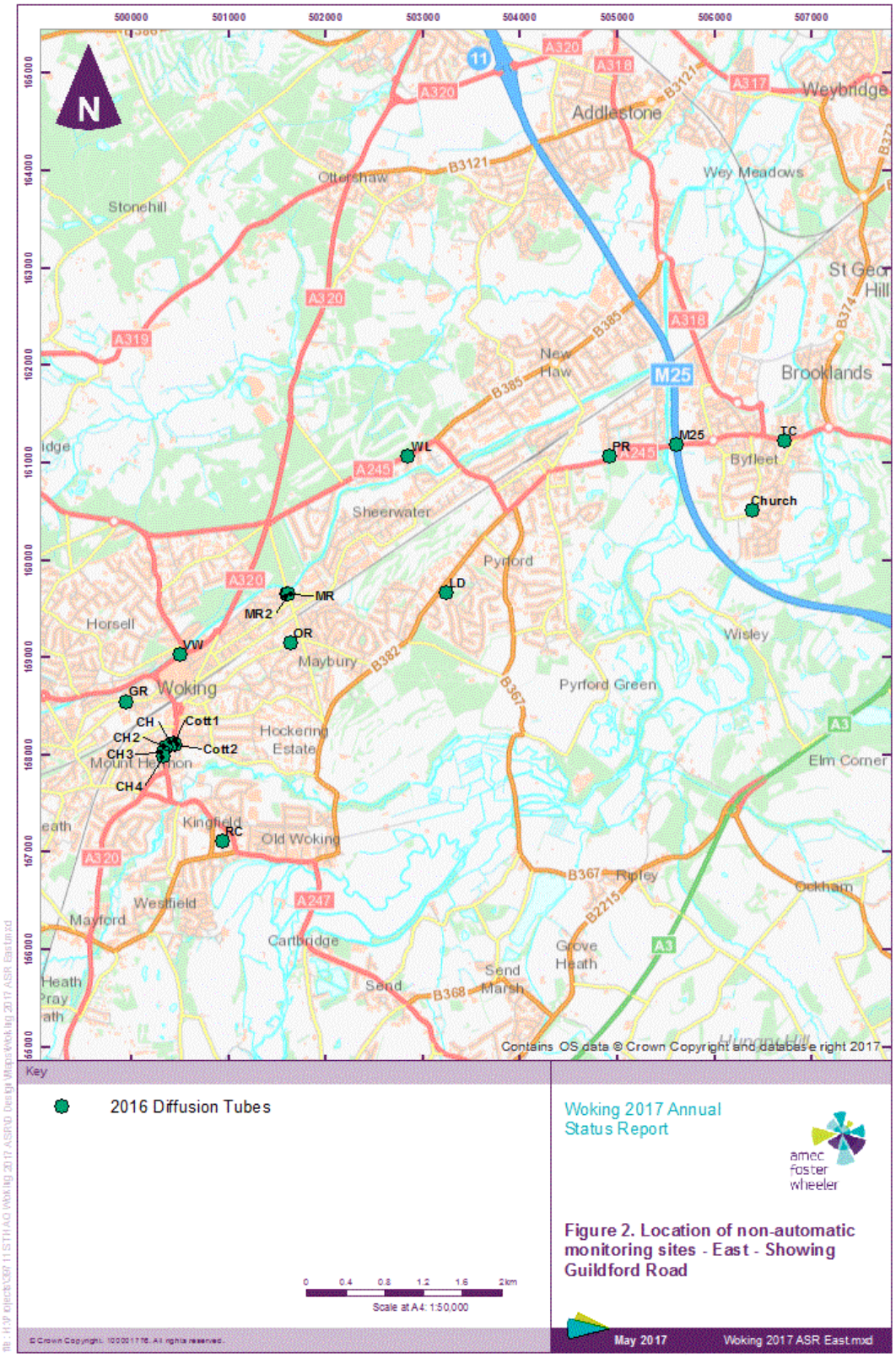


Figure 3 Anchor Hill AQMA boundary

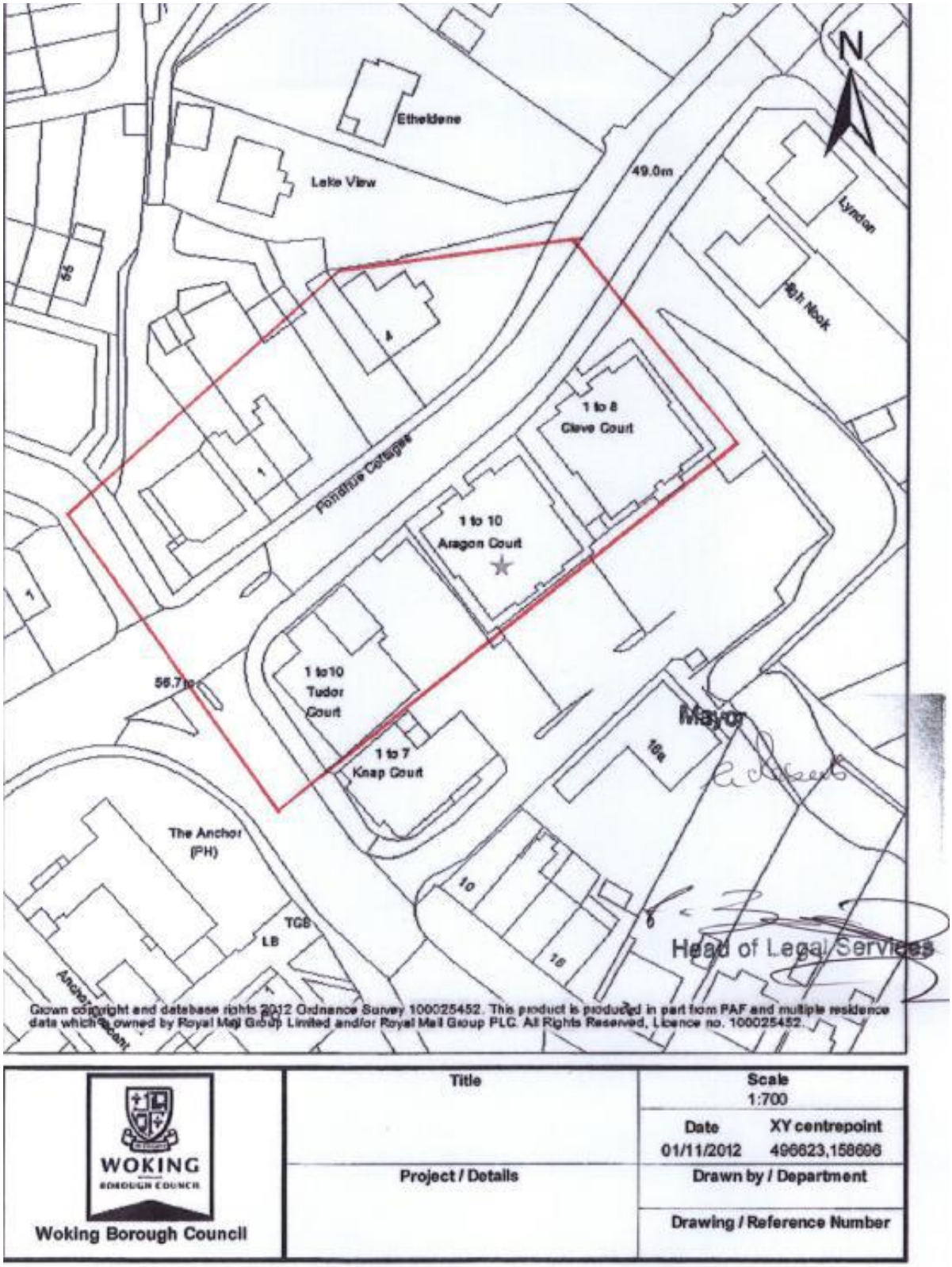
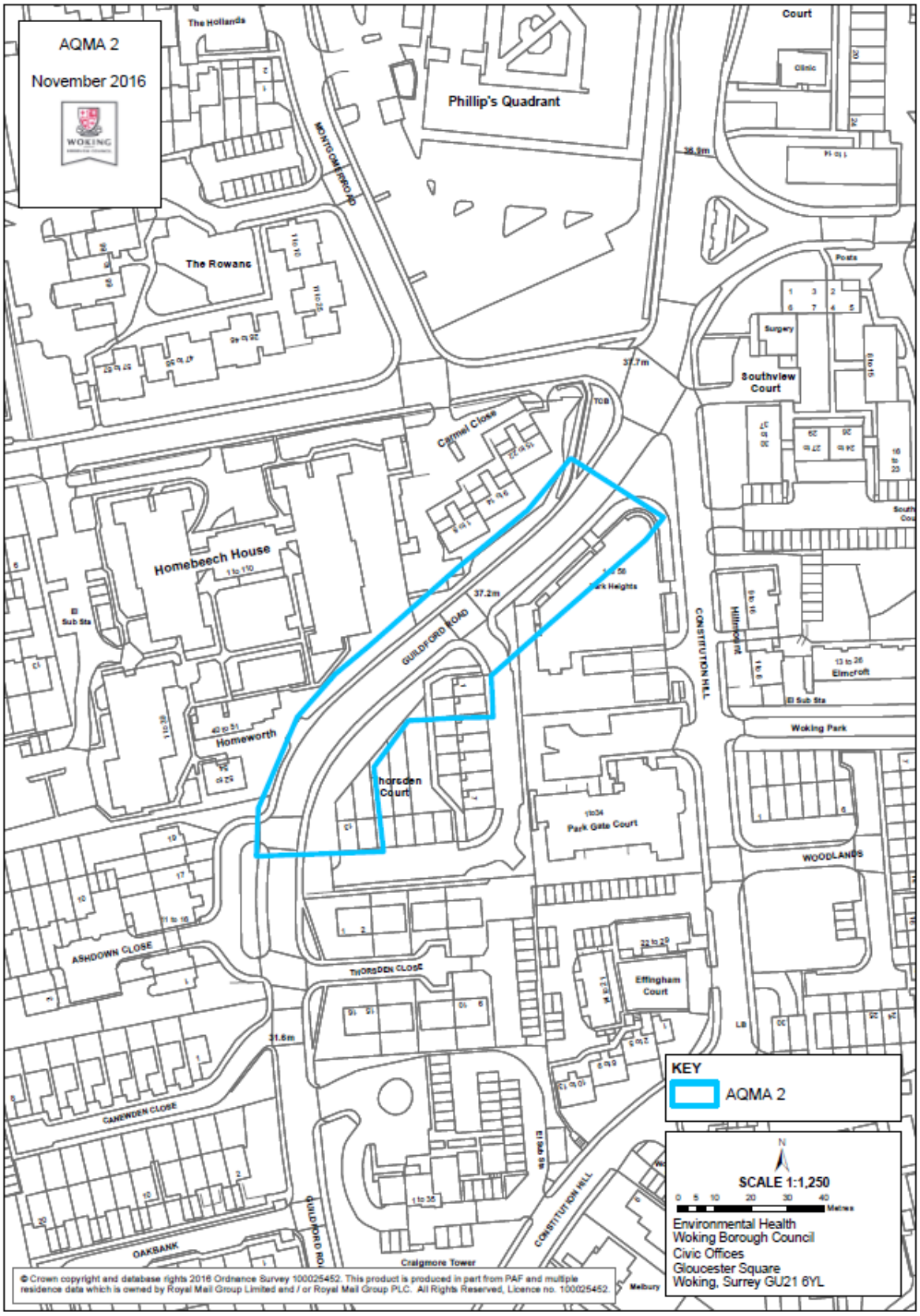


Figure 4 Guildford Road AQMA boundary



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
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
MOVA	Microprocessor Optimised Vehicle Actuation
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
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
SO_2	Sulphur Dioxide

References

Environmental equity, air quality, socioeconomic status and respiratory health (2010).

Amec Foster Wheeler Environment & Infrastructure UK Ltd (2015). Air quality further assessment for Woking Borough Council.

Amec Foster Wheeler Environment & Infrastructure UK Ltd (2015). Woking Borough Council – Anchor Hill AQMA – Air Quality Action Plan.

Defra (2006). Air quality and social deprivation in the UK: an environmental inequalities analysis.

Defra (2013). Abatement cost guidance for valuing changes in air quality.

Defra (2016). Local Air Quality Management Technical Guidance LAQM.TG (16).

Woking Council (2014). Air quality progress report for Woking Council.

Surrey County Council (2011). Surrey transport plan: Air quality strategy.