



WOKINGHAM
BOROUGH COUNCIL

2020 Air Quality Annual Status Report (ASR)

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

June 2020

Local Authority Officer	Charlie Fielder
Department	Public Protection Partnership
Address	Public Protection Partnership Theale Library Church Street Theale Berkshire RG7 5BZ
Telephone	01635 503242
E-mail	ehadvice@westberks.gov.uk
Report Reference number	WOKASR2020
Date	June 2020

Executive Summary: Air Quality in Our Area

Air Quality in Wokingham Borough

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 billion³.

The major source of air quality pollutants in Wokingham Borough is road transport, and the main pollutant of concern is nitrogen dioxide (NO₂). Three Air Quality Management Areas (AQMAs) have been declared for exceedances of the Annual Mean NO₂ Objective. These are located in Wokingham Town Centre, Twyford Village Centre Crossroads and along, and 60m either side of, the M4 throughout the whole of the borough (https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=318). (see Map 17 & 18)

The diffusion tube sites NO₂ levels in Wokingham, have shown a decreasing trend in NO₂ since the 2016.

The continuous monitoring unit in Peach Street Wokingham recorded an Annual Mean NO₂ level of 33.0µg/m³, which meets the Annual Mean NO₂ Objective (40µg/m³), although 1 diffusion tube located within the Wokingham Town Centre AQMA showed a slight exceedance with a NO₂ level of 41.8µg/m³, at site WOK838 Giggling Spring Shute End. The continuous monitor also met the 1 hour NO₂ objective.

Within the Twyford AQMA the continuous monitor recorded an Annual Mean NO₂ level of 29.9µg/m³, which also met the objective. However, only 1 diffusion tube triplicate site located within the Twyford Cross Road AQMA showed a slight exceedance with a NO₂ level of 42.8µg/m³ at site WOK (850, 887 & 888) 19 High Street. Which when

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

distance corrected was $41.9\mu\text{g}/\text{m}^3$ at a location of relevant exposure. The Twyford continuous monitor also met the 1 hour NO_2 objective.

Further, there were no exceedances of the Annual Mean NO_2 Objective from the monitoring sites within the M4 AQMA.

No diffusion tube results were recorded above $60\mu\text{g}/\text{m}^3$ which indicated no exceedances of the 1 hour NO_2 objective.

No extensions or amendments to the AQMAs are required nor any new AQMAs to be declared.

The preparation of the Air Quality Action Plans for Twyford and Wokingham AQMAs was published in March 2018, and is currently in the implementation stage.

Environmental Health (Public Protection Partnership (PPP)) has continued to work in conjunction with the Transport Policy Team with the implementation of Local Transport Plan 3 (2011 – 2026). The Plan acknowledges the link with the M4 AQMA and any future AQAP's. There is also a specific Policy on Air Quality (Policy LTP HW10) which states that the Council will continue to develop and implement our Draft Air Quality Action Plan in response to pollution caused by vehicle emissions. Furthermore, a key objective of the Strategic Environmental Assessment for LTP3 was to improve air quality. LTP Strategies continue to be reviewed. The Local Plan Update (2026-2036) has commenced following which the next Transport Vision review will take place along with the next LTP.

Actions to Improve Air Quality

All planning applications are scrutinised for their air quality impact and potential to introduce new receptors into areas of existing poor air quality in the borough. Air quality assessments have been provided where necessary and appropriate mitigation requested. Applications have included several major residential and mixed use residential and commercial schemes, traffic flow changes to road schemes, new relief road schemes and any other applications which may have an impact to the AQMAs and other hotspot locations.

Environmental Health Officers have received appropriate training in fulfilling their LAQM duties and are part of appropriate internal working groups to ensure that air quality impacts in specific projects or areas of highways works are considered.

Wokingham Borough Council

A joint application with Bracknell Forest and West Berkshire Councils to the Air Quality Grant Scheme 2018-19 was made but unfortunately was not successful in securing grant funding for the project of creating an anti-idling campaign. However My Journey within Wokingham Borough were successful and was awarded a Grant which is being put towards measure 10, 20, & 38 on the AQAP.

During Air Quality Day in 2019 Wokingham Borough erected banners in both Wokingham and Twyford to ask people to cut their engines and stop idling (see Figure S.1). A Green Lamp Post is being trialled in Twyford, and it is anticipated that the impact will be evaluated in the 2021 ASR (Figure S.2).



Figure S.1: Wokingham & Twyford Anti-Idling Banners

Conclusions and Priorities

One of Wokingham Borough Council's priorities is to "tackle traffic congestion in specific areas of the Borough" and one of its underpinning principles is to "improve health, wellbeing and quality of life".

The following local priorities have been set in Wokingham Borough:

Wokingham Borough Council

- Continuing the joint working between the Public Health and Environmental Health teams and links within the Berkshire Public Health Shared Team, considering the inclusion of air quality in the Public Health Work Plan and the Health and Wellbeing Strategy;
- Continuing to work within the unitary authority with the Transport Policy and Highways Teams;



Figure S.2: Twyford Green Lamp post.

- Continue the implementation of the AQAP for the Wokingham Town Centre and Twyford Crossroads;
- Increase the community awareness of air pollution through involvement in
- Continue the continuous monitoring in both Twyford and Peach Street and passive air quality monitoring programmes, also looking at alternative methods for reducing the NO₂.
- Working with new companies to start innovative project to help reduce NO₂ in 2020/21

Wokingham Borough Council

- Wokingham Borough Council would like to proceed with revocation of the M4 AQMA as this the third year it has been below the Annual Mean NO₂ Objective Level.

The following challenges have been identified:

- Budget allocation for progressing measures in the AQAP and actions however funding applications will be applied for where possible/appropriate; and
- Linking of the Public Health Outcome Framework and health profiles to air quality to show any causal relationship.

Local Engagement and How to get Involved

For further details on air quality in Wokingham Borough please refer to our website at <http://info.westberks.gov.uk/index.aspx?articleid=27513>.

- Visit our My Journey website - Your one stop destination for travel information and advice in and around Wokingham borough: <http://www.myjourneywokingham.com/>
- Individuals or members of local groups are invited to share any ideas they have to cut NO₂ levels in Wokingham Borough by emailing:

environmental.health@wokingham.gov.uk

Other useful websites include:

<https://uk-air.defra.gov.uk>

<http://jsna.wokingham.gov.uk/people-and-places/environmental-health-andlicensing>

- There are a number of ways members of the public can help to improve local air quality: Walk or cycle short distances of less than one or two miles rather than driving
- Search for car sharing opportunities using the Liftshare UK <https://liftshare.com/uk> or Faxi (<https://faxi.co.uk/>)
- Use the bus or train regularly and keep up-to-date with the latest bus routes timetables.

Table of Contents

Executive Summary: Air Quality in Our Area.....	i
Air Quality in Wokingham Borough	i
Actions to Improve Air Quality	ii
Conclusions and Priorities	iii
Local Engagement and How to get Involved	v
1 Local Air Quality Management.....	1
2 Actions to Improve Air Quality.....	2
2.1 Air Quality Management Areas.....	2
2.2 Progress and Impact of Measures to address Air Quality Wokingham Borough.....	5
2.3 PM _{2.5} – Local Authority Approach to Reducing Emissions and/or Concentrations.....	13
3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance.....	16
3.1 Summary of Monitoring Undertaken	16
3.1.1 Automatic Monitoring Sites	16
3.1.2 Non-Automatic Monitoring Sites.....	16
3.2 Individual Pollutants	16
3.2.1 Nitrogen Dioxide (NO ₂).....	17
3.2.2 Particulate Matter (PM ₁₀).....	21
3.2.3 Particulate Matter (PM _{2.5}).....	21
3.2.4 Sulphur Dioxide (SO ₂)	22
Appendix A: Monitoring Results	23
Appendix B: Full Monthly Diffusion Tube Results for 2019.....	40
Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC	45
Appendix D: Map(s) of Monitoring Locations and AQMAs	59
Map D.3: A map of the Twyford Cross Roads AQMA	61
Map D.4: A map of the M4 AQMA, including Tube location and Annual Mean NO ₂ concentrations	62
Map D.5: A map of the Wokingham Town Centre AQMA, including Tube location and Annual Mean NO ₂ concentrations	63
Map D.6: A map of the Twyford Cross Roads AQMA, including Tube location and Annual Mean NO ₂ concentrations.....	64

Map D.7: A map of the Diffusion Tubes in Sonning, sites 19 & 829.....	65
Map D.8: A map of the Diffusion Tubes in On Henley Bridge, site 509.....	66
Map D.9: A map of the Diffusion Tubes outside the Wokingham Town AQMA, sites 805 & 803	67
Map D.10 - A map of the Diffusion Tube, sites 827	68
Map D.11: A map of the Diffusion Tube, sites 883.....	69
Map D.12: A map of the Diffusion Tube, sites 817	70
Map D.13 A map of the Diffusion Tube, sites 825	71
Map D.14: A map of the Diffusion Tube, sites 891	72
Map D.15: A map of the Diffusion Tube, sites 866, and the close proximity to the Wokingham AQMA.....	73
Map D.16: A map of all the Diffusion Tube Sites in Wokingham Borough Council	74
Map D.17: A map of all the AQMA's in Wokingham Borough Council.....	75
Map D.18: A map of all the AQMA's in Wokingham Borough Council (closer up)	76
Map D.19: A map of all the Monitoring Sites & AQMA's in Wokingham Borough Council.	77
Appendix E: Summary of Air Quality Objectives in England.....	78
Glossary of Terms	79

List of Tables

Table 2.1 – Declared Air Quality Management Areas.....	3
Table 2.2 – Progress on Measures to Improve Air Quality	9
Table 2.3 - Showing the Fraction of Mortality attributable to particulate air pollution indicators value within Berkshire.....	13
Table 2.4 - A Pie Chart showing both the Primary and Secondary sources of PM _{2.5}	15
Table A.1 - Details of Automatic Monitoring Sites.....	233
Table A.2 – Details of Non-Automatic Monitoring Sites	244
Table A.3 – Annual Mean NO ₂ Monitoring Results	299
Table A.4 – 1-Hour Mean NO ₂ Monitoring Results	399
Table B.1 - NO ₂ Monthly Diffusion Tube Results – 2019.....	40
Table C.1 - Wokingham Town Centres Recalculated Concentrations.....	49
Table C.2 - Twyford Village Cross Roads Recalculated Concentrations.....	48
Table C.3 - Corrected Data presented at the end of Q1 2019	49
Table C.4 - Data presented for Q1 in the Annual Report 2019.....	49

Table C.5 - Annualisation of data	57
Table C.6 - Showing the Annualised Mean calculations.....	57
Table C.7 - Showing the Annualised NO ₂ Means calculations.....	58
Table E.1 – Air Quality Objectives in England	78

List of Figures

Figure S.1 - Wokingham & Twyford's Anti-Idling Banners.....	iv
Figure S.2 - Twyford's Green Lamp post.....	iv
Figure 3.1 - Wokingham Daily NO ₂ 2019.....	18
Figure 3.2 - Twyford Daily NO ₂ 2019.....	19
Figure A.1 – Trends in Annual Mean NO ₂ Concentrations.....	35
Figure A.1.1 - This graph shows the trends in Annual Mean NO ₂ Concentrations in the M4 AQMA.....	35
Figure A.1.2 -This graph shows the trends in Annual Mean NO ₂ Concentrations in the Wokingham AQMA.....	36
Figure A.1.3 - This graph shows the trends in Annual Mean NO ₂ Concentrations in the Twyford AQMA.....	37
Figure A.1.4 - This graph shows the trends in Annual Mean NO ₂ Concentrations in Wokingham borough.....	38
Figure C.1 – Nitrogen Dioxide AIR PT 2019.....	52
Figure C.2 - Precision & Accuracy of the Triplicated Tubes for Wokingham Town Centre.....	56
Figure C.3 – Precision & Accuracy of the Triplicated Tubes for Twyford village Cross Roads.....	56
Figure C.4 – Distance correction	58

1 Local Air Quality Management

This report provides an overview of air quality in Wokingham Borough during 2019. 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 Wokingham Borough 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 (AQMA) 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 compliance with the objectives.

A summary of AQMA declared by Wokingham Borough can be found in Table 2.1. Further information related to declared or revoked AQMA, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=318

Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMA, which provides maps of air quality monitoring locations in relation to the AQMA(s).

There are no proposals to declare a new AQMA. There are no proposals to amend any of the AQMA.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objective	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		
						At Declaration		Now		Name	Date of Publication	Link
M4 AQMA	Declared 2001, Amended 2004 (WOK 841)	NO ₂ Annual Mean	Wokingham borough	Zone 60m either side of the M4 from Council's boundaries with RBC & RBW&M throughout the borough and 10m either side of the A329(M)/A3290 The AQMA was reduced to the Council's boundaries with RBC & RBW&M throughout the borough and 10m either side of the A329(M)/A3290 including an extended area along the A329 Reading Rd, where it underpasses the M4.	YES	69 (2001), 56 (2004)	µg/m ³ µg/m ³	0	Exceedances (met objective as Annual mean of 39.1 µg/m ³)	refer LTP3		http://www.wokingham.gov.uk/parking-road-works-and-transport/transport-and-roads-guidance-and-plans/?categoryesctf91f252ff-550d-4cfa-a838-92ef2cb5f83c=7749

Wokingham Borough Council

M4 AQMA	Declared 2001, Amended 2004	NO ₂ 1 Hour Mean	Wokingham borough	Zone 60m either side of the M4 from Council's boundaries with RBC & RBW&M throughout the borough and 10m either side of the A329(M)/A3290	YES	228 (percentile of hourly means)		N/A				
Twyford Crossroads AQMA	Nov-15	NO ₂ Annual Mean	Twyford	Residential and commercial properties along parts of High St in the west, Wargrave Rd in the northwest, London Rd in the north-east and Church St the south-east.	NO	54	µg/m ³	41.9	µg/m ³ (average triplicate at location of relevant exposure) <i>(19 High Street - Triplicate Site)</i>	WBC AQAP 2017	Mar-18	http://info.westberks.gov.uk/CHttpHandler.ashx?id=45385
Wokingham Town Centre AQMA	Dec 2015 (WOK838)	NO ₂ Annual Mean	Wokingham	Residential and commercial properties along a small part of Reading Rd and Station Rd in the northwest, along Shute End and into Broad St and Denmark St in the south-west and Peach St into London Rd in the west.	NO	52	µg/m ³	41.8	µg/m ³	WBC AQAP 2017	Mar-18	http://info.westberks.gov.uk/CHttpHandler.ashx?id=45385

☒ Wokingham Borough 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 Wokingham Borough

Defra's appraisal of last year's ASR concluded:

- The Council present several figures displaying the location of monitoring sites and the AQMA boundary. In addition to this it would be beneficial for the Council to include one figure with all the monitoring locations and AQMA boundary. This way the reader can gauge how the monitoring locations relate spatially to one another. (See Map 19).
- The Council have stated that they wish to consider the revocation of the M4 AQMA due to continued low levels of NO₂. It is recommended that at least 3 full years of continued compliance are achieved before AQMA revocation, this report concludes year 2.

Wokingham Borough Council would like to revoke the M4 AQMA as it can now show 3 years of continual compliance.

- It would be useful if Section 2.3 could make reference to the Public Health Outcomes Framework, and the local indicator for PM_{2.5} in the district. [The Council may wish to consider comparing the '3.01 - Fraction of mortality attributable to particulate air pollution indicator' value for Wokingham to nearby LAs and National indicator values. This can be found in the link below.
<https://fingertips.phe.org.uk/profile/public-health-outcomesframework/data#page/0/qid/1000043/pat/6/par/E12000005/ati/101/-are/E07000194>]

Wokingham Borough has taken forward a number of direct measures during the current reporting year of 2019 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 their respective Action Plans LTP3. Key completed measures are:

- Construction on phase two of the Winnersh Relief Road to connect the B3030 King Street Lane to the A329 Reading Road, is underway and should be complete in early 2021. This is part of the Council's multi million pound strategic new roads

programme, which is being built to assist in improving network resilience to support the growth of the borough.

- Information on the My Journey website has been refreshed in relation to electric vehicles and car clubs. Our personalised travel planners contacted over 470 new homes in the Wokingham Town area providing information on the local car club and offering a voucher for reduced membership fees and an introductory fuel offer. Our existing Electric Vehicle (EV) charge points have been reviewed and greener energy procured; agreements with charge point suppliers are being reviewed to ensure ease of use and maximum availability for users.
- Promotion of active travel and travel choices via the My Journey website is on-going, in 2019/20 we refreshed the website to make it easier to find mode specific travel information. There were 54,000 visitors to the website which represents 9% increase on the previous year. We have continued to promote active travel through our social media feeds, and introduced social competitions as a new way to engage with our residents. Our Facebook followers increased 14-fold in 2019/20 with our top post reaching 5,362 people.

My Journey has partnered with Love to Ride and ran four cycling campaigns across the borough in 2019/20. Cycle September saw over 7,500 interactions on our Love to Ride Facebook posts across the month. 209 residents and employees registered on the platform during the campaign, logging 17,358 miles cycled and saving the equivalent of 1,819 CO₂ (kg) compared to the equivalent car trips. Follow-up research show 22% of all riders taking part in cycle September were riding more regularly six months after the challenge.

- The Thames Valley Park and Ride development site is constructed and awaiting use. The provision of the park and ride bus has been put on hold given the impact of COVID-19 on working patterns and bus travel. The council are currently looking at opportunities to use the site as part of a temporary active travel plan for the area.
- Progress with the East Reading Mass Rapid Transit project is currently on-hold given the current situation with COVID-19 on bus travel. This scheme maybe reviewed as a more multi-mode scheme to help lock-in active travel habits.

My Journey data has shown the following key statistics:

- between 2016 and 2019 there has been a 30% increase in residents indicating they cycle at least once/week and a 8% increase in walking once/week
- In 18/19 we trained 1,737 children in Bikeability hitting our local transport plan target for 2026 of training 80% of year six children in Bikeability.
- In 2018/19 bus passengers increased to 2.8 million passenger journeys in the borough, our largest percentage increase in the past 10 years. We also had the fourth highest percentage increase in bus passenger numbers in England outside of London.
- The growth of ultra-low emission vehicles in WBC is 155% compared to 149% in the south-east from 2015/16 to 2017/18, with over 2269 in 2018/19 compared to 1468 in 2017/18.

Wokingham Borough expects the following measures to be completed over the course of the next reporting year:

- The appointment of an Eco-Travel officer to work with schools.
- Continued promotion of Active Travel through the My Journey platforms.
- The introduction of temporary measures to encourage walking and cycling in Wokingham Town Centre.
- Development of EV strategy and implementation of EV charge points as appropriate to help increase the uptake of EV in the borough.
- Continual working with Public Health Colleagues, My Journey Colleagues, Climate Change Colleagues, and Transport & Planning Officers.
- Wokingham Borough's priorities for the coming year are as per the 2020 measures above.
- The principal challenges and barriers to implementation that Wokingham Borough anticipates facing are related to resources and lack of funding to progress and implement more actions.
- Progress on the following measures has been slower than expected due to resources and lack of funding to implement more actions.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Wokingham Borough anticipates that further additional measures, not yet prescribed, may be required in subsequent years to achieve compliance and enable the revocation of the Twyford Crossroads and Wokingham Town Centre AQMAs.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1 AQAP Twyford 1	Investigate the feasibility of alternative traffic routes around Twyford	Transport Planning and Infrastructure	Other	2017-2019	WBC	WBC	Feasibility study carried out.	12.1 µg/m3	Local Plan update is ongoing. This will make recommendation regarding development and supporting infrastructure needs.	Local Plan Update process will conclude in 2020/21	Aim for some through traffic avoided through AQMA.
2 AQAP Twyford 2	Twyford Railway station 1. consider access for vehicles, taxis, cyclists and pedestrians. 2. consider integration of public transport . 3. consider car parking and cycling provisions	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services	2017-2019 onwards	WBC, GWR, Twyford PC	WBC, GWR, Twyford PC	Changes incorporated.	12.1 µg/m3	Preliminary studies have been undertaken by GWR & WBC to understand costs and option available for development. Bid for funding submitted to GWR and LEP to help implement measures	Long term project	To work with all partners to further promote and encourage sustainable transport to and from stations, this includes soft measures as well as infrastructure delivery.
3 AQAP Twyford 3	Review cycle paths	Transport Planning and Infrastructure	Cycle network	2016-2018	WBC	WBC	Increase in usage.	12.1 µg/m3	Ongoing project	Ongoing project	Cycleway delivery is part of the yearly capital programme
4 AQAP Twyford 4	investigate options of A4 and A3032 junction at Hare Hatch	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2018/2019	WBC	WBC	Investigation carried out.	12.1 µg/m3	No progress to date. Budget needs to be agreed and allocated.	2018/19	Traffic more likely to travel east of village so avoiding AQMA
5 AQAP Twyford 5	Continue to monitor traffic lights and crossings to maximum efficiency and consider their functionality including left turns and peak hour use	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	tbc	WBC	WBC	Review of phases with traffic flow data and real time air quality data	12.1 µg/m3	TRL conducting an investigation to look at impact on AQ, and to see if feasible –results April 2020.	tbc	Dependant on the results from TRL. Determine effect on air quality with different phases. Linked with traffic monitoring to be set up and new continuous monitoring due to commence January 2019.
6 AQAP Twyford 6	Carry out feasibility study for Low Emission Zone for the crossroads	Promoting Low Emission Transport	Low Emission Zone (LEZ)	tbc	WBC	WBC	Feasibility study carried out.	12.1 µg/m3	TRL conducting an investigation to look at impact on AQ, and to see if feasible –results April 2020	2020/2021	Dependant on the results from TRL. Business case for a LEZ needs developing. Consider implications of the transfer of Criminal Parking Enforcement powers to Local Highway Authority.
7 AQAP Twyford 7	Review of bus fleet and consider alternative fuels.	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	2016/2017	Bus companies as contracted by WBC	Bus companies as contracted by WBC	Increase in number of buses run on alternative fuels.	12.1 µg/m3	2017 RTL run hybrid buses. CNG all low emission. . Courtney Buses Contract to be retendered in 2021 for implementation 2022	Ongoing with other operators	Reducing emissions within AQMA.
8 AQAP Twyford 8	Install "Cut Pollution. Turn off your engine" signs when queuing traffic at traffic lights.	Public Information	Other	2018-2019	WBC	WBC	Drivers to follow advice.	12.1 µg/m3	Programmes of signing to be included in Highways capital programme	2019-2020	Temporary banners were installed ahead of Clean Air Day in June 2019.
9 AQAP Twyford 9	Consider feasibility of Park and Ride strategy for Twyford	Alternatives to private vehicle use	Bus based Park & Ride	2017-2019	WBC	WBC	Feasibility study carried out.	12.1 µg/m3	No progress to date. Budget needs to be agreed and allocated	tbc	A study needs to be undertaken, including the business case.

10 AQAP Twyford 10	School Travel Plans (Mode Shift Stars)	Promoting Travel Alternatives	School Travel Plans	2016	WBC	WBC	Continue to be developed and reviewed.	12.1 µg/m3	Ongoing – DEFRA funding awarded to employ an Eco-Travel officer for schools in 2020/2021 to accelerate mode shift	Open ended	Reduction in cars travelling through AQMA, COVID-19 and schools phased return.
11 AQAP Wok TC 1	Intelligent traffic signals at Shute End	Traffic Management	Strategic highway improvements, Re- prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	tbc	WBC	WBC	Installation of MOVA.	15.5µg/m3	No progress to date, budget needs to be agreed and allocated	tbc	Intelligent signals are more costly than regular signals and budget will have to be allocated.
12 AQAP Wok TC 2	Consider speed reduction through town centre	Traffic Management	Reduction of speed limits, 20mph zones	tbc	WBC Highways, TVP	WBC Highways, TVP	tbc	15.5µg/m3	No progress to date	tbc	Requires TRO supported by TVP. Consider design speed as well as speed limit. Traffic travels at approx. 20mph.
13 AQAP Wok TC 3	Review traffic routes in town centre and consider if any roads require restricted access	Traffic Management	Strategic highway improvements, Re- prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	ongoing	WBC	WBC	Review carried out.	15.5µg/m3	No progress to date, business case needs to be developed	tbc	This action requires a major remodelling of the highway. Scenarios will have to be modelled to ensure that the problem is not simply transferred to another part of the network.
14 AQAP Wok TC 4	North Wokingham Distributor Road	Traffic Management	Strategic highway improvements, Re- prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	completed	WBC	WBC	Completion.	15.5µg/m3	Under construction	2020-2021	Includes bus stops and cycleways.
15 AQAP Wok TC 5	South Wokingham Distributor Road	Traffic Management	Strategic highway improvements, Re- prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	commenced	WBC	WBC	Completion.	15.5µg/m3	Commenced at Montague Park	2020 -2021	Includes bus stops and cycleways.
16 AQAP Wok TC 6	Reconfiguration of Shute End / Broad Street / Rectory Road junction	Traffic Management	Strategic highway improvements, Re- prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	tbc	WBC	WBC	Reduction in NO ₂	15.5µg/m3	No progress to date, business case needs to be developed	tbc	Land available at Shute End is limited to provide any new solution.
17 AQAP Wok TC 7	Consider outcome of feasibility study of improvements to Rectory Road / Wiltshire Road	Traffic Management	Strategic highway improvements, Re- prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	tbc	WBC	WBC	Feasibility study carried out.	15.5µg/m3	No progress to date, business case needs to be developed	tbc	Historically there have been a number of studies into this location and land availability has always been a limiting factor.
18 AQAP Wok TC 8	Active management of car parking	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	completed	WBC	WBC	Implementation.	15.5µg/m3	Introduction of Civil Parking Enforcement 2018.	2018	This actively manages car parking in the town centre and across the borough.
19 AQAP Wok TC 9	Alternative arrangement for access to car parks	Traffic Management	Other	2017/18	WBC	WBC	Implementation.	15.5µg/m3	This is part of the Town Centre regeneration process	tbc	Parking strategy e.g. Easthampstead Road carpark.

20 AQAP Wok TC 10	Workplace and School travel planning	Promoting Travel Alternatives	School Travel Plans	commenced	WBC	WBC (My Journey won DEFRA AQ Gran)	Continue to implement number of plans.	15.5µg/m3	Long standing programme of school travel plans, DEFRA funding awarded for Eco-Travel Officer and Beat the Street in Wokingham AQAP in 2020/2021	My Journey Wokingham is a long standing project Beat the Street Spring / Summer 2021	Modal shift starts programme. COVID-19 and phased return to schools and workplaces.
21 AQAP Wok TC 11	Residential travel planning	Promoting Travel Alternatives	Personalised Travel Planning	commenced	WBC	WBC	Continue to implement number of plans.	15.5µg/m3	Programme started 2017/18	My Journey Wokingham is a long standing project	Personalised travel planning promoting the benefits of sustainable travel.
22 AQAP Wok TC 12	Carry out feasibility study for Low Emission Zone	Promoting Low Emission Transport	Low Emission Zone (LEZ)	tbc	WBC	WBC	Feasibility study carried out.	15.5µg/m3	No progress to date, business case needs to be developed	tbc	This action also requires transport modelling to understand likely impacts.
23 AQAP Wok TC 13	Park and Ride for Wokingham Town Centre	Alternatives to private vehicle use	Bus based Park & Ride	2016-2018	WBC	WBC	Installation and number of journeys.	15.5µg/m3	Outline plans being developed	Dec-19	Using RTLs existing hybrid buses (Lion 4).
24 AQAP generic 1	Review locations and publication of EV charging points and increase provision	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	tbc	WBC	WBC	Number of charging points	15.5µg/m3	No progress to date, business case needs to be developed	tbc	Preparing for the future will increase in update of EV use. Decrease in car emissions. Mitigation at planning stage within the new local plan.
25 AQAP generic 2	Consider implementation of parking charge related to vehicle type e.g. free for electric	Promoting Low Emission Transport	Priority parking for LEV's	tbc	WBC	WBC	Policy agreed and implemented.	15.5µg/m3	No progress to date	tbc	Encouraging residents and commuters to consider EV vehicle.
26 AQAP generic 3	Low emission vehicles - consider implementation in Council contracts / fleet cars etc. EV pool cars for WBC staff	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	16/17	WBC	WBC	Vehicle usage.	15.5µg/m3	WBC EH and TP/WSP have zero emission and hybrid company vehicles	tbc	Requirements to have low and zero emission vehicles and plant need to be included in any new WBC let contract.
27 AQAP generic 4	Consider removal of on street parking to provide more space for cycle lanes, EVs, Car clubs, provision of on street charging points	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	tbc	WBC	WBC	tbc	15.5µg/m3	No progress to date	tbc	This action would be considered politically and economically sensitive.
28 AQAP generic 5	No idling signs - for buses and taxis in waiting areas and at level crossings	Traffic Management	Anti-idling enforcement	2018-19	WBC	WBC	Number of signs installed.	15.5µg/m3	Cut engine banners to be installed in 2019-2020	2019-2020	Enforcement will require TVP assistance.
29 AQAP generic 6	Roadside emission testing, detecting and fining polluting vehicles	Traffic Management	Testing Vehicle Emissions	tbc	WBC, TVP	WBC, TVP	Number of vehicles failed.	15.5µg/m3	No progress	tbc	Link with work by Trading Standards re overloaded vehicles, will require implementation of legislation.
30 AQAP generic 7	Improvement of cycle routes to ensure continuous and integrated	Transport Planning and Infrastructure	Cycle network	17/18	WBC	WBC	Length of cycle ways provided.	15.5µg/m3	Ongoing	Ongoing	Capital funding for improvements and updating cycle network borough wide.
31 AQAP generic 8	Residential Travel Planning	Promoting Travel Alternatives	Personalised Travel Planning	2016/17	WBC	WBC	Number of plans.	15.5µg/m3	Programmed started 2017/18	Open ended	PTP promoting the benefits of sustainable transport through My Journey project. Linked to future development.
32 AQAP generic 9	Encourage WBC staff to travel more sustainably	Promoting Travel Alternatives	Workplace Travel Planning	2017	WBC	WBC	Increase in commuting by alternative means.	15.5µg/m3	WBC offices have adopted a travel plan	Ongoing	WBC offices have adopted a travel plan that is supported by My Journey Wokingham project.

33 AQAP generic 10	Secure and sheltered bike parking provision	Promoting Travel Alternatives	Promotion of cycling	ongoing	WBC	WBC	Provided	15.5µg/m3	Ongoing	Ongoing	2019 - Aside from Travel Plan requirements there is a planning policy requirement to provide parking – including cycle storage – in line with standards so all development will include appropriate provision (including shelter for long-term storage - i.e. residential, employee.)
34 AQAP generic 11	Partnership with Sustrans	Promoting Travel Alternatives	Promotion of cycling	2016	WBC	WBC	Number of events.	15.5µg/m3	Officer started in 2016 as part of My Journey Wokingham project	2020/21	Active Travel Officer promotes all forms of sustainable transport doing public demonstrations and events.
35 AQAP generic 12	Promoting active travel via My Journey website	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2017	WBC	WBC	Projects implemented.	15.5µg/m3	Variety of projects implemented	Ongoing	Ongoing.
36 AQAP generic 13	Thames Valley Park and Ride	Alternatives to private vehicle use	Bus based Park & Ride	2016-17	WBC/RBC	WBC/RBC	Opening of scheme.	15.5µg/m3	Planning permission granted 2017	2019	Delivered in partnership with RBC and funded through the Local Growth Fund.
37 AQAP generic 14	Provision of car clubs with or without Evs	Alternatives to private vehicle use	Car Clubs	2015 feasibility study	WBC	WBC	Usage of vehicles.	15.5µg/m3	1 car club operational at Montague Park	Ongoing	Developers required to deliver car clubs as part of their commitments to residential travel plans.
38 AQAP generic 15	Awareness campaign for the risks of poor air quality and promoting active and sustainable travel	Public Information	Via other mechanisms	2017/18	WBC PH	WBC PH	Increased awareness.	15.5µg/m3	My Journey Wokingham promoting active travel and using social media to raise awareness of Clean Air Day – DEFRA funding secured to add air quality page to My Journey website in 2020/21	Yearly	Use apps or technology to show people how to avoid exposure to pollution.
39 AQAP generic 16	Air Quality included in to JSNA and Health and Wellbeing Strategy	Policy Guidance and Development Control	Other policy	2016/17	WBC, PH Berkshire	WBC, PH Berkshire	Inclusion in JSNA reviews and Health and Wellbeing Strategy.	15.5µg/m3	JSNA due for publication March 2019 and considers air quality. Active transport is a priority for the HWBS.	2018	Link with Director of Public Health for Berkshire.
40 AQAP generic 17	New Local Plan and LTP4 - Sustainable Transport, include EV charging points for new developments	Policy Guidance and Development Control	Other policy	tbc	WBC Planning and PH	WBC Planning and PH	Implementation.	15.5µg/m3	Public Health and Planning teams working together on Local Plan and LTP	tbc	PH team must make the correct representation to support the Planning Policy team through the EIP process, proving it is not an unnecessary burden on developers.
41 AQAP generic 18	Linking with Highway Asset Management Plans	Policy Guidance and Development Control	Other policy	tbc	WBC	WBC	tbc	15.5µg/m3	No progress	tbc	
42 AQAP generic 19	Neighbourhood Development Plans to consider air quality	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	tbc	WBC with town and parish councils	WBC with town and parish councils	Inclusion in plans.	15.5µg/m3	No progress	tbc	Inform Parish and Town Councils.
43 AQAP generic 20	Freight Management Plan	Freight and Delivery Management	Delivery and Service plans	2019/20	WBC	WBC	Review and implementation.	15.5µg/m3	No progress to date, business case needs to be developed	tbc	Consider freight access to town centre, including destination and delivery times. Link with Freight Route Network.

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.

The latest PM_{2.5} data available (2017) from DEFRA show that Wokingham Borough has a maximum level of 11.98 (co-ordinates x 477500 y170500), and the average level of 10.13. (<https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017>). Table 2.4 shows that 0.81% of PM_{2.5} is produced by Road & Transport, the other 99.19% is from other factors.

The fraction of mortality attributable to particulate air pollution indicator' value for Wokingham Borough and other Local Authorities within Berkshire, can be seen in Table 2.3. Further information about other areas in the UK can be found using the link below. <https://fingertips.phe.org.uk/profile/public-health-outcomesframework/data#page/0/gid/1000043/pat/6/par/E12000005/ati/101/-are/E07000194>

Table 2.3: Showing the Fraction of Mortality attributable to particulate air pollution indicator value within Berkshire.

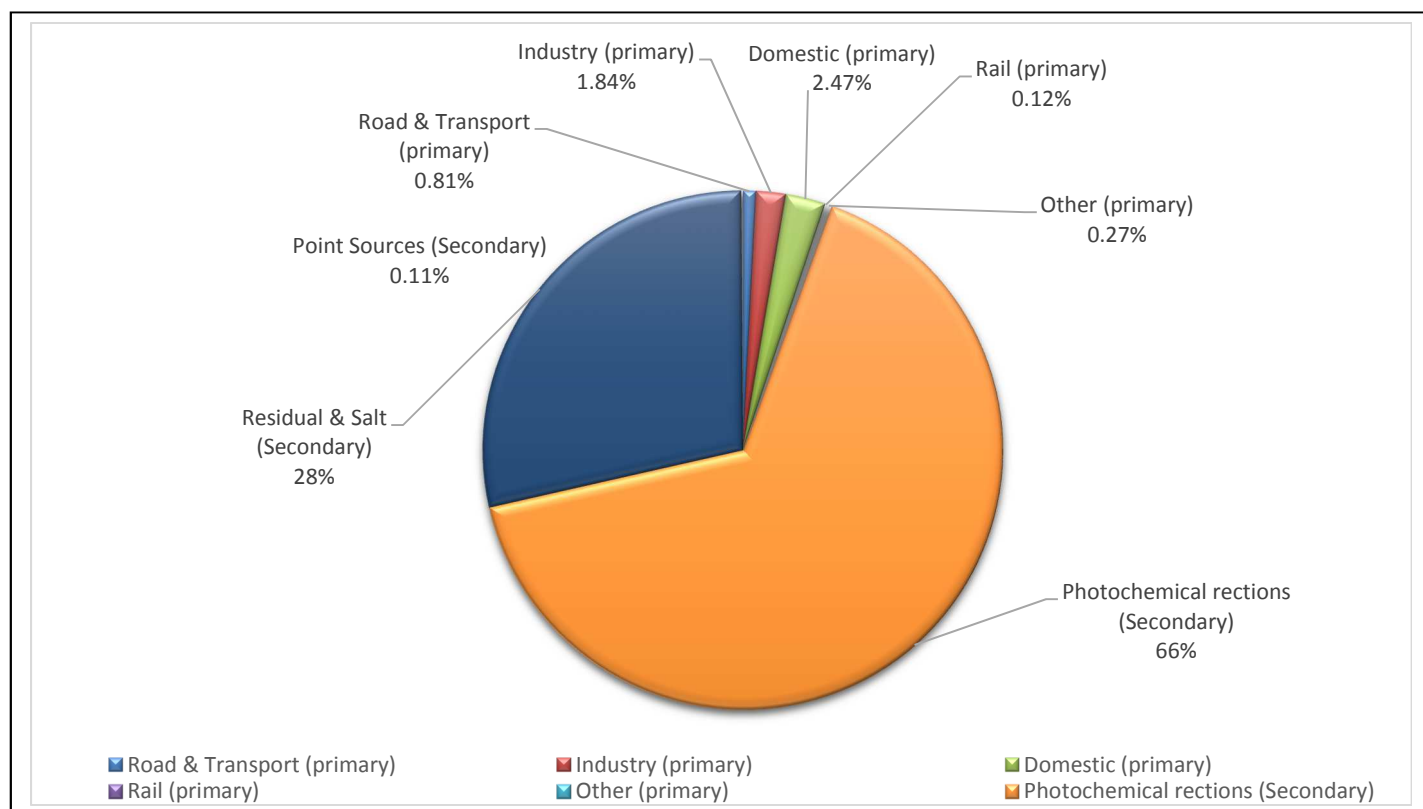
Bracknell Forest	Reading	Slough	West Berkshire	Windsor & Maidenhead	Wokingham
5.7	6.3	6.5	5.3	5.8	5.9

Wokingham Borough is continuing to take the following measures to address PM_{2.5}:

1. The Health and Wellbeing Strategy (2014-2017) and the Public Health Work Plan both include several actions to increase walking and cycling in order to encourage and increase active travel and reduce obesity and inactivity in the borough. This will lead to a decrease in shorter car trips thus also reducing vehicle pollutants including PM_{2.5}.

2. The development of a joint action plan between Public Health and Environmental Health for air quality will consider how Wokingham Borough will consider the impact on PM_{2.5} throughout the district and its reduction. It is likely that a marketing plan will be set up to raise awareness of how air quality can be improved such as active travel and the uptake of electric vehicles.
3. Work in implementing the actions in the Local Transport Plan and the Local Development Framework Core Strategy. For example, a new housing development might contribute to alterations to nearby junctions to increase capacity whilst also improving cycle and pedestrian links, provision of electric vehicle charging infrastructure, and contributing to bus services so that the site is served by public transport and thereby linking many other measures together in a site travel plan to encourage people to choose sustainable travel.
4. Wokingham Borough continually gives advice out regarding Bonfires and Commercial burning through out the year, and the website is updated to help inform the public. <https://publicprotectionpartnership.org.uk/environmental-health/neighbourhood-concerns/smoke-and-bonfires/>
5. Currently there is no statutory requirement for the Council to monitor and report on PM_{2.5}, however we are currently investigating equipment options that can be used to monitor the PM_{2.5} in the AQMA's. Installation of this equipment is subject to funding.

Table 2.4. A Pie Chart showing both the Primary and Secondary sources of PM_{2.5}



(<https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017>)

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

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

Wokingham Borough undertook automatic (continuous) monitoring at 2 sites during 2019. Table A.1 in Appendix A shows the details of the sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available at <https://uk-air.defra.gov.uk/data/>.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Wokingham undertook non-automatic (passive) monitoring of NO₂ at 46 sites, of which 4 sites are triplicated, during 2019. 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) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), are included in Appendix C.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias⁴, “annualisation” (where the data capture falls below 75%), and distance correction⁵. Further details on adjustments are provided in Appendix C.

⁴ <https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html>

⁵ Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

3.2.1 Nitrogen Dioxide (NO₂)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³. Note that the concentration data presented in Table A.3 represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

Figure A.1.3 **This graph shows the trends in Annual Mean NO₂ Concentrations in the Twyford AQMA**

Figure A.1.4 This graph shows the trends in Annual Mean NO₂ Concentrations in Wokingham Borough

Table A.4 in Appendix A compares the ratified continuous monitored NO₂ hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year.

Continuous Monitoring Wokingham – Peach Street

An Annual Mean NO₂ concentration of 33.0µg/m³ was recorded by the Wokingham automatic monitoring (CM2) unit in 2019. This shows that within the Wokingham Town Centre AQMA, NO₂ levels were not exceeding the objective limit at the CM2. This is a slight increase 0.1µg/m³ on the 2018 result (32.9µg/m³) but is lower than the 2015 level when the monitor commenced. Data capture was a good rate of 84.1%.

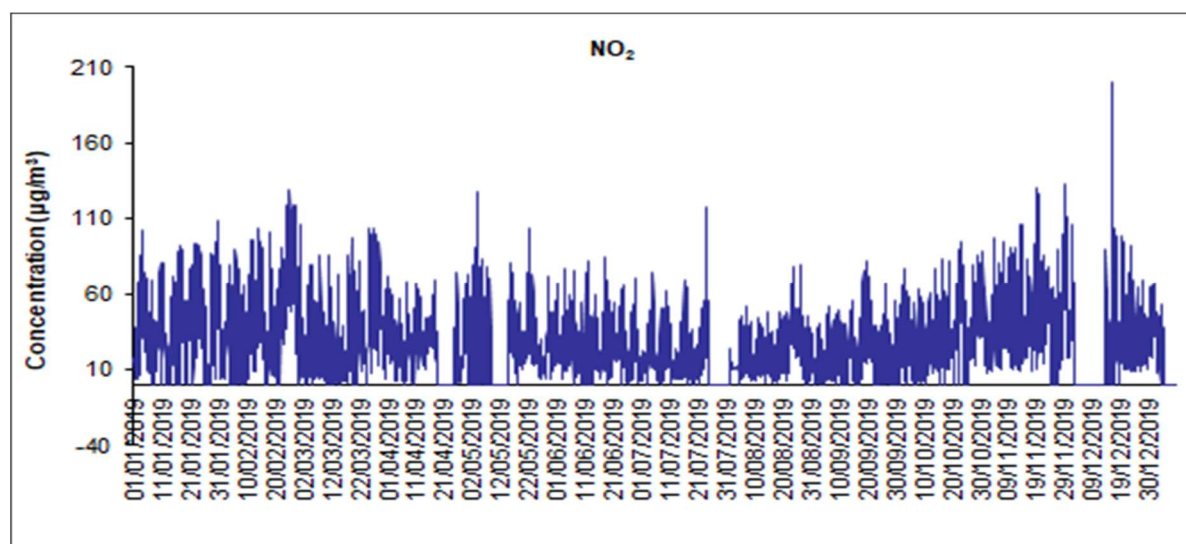
The results have been compared to other nearby sites. Seasonal data trends seen at Wokingham Continuous Monitor are similar to those at comparable AURN monitoring sites at Horley and Reading New Town.

The average NO₂ readings from the Continuous Monitor align well with Diffusion Tubes results, within 6µg/m³, during January, February, March, May, October and November 2019. However in April, June, July, August and September 2019, the Continuous Monitor average was considerably lower than the Diffusion Tube triplicate mean.

The roadworks in the vicinity may have affected traffic and subsequent pollution levels in the second half of the year. Figure 3.1 shows the annual trend over the last year.

The $200\mu\text{g}/\text{m}^3$ hourly mean objective was met with only a single occurrence of $200.6\mu\text{g}/\text{m}^3$. This is a decrease from 15 in 2017 and 10 in 2016. This occurrence happened on Monday 16th December 2019 at 16:00 hours.

Figure 3.1: Wokingham Daily NO₂ 2019



Continuous Monitoring Twyford – Cross Roads

The monitor was installed in January 2019. An Annual Mean NO₂ concentration of $29.9\mu\text{g}/\text{m}^3$ was recorded by the Twyford automatic monitoring unit (CM3) in 2019. This shows that within the Twyford Village AQMA at the cross roads, the NO₂ levels were not exceeding the objective limit. Data capture was a good rate of 99.1%.

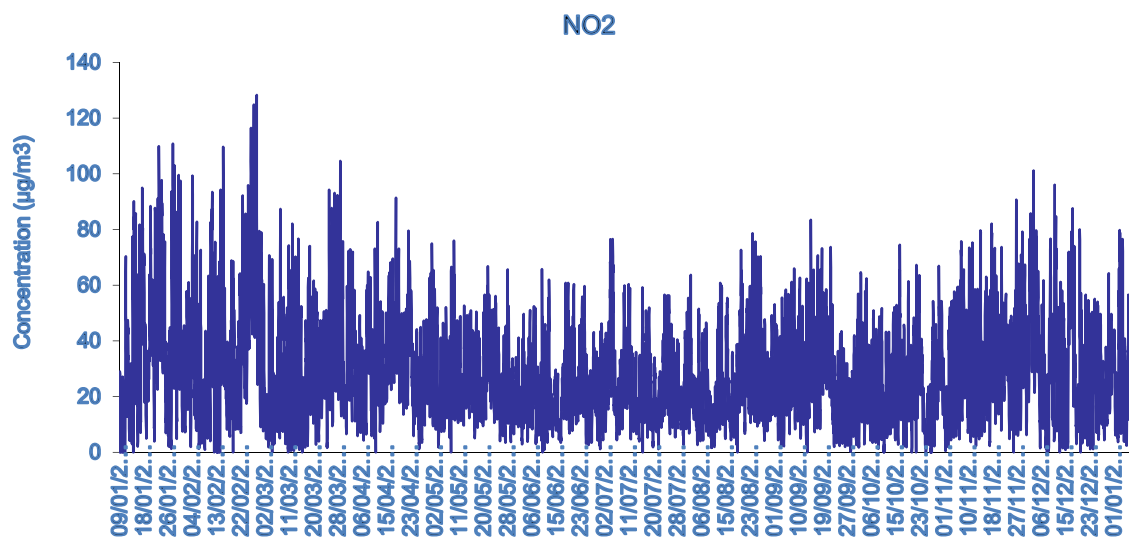
Twyford NO₂ concentrations generally demonstrate similar patterns as nearby monitoring sites in Newbury and Bracknell, and AURN sites at Reading New Town, Oxford St. Ebbes and Horely. Overall concentration of nitrogen dioxide in Twyford was lower than concentration of nearby comparison sites, including AURN monitoring stations.

Diffusion tube results maintained a similar trend when compared with averaged concentrations and demonstrate slight over reading with concentrations of continuous analyser (by annual average of 8% and ranging between 2.7 and 13.6%).

The Data was generally consistent with the Diffusion Tube results, although the monitor in January and March was reading approximately $20\mu\text{g}/\text{m}^3$ above the tube levels, on further investigation it was found by our contractors (TRL) that the NO_2 and NO channels were initially set up the wrong way round. Since then, they have rectified this issue and calibrated / ratified the data with the standard protocol. See Appendix C for more details.

There were no exceedances of the $200\mu\text{g}/\text{m}^3$ hourly mean objective recorded.

Figure 3.2: Twyford Daily NO_2 2019



Wokingham Council Diffusion Tube Data

The Annual Mean Objective of $40\mu\text{g}/\text{m}^3$ was exceeded at 2 of the monitoring sites, 1 site within Wokingham Town Centre AQMA (WOK838 Giggling Spring, Shute End), and 1 (Triplicate) site within the Twyford Crossroads AQMA (WOK850,887, 888 - 19 High Street). All mean concentrations were less than $60\mu\text{g}/\text{m}^3$ which therefore indicates no exceedances of the 1-hour NO_2 objective.

M4 AQMA Diffusion Tube Data

There were no exceedances of the Annual Mean Objective within the AQMA, and only one site increased in NO_2 .

All the sites within the AQMA had reduced this year apart from 1 (WOK836 Old Whitney Wood Lane) which increased slightly from 26.2µg/m³ in 2018 to 27.0µg/m³ in 2019.

Significant changes to the road layout has taken place in this location in the last 3 years with the opening of the new motorway bridge and the Shinfield Eastern Relief Road, the latter on 31/10/17. This has seen the movement of traffic on the A327 away from this monitoring location further east to the other side of Shinfield. Roadworks within the Borough on the M4 with a speed limit of 50mph have been in place during much of 2018 and 2019 which may also account for the reduction in levels. The levels have continued to decrease in the AQMA and now the future revocation needs to be carried out.

Monitoring within and outside this AQMA will continue in 2020.

Wokingham Town Centre AQMA Diffusion Tube Data

8 Diffusion Tubes sites are located within the Wokingham AQMA, and one of the sites is a triplicate and co-located with the Continuous Monitor. Within this AQMA 1 site exceeded the Annual Mean (40µg/m³) Objective in 2019, compared to 4 locations in 2016 this site was:

WOK838 Giggling Spring Shute End – this increase on 2018 concentration from 41.3µg/m³ to 41.8µg/m³, and the site has exceeded for the last 5 years. This site represents relevant exposure. However the NO₂ at the site has decreased since 2015 when it was 43.0µg/m³

There was a decrease of NO₂ at 2 of the sites (WOK 872 Registry Office & WOK868 59 London Road) from 2018. However the rest of the sites increased slightly in 2019.

Further, 2019 has seen the continuation of work to Wokingham town centre within the AQMA, with the regeneration project of Peach Street, Rose Street and Market Place and the additional phases of the regeneration commence at Elms Field. Queuing Traffic has increased in the Town Centre this year due to the above works and this may have reflected in the slightly elevated levels compared to 2018.

Monitoring within and outside this AQMA will continue in 2020.

Twyford Crossroads AQMA Diffusion Tube Data

The Twyford Crossroads AQMA has 5 Diffusion Tubes sites, 3 of the sites are triplicated and one of these is co-located with a Continuous Monitor. Within this AQMA 1 (triplicate) site exceeded the Annual Mean Objective in 2019, which was:

WOK (850, 887 & 888) 19 High Street – this increased in concentration from 2018, from a triplicated average of $42.6\mu\text{g}/\text{m}^3$ to $42.8\mu\text{g}/\text{m}^3$ in 2019, at the roadside. When distance corrected to the nearest receptor the level decreased to $41.9\mu\text{g}/\text{m}^3$. The NO_2 at this site has generally decreased since 2015 ($46\mu\text{g}/\text{m}^3$).

Within Twyford AQMA 4 of sites decreased in NO_2 from 2018, one of which was a triplicate.

A new triplicate site has been co-located with the continuous monitor (WOK 884, 885, 886 Twyford X roads).

The WOK864 1 Waltham Roads site is not within the Twyford Crossroads AQMA but is only 22m to the South East, located to enable determination as to whether the AQMA boundary needs to be altered, this location increased from $35.7\mu\text{g}/\text{m}^3$ in 2018 to $36.9\mu\text{g}/\text{m}^3$ in 2019, and has reduced from $42\mu\text{g}/\text{m}^3$ since 2015, therefore the AQMA boundary does not need to be extended at this time.

Monitoring within and outside this AQMA will continue in 2020.

Outside of the AQMAs

Within the rest of Wokingham borough the sites met the Annual Mean Objective of $40\mu\text{g}/\text{m}^3$. 14 of the sites have increased from the 2018 NO_2 levels, 9 have decreased, 2 remain the same and 1 site is new (WOK891 6 Budd Grove) for 2019.

One of the sites which has decreased is WOK 883 Evendons Primary School, this is located on the roadside and has reduced from $31.1\mu\text{g}/\text{m}^3$ in 2018 to $29.1\mu\text{g}/\text{m}^3$ in 2019, which is $10.1\mu\text{g}/\text{m}^3$ below the Annual Mean Objective.

All of the sites recorded annual mean levels the lowest since 2017 and no sites were recorded above $60\mu\text{g}/\text{m}^3$ which would indicate exceedance of the 1 hour objective.

3.2.2 Particulate Matter (PM_{10})

No particulate matter (PM_{10}) monitoring is undertaken.

3.2.3 Particulate Matter ($\text{PM}_{2.5}$)

No particulate matter ($\text{PM}_{2.5}$) monitoring is undertaken.

3.2.4 Sulphur Dioxide (SO₂)

No sulphur dioxide monitoring is undertaken, as it is not required by DEFRA.

Appendix A: Monitoring Results

Table A.1 - Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Inlet Height (m)
CM2	Peach Street Wokingham	Roadside	481348	168603	NO ₂	YES	Chemiluminescent	3	1.5	1.5
CM3	Twyford Cross Roads	Kerbside	332200	433540	NO ₂	YES	Chemiluminescent	0	N/A	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)
WOK11	Robin Hood Lane Winnersh	Roadside	478133	170598	NO ₂	NO	4	2.4	NO	2.3
WOK19	Thames Street (by bridge) Sonning	Roadside	475583	175704	NO ₂	NO	22	2	NO	2.25
WOK52	Westende Flats London Road Wokingham	Urban Centre	481521	168750	NO ₂	NO	3	1.9	NO	2.35
WOK53	Dunt Lane Hurst	Roadside	479770	171088	NO ₂	YES	28	1.2	NO	2
WOK70	Longdon Road Winnersh	Roadside	478011	170135	NO ₂	YES	25	1.7	NO	2.35
WOK71	38 King Street Lane Winnersh	Roadside	477907	170191	NO ₂	NO	20	3.1	NO	2.4
WOK98	309 Reading Road Winnersh	Roadside	478611	170225	NO ₂	YES	0	11.8	NO	1.65
WOK503	25 Rainworth Close Lower Earley	Suburban	474251	169683	NO ₂	NO	3	0.5	NO	2.1
WOK505	23 Church Road Earley	Roadside	474444	172062	NO ₂	NO	10	1.8	NO	2.15
WOK509	Henley Bridge Remenham	Roadside	476414	182648	NO ₂	NO	7	4.7	NO	2.3
WOK601	Sadler's Lane Winnersh	Roadside	478815	170068	NO ₂	NO	15	1.5	NO	1.9

Wokingham Borough Council

WOK602	2 Green Lane Winnersh	Roadside	478739	170107	NO ₂	YES	3	1.7	NO	1.65
WOK803	3 Wellington Road Wokingham	Roadside	480651	168544	NO ₂	NO	3	1.1	NO	2.3
WOK805	18 Barkham Road Wokingham	Roadside	480547	168543	NO ₂	NO	0	5.7	NO	1.9
WOK817	298 London Road Wokingham	Roadside	483227	168801	NO ₂	NO	11.5	2.1	NO	2.2
WOK825	High Street south Wargrave	Roadside	478541	178634	NO ₂	NO	0	2.2	NO	2.1
WOK827	The Old Station House Station Road Twyford	Kerbside	479047	175831	NO ₂	NO	3	1	NO	2.3
WOK829	Long Acre Thames Street Sonning	Roadside	475806	175577	NO ₂	NO	0	1.7	NO	2.3
WOK835	14 Robinhood Lane Winnersh	Roadside	478192	170672	NO ₂	NO	8	1.5	NO	2.2
WOK836	343 Old Whitley Wood Lane Shinfield	Roadside	472321	168688	NO ₂	YES	7.5	1.2	NO	2.3
WOK838	Giggling Spring Shute End Wokingham	Roadside	480979	168979	NO ₂	YES	0	2.8	NO	2.3
WOK840	30 Finbeck Way Lower Earley	Suburban	473128	168776	NO ₂	NO	0	18.4	NO	1.7
WOK841	2 Lane End Villas Shinfield	Roadside	473128	168776	NO ₂	YES	4.5	3.2	NO	2.4

Wokingham Borough Council

WOK842	Foxglade, Brookers Hill Shinfield	Other	472739	168658	NO ₂	YES	0	35.5	NO	1.6
WOK844	Buckingham Court Wokingham	Roadside	481492	168775	NO ₂	YES	1.32	1.21	NO	2.4
WOK846	4 Hatch Farm Cottages Sindlesham	Roadside	477135	170020	NO ₂	YES	0	39	NO	7.75
WOK850	19 High Street Twyford 1	Roadside	478738	175986	NO ₂	YES	0.3	1.2	NO	2.35
WOK857	1 Rectory Road Wokingham	Roadside	481044	168733	NO ₂	YES	0	2	NO	2.4
WOK861	Mill Lane (by bridge) Sindlesham	Roadside	476981	170120	NO ₂	YES	12.6	1	NO	1.8
WOK863	3 Wargrave Road Twyford	Roadside	478768	176012	NO ₂	YES	1.9	0.9	NO	2.35
WOK864	1 Waltham Road Twyford 1	Roadside	478891	175942	NO ₂	NO	0	3.4	NO	2.35
WOK866	58 Denmark Street Wokingham	Roadside	481033	168300	NO ₂	NO	0	5	NO	1.8
WOK867	21 Denmark Street Wokingham	Roadside	481104	168444	NO ₂	YES	0.5	1.4	NO	2.5
WOK868	59 London Road Wokingham	Roadside	481639	168796	NO ₂	YES	3.3	1.4	NO	2.45
WOK869	Muille 26 High Street Twyford	Roadside	478681	175998	NO ₂	NO	0.5	0.5	NO	2.45
WOK870	Hunt&Nash Church Street Twyford	Roadside	478813	175975	NO ₂	YES	0	1.9	NO	2.5
WOK871	15 London Road Twyford 1	Roadside	478829	176023	NO ₂	YES	0.8	1.6	NO	2.45

Wokingham Borough Council

WOK872	Old Registry Office Reading Road Wokingham	Roadside	480816	168793	NO ₂	YES	0.3	2.6	NO	2.35
WOK873	27 The Terrace Wokingham	Roadside	480863	168787	NO ₂	NO	0	0	NO	2.5
WOK874	Corner Broad St & Rose St Wokingham	Roadside	481027	168721	NO ₂	YES	1.7	1.1	NO	2.35
WOK875	15 London Road Twyford 2	Roadside	478829	176023	NO ₂	YES	0.8	1.6	NO	2.45
WOK876	15 London Road Twyford 3	Roadside	478829	176023	NO ₂	YES	0.8	1.6	NO	2.45
WOK877	Almshouses London Road Twyford	Roadside	478903	176060	NO ₂	NO	1.7	3.2	NO	2.45
WOK878	17 Wargrave Road Twyford	Roadside	478719	176099	NO ₂	NO	4.2	2	NO	2.4
WOK879	Peach Street Unit 1	Roadside	481348	168603	NO ₂	YES	3	1.5	YES	1.4
WOK880	Peach Street Unit 2	Roadside	481348	168603	NO ₂	YES	3	1.5	YES	1.4
WOK881	Peach Street Unit 3	Roadside	481348	168603	NO ₂	YES	3	1.5	YES	1.4
WOK882	341 Whitley Wood Lane Shinfield	Roadside	472298	168679	NO ₂	NO	3	1	NO	2.18
WOK 883	Evendons Primary School	Roadside	480477	167003	NO ₂	NO	1	2.2	NO	2.2
WOK 884	Twyford Xroads 1	Roadside	481348	168603	NO ₂	YES	3	1.5	YES	1.5
WOK 885	Twyford Xroads 2	Roadside	481348	168603	NO ₂	YES	3	1.5	YES	1.5
WOK 886	Twyford Xroads 3	Roadside	481348	168603	NO ₂	YES	3	1.5	YES	1.5
WOK 887	19 High Street Twyford 2	Roadside	478738	175986	NO ₂	YES	0.3	1.2	NO	2.35

WOK 888	19 High Street Twyford 3	Roadside	478738	175986	NO ₂	YES	0.3	1.2	NO	2.35
WOK 889	1 Waltham Road Twyford 2	Roadside	478891	175942	NO ₂	NO	0	3.4	NO	2.35
WOK 890	1 Waltham Road Twyford 3	Roadside	478891	175942	NO ₂	NO	0	3.4	NO	2.35
WOK 891	6 Budd Grove	Receptor	477504	170252	NO ₂	NO	10.0	1.0	NO	2.00

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.3 – Annual Mean NO₂ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for 2019 Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO ₂ Annual Mean Concentration (µg/m ³) (3) (4)				
							2015	2016	2017	2018	2019
CM2 Peach Street Wokingham	481348	168603	Roadside	Automatic	100	84.1	35	41.3	38.1	32.9	33.0
CM3 Twyford Cross Roads	478765	176003	Kerbside	Automatic	100	99.1	-	-	-	-	29.9
WOK11 Direction Grp, Robinhood Lne,	478133	170598	Roadside	Diffusion Tube	100	100	32	31.9	35.4	29.2	32.0
WOK19 Thames St, Sonning	475583	175704	Roadside	Diffusion Tube	100	100	27	22.2	31.1	26.5	28.9
WOK52 Westende Flats, Peach St	481521	168750	Urban Centre	Diffusion Tube	100	91.7	33	30.8	34.9	29.2	30.3
WOK53 Dunt Lane, Hurst	479770	171088	Roadside	Diffusion Tube	100	91.7	27	22	27.8	22.8	21.1
WOK70 Longdon Rd, Winnersh	478011	170135	Roadside	Diffusion Tube	100	100	29	25	28.5	27.3	25.5
WOK71 38 King St Lane, Winnersh	477907	170191	Roadside	Diffusion Tube	100	100	33	24.3	33.1	30.2	31.9
WOK98 309 Reading Road	478611	170225	Roadside	Diffusion Tube	100	91.7	32	29	37.1	31.1	25.4

Wokingham Borough Council

WOK503 Rainworth Close, B3270	474251	169683	Suburban	Diffusion Tube	100	100	31	27	32.2	26.7	27.5
WOK505 Church Road	474444	172062	Roadside	Diffusion Tube	100	100	38	31.5	38.3	36.9	36.5
WOK509 Henley Bridge	476414	182648	Roadside	Diffusion Tube	100	83.3	27	24.4	28.1	23.8	23.9
WOK601 Sadlers Lane, Wok'ham	478815	170068	Roadside	Diffusion Tube	100	100	25	24.8	23.1	22.4	20.0
WOK602 Green Lane	478739	170107	Roadside	Diffusion Tube	100	100	28	27.4	26.0	25.2	21.2
WOK803 3 Wellington Road	480651	168544	Roadside	Diffusion Tube	100	100	28	29.1	32.1	30.7	30.7
WOK805 18 Barkham Road	480547	168543	Roadside	Diffusion Tube	100	91.7	24	27	25.9	23.7	25.0
WOK817 London Rd (298)	483227	168801	Roadside	Diffusion Tube	100	100	29	26.1	33.1	28.8	21.6
WOK825 54 High St Wargrave	478541	178634	Roadside	Diffusion Tube	100	100	35	36	35.6	29.5	31.1
WOK827 Station Rd, Twyford	479047	175831	Kerbside	Diffusion Tube	100	100	27	23.4	27.9	21.4	20.6
WOK829 Long Acre Thames St	475806	175577	Roadside	Diffusion Tube	100	100	31	33	33.3	28.0	28.6
WOK835 14 Robinhood Lane	478192	170672	Roadside	Diffusion Tube	100	100	33	28.5	32.4	27.9	26.6
WOK836 349 Old Whitley Wood Ln	472321	168688	Roadside	Diffusion Tube	100	100	38	29.6	33.6	26.2	27.0
WOK838 Giggling	480979	168979	Roadside	Diffusion Tube	100	100	43	45	44.0	41.3	41.8

Wokingham Borough Council

Spring, Shute End											
WOK840 30 Finbeck Way	473128	168776	Suburban	Diffusion Tube	100	100	24	24	24.9	21.6	24.8
WOK841 Lane End Villas	473128	168776	Roadside	Diffusion Tube	100	100	39	37.2	39.1	30.1	33.3
WOK842 Foxglade, Brookers Hill	472739	168658	Other	Diffusion Tube	100	100	26	29	25.0	24.6	20.0
WOK844 Buckingham Court	481492	168775	Roadside	Diffusion Tube	100	100	39	40.5	45.0	36.0	38.6
WOK846 4 Hatch Farm Cottages	477135	170020	Roadside	Diffusion Tube	100	100	27	29	27.4	25.6	21.6
WOK850 19 High St, Twyford	478537	178606	Roadside	Diffusion Tube	100	91.7	46	43	44.9	42.6	42.8
WOK857 Rectory Rd, Wokingham	478738	175986	Roadside	Diffusion Tube	100	100	41	45	49.1	39.3	39.9
WOK861 Mill Lane (by bridge)	481044	168733	Roadside	Diffusion Tube	100	91.7	42	29	34.1	26.3	23.2
WOK863 3 Wargrave Rd, Twyford	478768	176012	Roadside	Diffusion Tube	100	91.7	35	33.3	36.7	34.6	30.7
WOK864 1 Waltham Rd, Twyford	478891	175942	Roadside	Diffusion Tube	100	75.1	42	43	41.8	35.7	36.9
WOK866 58 Denmark Street	481033	168300	Roadside	Diffusion Tube	100	100	31	32	27.6	23.6	25.3
WOK867 21 Denmark St, Wok	481104	168444	Roadside	Diffusion Tube	100	100	28	28.2	27.6	23.1	23.7

Wokingham Borough Council

WOK868 59 London Road	481639	168796	Roadside	Diffusion Tube	100	25.1	31	27.8	30.5	30.3	27.7 ⁽³⁾
WOK869 Mullie (26) High Street	478681	175998	Roadside	Diffusion Tube	100	100	32	28.1	30.7	28.1	27.1
WOK870 Hunt & Nash Church St	478813	175975	Roadside	Diffusion Tube	100	100	33	33	34	29.3	29.0
WOK871 15 London Rd, Twyford 1	478829	176023	Roadside	Diffusion Tube	100	83.3	32	30.7	32.3	27.4	27.3
WOK872 Registry Office, Reading Rd	480816	168793	Roadside	Diffusion Tube	100	83.3	32	36.4	38.1	33.2	32.4
WOK873 27 The Terrace	480863	168787	Roadside	Diffusion Tube	100	100	24	27	26.5	24.6	24.7
WOK874 Broad St, Wokingham	481027	168721	Roadside	Diffusion Tube	100	100	23	24.9	26.9	27.9	28.9
WOK875 15 London Rd, Twyford 2	478829	176023	Roadside	Diffusion Tube	100	100	31	30.7	31.8	27.4	27.3
WOK876 15 London Rd, Twyford 3	478829	176023	Roadside	Diffusion Tube	100	91.7	32	30.7	32.7	28.4	27.3
WOK 877 Almshouses, London Rd	478903	176060	Roadside	Diffusion Tube	100	91.7	27	25.9	26.9	22.9	22.9
WOK 878 17 Wargrave Rd Twyford	478719	176099	Roadside	Diffusion Tube	100	100	28	27.4	30.2	25.2	25.7
WOK879 Peach Street Unit 1	481348	168603	Roadside	Diffusion Tube	100	100	38	35.5	39.0	33.4	36.7

WOK880 Peach Street Unit 2	481348	168603	Roadside	Diffusion Tube	100	100	36	35.5	39.7	33.4	36.7
WOK881 Peach Street Unit 3	481348	168603	Roadside	Diffusion Tube	100	100	38	35.5	38.9	33.4	36.7
WOK 882 Sign Whitley Wd Ln	481348	168603	Roadside	Diffusion Tube	100	100	–	30.6	39.5	33.4	32.6
WOK 883 Evendons Pri Sch	481348	168603	Roadside	Diffusion Tube	100	91.7	–	–	–	31.1	29.1
WOK884 Twyford Xroads 1	478765	176003	Roadside	Diffusion Tube	100	100	–	–	–	43	30.5
WOK 885 Twyford X roads 2	478765	176003	Roadside	Diffusion Tube	100	100	-	-	-	-	30.5
WOK 886 Twyford X roads 3	478765	176003	Roadside	Diffusion Tube	100	100	-	-	-	-	30.5
WOK 887 19 High St Twyford 2	478829	176023	Roadside	Diffusion Tube	100	100	-	-	-	42.6	42.8
WOK 888 19 High St Twyford 3	478829	176023	Roadside	Diffusion Tube	100	75.1	–	–	–	42.6	42.8
WOK 889 1 Waltham Rd 2	478903	176060	Roadside	Diffusion Tube	100	58.3	–	–	–	35.3	37.9
WOK890 1 Waltham Rd 3	478719	176099	Roadside	Diffusion Tube	100	100	–	–	–	35.6	36.2 ⁽³⁾
WOK891 6 Budd Grove	477504	170252	Roadside	Diffusion Tube	100	100	-	-	-	-	22.2

☒ Diffusion tube data has been bias corrected

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

☒ **Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance adjustment**

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 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.

(4) Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

Figure A.1 – Trends in Annual Mean NO₂ Concentrations

Figure A.1.1 This graph shows the trends in Annual Mean NO₂ Concentrations in the M4 AQMA



Figure A.1.2 This graph shows the trends in Annual Mean NO₂ Concentrations in the Wokingham AQMA

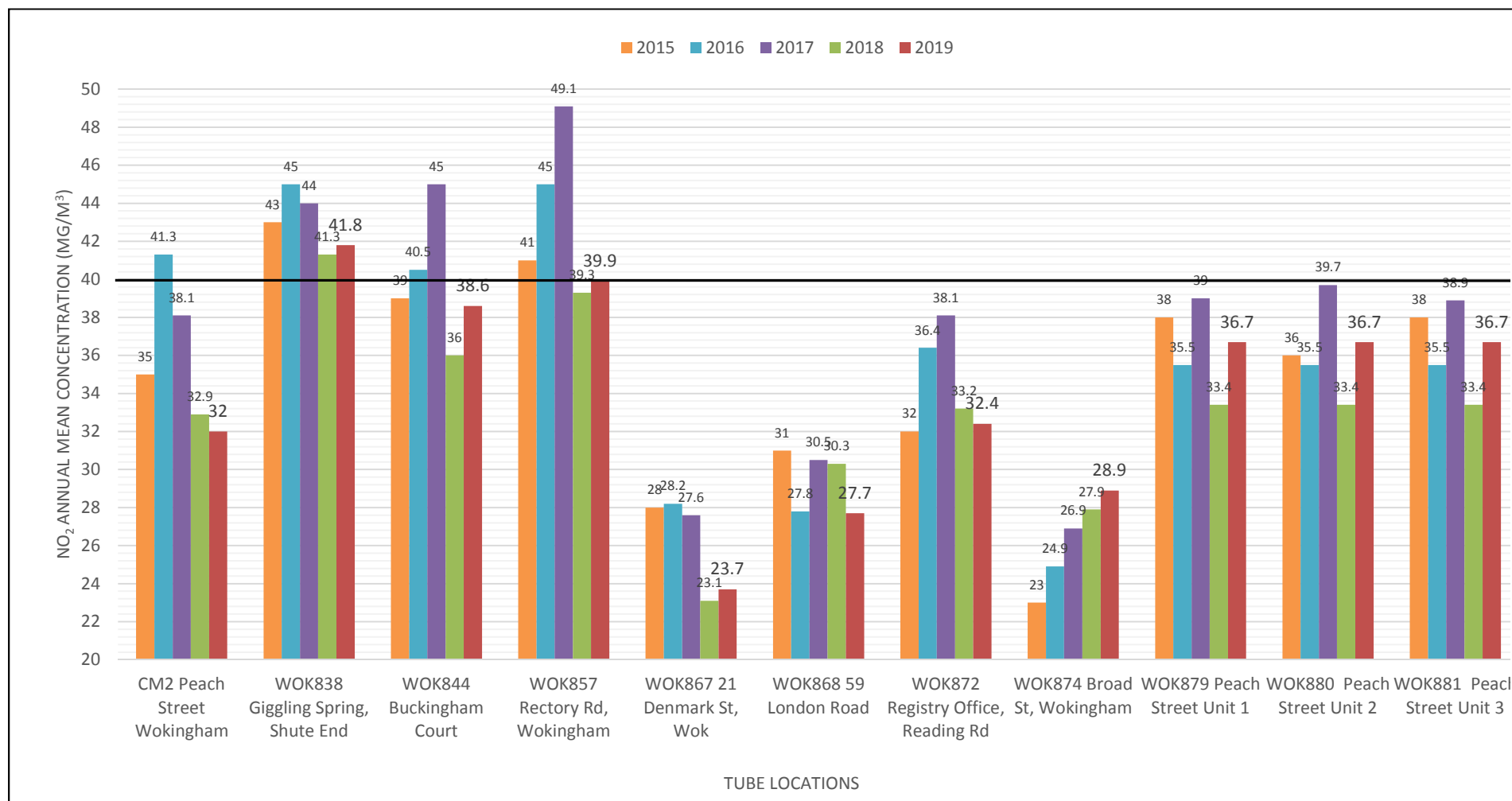


Figure A.1.3 This graph shows the trends in Annual Mean NO₂ Concentrations in the Twyford AQMA

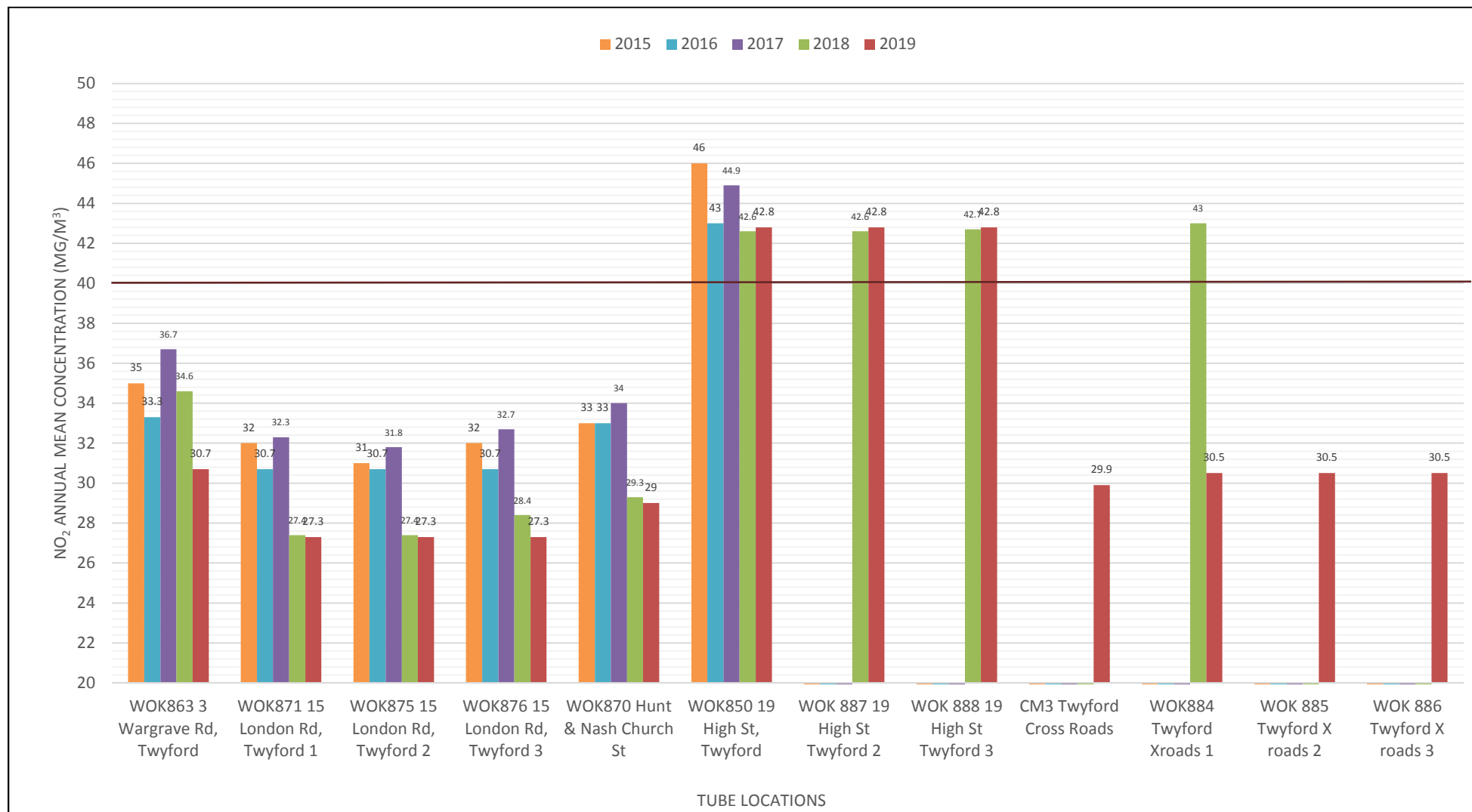


Figure A.1.4 This graph shows the trends in Annual Mean NO₂ Concentrations in Wokingham Borough

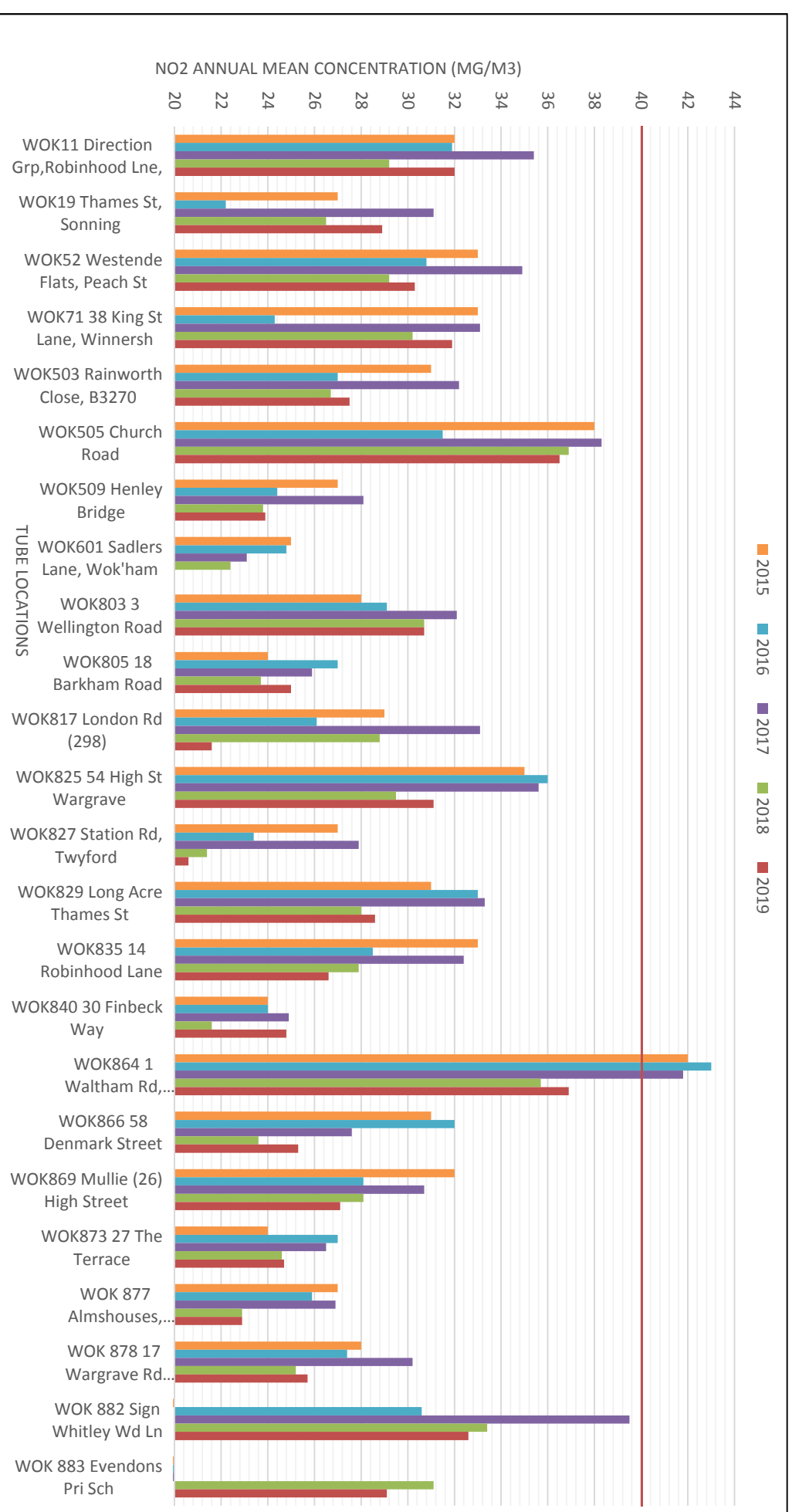


Table A.4 – 1-Hour Mean NO₂ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2019 (%) ⁽²⁾	NO ₂ 1-Hour Means > 200µg/m ³ ⁽³⁾				
							2015	2016	2017	2018	2019
CM2 Peach Street Wokingham	481348	168603	Roadside	Automatic	100	84.1	0 (127)	10	15	0	0 (112.34)
CM3 Twyford Cross Roads	478765	176003	Kerbside	Automatic	100	99.1	-	-	-	-	0

Notes:

Exceedances of the NO₂ 1-hour mean objective (200µg/m³ 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. (If 99.8th percentile >200 µg/m³ = more than 18 exceedances of 200 µg/m³ a year).

Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 - NO₂ Monthly Diffusion Tube Results - 2019

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO ₂ Mean Concentrations (µg/m³)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Mean Raw Data	Bias Adjusted (0.93) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
WOK11 Direction Grp,Robinhood Lne,	478133	170598	40.9	42.7	32.4	33.8	29.2	26.9	29.0	29.1	47.8	27.5	38.1	36.3	34.5	32.0	
WOK19 Thames St, Sonning	475583	175704	34.3	38.4	28.7	26.3	25.1	24.5	26.6	24.7	55.3	23.6	34.4	31.7	31.1	28.9	
WOK52 Westende Flats, Peach St	481521	168750	40.6	41.2	31.7	43.3	m	28.2	16.2	27.7	29.4	33.0	37.6	29.8	32.6	30.3	
WOK53 Dunt Lane, Hurst	479770	171088	31.0	34.4	20.8	21.6	m	15.7	17.5	20.2	20.0	21.3	28.1	19.4	22.7	21.1	
WOK70 Longdon Rd, Winnersh	478011	170135	38.2	34.7	29.5	26.5	20.5	20.2	22.3	23.2	24.3	26.0	35.0	28.3	27.4	25.5	
WOK71 38 King St Lane, Winnersh	477907	170191	34.7	43.9	32.0	44.5	30.9	27.8	30.7	29.6	35.0	28.9	44.2	29.6	34.3	31.9	
WOK98 309 Reading Road	478611	170225	40.3	42.1	m	26.8	22.6	22.8	22.4	24.4	24.7	23.9	28.4	22.1	27.3	25.4	

Wokingham Borough Council

WOK503 Rainworth Close, B3270	474251	169683	39.7	46.2	30.1	28.8	26.6	24.4	23.0	28.7	25.0	25.2	29.3	27.6	29.5	27.5	
WOK505 Church Road	474444	172062	49.8	46.3	39.7	41.2	37.3	37.4	35.4	32.6	36.2	35.7	43.5	36.1	39.3	36.5	31.1
WOK509 Henley Bridge	476414	182648	m	33.5	26.0	25.7	23.7	23.6	26.4	m	23.7	22.6	27.1	24.4	25.6	23.9	
WOK601 Sadlers Lane, Wok'ham	478815	170068	32.3	21.7	20.4	30.7	20.3	19.0	16.3	11.6	18.9	20.8	28.6	17.2	21.5	20.0	
WOK602 Green Lane	478739	170107	33.0	25.9	23.1	32.2	20.1	20.9	18.2	13.3	20.6	15.5	32.6	18.4	22.8	21.2	
WOK803 3 Wellington Road	480651	168544	45.3	37.9	30.3	41.2	30.0	22.9	27.0	25.9	m	33.5	44.4	24.9	33.0	30.7	
WOK805 18 Barkham Road	480547	168543	33.3	31.9	24.5	36.5	22.8	22.2	20.7	m	23.8	24.1	32.9	23.7	26.9	25.0	
WOK817 London Rd (298)	483227	168801	28.5	29.8	23.5	23.2	21.4	17.1	17.7	19.4	20.3	22.8	32.4	23.3	23.3	21.6	
WOK825 54 High St Wargrave	478541	178634	38.6	45.0	35.3	34.3	30.1	30.4	27.2	27.3	31.9	34.4	33.1	33.3	33.4	31.1	
WOK827 Station Rd, Twyford	479047	175831	26.3	30.9	20.2	22.6	19.9	18.8	18.2	13.0	19.8	23.8	30.1	21.7	22.1	20.6	
WOK829 Long Acre Thames St	475806	175577	37.1	33.3	30.5	32.2	28.3	28.3	26.3	29.4	29.1	29.8	39.5	25.5	30.8	28.6	
WOK835 14 Robinhood Lane	478192	170672	42.5	37.6	30.2	35.5	26.7	19.9	27.2	0.6	31.5	25.7	37.2	28.7	28.6	26.6	
WOK836 349 Old Whitley Wood Ln	472321	168688	45.7	39.5	26.8	28.3	24.6	22.0	23.9	27.8	25.7	26.9	28.2	29.3	29.1	27.0	
WOK838 Giggling Spring, Shute End	480979	168979	63.5	46.1	43.8	54.4	41.4	40.5	40.4	34.8	40.4	40.6	59.5	34.3	45.0	41.8	

Wokingham Borough Council

WOK840 30 Finbeck Way	473128	168776	62.6	36.1	22.5	23.6	18.5	17.9	17.6	20.5	19.9	22.2	29.6	29.6	26.7	24.8	
WOK841 Lane End Villas	473128	168776	89.6	36.4	34.5	35.1	29.7	27.3	26.3	26.6	28.0	27.0	38.3	30.3	35.8	33.3	
WOK842 Foxglade, Brookers Hill	472739	168658	30.2	26.1	22.7	27.0	21.9	19.1	16.5	15.9	20.3	19.5	19.5	19.2	21.5	20.0	
WOK844 Buckingham Court	481492	168775	50.7	52.6	45.5	43.7	38.6	34.8	33.1	37.6	38.6	39.3	50.5	32.8	41.5	38.6	36.3
WOK846 4 Hatch Farm Cottages	477135	170020	30.8	26.5	23.0	27.7	20.8	22.0	16.9	16.7	22.2	19.4	34.4	18.7	23.2	21.6	
WOK850 19 High St, Twyford	478537	178606	m	60.4	52.2	46.3	42.4	42.6	44.6	38.4	30.9	38.0	52.5	39.6	44.3	41.2	40.4
WOK857 Rectory Rd, Wokingham	478738	175986	46.9	51.4	38.7	58.1	37.4	39.0	34.4	38.1	38.2	36.2	58.3	37.7	42.9	39.9	
WOK861 Mill Lane (by bridge)	481044	168733	31.6	32.9	18.9	24.0	22.5	22.4	22.7	22.9	25.0	25.7	m	26.1	25.0	23.2	
WOK863 3 Wargrave Rd, Twyford	478768	176012	41.8	44.7	36.2	31.5	27.6	27.1	29.5	25.5	m	31.0	36.4	31.4	33.0	30.7	
WOK864 1 Waltham Rd, Twyford	478891	175942	m	50.9	37.5	34.5	m	37.3	36.3	38.1	32.7	m	52.0	38.3	39.7	36.9	
WOK866 58 Denmark Street	481033	168300	33.6	33.1	27.2	28.7	25.1	24.2	22.7	23.0	23.9	26.0	34.2	25.0	27.2	25.3	
WOK867 21 Denmark St, Wok	481104	168444	37.4	32.2	27.9	27.9	21.8	19.8	16.6	18.3	22.3	25.4	33.1	22.8	25.5	23.7	
WOK868 59 London Road	481639	168796	41.5	M	M	25.5	29.0	m	m	m	m	m	m	m	32.0	27.7 ⁽¹⁾	
WOK869 Mullie (26) High Street	478681	175998	35.9	38.2	28.3	33.8	27.1	27.5	26.0	22.3	26.4	28.0	32.3	23.6	29.1	27.1	

Wokingham Borough Council

WOK870 Hunt & Nash Church St	478813	175975	38.1	44.3	30.3	32.6	27.3	25.9	29.5	26.2	27.1	26.9	35.2	30.8	31.2	29.0	
WOK871 15 London Rd, Twyford 1	478829	176023	m	38.6	32.0	29.4	m	25.7	25.8	23.6	28.5	25.8	33.4	27.7	29.0	27.0	
WOK872 Registry Office, Reading Rd	480816	168793	42.4	M	33.1	39.5	33.8	31.3	33.6	35.7	33.9	34.2	m	31.4	34.9	32.4	
WOK873 27 The Terrace	480863	168787	38.4	31.2	24.8	33.2	25.6	22.9	21.4	19.7	24.9	24.0	30.1	22.9	26.6	24.7	
WOK874 Broad St, Wokingham	481027	168721	41.1	36.7	32.9	35.4	28.0	26.3	23.1	24.8	28.0	30.5	41.7	24.9	31.1	28.9	
WOK875 15 London Rd, Twyford 2	478829	176023	40.4	38.1	31.6	27.6	28.1	25.7	26.9	24.4	25.2	24.1	38.3	27.8	29.8	27.7	
WOK876 15 London Rd, Twyford 3	478829	176023	38.1	36.6	m	28.1	29.4	24.9	26.3	21.5	27.5	26.2	34.3	29.4	29.3	27.3	
WOK 877 Almshouses, London Rd	478903	176060	30.7	37.9	26.5	20.3	19.8	20.0	18.7	19.7	22.0	m	27.5	27.4	24.6	22.9	
WOK 878 17 Wargrave Rd Twyford	478719	176099	36.3	38.4	24.4	27.1	23.0	23.6	22.5	18.8	24.9	26.3	38.3	28.0	27.6	25.7	
WOK879 Peach Street Unit 1	481348	168603	48.1	45.2	37.1	46.9	37.3	32.7	33.0	36.5	38.0	33.0	45.3	34.8	39.0	36.3	
WOK880 Peach Street Unit 2	481348	168603	42.2	51.8	37.0	45.0	35.3	35.2	35.0	35.2	40.4	36.9	44.7	32.3	39.2	36.5	
WOK881 Peach Street Unit 3	481348	168603	45.4	51.9	39.2	43.5	34.4	34.8	32.6	38.5	38.1	36.7	52.3	34.0	40.1	37.3	
WOK 882 Sign Whitley Wd Ln	481348	168603	35.2	48.6	34.5	38.5	31.4	28.4	31.0	33.0	30.8	32.9	43.9	32.3	35.0	32.6	

Wokingham Borough Council

WOK 883 Evendons Pri Sch	481348	168603	m	41.0	30.7	35.2	26.2	28.8	28.1	27.9	30.1	31.3	35.2	30.0	31.3	29.1	
WOK884 Twyford Xroads 1	478765	176003	45.7	40.3	35.6	34.2	30.6	29.0	25.6	27.4	28.0	25.5	40.9	30.5	32.8	30.5	
WOK 885 Twyford X roads 2	478765	176003	44.2	37.5	38.1	36.5	31.1	25.8	29.7	24.6	32.8	28.9	40.2	28.3	33.1	30.8	
WOK 886 Twyford X roads 3	478765	176003	33.2	41.1	39.4	30.1	30.3	28.9	29.0	25.4	40.4	28.1	32.6	29.5	32.3	30.1	
WOK 887 19 High St Twyfd 2	478829	176023	56.0	61.6	47.4	41.0	48.4	43.5	51.7	43.5	47.2	37.7	44.8	42.8	47.1	43.8	42.9
WOK 888 19 High St Twyfd 3	478829	176023	53.8	55.9	49.4	43.0	46.0	45.1	43.1	40.5	41.8	37.1	58.3	45.1	46.6	43.3	42.4
WOK 889 1 Waltham Rd 2	478903	176060	50.8	55.4	M	33.3	35.9	34.7	37.2	37.0	m	m	41.6	40.8	40.7	37.9	
WOK890 1 Waltham Rd 3	478719	176099	52.0	53.1	40.7	34.1	35.4	m	35.8	m	m	m	41.8	m	41.9	36.2 ⁽¹⁾	
WOK891 6 Budd Grove	477504	170252	30.0	32.6	22.9	25.1	19.3	18.1	18.0	20.0	21.0	24.3	29.6	25.5	23.9	22.2	

☐ Local bias adjustment factor used

☒ National bias adjustment factor used

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

☒ Where applicable, data has been distance corrected for relevant exposure in the final column

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 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

QA/QC of Continuous Monitoring Stations

TRL carry out the QA/QC on behalf of Wokingham Borough Council, below is their QA/QC procedure.

Site operation

Routine instrument calibrations are conducted approximately once per fortnight, which involve zero and span checks, a written record of the gas analyser diagnostics and a general visual inspection of all equipment is undertaken. There is a written operating procedure and a calibration record sheet is completed at every site visit.

Data retrieval and daily data checking

Data from the monitoring station is retrieved and processed on a Campbell CR10x data logger as 15-minute mean data. The logger was interrogated via a Siemens TC35i GSM modem at 8-hourly intervals by the ENVIEW 2000 software hosted at TRL. This was used to retrieve, check and archive data. TRL's internal QA/QC procedures require all data to be backed up on a secure server and all documentation associated with each site to be uniquely identified and securely stored to provide an audit trail. Daily data inspections are undertaken during office hours using the facilities of the Data Management System. Initial observations of the Management System indicate whether the site has been contacted during its nominated 'poll time' overnight. If this has not been successful a manual poll of the site may be required. If this is not successful further investigation of the communications integrity will be required to establish contact with the site modem and data logger. Three day plots of recorded data are viewed for the requested site, and these are inspected and assessed for continuity, validity, minimum and maximum values, date and time, power failures and general integrity. All anomalies are recorded on the Daily Check sheet, as required. Any anomalies or queries arising from daily inspection of data, or system operation, are brought to the attention of the Project Manager who will evaluate the situation, and initialise any necessary action. In the event that the PM is not available, contact will be made with the next available senior person within the monitoring team. Any issues identified with equipment operation will be referred to the client for attention within 24 hours (excluding weekends). On a weekly basis, data are examined using summary

statistics and outlier analysis to establish data validity. If unusual data episodes are recorded, these would be routinely examined over longer data periods to establish their impact on trends but would also be cross referenced with data peaks and troughs recorded at other national monitoring stations. In addition, integrity and validity of data logger clock times are checked, and any significant errors recorded in the Data Management System logbook. All site data recorded through the Data Management System is archived on TRL's Network. The data is backed up daily, and the TRL IT Department maintains these data within their long-term and secure archives. This secures all data in the event of any system failure.

Data calibration and ratification

Data is ratified as per AURN recommended procedures. The calibration and ratification process for automatic gas analysers corrects the raw dataset for any drift in the zero baseline and the upper range of the instrument. This is done using Evista software based calibration and ratification process which incorporates the zero and span check information from the calibration visits. The zero reading recorded during the calibration visits is used to adjust any offset of the baseline of the data. The difference between the span value obtained between one calibration visit and the next visit is used to calculate a factor. This change is assumed to occur at the same rate over the period between calibrations and as such the factor is used as a linear data scaler. This effectively results in the start of the period having no factor applied and the end of the period being scaled with the full factor with a sliding scale of the factor in-between. After applying the calibration factors, it is essential to screen the data, by visual examination, to see if they contain any unusual measurements or outliers. Errors in the data may occur as a result of equipment failure, human error, power failures, interference or other disturbances. Data validation and ratification is an important step in the monitoring process. Ratification involves considerable knowledge of pollutant behaviour and dispersion, instrumentation characteristics, field experience and judgement. On completion of this data correction procedure, the data set is converted to hourly means and a summary of the data is provided to Wokingham Borough Council at quarterly intervals and a calendar year annual report is prepared.

Independent Site Audits

In addition to these checks an independent site audit is carried out every 12 months to ensure the monitoring equipment is operating correctly. The audits that are carried out utilise procedures that are applied within DEFRA's National Automatic Air Monitoring Networks Quality Control Programme. The efficiency of the analyser's convertor is checked and the analyser is also flow and leak tested. The gas bottle used for calibrations on site is also checked against the auditor's gas bottle to ensure the stability of the gas concentration.

Wokingham Town Centre

The site audit for the Wokingham Town Centre automatic monitoring unit was carried out on 13th September 2019. A major factor governing the analyser's performance is the NO_x analyser's converter and its ability to reduce the nitrogen dioxide to nitric oxide. The recommended range for instrumentation in the national automatic air monitoring network is in the range of 98% - 102% efficient. Our tests show the converter in this analyser to be 100.0% efficient at NO₂ concentrations of 268ppb. This is an ideal result. The analyser exhibited good steady state responses to both zero and span (calibration) gases with acceptable levels of variation (noise). Although it was reported that the analyser response to the internal zero scrubber was marginally high readings especially when compared to audit zero gas readings. Therefore, it was recommended that the scrubber materials are replaced.

To ensure that the analyser is sampling only ambient air the instrument was leak checked. The analyser passed the leak test showing no signs of a leak. The NO_x analyser flow rate was measured using a calibrated flow meter and compared against the analyser's flow rate sensor to evaluate its accuracy. The measured flow rate result was outside the ($\pm 10\%$) recommended limit and it was advised the underlying reason to be investigated and rectified. It was suspected by the auditor that the flow rate sensor might be faulty, and it was suggested this be checked and repaired/replaced if necessary. Based on the NO_x analyser's response to the audit standard and audit zero, the concentrations of the stations NO cylinder have been reassessed. This provides an indication of the site standards stability. For the purpose of these stability checks, the criteria adopted within the national network, and used here, is that the

recalculated concentration should lie within 10% of the stated concentrations. The results of the recalculations are presented in Table C.1

Table C.1 Wokingham Town Centres Recalculated Concentrations

TRL Wokingham – NO cylinder 195212				
	NOx (ppb)	% change from stated	NO (ppb)	% change from stated
Manufacturers Stated Concentration	464	---	461	---
Recalculated concentration (13/09/19)	459	-1.0	456	-1.1

The recalculated results for the site NO cylinder at the TRL Wokingham monitoring site were stable, within the definition adopted above, and can therefore reliably be used to scale ambient data.

The recalculated results for the site NO cylinder at the TRL Wokingham monitoring site were stable, within the definition adopted above, and can therefore reliably be used to scale ambient data.

Twyford Village Cross Roads

The site audit for the Twyford Town Centre automatic monitoring unit was carried out on 13th September 2019. A major factor governing the analyser's performance is the NOx analyser's converter and its ability to reduce the nitrogen dioxide to nitric oxide. The recommended range for instrumentation in the national automatic air monitoring network is in the range of 98% -102% efficient. Our tests show the converter in this analyser to be 98.5% efficient at NO₂ concentrations of 270ppb. This is a good result. The analyser exhibited good steady state responses to both zero and span (calibration) gases with acceptable levels of variation (noise).

To ensure that the analyser is sampling only ambient air the instrument was leak checked. The analyser passed the leak test showing no signs of a leak. The NOx analyser flow rate was measured using a calibrated flow meter and compared against the analyser's flow rate sensor to evaluate its accuracy. The measured flow rate result was just outside the ($\pm 10\%$) recommended limit and it was advised the underlying reason to be investigated and rectified. Based on the NOx analyser's response to the

audit standard and audit zero, the concentrations of the stations NO cylinder have been reassessed. This provides an indication of the site standards stability. For the purpose of these stability checks, the criteria adopted within the national network, and used here, is that the recalculated concentration should lie within 10% of the stated concentrations. The results of the recalculations are presented in Table C.2.

Table C.2 Twyford Village Cross Roads Recalculated Concentrations

TRL Twyford – NO cylinder 195212				
	NOx (ppb)	% change from stated	NO (ppb)	% change from stated
Manufacturers Stated Concentration	464	---	461	---
Recalculated concentration (13/09/19)	459	-1.0	456	-1.1

The recalculated results for the site NO cylinder at the TRL Wokingham monitoring site were stable, within the definition adopted above, and can therefore reliably be used to scale ambient data.

Twyford Quarter 1 Calculation Error

The Twyford real time monitor was installed in late 2018 and measures Nitrogen dioxide. The cabin is a bespoke design to have the smallest possible footprint.

At the end of the first three months a “short form” report was produced, this document is designed to provide provisional data to the clients to give a progress update. The reason for quoting “provisional” on the data set is to denote that it is subject to change. Generally, changes will only occur following the UKAS audit findings, but can also be affected by the review of data over a longer period and comparison to diffusion tubes.

Below are the data sets which representing the stages used to investigate the question over the data by TRL. The first was issued on the 13th May 2019 to Wokingham Borough Council by TRL. It was identified at the time that the results for the first quarter seemed high and this was discussed with PPP. TRL considered excluding the data but came to an agreement with PPP to review it again later in the year, after the UKAS audit had been carried out (to confirm correct operation). An internal (TRL) review of the site was carried out at the time and no instrument errors were identified.

The column in question is the Average NO₂ in Table C.3.

Table C.3 Data presented at the end of Q1 2019

Diffusion Tube Dates	Month	NO ₂ % Capture	Average of NO (µg/m ³)	Average of NO _x (µg/m ³)	Average of NO ₂ (µg/m ³)	Diffusion Tube Average of NO ₂ (µg/m ³)
09/01/2019 to 06/02/2019	January	97.7	35.2	95.9	61.0	41.0
06/02/2019 to 03/03/2019	February	97.0	37.7	94.7	57.0	39.6
03/03/2019 to 04/04/2019	March	99.9	31.7	66.9	35.1	37.7

Table C.4 Corrected Data presented for Q1 in the Annual Report 2019

Diffusion Tube Dates	Month	NO ₂ % Capture	Average of NO (µg/m ³)	Average of NO _x (µg/m ³)	Average of NO ₂ (µg/m ³)	Diffusion Tube Average of NO ₂ (µg/m ³)
09/01/2019 to 06/02/2019	January	95.6	36.7	95.5	39.2	41.0
06/02/2019 to 03/03/2019	February	98.3	32.4	87.7	38.0	39.6
03/03/2019 to 04/04/2019	March	99.6	21.9	66.6	32.9	37.7

During the Q3 period the NO/NO_x analyser developed a problem which required investigation. It was at this point that an issue with the NO and NO₂ channels was identified by TRL, while both had been reporting correct data, they had been incorrectly labelled (swapped). In the winter months where NO₂ levels are naturally higher the differences in the channel data can be less obvious to identify.

For the reporting of data as per DEFRA guidance, NO₂ values are calculated by NO_x – NO.

Following the identification of this issue the raw data was correctly identified and re-imported into the database. This correct data was then used for the ratified end of year report see Table C.4.

Certificate of Calibration

Calibration factors and zeros have been produced on the basis of the audit calibrations conducted. All of these calibrations were conducted with transfer standards traceable to national metrology standards. The Certificate of Calibration provides the calibration and zero response factors for the oxides of nitrogen analysers under test on the day of the audits. It is available upon request from TRL.

Data Management

The following recommendations and comments can be made as a result of these audits:

- Compare the TRL database scaling factors for the day of the audit with the factors and zeros on the Certificate of Calibration. If a deviation greater than the uncertainty associated with the calibration factor on the certificate is found, investigate the underlying reason and implement suitable data management actions.
- Consider the impact of the analyser flow test failure will have on the data sets. The data should be reviewed for signs of discontinuity and you must ensure this fault is rectified.

QA/QC of Diffusion Tube Monitoring

The Workplace Analysis Scheme for Proficiency (WASP) is an independent analytical performance testing scheme, operated by the Health and Safety Laboratory (HSL). WASP formed a key part of the former UK NO₂ Network's QA/QC, and remains an important QA/QC exercise for laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management. The laboratory participants analyse four spiked tubes, and report the results to HSL. HSL assign a performance score to each laboratory's result, based on their deviation from the known mass of nitrite in the analyte. The Performance criteria are due to be changed, at present the criteria are based on the z-score method, and equates to the following:

GOOD: Results obtained by the participating laboratory are on average within 13% of the assigned value. This equates to a Rolling Performance Index (RPI) of 169 or less.

ACCEPTABLE: Results obtained by the participating laboratory are on average within 13- 26% of the assigned value. This equates to an RPI of 169 - 676.

WARNING: Results obtained by the participating laboratory are on average within 26 – 39% of the assigned value. This equates to an RPI of 676 - 1521.

FAILURE: Results obtained by the participating laboratory differ by more than 39% of the assigned value. This equates to an RPI of greater than 1521.

However from April 2009, the criteria has been based upon the Rolling Performance Index (RPI) statistic and will be tightened to the following:

GOOD: Results obtained by the participating laboratory are on average within 7.5% of the assigned value. This equates to an RPI of 56.25 or less.

ACCEPTABLE: Results obtained by the participating laboratory are on average within 15% of the assigned value. This equates to an RPI of 225 or less.

UNACCEPTABLE: Results obtained by the participating laboratory differ by more than 15% of the assigned value. This equates to an RPI of greater than 225.

Wokingham Borough Council use Gradko International for the supply and analysis of the nitrogen dioxide diffusion tubes for their non-automatic monitoring programme. Gradko's performance for AIR PT please see Table C.2. Nitrogen Dioxide AIR PT 2019.

Diffusion Tube Bias Adjustment Factors

Gradko International Ltd of St Martin's House 77 Wales Street Winchester Hampshire is the supplier and analyst of the nitrogen dioxide diffusion tubes. The tubes are analysed by U.V. spectrophotometry. The limit of detection is 20% TEA/Water.

Factor from Local Co-location Studies and Discussion of Choice of Factor to Use

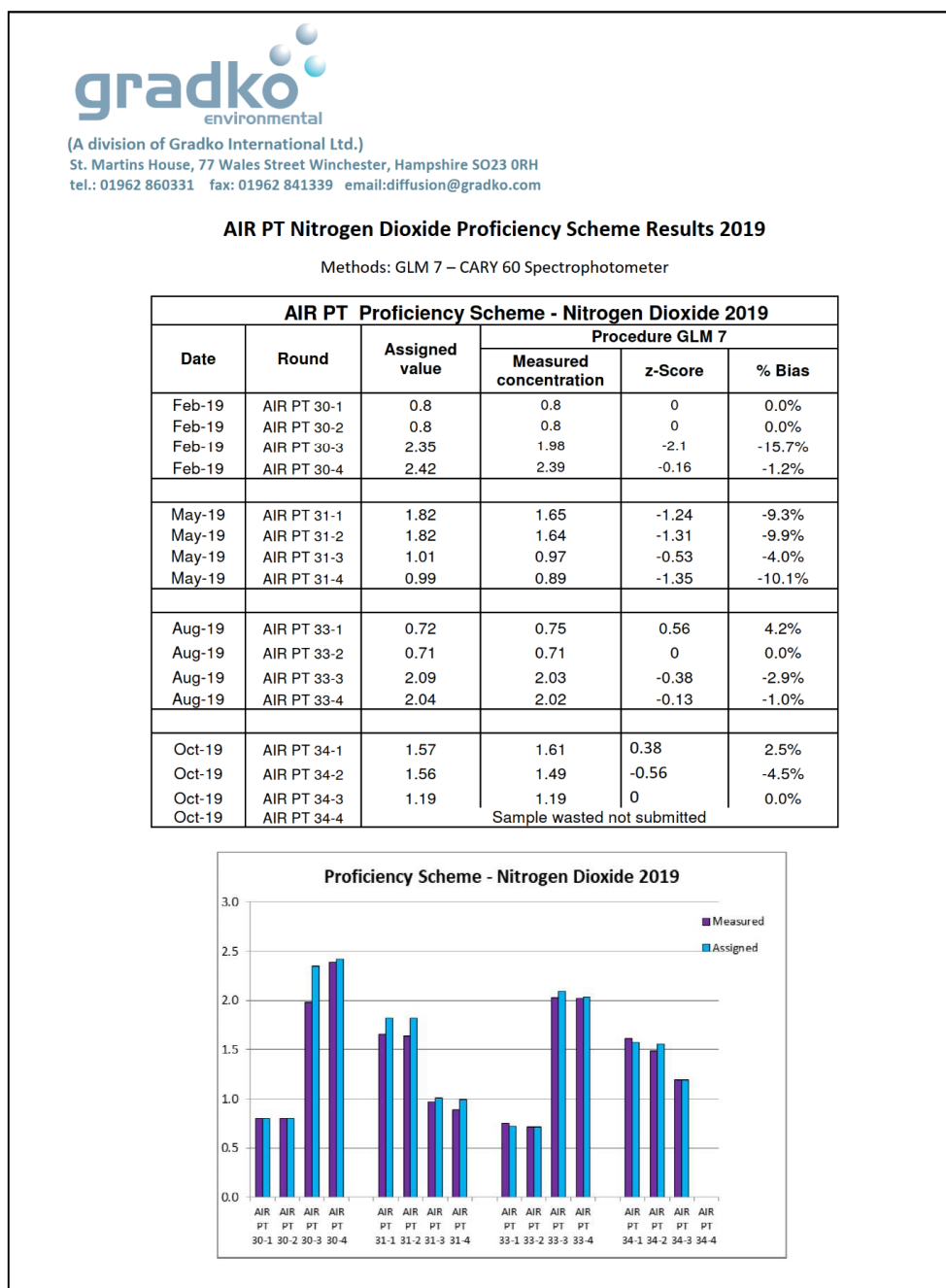
The national study of bias adjustment factors spreadsheet (ref. 03/20) suggested a bias adjustment factor of **0.93** be applied. A copy of the co-location spreadsheet used is provided below.

In determining the bias adjustment factor for the 2019 data the following was taken into consideration:

Cases where the locally obtained bias adjustment factor may be more representative:

- Where the diffusion tube exposure periods are weekly or fortnightly – the Wokingham town centre & Twyford Village Cross Roads co-location study is monthly.
- If the co-location site is unusual in some way: for example, affected by specific large nitrogen oxides (NO_x) sources other than road traffic, such as local industrial installations – the Wokingham town centre co-location study is predominantly influenced by road traffic.
- For tubes exposed in a similar setting to the co-location site – the Wokingham Town Centre & Twyford Village Cross Roads co-location study site is a roadside location, as are over 95% of the diffusion tubes located in Wokingham Borough. Therefore, the bias adjustment factor determined from either of these locations may not be deemed appropriate to apply to the Wokingham Borough non-roadside sites.
- Where the duration of the whole diffusion tube study is less than one year, especially if it is less than nine months – the Wokingham Town Centre & Twyford Village Cross Roads co-location study and diffusion tube surveys are all for a full calendar year.
- Where the Review and Assessment Helpdesk spreadsheet (national database) contains data from fewer than five other studies using the same laboratory and preparation. – The national database contains 27 studies therefore it could be used.

Figure C.1 - Nitrogen Dioxide AIR PT 2019



- For co-location sites with “good” precision for the diffusion tubes and with high quality chemiluminescence results – It can be seen from the table below that both the Wokingham Town Centre & Twyford Village Cross Roads co-location study achieved “good” precision and the Wokingham town centre chemiluminescence results (automatic monitoring) are high quality (see the QA/QC of Automatic Monitoring section above).

Cases where the combined (national) bias adjustment factor may be more representative:

- Where the survey consists of tubes exposed over a range of settings, which differ from the co-location site – this is not the case for Wokingham Borough.
- Where the co-location study is for less than nine months, although the diffusion tube monitoring is for a longer period - The Wokingham town centre & Twyford Village Cross Roads co-location study and diffusion tube surveys are for a full calendar year (2019).
- Where the automatic analyser has been operated using local, rather than national, QA/QC procedures - The Wokingham town centre chemiluminescence results (automatic monitoring) are high quality, see the QA/QC of Automatic Monitoring section above.
- Where data capture from the automatic analyser is less than 90%, or there have been problems with data quality – due to Data capture from the Wokingham Town centre automatic monitor was 84.15% in 2019 (Figure C.2))& the data capture from the Twyford Village Cross Roads automatic monitor was 99.1% in 2019 (Figure C. 3).
- For co-location sites with “poor” precision or laboratories with predominately “poor” precision, as set out on the Review & Assessment Helpdesk website - It can be seen from the table below that both the Wokingham Town Centre & Twyford Village Cross Roads co-location study & achieved “good” precision and the laboratory precision was “good”. See the QA/QC of Diffusion Tube Monitoring section above.

In conclusion, it can be seen from the discussion above that due to the high data capture rate from the automatic analyser in Twyford (99%) it would be possible to derive a local bias factor. But as the second automatic analyser in Wokingham town centre did not achieve adequate data capture (84.15%). The decision was taken to use the National bias adjustment factor of 0.93 to maintain consistency across the Borough.

Precision and Accuracy

Figure C.2 – Precision & Accuracy of the Triplicated Tubes for Wokingham Town Centre.

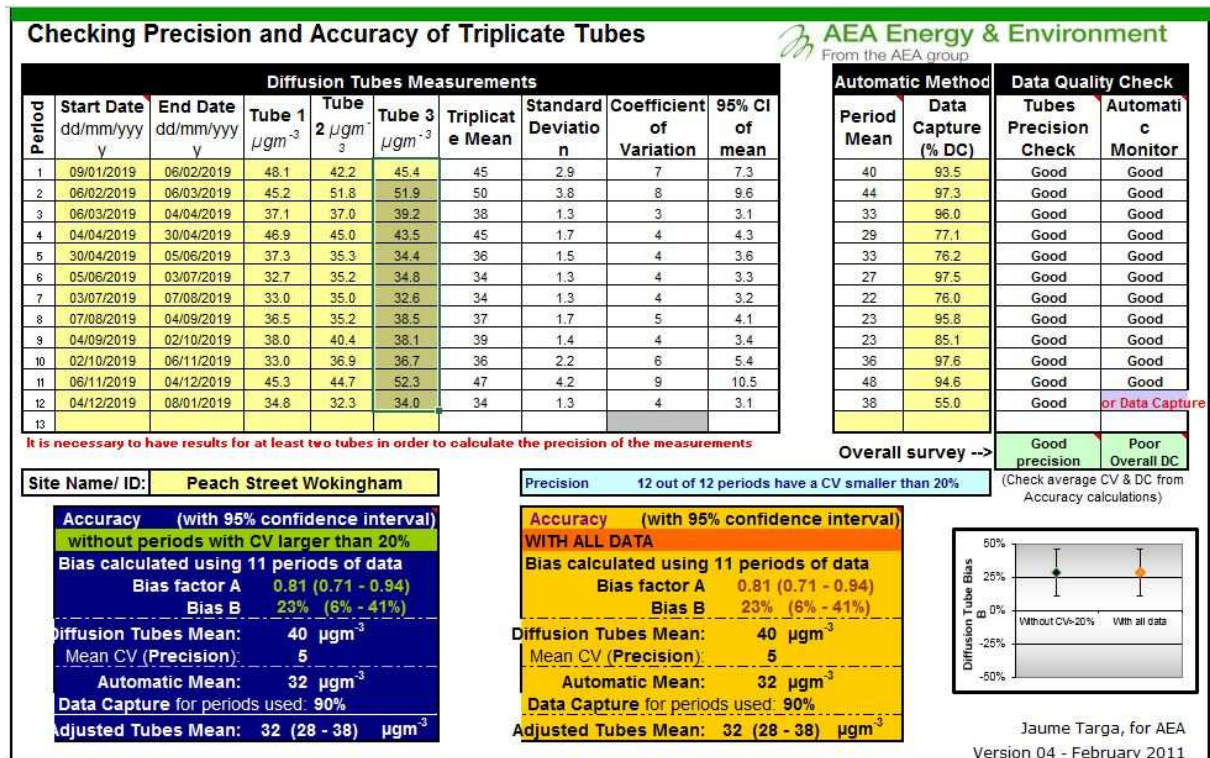
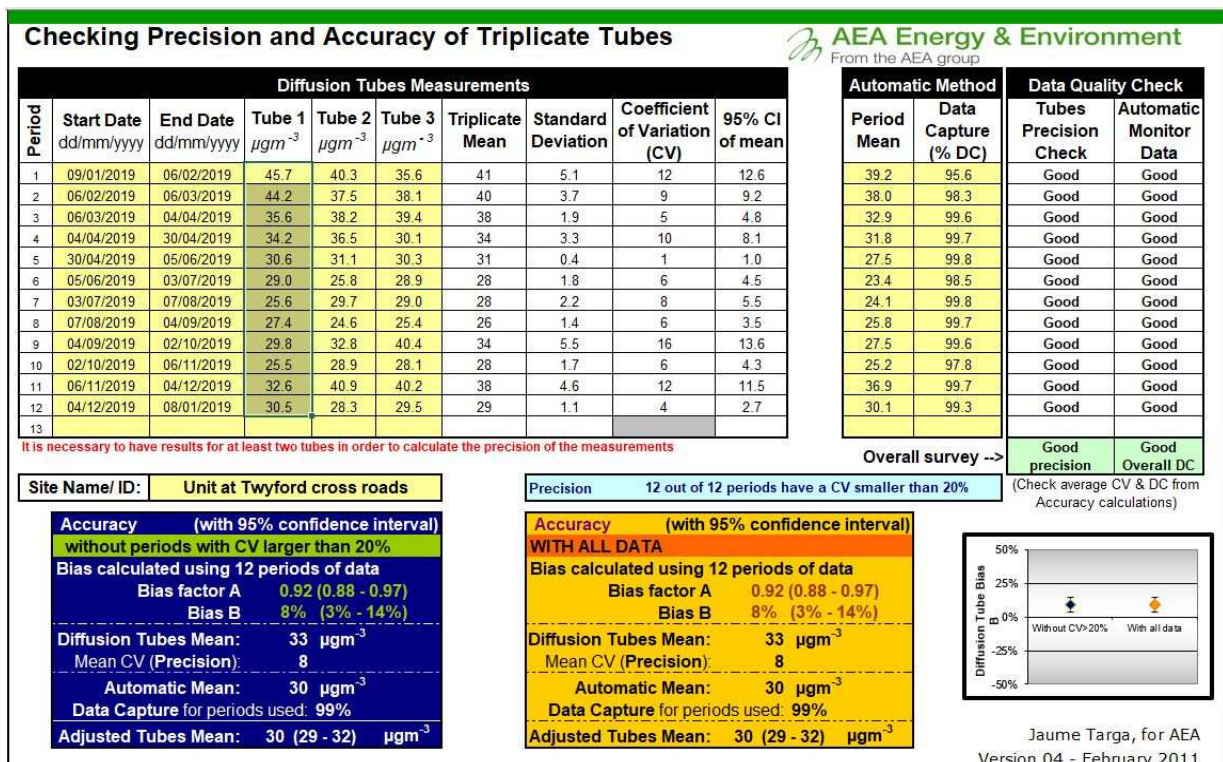


Figure C.3 – Precision & Accuracy of the Triplicated Tubes for Twyford village Cross Roads.



Annualisation

In order to annualise, two to four background monitoring sites must be identified. These must form part of the AURN network, be within 50 miles of the site, have >85% data capture and should be background urban suburban or rural locations. Selected sites:

- Reading New Town (RNT)
- Oxford St Ebbes (OSE)

As required annualisation of data was carried out for 2 site, referring to procedure in TG(16) (updated Feb 2017) Box 7.9:

Table C.5 - Annualisation of data

Site	Site type	Annual mean 2019 $\mu\text{g}/\text{m}^3$	Period mean 2019 $\mu\text{g}/\text{m}^3$	Ration (A/P)
RNT	Background	24.28	27.84	0.96
OSE	Background	15.91	16.08	0.97
Average				0.93

It has only been possible to capture 58.33% of data at WOK890 1 Waltham Rd 3, as the tubes were missing during the change overs, the NO₂ measured mean concentration M for this period is 41.9 $\mu\text{g}/\text{m}^3$ and the Bias Corrected Annualised data is 35.8 $\mu\text{g}/\text{m}^3$. At site WOK868 59 London Road also only captured 25% of data, the NO₂ measured mean concentration M for this period is 32.0 $\mu\text{g}/\text{m}^3$, and the Bias Corrected Annualised data is 29.4 $\mu\text{g}/\text{m}^3$.

Table C.6 - Showing the Annualised Mean calculations

Site	Annual NO ₂ Mean (M) ($\mu\text{g}/\text{m}^3$)	Annualise NO ₂ Mean ($\mu\text{g}/\text{m}^3$) (*0.93)	Bias Corrected NO ₂ Mean ($\mu\text{g}/\text{m}^3$) (*0.93)
WOK890 1 Waltham Rd 3	41.9	38.5	36.0
WOK868 59 London Road	32.0	29.4	27.7


Distance Correction

Distance correction was required at one of the bias corrected sites as it reported above 36mg/m³ (TG.16 para 7.78) and there is influence from the one road present in relation to the nearest sensitive receptor (receptor within 20m of monitoring location). 5 sites required distance correction calculation using the NO₂ fall off with distance calculator v4.2, and the results can be seen in Figure C.4 & Table C.3.

Table C.7 - Showing the Annualised NO₂ Means calculations

Site ID	Bias Adjusted Annual NO ₂ Mean (µg/m ³)	Triplicate Average Annual NO ₂ Mean (µg/m ³)	Predicted Annual NO ₂ Mean at Receptor (µg/m ³)	Triplicate Average Predicted Annual NO ₂ Mean at Receptor (µg/m ³)
WOK505 Church Road	36.5		31.1	
WOK844 Buckingham Court	38.6		36.3	
WOK850 19 High St, Twyford	41.2	42.8	40.4	41.9
WOK 887 19 High St Twyford 2	43.8	42.8	42.9	41.9
WOK 888 19 High St Twyford 3	43.3	42.8	42.4	41.9

Figure C.4 – Distance correction



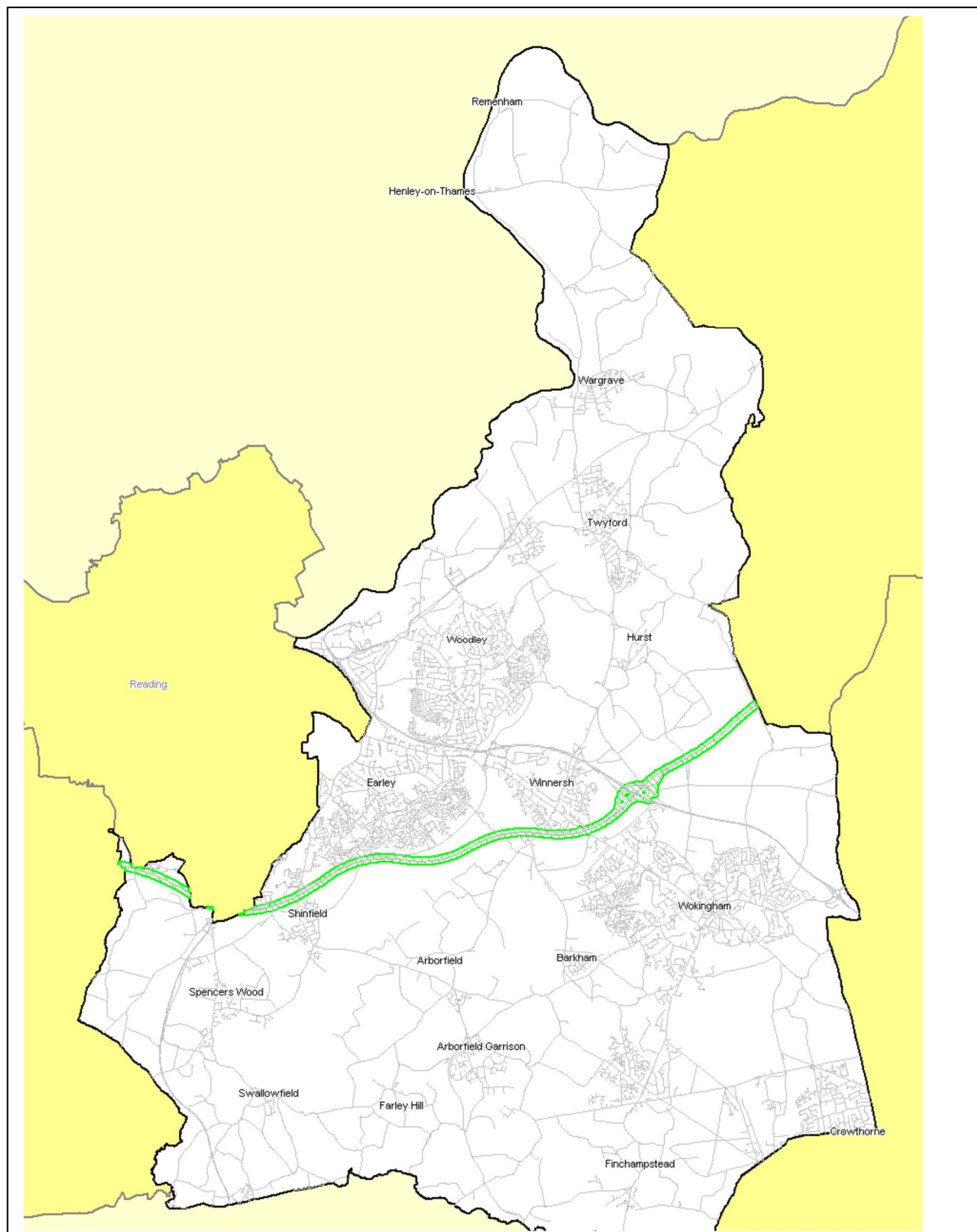
BUREAU VERITAS

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1.2 metres
Step 2	How far from the KERB is your receptor (in metres)?	1.5 metres
Step 3	What is the local annual mean background NO ₂ concentration (in µg/m ³)?	23 µg/m ³
Step 4	What is your measured annual mean NO ₂ concentration (in µg/m ³)?	43.3 µg/m ³
Result	The predicted annual mean NO ₂ concentration (in µg/m ³) at your receptor	42.4 µg/m ³

Appendix D: Map(s) of Monitoring Locations and AQMAs

Map D.1: The Map of the M4 AQMA



Map D.2: A Map of the Wokingham Town Centre AQMA

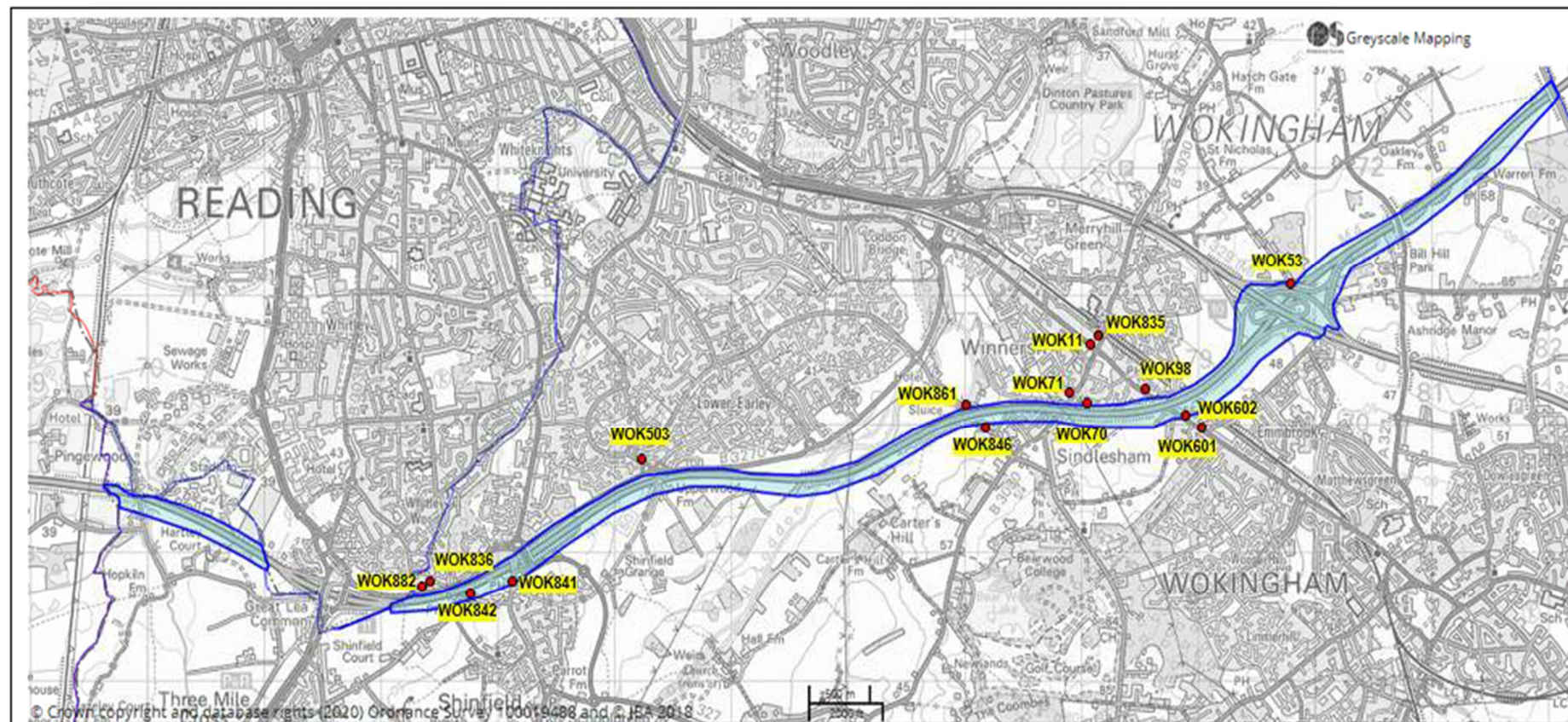


Map D.3: A map of the Twyford Cross Roads AQMA



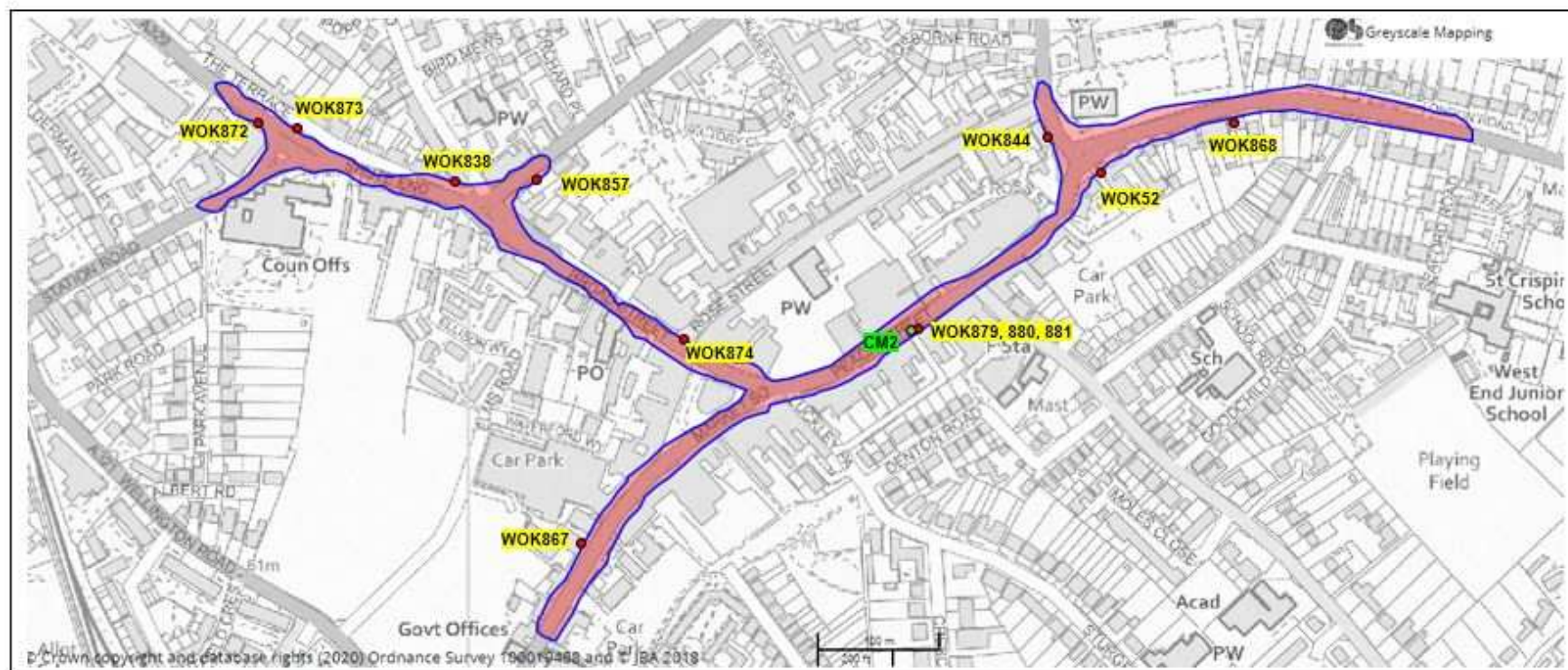
Map D.4: A map of the M4 AQMA, including Tube location and Annual Mean NO₂ concentrations

Diffusion Tube	WOK 882	WOK 836	WOK 842	WOK 841	WOK 503	WOK 861	WOK 846	WOK 71	WOK 70	WOK 11	WOK 835	WOK 98	WOK 602	WOK 601	WOK 53
NO ₂ Annual Mean Concentration (µg/m ³)	37.3	27.0	20.0	33.3	27.5	23.2	21.6	31.9	25.5	32.0	26.6	25.4	21.2	20.0	21.1



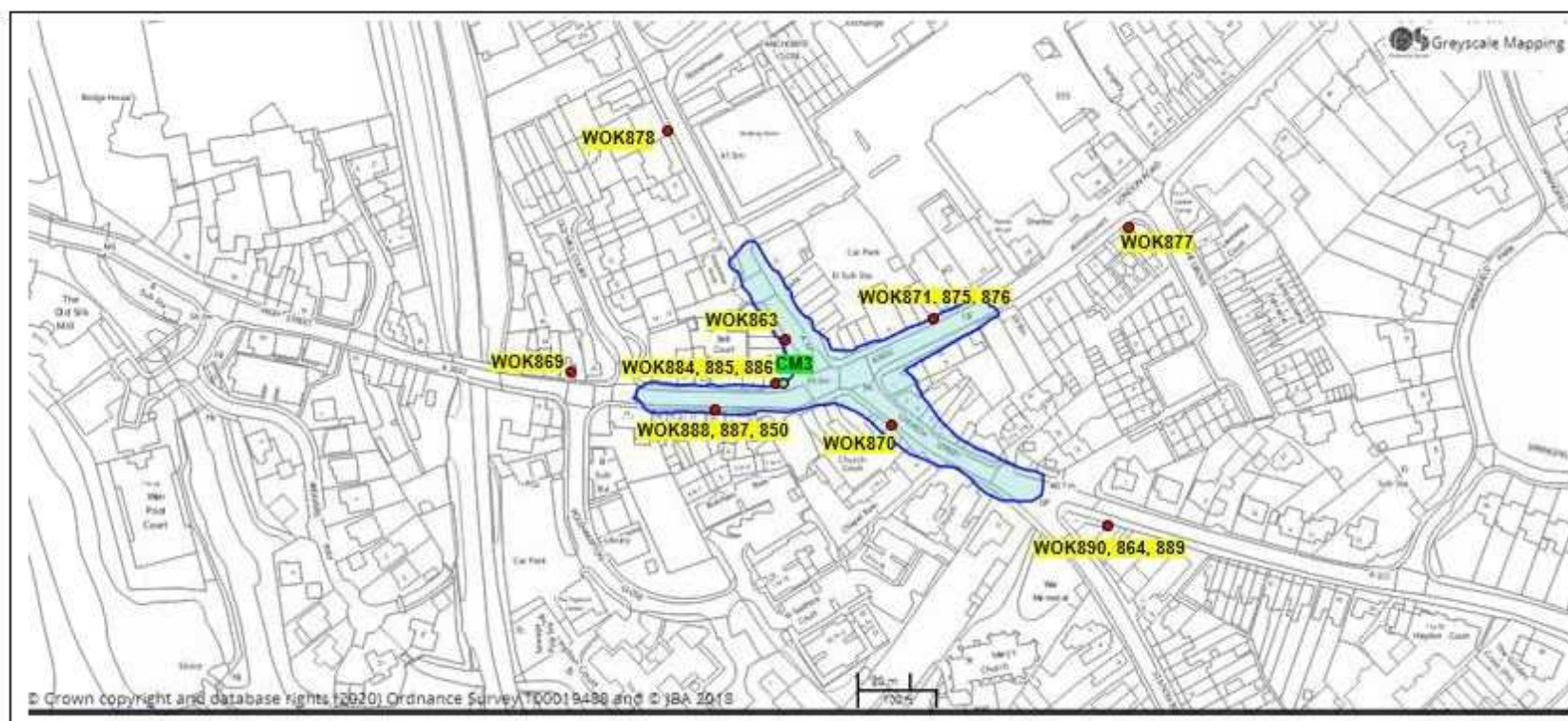
Map D.5: A map of the Wokingham Town Centre AQMA, including Tube location and Annual Mean NO₂ concentrations

Diffusion Tube	WOK 872	WOK 873	WOK 857	WOK 874	WOK 844	WOK 867	WOK 52	WOK 868	WOK 879	WOK 880	WOK 881	WOK 838	CM2
NO ₂ Annual Mean Concentration (µg/m ³)	32.4	24.7	39.9	28.9	38.6	23.7	30.3	27.7	36.3	36.5	37.3	41.8	33.0
									TriPLICATE Average 36.8				

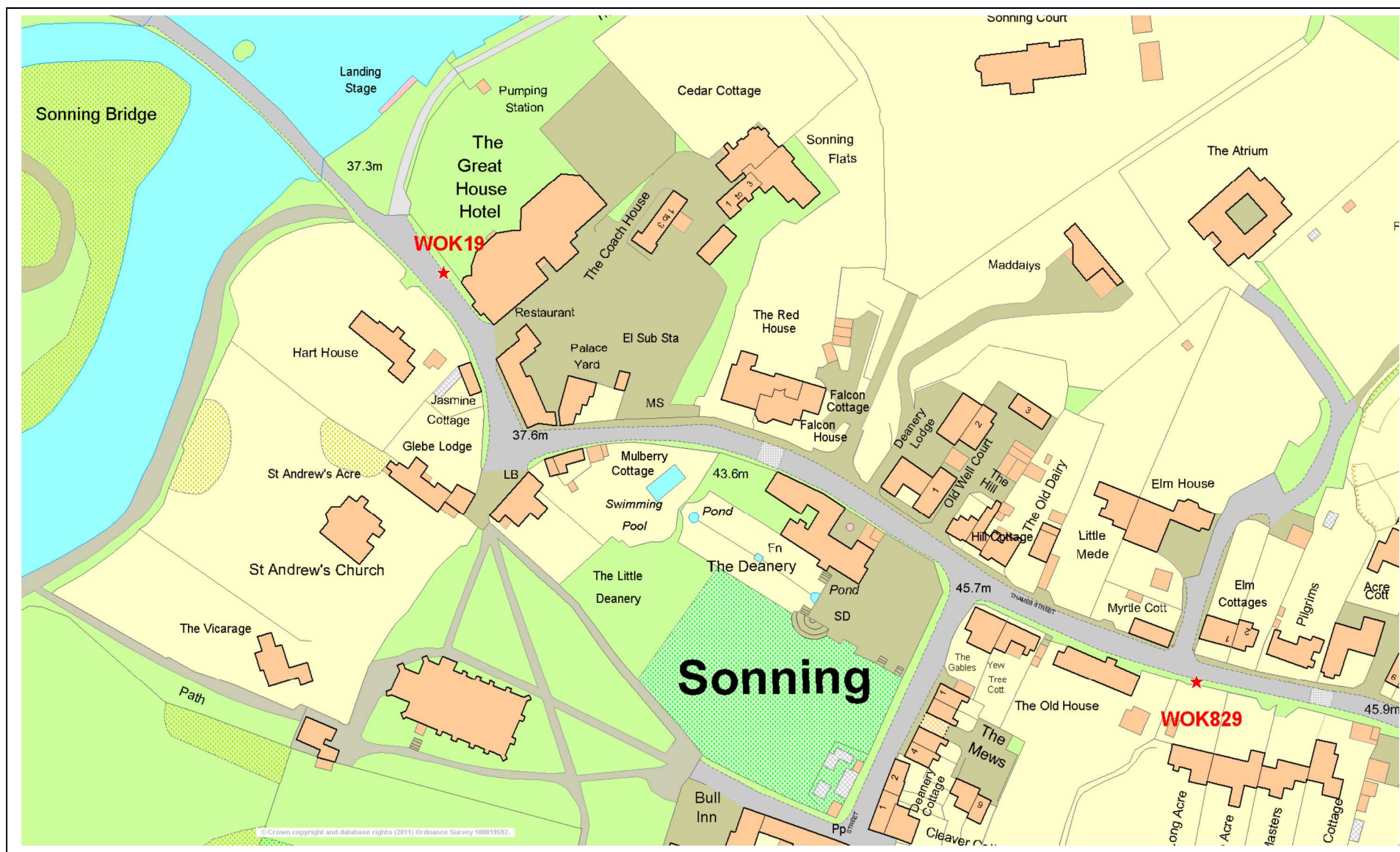


Map D.6: A map of the Twyford Cross Roads AQMA, including Tube location and Annual Mean NO₂ concentrations.

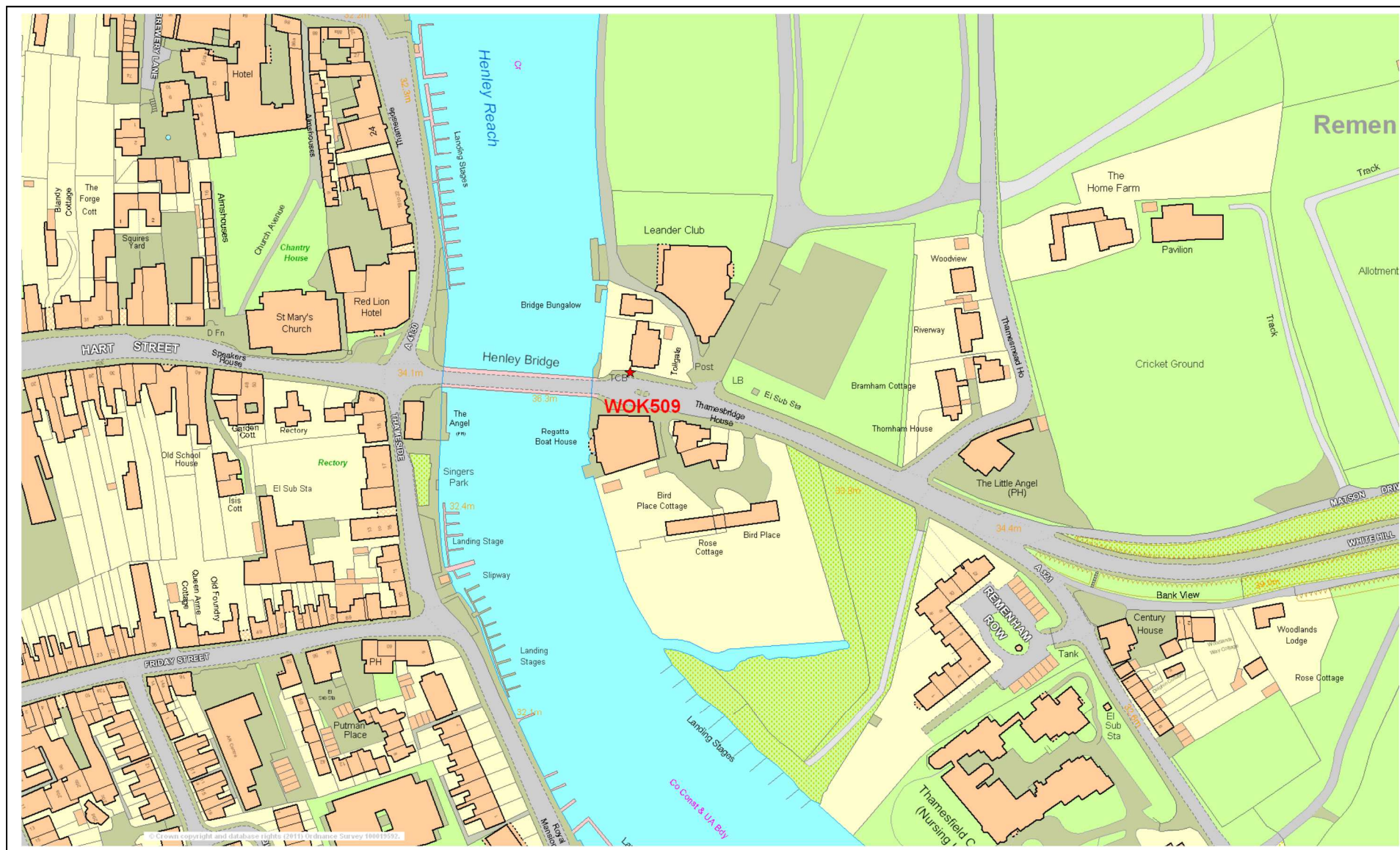
Diffusion Tube	WOK 878	WOK 863	WOK 877	WOK 890	WOK 889	WOK 864	WOK 869	WOK 884	WOK 885	WOK 886	CM3	WOK 871	WOK 875	WOK 876	WOK 888	WOK 887	WOK 850	WOK 870
NO ₂ Annual Mean Concentration (µg/m ³)	25.7	30.7	22.9	36.2	37.9	36.9	27.1	30.5	30.8	30.1	29.9	27.0	27.7	27.3	43.3	43.8	41.2	29.0
				Triplicated Average 37.0				Triplicated Average 30.5				Triplicated Average 27.3			Triplicated Average 42.8			



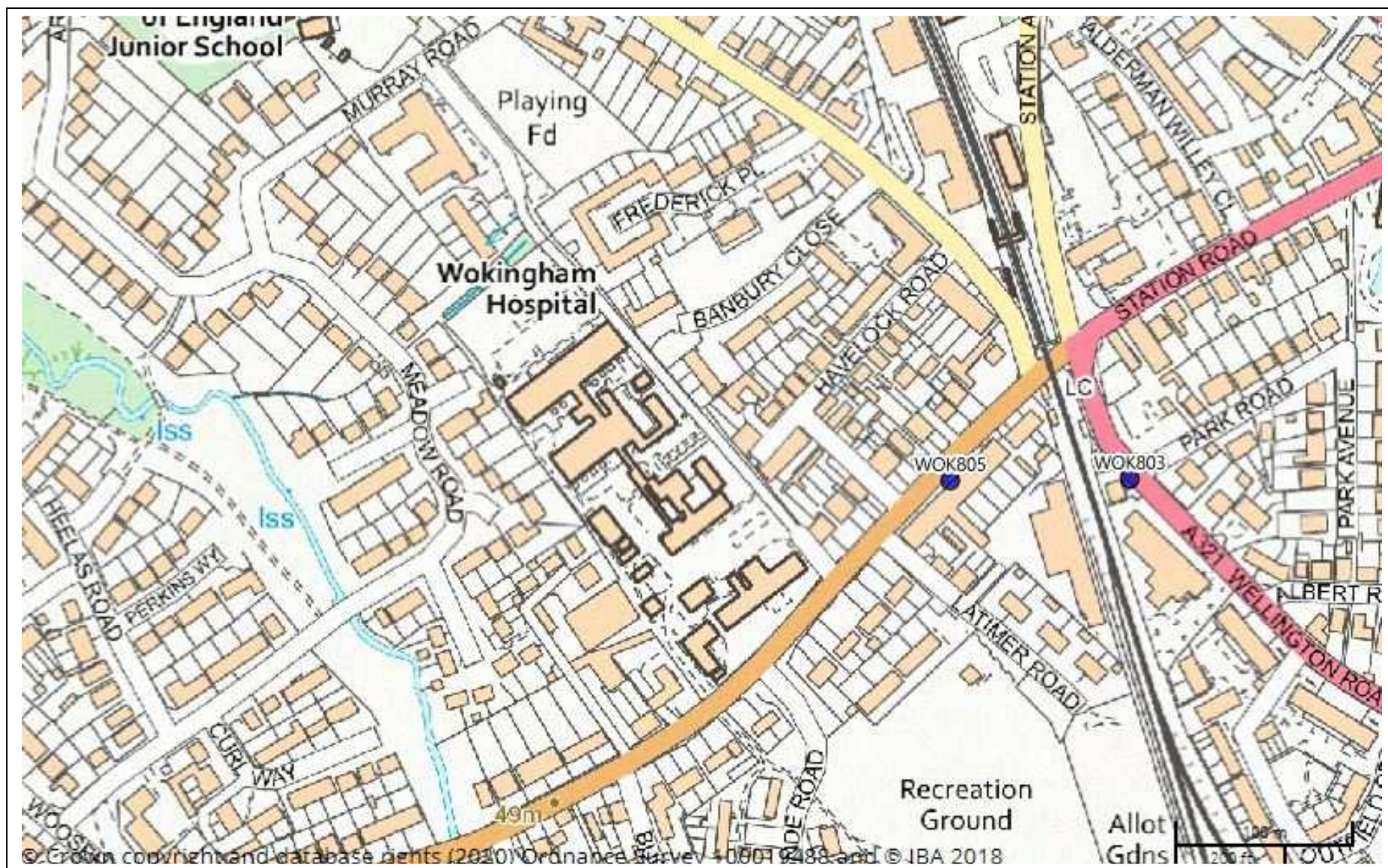
Map D.7: A map of the Diffusion Tubes in Sonning, sites 19 & 829



Map D.8: A map of the Diffusion Tubes in On Henley Bridge, site 509



Map D.9: A map of the Diffusion Tubes outside the Wokingham Town AQMA, sites 805 & 803



Map D.10 - A map of the Diffusion Tube, sites 827

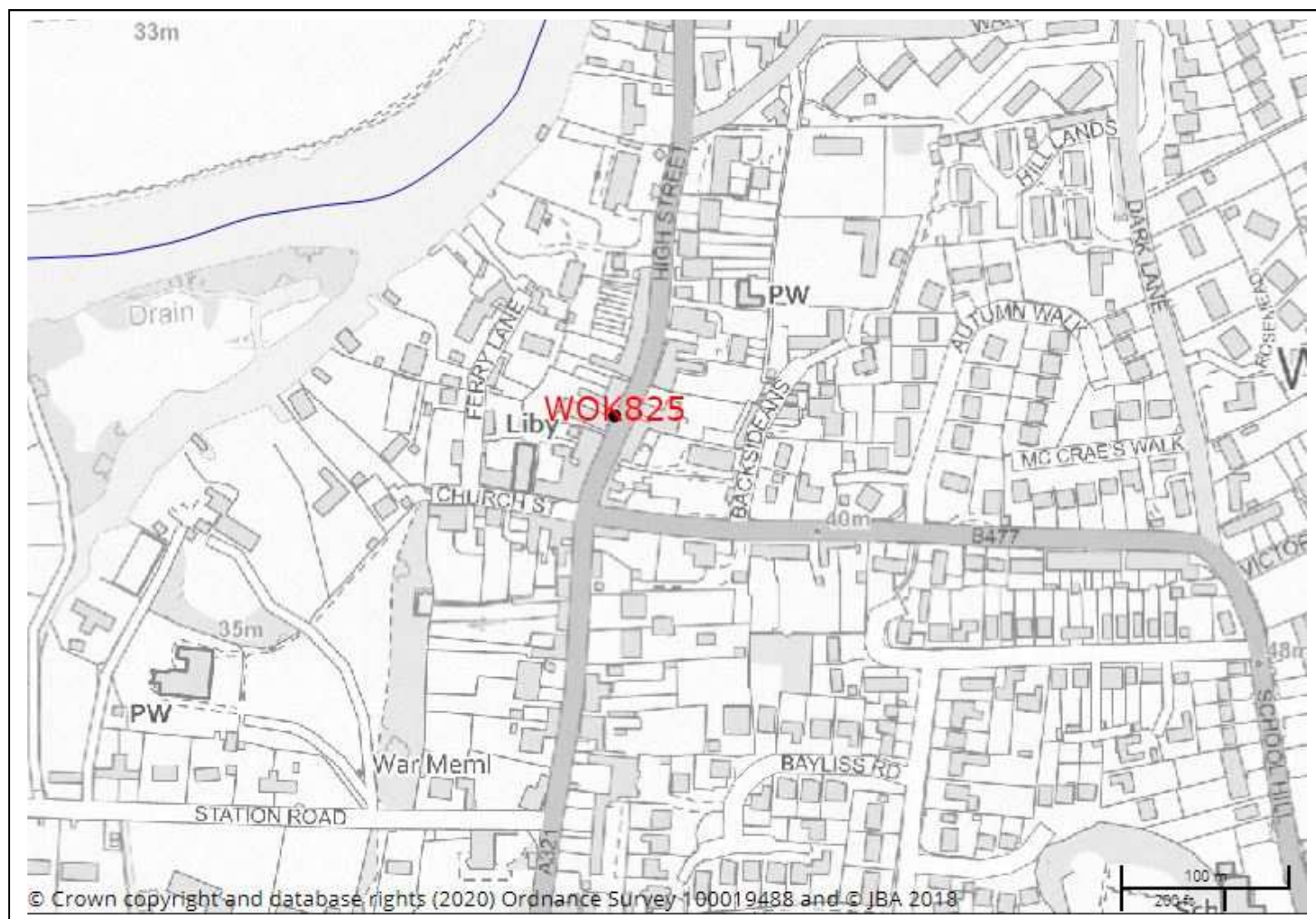




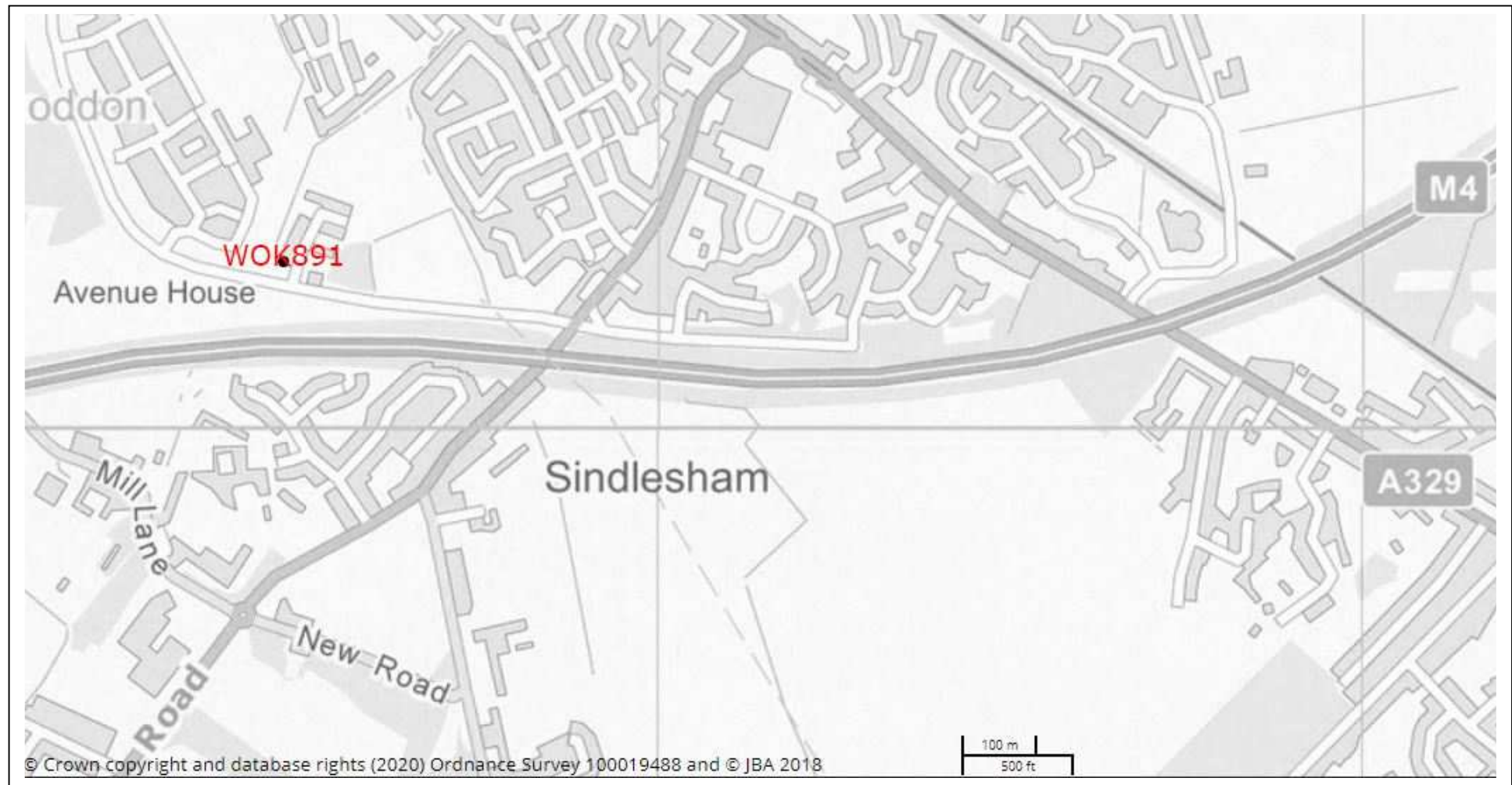
Map D.12: A map of the Diffusion Tube, sites 817



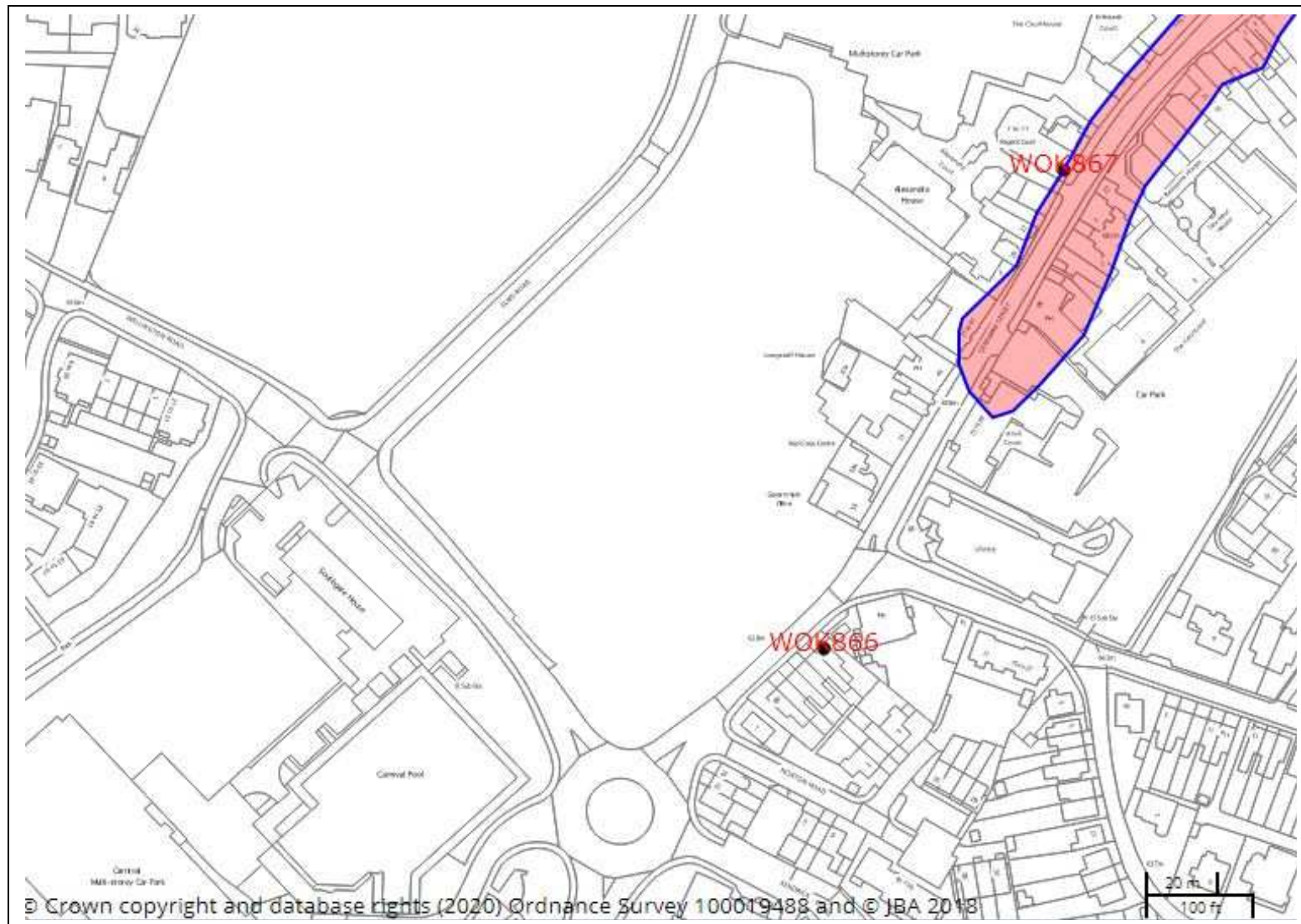
Map D.13 A map of the Diffusion Tube, sites 825



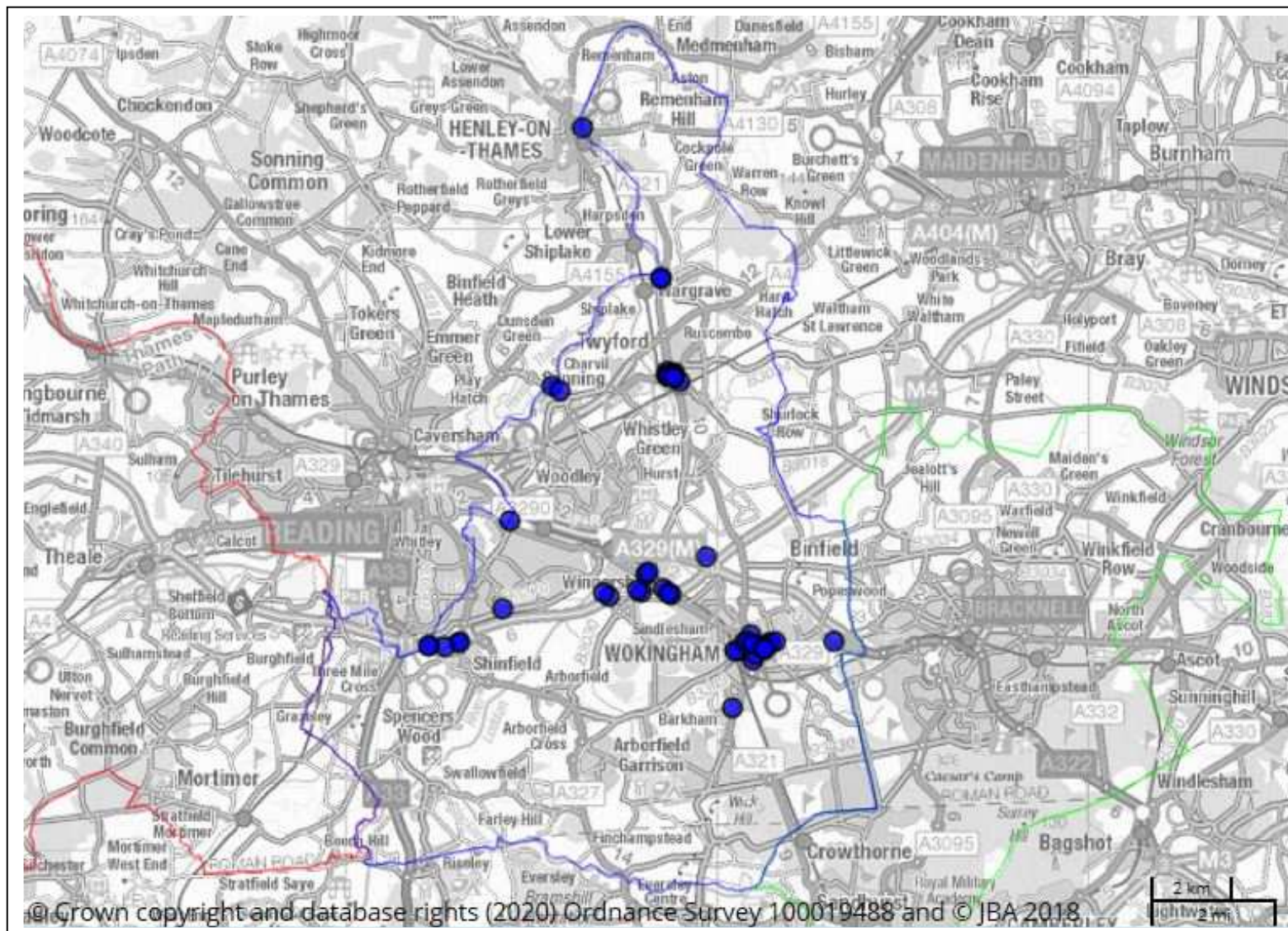
Map D.14: A map of the Diffusion Tube, sites 891



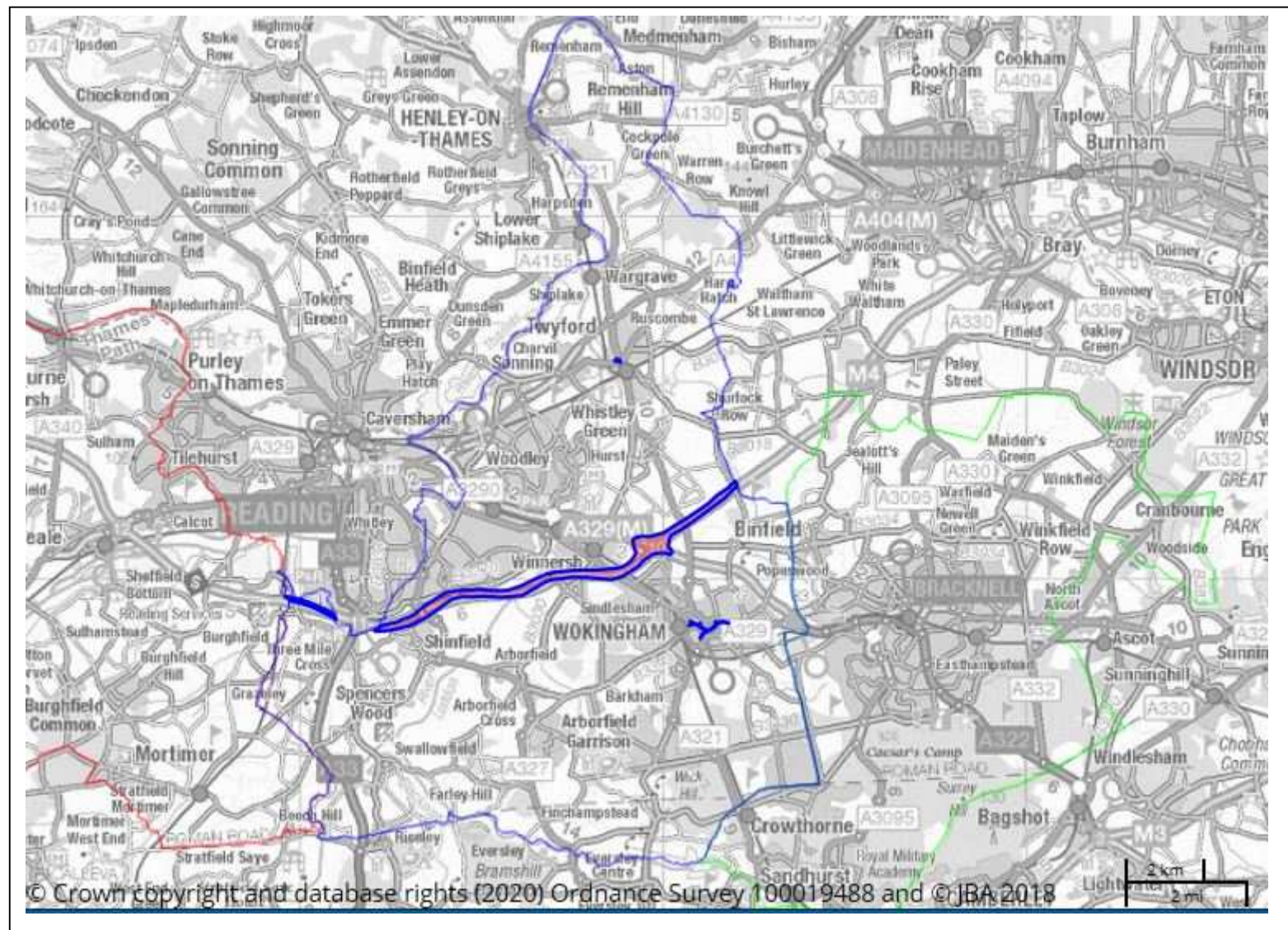
Map D.15: A map of the Diffusion Tube, sites 866, and the close proximity to the Wokingham AQMA



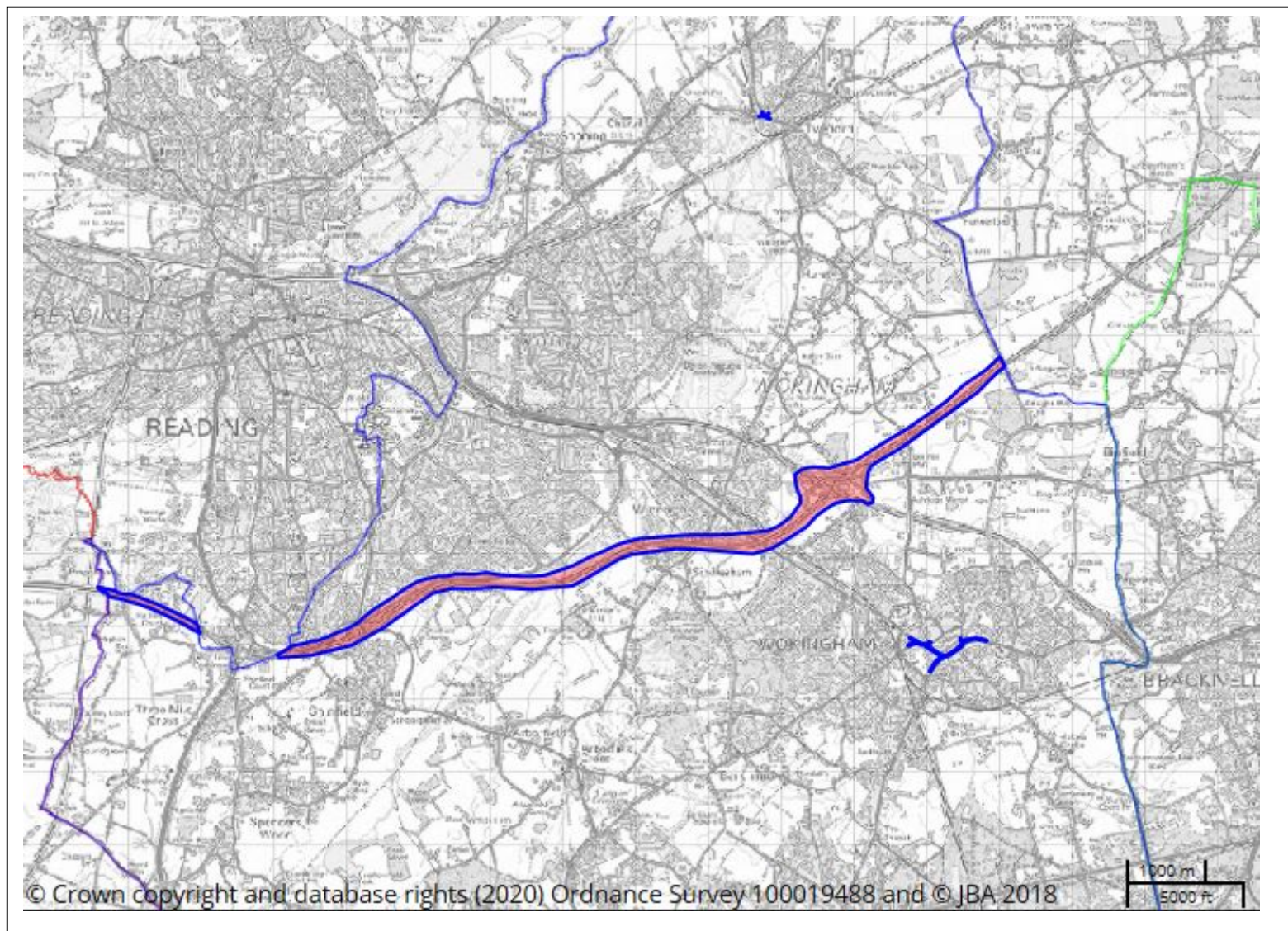
Map D.16: A map of all the Diffusion Tube Sites in Wokingham Borough Council



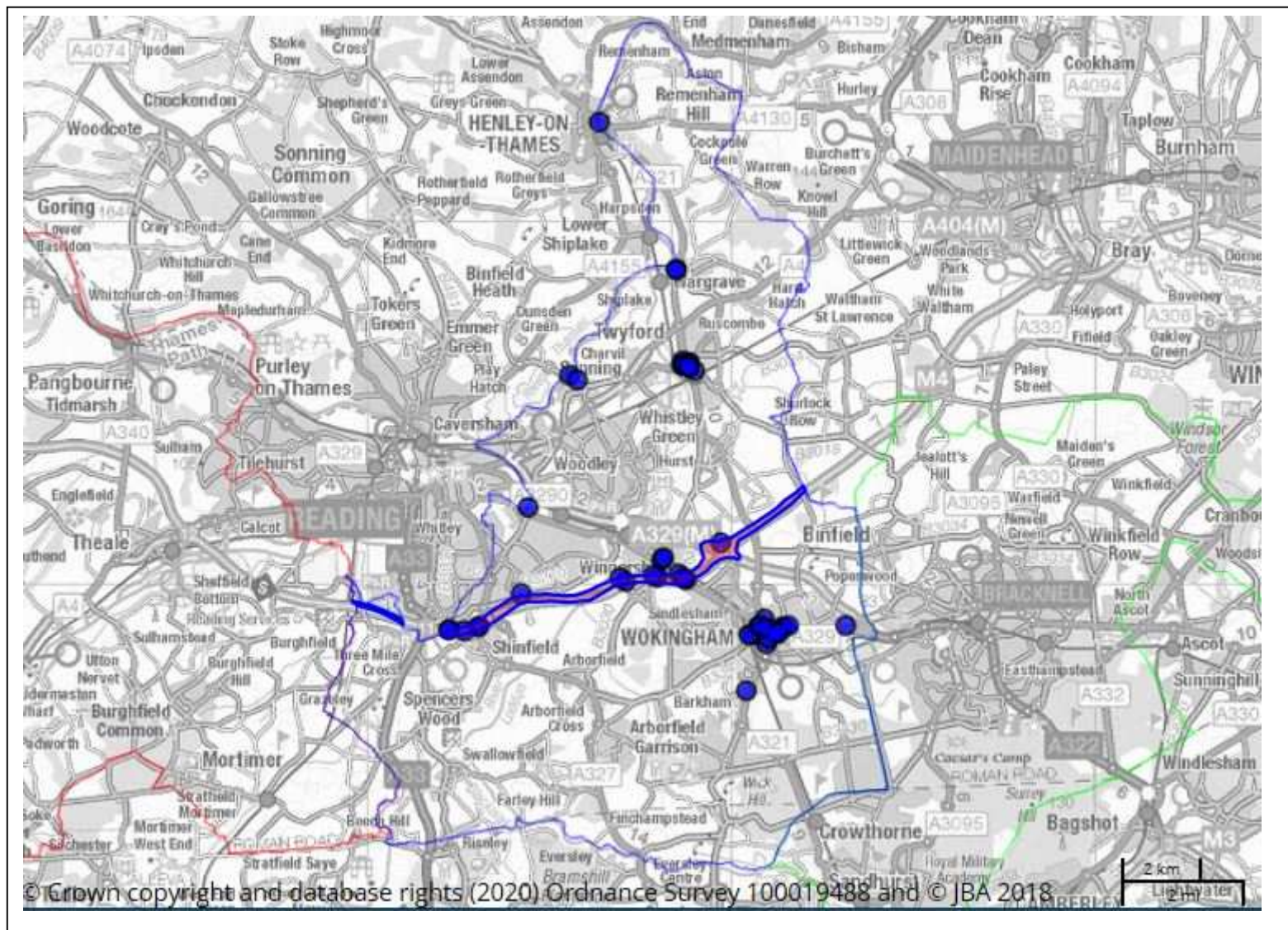
Map D.17: A map of all the AQMA's in Wokingham Borough Council



Map D.18: A map of all the AQMA's in Wokingham Borough Council (closer up)



Map D.19: A map of all the Monitoring Sites & AQMA's in Wokingham Borough Council.



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective ⁶	
	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

⁶ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

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
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