



WOKINGHAM
BOROUGH COUNCIL

2022 Air Quality Annual Status Report (ASR)

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

Date: June, 2022

Information	Wokingham Borough Council Details
Local Authority Officer	Residential & Environmental Team
Department	Safety & Enforcement
Address	Wokingham Borough Council Shute End Wokingham Berkshire RG40 1BN
Telephone	0118 9746000
E-mail	Environmental.Health@wokingham.gov.uk
Report Reference Number	WOKASR2021
Date	June 2022 Report prepared by PPP on behalf of Wokingham Borough Council

Executive Summary: Air Quality in Our Area

Air Quality in Wokingham Borough Council

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, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas^{1,2}.

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages³, with a total estimated healthcare cost to the NHS and social care of £157 million in 2017⁴.

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 Appendix D).

The diffusion tube sites of NO₂ levels in Wokingham borough have shown a decreasing trend since the 2017. No diffusion tube sites located within Wokingham exceeded the Annual Mean Objective.

The continuous monitoring unit in Peach Street Wokingham, within the Wokingham AQMA, recorded an Annual Mean NO₂ level of 24.2µg/m³, which meets the Annual Mean NO₂ Objective (40µg/m³) was not exceeded. The continuous monitoring also met the 1 hour NO₂ objective.

1 Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

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

3 Defra. Air quality appraisal: damage cost guidance, July 2021

4 Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

Within the Twyford AQMA the continuous monitoring recorded an Annual Mean NO₂ level of 26.0µg/m³, which also met the objective.

Further, there were no exceedances of the Annual Mean NO₂ Objective from the monitoring sites within the M4 AQMA.

No diffusion tube results were recorded above 60µg/m³ which indicated no exceedances of the 1 hour NO₂ 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

Whilst air quality has improved significantly in recent decades, and will continue to improve due to national policy decisions, there are some areas where local action is needed to improve air quality further.

The 2019 Clean Air Strategy⁵ sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero⁶ sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given

5 Defra. Clean Air Strategy, 2019

6 DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

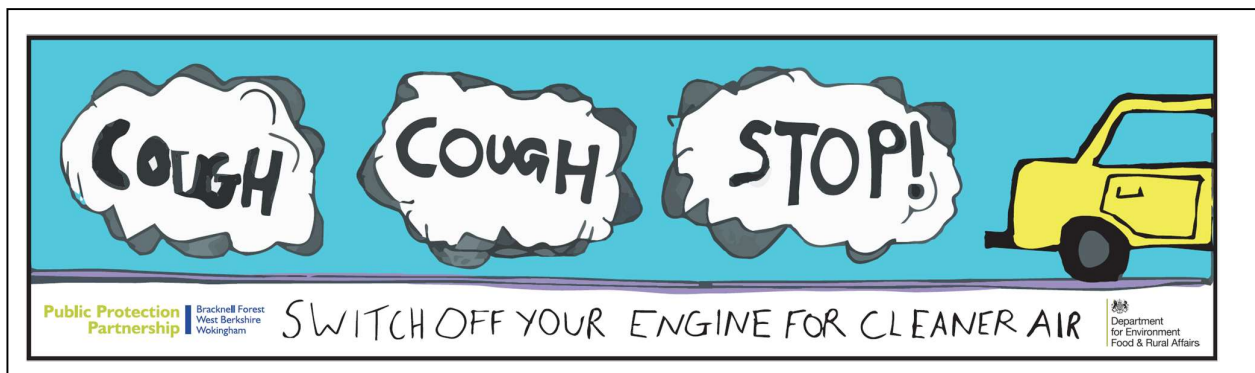
All planning applications are scrutinised for their air quality impact (dust, fires and vehicles) and potential to introduce new receptors into areas of existing poor air quality in the borough. Air quality assessments have been provided where necessary and appropriate mitigation requested. Applications 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.

A joint application with Bracknell Forest and West Berkshire Councils to the Air Quality Grant Scheme 2020 was made and we were successful in securing grant funding of £259,000 for the project of creating an anti-idling campaign, measuring PM_{2.5} at the schools located near/within the AQMA's and looking at behaviour change of our residents. In 2021 an Air Quality Officer was appointed and successfully ran the "Bumper Stickers Competition", (Figure S.4), where children were asked to create a sticker to put in the rear of a car to remind the people behind to switch off their engines. (<https://publicprotectionpartnership.org.uk/environmental-health/air-quality/anti-idling-bumper-sticker-schools-competition/>)

PPP also started the procurement process for the PM_{2.5} School monitoring and Behaviour Change Specialists, both who were appointed in early 2022.

Figure S.1-The Bumper Sticker



MyJourney within Wokingham Borough were successful and awarded a DEFRA Grant in both 2020 & 2021 which is being put towards measure 10, 20, & 38 on the AQAP.

During Clean Air Day in 2019 Wokingham Borough erected highway banners in both Wokingham and Twyford to ask drivers to cut their engines and stop idling (see Figure S.2). These Banners are to be revamped using the DEFRA Grant and the Behaviours Change specialists in 2022. There are also several Green Lamp Posts in Twyford, and it is anticipated that the impact will be evaluated in the 2023 ASR (Figure S.3).

An anti-idling competition was run by MyJourney, along with PPP to help the children become aware of idling and how it can causes pollution in 2020. As the banners were so popular with Schools and the Local Parishes this were continued to by erected during 2021 outside schools and areas where traffic idle such as the Twyford Railway station, see Figure S.1. These banners continue to be displayed at the winning schools or outside areas where there is idling.



Figure S.2 -The Clean Air Day Banner



Figure S.3 - Wokingham & Twyford Anti-Idling Banners

Conclusions and Priorities

In conclusion there were no exceedances within the Twyford, Wokingham Town Centre and M4 AQMAs, and there has not been for 5 years in the M4 AQMA, 2 years in both the Wokingham TC & Twyford AQMA. It is not appropriate to revoke to AQMA's as of yet as we will need 3 years of, pandemic free data, (and smart motorway road works complete for the M4) showing no exceedances in the AQO before this can be actioned. The data collected indicated that no further extension are needed to be made to the AQMAs or do we need to look at declaring anymore.

The Action Plan is currently being implemented with more being progressed each year, this can be seen in Table 2.2.

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:

- 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;
- Continue the implementation of the AQAP for the Wokingham Town Centre and Twyford Crossroads;
- Increase the community awareness of air pollution through involvement in Clean Air Day.
- 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 the innovative project to help reduce NO₂ in 2021/2022

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 in order to show any causal relationship.
- The pandemic.

The Pandemic and NO₂

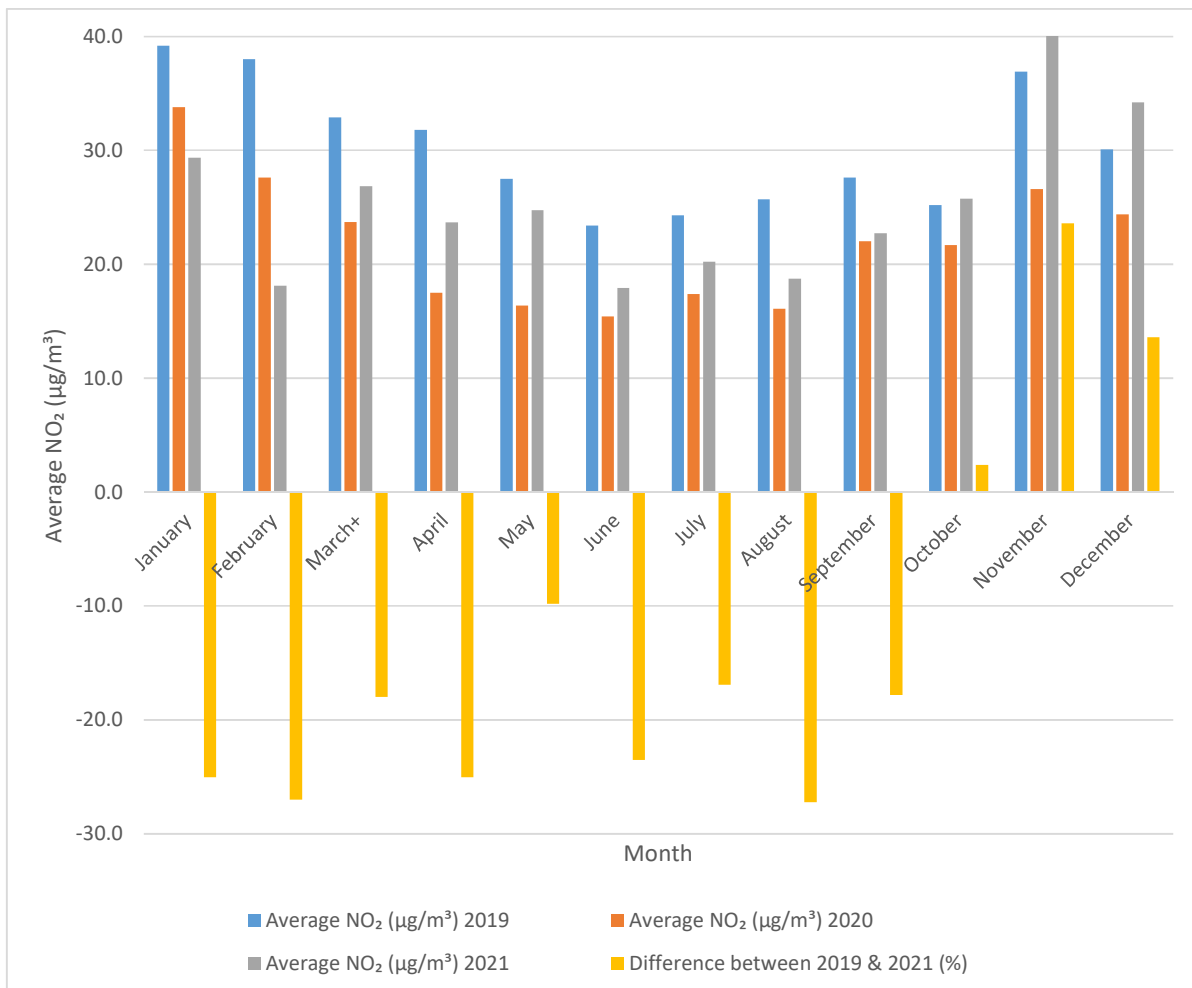
These past two years have been the only time in our history of AQ monitoring when we have had very limited vehicles in some months on the road network in the Wokingham borough. Graphs S.1 & S.2 show the pre-covid NO₂ data (2019) from both continuous monitors and the pandemic lockdown year's data (2020 & 2021).

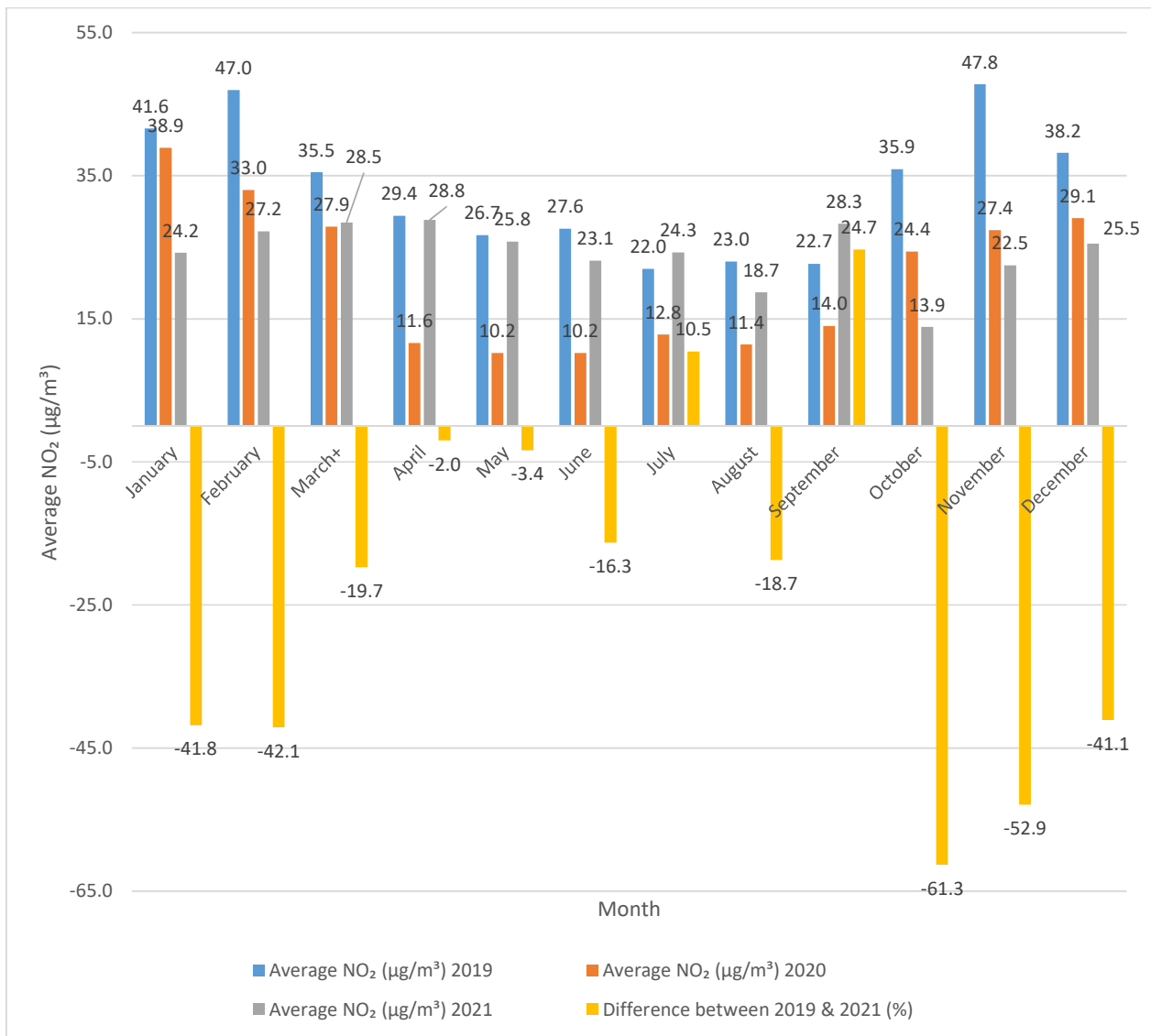
- The Twyford Cross Roads saw a reduction of NO₂ between 27% and 45% in 2020 compared to 2019, and between 27% and 61% in Wokingham Town Centre (Peach Street). This equated to a 27.96% reduction in NO₂ annual mean concentration

relative to 2019 in Twyford and 39.9% in Wokingham. If you compare 2021 to 2019 there is still an average reduction of 14.9% in Twyford and 26.9% in Wokingham.

- The Graphs S.2 show the monthly averages for 2019, 2020, and 2021, the orange bars show the percentage increase and decrease between 2019 (pre-covid) and 2021 (the last year with a lock down). The Peach Streets graph shows the NO₂ for 2021 was less than 2019. The greatest decreases can be seen in January & February (lockdown) and October, November & December. Whereas the Twyford Graph shows a percentage decrease in NO₂ from 2019 to 2021 from January to September, and an increase in October, November & December.

Graph S.1 - The monthly average NO₂ from the Twyford CM comparing 2019, 2020 & 2021





Graph S.2 - The monthly average NO₂ from the Peach Street CM comparing 2019, 2020 & 2021

Local Engagement and How to get Involved

For further details on air quality in Wokingham Borough, please refer to our website at <https://publicprotectionpartnership.org.uk/environmental-health/air-quality>

- Public Protection Partnership <https://publicprotectionpartnership.org.uk/environmental-health/air-quality/vehicle-idling/>
- Domestic Fuel information <https://publicprotectionpartnership.org.uk/environmental-health/air-quality/air-quality-domestic-solid-fuels-standards-england-regulations-2020/>

- Visit our MyJourney 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://fagi.co.uk/>)
- Use the bus or train regularly and keep up-to-date with the latest bus routes timetables.

We are also on Social Media including Twitter and Facebook [click here](#), Twitter [click here](#))

Figure S.4 - A Social media Facebook post about the AQ



Local Responsibilities and Commitment

This ASR was prepared by the Environmental Quality Team of Public Protection Partnership for Wokingham Borough Council with the support and agreement of the following officers and departments:

Highways Authority,

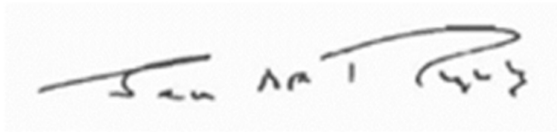
Environmental Health & Public Health,

Planning Authority

This ASR has been approved by: Sean Murphy

This ASR has not been signed off by a Director of Public Health.

This ASR has been signed off by the manager of Public Protection Partnership

A handwritten signature in black ink, appearing to read 'Sean Murphy', is shown on a light background.

Sean Murphy

Public Protection Manager

If you have any comments on this ASR please send them to Environmental Health at:

Wokingham Borough Council

Shute End

Wokingham

Berkshire

RG40 1BN

0118 9746000

Environmental.health@wokingham.gov.uk

Table of Contents

Executive Summary: Air Quality in Our Area	i
Air Quality in Wokingham Borough Council	i
Actions to Improve Air Quality	ii
Figure S.1-The Bumper Sticker	iii
Figure S.2 -The Clean Air Day Banner	iv
Figure S.3 - Wokingham & Twyford Anti-Idling Banners	v
Conclusions and Priorities	v
The Pandemic and NO ₂	vi
Graph S.1 - The monthly average NO ₂ from the Twyford CM comparing 2019, 2020 & 2021	vii
Graph S.2 - The monthly average NO ₂ from the Peach Street CM comparing 2019, 2020 & 2021	viii
Local Engagement and How to get Involved.....	viii
Figure S.4 - A Social media Facebook post about the AQ	ix
Local Responsibilities and Commitment	x
1 Local Air Quality Management	1
2 Actions to Improve Air Quality	2
Air Quality Management Areas	2
Progress and Impact of Measures to address Air Quality in Wokingham Borough Council	5
Traffic Data for Wokingham Borough Council	10
Graph 2.1 – A329 Reading Road (between Albany Park Drive and Arbor Lane) Traffic Flow Comparison between 2019-2021	11
Graph 2.1 – A4 Bath Road (between B4446 Sonning Lane and Parkway Drove) Traffic Flow Comparison between 2019 - 2021	11
PM _{2.5} – Local Authority Approach to Reducing Emissions and/or Concentrations	20
Table 2.3: Showing the Fraction of Mortality attributable to particulate air pollution indicator value within Berkshire	20
Figure 1.2 - A Pie Chart showing both the Primary and Secondary sources of PM _{2.5}	22
3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance	22
Summary of Monitoring Undertaken	23
3.1.1 Automatic Monitoring Sites	23
3.1.2 Non-Automatic Monitoring Sites	23
Individual Pollutants	23
3.1.3 Nitrogen Dioxide (NO ₂)	23
Graph 3.1 – Trends in Annual Mean NO ₂ Concentrations in the M4 AQMA Error! Bookmark not defined.	
3.1.4 Continuous Monitoring Wokingham – Peach Street.....	25
Graph 3.1 - Wokingham Daily NO ₂ 2021	25

3.1.5	Continuous Monitoring Twyford – Cross Roads	25
Graph 3.2 - Twyford Daily NO ₂ 2021		26
3.1.6	Wokingham Borough Diffusion Tube Data	26
3.1.7	M4 AQMA Diffusion Tube Data	26
3.1.8	Wokingham Town Centre AQMA Diffusion Tube Data	27
3.1.9	Twyford Crossroads AQMA Diffusion Tube Data	28
3.1.10	Outside of the AQMAs	28
3.1.11	Particulate Matter (PM ₁₀)	28
3.1.12	Particulate Matter (PM _{2.5}).....	28
3.1.13	Sulphur Dioxide (SO ₂).....	29
Appendix A: Monitoring Results		30
Graph A.1 – Trends in Annual Mean NO ₂ Concentrations in the Wokingham AQMA.....		41
Graph A.2 – Trends in Annual Mean NO ₂ Concentrations in the Twyford AQMA.....		42
Graph A.3 – Trends in Annual Mean NO ₂ Concentrations in the M4 AQMA		43
Table A.5 – 1-Hour Mean NO ₂ Monitoring Results, Number of 1-Hour Means > 200µg/m ³		44
Appendix B: Full Monthly Diffusion Tube Results for 2021		45
Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC		48
New or Changed Sources Identified Within Wokingham Borough Council During 2021.....		48
Additional Air Quality Works Undertaken by Wokingham Borough Council During 2021		48
Table C.1 – PM _{2.5} & PM ₁₀ results from the Study in Wokingham		48
QA/QC of Diffusion Tube Monitoring		49
Diffusion Tube Annualisation.....		50
Diffusion Tube Bias Adjustment Factors		50
Factor from Local Co-location Studies and Discussion of Choice of Factor to Use.....		50
Table C.2 – Bias Adjustment Factor		51
NO ₂ Fall-off with Distance from the Road.....		52
QA/QC of Automatic Monitoring		52
Site operation.....		52
Data calibration and ratification		53
Independent Site Audits.....		54
Wokingham Town Centre		54
Table C.3 Wokingham Town Centres Recalculated Concentrations		55
Twyford Village Cross Roads		55
Table C.4 Twyford Village Cross Roads Recalculated Concentrations		56
OSIRIS PM Analyser		56
Certificate of Calibration		57
Data Management		57
Automatic Monitoring Annualisation		57
NO ₂ Fall-off with Distance from the Road.....		57

Table C.5 – Annualisation Summary (concentrations presented in $\mu\text{g}/\text{m}^3$).....	58
Table C.6 – Local Bias Adjustment Calculation	58
Appendix D: Map(s) of Monitoring Locations and AQMAs	59
Figure D.1 – Map of Wokingham Town Centre AQMA.....	59
Figure D.2 – Map of Twyford Crossroads AQMA.....	60
Figure D.3 – Map of M4 AQMA	61
Figure D.4 - Wokingham Town Centre AQMA Air Quality Monitoring Locations	62
Figure D.5 – Twyford Crossroads AQMA Air Quality Monitoring Locations.....	63
Figure D.6 – Map of M4 (West) Air Quality Monitoring Locations.....	64
Figure D.7 – Map of M4 (East) Air Quality Monitoring Locations.....	65
Figure D.8 – Map of (883) Evendons Primary School.....	66
Figure D.9 – Map of (825) 54 High St Wargrave.....	67
Figure D.10 – Map of (817) 298 London Rd	68
Figure D.11 – Map of (509) Henley Bridge	69
Figure D.12 – Map of (505) Church Road.....	70
Figure D.13 – Map of Sonning Air Quality Monitoring Locations	71
Figure D.14 – Map of Wokingham	72
Appendix E: Summary of Air Quality Objectives in England.....	73
Glossary of Terms	74
References	75

Figures

Figure A.1 – Trends in Annual Mean NO ₂ Concentrations in the Wokingham AQMA.....	41
Figure D.1 – Map of Non-Automatic Monitoring Site.....	59

Tables

Table 2.1 – Declared Air Quality Management Areas	3
Table 2.2 – Progress on Measures to Improve Air Quality.....	12
Table A.1 – Details of Automatic Monitoring Sites	30
Table A.2 – Details of Non-Automatic Monitoring Sites	31
Table A.3 – Annual Mean NO ₂ Monitoring Results: Automatic Monitoring (µg/m ³).....	35
Table A.4 – Annual Mean NO ₂ Monitoring Results: Non-Automatic Monitoring (µg/m ³)	36
Table A.5 – 1-Hour Mean NO ₂ Monitoring Results, Number of 1-Hour Means > 200µg/m ³	43
Table B.1 – NO ₂ 2021 Diffusion Tube Results (µg/m ³)	45
Table C.1 – Bias Adjustment Factor	51
Table C.2 – Annualisation Summary (concentrations presented in µg/m ³).....	58
Table C.3 – Local Bias Adjustment Calculation	58
Table E.1 – Air Quality Objectives in England	73

1 Local Air Quality Management

This report provides an overview of air quality in Wokingham Borough Council during 2021. 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 Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E.1.

2 Actions to Improve Air Quality

Air Quality Management Areas

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

A summary of AQMAs declared by Wokingham Borough Council can be found in Table 2.1. The table presents a description of the 3 AQMA(s) that are currently designated within Wokingham Borough Council. Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of AQMAs and also the air quality monitoring locations in relation to the AQMAs. The air quality objectives pertinent to the current AQMA designations are as follows:

- NO₂ annual mean,
- NO₂ hourly mean.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
M4 AQMA	Declared 2001, Amended 2004 (WOK841)	NO2 Annual Mean	Zone 60m either side of the M4 from the Councils boundaries with RBC & RBW&M throughout the borough and 10m either side of the A329 (M)/A3290. The AQMA was reduced to the Councils 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)	19.8	Refer to the LTP3	https://uk-air.defra.gov.uk/aqma/details?aqma_ref=1602
M4 AQMA	Declared 2001, Amended 2004 (WOK841)	NO2 1 Hour Mean	Zone 60m either side of the M4 from the Councils boundaries with RBC & RBW&M throughout the borough and 10m either side of the A329 (M)/A3290.	YES	228 (percentile of hourly mean)	0	WBC AQAP 2017	https://uk-air.defra.gov.uk/aqma/details?aqma_ref=1602

Twyford Crossroads AQMA	Declared November 2015 (WOK 850)	NO ₂ Annual Mean	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	32.5	WBC AQAP 2017	https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=318
Wokingham Town Centre AQMA	Declared 2015 (WOK838)	NO ₂ Annual Mean	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.	52	NO	36.5	WBC AQAP 2017	https://uk-air.defra.gov.uk/aqma/details?aqma_ref=1602#1111

Wokingham Borough Council confirm the information on UK-Air regarding their AQMA(s) is up to date.

Wokingham Borough Council confirm that all current AQAPs have been submitted to Defra.

Progress and Impact of Measures to address Air Quality in Wokingham Borough Council

Defra's appraisal of last year's ASR concluded that the 2020 report was well structured, detailed, and provides the information specified in the Guidance. The following comments are designed to help inform future reports.

1. Robust and accurate QA/QC procedures were applied. Calculations for bias adjustment, annualisation and distance-correction factors were outlined in detail, although a figure showing the national bias adjustment factor determination would be beneficial in future reports.
2. Wokingham Borough Council should upload their diffusion tube data via the Diffusion Tube Data Entry System (DTDES) on the LAQM Portal. *This has been carried out.*
3. The Council has included discussion and review of its AQMAs and monitoring strategy, which is well-informed due to its extensive monitoring network, with additional diffusion tubes added to provide further monitoring, and demonstrates the Council's proactive and dedicated approach to improving air quality.
4. Comments from last year's ASR have been mentioned and addressed. This is welcomed and encouraged for future ASRs.
5. The Council's action plan takes forward a number of important measures and well details the progress being made.
6. The Council has an extensive NO₂ monitoring strategy. Monitoring of other pollutants such as PM₁₀/PM_{2.5}, while not compulsory, could be considered to better inform how to tackle PM_{2.5} pollution. The Council have specifically mentioned and discussed the Public Health Outcomes Framework fraction of mortality attributable to particulate pollution within Berkshire, which is welcomed.
7. The Council have provided clear mapping of the automatic and diffusion tube monitoring network, and very detailed and thorough trend analysis and discussion throughout the report, which is commendable.
8. The Council have provided a very detailed discussion and analysis of concentrations and traffic data regarding the impacts of the COVID-19 pandemic on air quality, and highlighted the opportunities and challenges going forward.
9. Overall, the report is very detailed, thorough and satisfies the criteria of relevant standards, and the report is an example of best practice. The Council should continue their excellent work.

Wokingham Borough Council has taken forward a number of direct measures during the current reporting year of 2021 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

43 measures are included within Table 2.2, with the type of measure and the progress Wokingham Borough Council have made during the reporting year of 2021 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within 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, was completed in early 2022. 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. The project has reduced the level of traffic passing through Winnersh Crossroads.
- Active Travel Fund Tranche 2 has been developed further with the selected scheme (Woodley to Reading Active Travel Route) consulted on in February 2022. Following consultation further design work is required to deliver a scheme more acceptable to the public.
- Active Travel Fund Tranche 3 has awarded £2.95m to the borough to enable us to complete the route from Woodley to Reading. As described above, we are currently redesigning the scheme but hope to complete implementation of some of the scheme in the next 12 months.
- Local Cycling and Walking Infrastructure Plan (LCWIP) for Wokingham Borough is underway with consultation on public views regarding walking and cycling in the borough completed. As part of the LCWIP outputs are cycling and walking network plans which identify preferred routes and core zones for further development and a prioritised schedule of infrastructure improvements for future investment; these plans are now in draft form, with a consultation on these routes planned for June 2022.
- In 2021 we were again unable to complete personalised travel planning for new communities due to the pandemic. We are therefore planning to deliver an enhanced PTP project covering two development sites in 2022.
- Our Electric Vehicle (EV) charge points have continued to be expanded with the number of publicly available charge points more than doubling in 2021 to 178. In addition, the Executive approved on-street and in public car park charge point provision using the DfT's Office for Zero Emission Vehicles' On-street Residential Chargepoint Scheme. The bid document for this has been prepared though needs amendment following a

change in the bidding criteria; once completed this should add approximately 60 charge points. [Wokingham charging points - EV points near Wokingham, Berkshire \(zap-map.com\)](https://www.zap-map.com)

- Promotion of active travel and travel choices via the MyJourney website is on-going. There were 79,449 visitors to the website. We have continued to promote active travel through our social media feeds, and our followers increased to 1,736 (Facebook) and 1014 (Twitter) in 2021/22 (financial year) with our top Facebook post reaching 2,856 people.
- MyJourney has continued to partner with Love to Ride and once again ran four cycling campaigns across the borough in 2021/22. Our main campaign, Cycle September, attracted 72 workplaces and over 1,400 residents were registered on the Love to Ride platform, logging 1,170,023 miles cycled and saving the equivalent of 190,889 LBS 295 participants compared with 241 the previous year.

- Bikeability figures for 2021 – 2022 :

Total no. of children trained on Bikeability courses = 1,501

Total no. of younger children trained on Learn to Ride courses in 2021-2022 = **273** - with 208 of them successfully riding after 1 or 2 sessions (76% success rate.)

This compares favourably with the previous year's figures for 2020 – 2021 (which were badly affected by school closures/Covid):

Total trained on Bikeability courses = 872

Total attending Learn to Ride courses in 2020 - 2021 = 99 (with 68% success rate.)

- We have also been awarded a larger Bikeability Grant by the Department for Transport for 2022 – 2023: a grant of £77,500 to train 1,800 children on Bikeability Courses + £5,832 for Learn to Ride training, making a total of **£83,332**.
- Bus services have suffered significantly from reduced patronage due to Covid-19. Reading Buses are continuing to operate services, though we have seen some reduced in frequency or cancelled completely due to lack of use. We continue to work with the bus operators to try to maintain a good level of service.

- WBC has just completed the Coppid Beech Park and Ride facility and continue to expand the Winnersh Triangle Park and Ride site. In addition, the Thames Valley Park and Ride site is also available for use. Despite this, there are currently only buses serving the Thames Valley Park and Ride due to this low usage and low expected uptake in the near future.
- We have completed our Local Bus Service Improvement Plan as required by the new national bus strategy. This will help us to enable increases in bus use and better, more reliable.
- For ULEV the number of all vehicle registrations for Q3 of 2021 in Wokingham was 1,793 compared with 135,430 for the SE as a whole this is an increase of 59% compared to 12 months earlier. (DfT Stat Table VEH0132).

WBC has been awarded funding by DEFRA to MyJourney to complete Air Quality education work in school in and around its AQMA's. The borough has appointed an Air Quality Active Travel Officer who has been working with schools to raise awareness of the issues and encourage increased active travel. As part of the initiative, the borough completed a Beat the Street project. The initiative took place across Wokingham town centre, Woosehill and Finchampstead over the summer. A total of 6,263 participants walked, cycled, wheeled and scooted 151,531 miles over six weeks between 8 June and 20 July. They received a survey at both the beginning and end of the game to assess its impact.

Feedback showed:

- 75% of inactive adults became active
- 74% of inactive children became active
- 80% used active modes of travel more
- 16 schools and 20 community teams took part
- 61% felt they had walked more
- 16% felt they had cycled more
- 2% had wheeled more

Wokingham Borough Council expects the above following measures to continue to be completed over the course of the next reporting year.

- Completion of the LCWIP for the whole borough. <https://wokinghamlcwip.commonplace.is/about>
- Development of our new Local Transport Plan (LTP4) in conjunction with a new Local Plan to 2038 which will define the locations of major development in the borough.
- MyJourney's extension of their DEFRA funded Eco-Travel Officer role. They will continue to work with schools in AQMAs. One of the main aspects of the project is to work closely with primary schools that are near Wokingham's AQMA's to monitor their Nitrogen Dioxide, assist with travel plans to aim for Modeshift Stars accreditations, deliver lesson packs, competitions, activities, assemblies, and events. Though this has been difficult with COVID-19 schools know how important the health and safety of their pupils is and therefore, with the individual school, the project adapts. Monitoring only outside the school and delivering resources digitally. There are 10 schools involved in the project and following a recent funding announcement we will now be aiming increase the number of schools working with us next year. WBC have recently introduced the "Better Points" app to the borough and will be promoting this throughout 2022.
- Continued promotion of Active Travel through the MyJourney platforms.
- Development of EV Strategy to help increase the uptake of EV in the borough (this was delayed in 2021 but will be completed by summer 2022).
- Development of a Low Emission Transport Strategy to assist with both improved air quality and reduced Carbon emissions.
- Continual working with Public Health Colleagues, MyJourney Colleagues, Climate Change Colleagues, and Transport & Planning Officers.
- Winnersh Triangle Park and Ride, is expanding the decking of the existing site to provide a minimum of 160 additional spaces on the site, works started in March 2021, via LEP funding and will continue this year. <https://www.wokingham.gov.uk/business-and-licensing/business-and-growth/local-enterprise-partnership-lep/>

Wokingham Borough Council worked to implement these measures in partnership with the following stakeholders during 2021:

- Neighbouring local authorities;

- The Highways Authority;
- The Planning Authority
- MyJourney
- The Public
- Local Schools
- Public Protection Partnership

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.

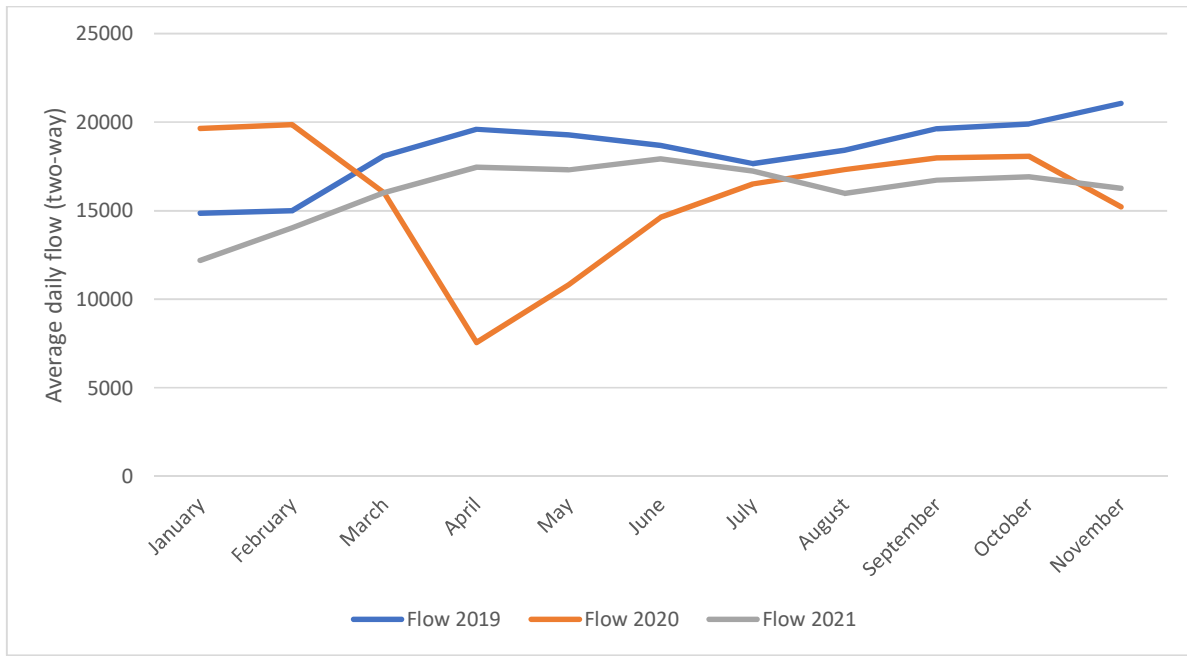
Progress on some measures has been slower than expected due to the ongoing COVID-19 pandemic and the resulting lockdowns. For example, the Bikeability industry was hard hit by the pandemic, with several instructors leaving the industry to find alternative work. This has left a shortage of instructors in 2021.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Wokingham Borough Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of the Twyford Crossroads, M4 and Wokingham Town Centre AQMAs.

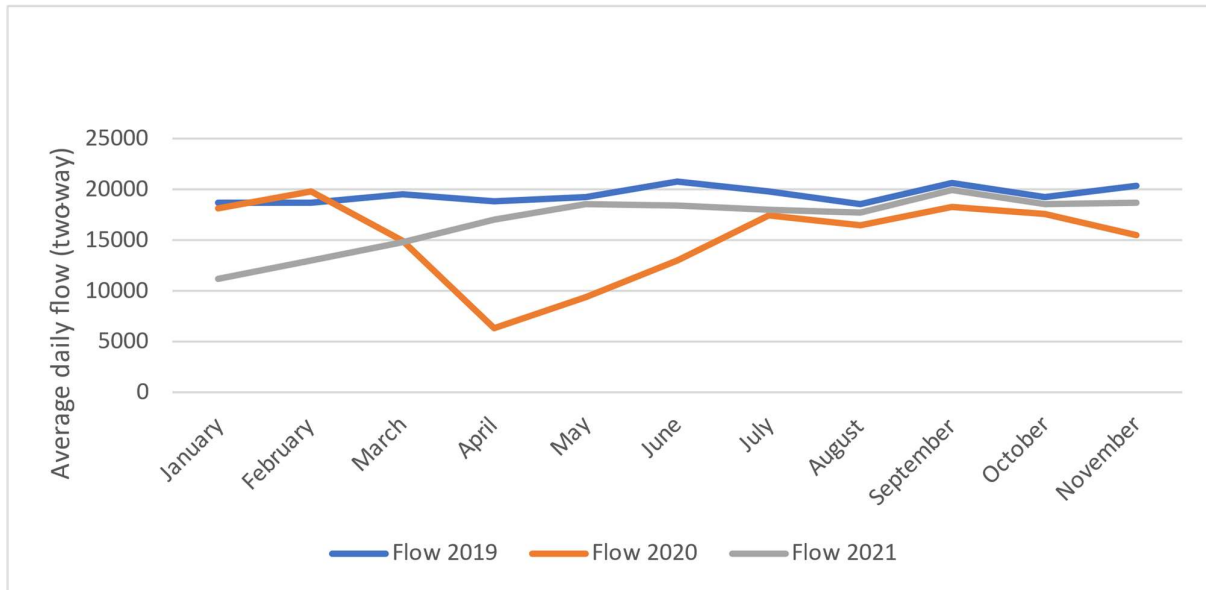
Traffic Data for Wokingham Borough Council

The traffic is monitored at two places in Wokingham Borough Council A4 Bath Road and the A329 Reading Road.

The A329 Reading Road (between Albany Park Drive & Arbor Lane), Winnersh showed a 12% decrease in traffic in 2021 compared to 2019, and a 3% increase in traffic since 2020. The A4 Bath Road (between B4446 Sonning Lane and Parkway Drive), Sonning also showed a 13% decrease in traffic in 2021 compared to 2019. But a larger 11% increase in traffic since 2020.



Graph 2.1 – A329 Reading Road (between Albany Park Drive and Arbor Lane) Traffic Flow Comparison between 2019-2021



Graph 2.1 – A4 Bath Road (between B4446 Sonning Lane and Parkway Drive) Traffic Flow Comparison between 2019 - 2021

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1 AQAP Twyford 1	Investigate the feasibility of alternative traffic routes around Twyford	Alternatives to private vehicle use	Bus based Park & Ride	2017-2019	2019	WBC	WBC	NO	Fully funded	£100k - £500k	Planning	12.1 µg/m3	Feasibility study carried out.	Local Plan update is ongoing. This will make recommendation regarding development and supporting infrastructure needs.	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	Select from the available categories	Select from the available classifications	2017-2019 onwards	2023	WBC, GWR, Twyford PC	WBC, GWR, Twyford PC	NO	Part-Funded	£10k - 50k	Design	12.1 µg/m3	Changes incorporated.	Some cycle parking added in 2020 however, there is now a feasibility underway with a view to make improvements using Station Improvement Funding from DfT	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	Select from the available categories	Select from the available classifications	2016-2018	2015	WBC	WBC	NO	Partially Funded	£1 million - £10 million	Implementation	12.1 µg/m3	Increase in usage.	Cycle paths are continually reviewed, however, a strategic LCWIP is underway which help us identify measures and prioritise improvements for future years	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	2019	WBC	WBC	NO	-	-	Planning	12.1 µg/m3	Investigation carried out.	No progress to date. Budget needs to be agreed and allocated.	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	-	-	WBC	WBC	NO	-	-	Planning	12.1 µg/m3	Review of phases with traffic flow data and real time air quality data	Ongoing investigation into whether this would work	!
6 AQAP Twyford 6	Carry out feasibility study for Low Emission Zone for the crossroads	Promoting Low Emission Transport	Low Emission Zone (LEZ)	-	2022	WBC	WBC	NO	-	-	Planning	12.1 µg/m3	Feasibility study carried out.	Ongoing investigation into whether this would work	
7 AQAP Twyford 7	Review of bus fleet and consider alternative fuels.	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	2016/2017	2032	Bus companies as contracted by WBC	Bus companies as contracted by WBC	NO	-	< £10k	Implementation	12.1 µg/m3	Increase in number of buses run on alternative fuels.	2017 RTL run hybrid buses. CNG all low emission. Courtney Buses Contract to be retendered in 2022 for implementation 2023	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.
8 AQAP Twyford 8	Install "Cut Pollution. Turn off your engine" signs when queuing traffic at traffic lights.	Public Information	Other	2018-2019	2020	WBC	WBC	NO	-	< £10k	Implementation	12.1 µg/m3	Drivers to follow advice.	Completed	-
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	NO	-	-	Planning	12.1 µg/m3	Feasibility study carried out.	Potential to connect to existing P&R though no viable bus service currently due to low patronage following Covid.	-
10 AQAP Twyford 10	School Travel Plans (Mode Shift Stars)	Promoting Travel Alternatives	School Travel Plans	2016	2032	WBC	WBC	YES	Funded	£10k - 50k	Implementation	12.1 µg/m3	Continue to be developed and reviewed.	Ongoing – DEFRA funding awarded to employ an Eco-Travel officer for schools in 2020/2021 and 2021/22 to accelerate mode shift. The Eco-Travel Officer role will continue	-

														for a further year.	
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	NO				15.5µg/m3	Installation of MOVA.	Design underway	Business case for a LEZ needs developing. Consider implications of the transfer of Criminal Parking Enforcement powers to Local Highway Authority.
12 AQAP Wok TC 2	Consider speed reduction through town centre	Traffic Management	Reduction of speed limits, 20mph zones	tbc		WBC Highways,	WBC Highways,	NO				15.5µg/m3	tbc	Design underway, potentially to be delivered as part of congestion alleviation work or future Town Centre Regeneration phases	Reducing emissions within AQMA.
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	NO				15.5µg/m3	Review carried out.	As above	Temporary banners were installed ahead of Clean Air Day in June 2019.
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	2022	WBC	WBC/Developers	NO	Not Funded	£10k - 50k		15.5µg/m3	Completion.	Under construction	

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	2025	WBC	WBC/Business Rates Retention Fund/Developer funding	NO	Funded	£10k - 50k		15.5µg/m3	Completion.	Commenced at Montague Park, new rail bridge completed, full SWDR will be completed as developers come forward and commence house building	Reduction in cars travelling through AQMA, COVID-19 and schools phased return.
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	NO	Funded			15.5µg/m3	Reduction in NO ₂	Design underway	
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	2023	WBC	WBC	NO	funded			15.5µg/m3	Feasibility study carried out.	Design underway	Requires TRO supported by TVP. Consider design speed as well as speed limit. Traffic travels at approx. 20mph.
18 AQAP Wok TC 8	Active management of car parking	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	completed	2018	WBC	WBC	NO				15.5µg/m3	Implementation.	Introduction of Civil Parking Enforcement 2018.	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.

19 AQAP Wok TC 9	Alternative arrangement for access to car parks	Traffic Management	Other	2017/18		WBC	WBC	NO				15.5µg/m3	Implementation.	This is part of the Town Centre regeneration process	Includes bus stops and cycle ways.
20 AQAP Wok TC 10	Workplace and School travel planning	Promoting Travel Alternatives	School Travel Plans	commenced		WBC	WBC	YES		£10k - 50k		15.5µg/m3	Continue to implement number of plans.	Long standing programme of school travel plans, DEFRA funding awarded for Eco-Travel Officer and Better Points in Wokingham AQAP	Includes bus stops and cycle ways. Better Points underway until October 2022.
21 AQAP Wok TC 11	Residential travel planning	Promoting Travel Alternatives	Personalised Travel Planning	commenced	n/a	WBC	S106 (developer)	NO		£10k - 50k		15.5µg/m3	Continue to implement number of plans.	Continuing in 2022	
22 AQAP Wok TC 12	Carry out feasibility study for Low Emission Zone	Promoting Low Emission Transport	Low Emission Zone (LEZ)	tbc		WBC	DEFRA AQ Grant	NO		£100k - £500k		15.5µg/m3	Feasibility study carried out.	No progress to date, business case needs to be developed	Business case for a LEZ needs developing. Consider implications of the transfer of Criminal Parking Enforcement powers to Local Highway Authority.
23 AQAP Wok TC 13	Park and Ride for Wokingham Town Centre	Alternatives to private vehicle use	Bus based Park & Ride	2016-2018	2022	WBC	WBC	NO		£1 million - £10 million		15.5µg/m3	Installation and number of journeys.	Coppid Beech P&R completed but awaiting better conditions before launch of service	This actively manages car parking in the town centre and across the borough.
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	2022	WBC	WBC	NO	Partially funded	£100k - £500k		15.5µg/m3	Number of charging points	Bid documents for ORCS bid completed, hope to implement in 2022/23	
25 AQAP generic 2	Consider implementation of parking charge related to vehicle type e.g. free for electric	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	tbc		WBC	WBC	NO				15.5µg/m3	Policy agreed and implemented.	No progress to date	

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	NO				15.5µg/m3	Vehicle usage.	WBC EH and TP/WSP have zero emission and hybrid company vehicles	Modal shift starts programme. COVID-19 and phased return to schools and workplaces.
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	NO				15.5µg/m3	tbc	Car Clubs strategy under development	Personalised travel planning promoting the benefits of sustainable travel.
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	NO				15.5µg/m3	Number of signs installed.	Cut engine banners to be installed in 2019-2020	
29 AQAP generic 6	Roadside emission testing, detecting and fining polluting vehicles	Traffic Management	Testing Vehicle Emissions	tbc		WBC, TVP	WBC	NO				15.5µg/m3	Number of vehicles failed.	No progress	Using RTLs existing hybrid buses (Lion 4).
30 AQAP generic 7	Improvement of cycle routes to ensure continuous and integrated	Transport Planning and Infrastructure	Cycle network	17/18		WBC	WBC	NO	> £10 million			15.5µg/m3	Length of cycle ways provided.	LCWIP due to be completed in 2022	
31 AQAP generic 8	Residential Travel Planning	Promoting Travel Alternatives	Personalised Travel Planning	2016/17		WBC	WBC, TVP	NO	> £10 million			15.5µg/m3	Number of plans.	Programmed started 2017/18	Preparing for the future will increase in update of EV use. Decrease in car emissions. Mitigation at planning stage within the new local plan.
32 AQAP generic 9	Encourage WBC staff to travel more sustainably	Promoting Travel Alternatives	Workplace Travel Planning	2017		WBC	WBC	NO				15.5µg/m3	Increase in commuting by alternative means.	WBC offices have adopted a travel plan	Encouraging residents and commuters to consider EV vehicle.

33 AQAP generic 10	Secure and sheltered bike parking provision	Promoting Travel Alternatives	Promotion of cycling	ongoing		WBC	WBC	NO		£100k - £500k		15.5µg/m3	Provided	Ongoing	Requirements to have low and zero emission vehicles and plant need to be included in any new WBC let contract.
34 AQAP generic 11	Partnership with MyJourney	Promoting Travel Alternatives	Promotion of cycling	2016	2021	WBC	WBC	NO		£500k - £1 million		15.5µg/m3	Number of events.	MyJourney Wokingham continuing to promote sustainable and active travel	This action would be considered politically and economically sensitive.
35 AQAP generic 12	Promoting active travel via MyJourney website	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2017		WBC	WBC	YES		£500k - £1 million		15.5µg/m3	Projects implemented.	Variety of projects implemented	Enforcement will require TVP assistance.
36 AQAP generic 13	Thames Valley Park and Ride	Alternatives to private vehicle use	Bus based Park & Ride	2016-17	2019	WBC/RBC	WBC	NO		£1 million - £10 million		15.5µg/m3	Opening of scheme.	Completed 2021 though no bus service currently	Link with work by Trading Standards re overloaded vehicles, will require implementation of legislation.
37 AQAP generic 14	Provision of car clubs with or without EVs	Alternatives to private vehicle use	Car Clubs	2015 feasibility study		WBC	WBC	NO				15.5µg/m3	Usage of vehicles.	1 car club operational at Montague Park. Car Clubs strategy under development	Capital funding for improvements and updating cycle network borough wide.
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/RBC	NO		£50k - £100k		15.5µg/m3	Increased awareness.	MyJourney Wokingham promoting active travel and using social media to raise awareness of Clean Air Day – DEFRA funding secured to add air quality page to MyJourney website in 2020/21	PTP promoting the benefits of sustainable transport through MyJourney project. Linked to future development.
39 AQAP generic 16	Air Quality included in to JSNA and Health and Wellbeing Strategy	Policy Guidance and Development Control	Other policy	2016/17	2018	WBC, PH Berkshire	WBC	NO				15.5µg/m3	Inclusion in JSNA reviews and Health and Wellbeing Strategy.	JSNA due for publication March 2019 and considers air quality. Active transport is a priority for the HWBS.	WBC offices have adopted a travel plan that is supported by MyJourney Wokingham project.
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 PH	NO		£100k - £500k		15.5µg/m3	Implementation.	Public Health and Planning teams working together on Local Plan and LTP	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.)
41 AQAP generic 18	Linking with Highway Asset Management Plans	Policy Guidance and Development Control	Other policy	tbc		WBC	WBC, PH Berkshire	NO				15.5µg/m3	tbc	No progress	Active Travel Officer promotes all forms of sustainable

															transport doing public demonstrations and events.
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 Planning and PH	NO				15.5µg/m3	Inclusion in plans.	All applications commented on	Ongoing.
43 AQAP generic 20	Freight Management Plan	Freight and Delivery Management	Delivery and Service plans	2019/20		WBC	WBC	NO				15.5µg/m3	Review and implementation.	No progress to date, business case needs to be developed	Delivered in partnership with RBC and funded through the Local Growth Fund.

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>). Figure 1.2 below 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.

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

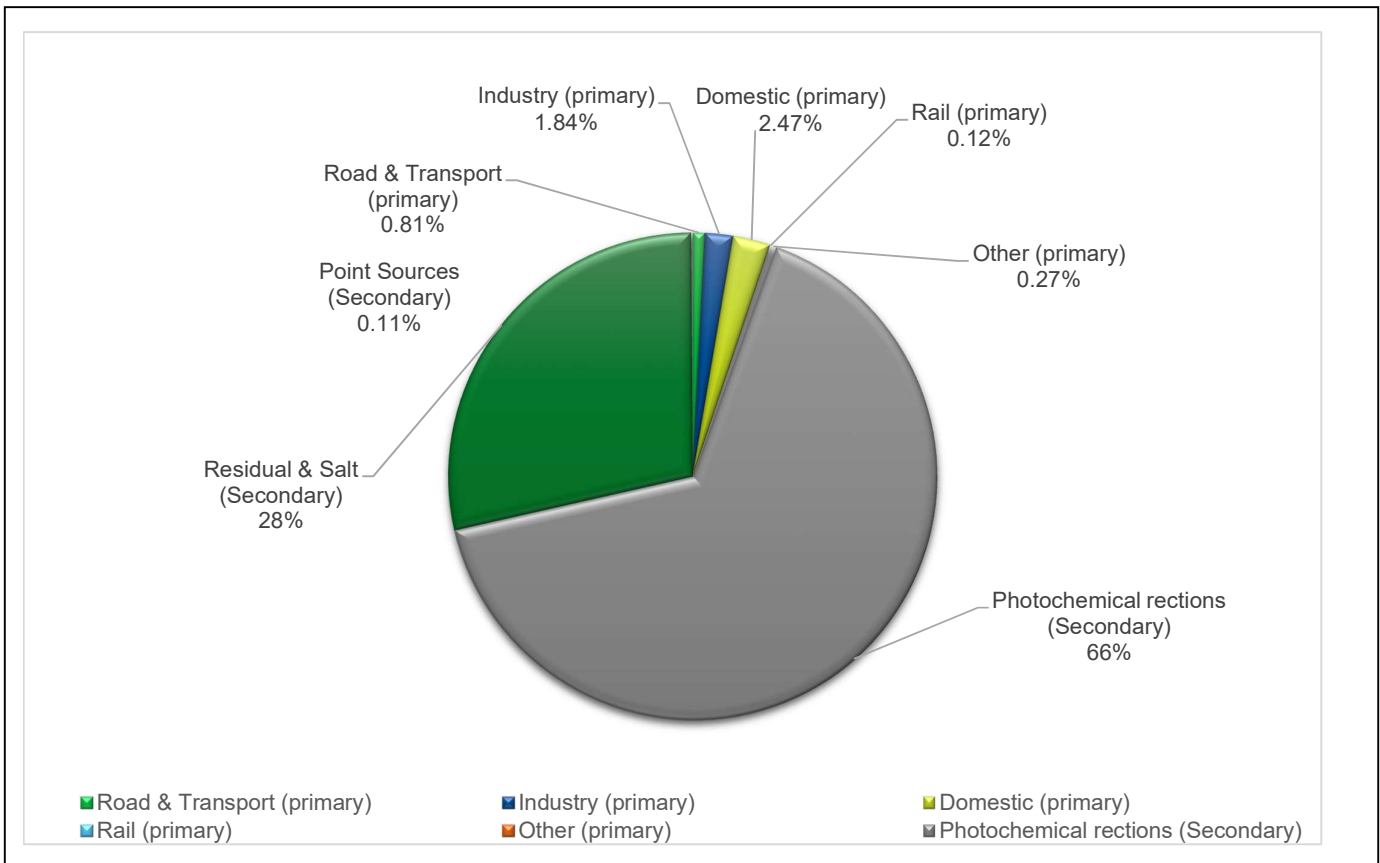
Wokingham Borough is continuing to take the following measures to address PM_{2.5}:

- The Health and Wellbeing Strategy (2018 - 2021) 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}. <https://wokingham.moderngov.co.uk/documents/s29650/Health%20and%20Wellbeing%20Board%20Strategy.pdf>
- 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.

- 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.
- Wokingham Borough continually gives out advice, including via social media, regarding bonfires and commercial burning throughout the year, and the website is updated to help inform the public. <https://publicprotectionpartnership.org.uk/environmental-health/neighbourhood-concerns/smoke-and-bonfires/>
- Currently there is no statutory requirement for the Council to monitor and report on PM_{2.5}, however in 2021/22 we were and are going to be continuing to monitoring schools inside and near the AQMA's and writing individual Action Plans if necessary, to look at each school individually following the DEFRA grant 2020/21 award of £259,000 (which is split between the PPP Authorities).
- Through the planning process dust production & dispersion on industrial sites is managed; as is the burning of any waste.

Figure 1.2 - 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

This section sets out the monitoring undertaken within 2021 by Wokingham Borough Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021 to allow monitoring trends to be identified and discussed.

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Wokingham Borough Council undertook automatic (continuous) monitoring at 2 sites during 2021. Table A.1 in Appendix A shows the details of the automatic monitoring 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.

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 Borough Council undertook non-automatic (i.e. passive) monitoring of NO₂ at 49 sites during 2021. Table A.2 in Appendix A presents the details of the non-automatic 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.

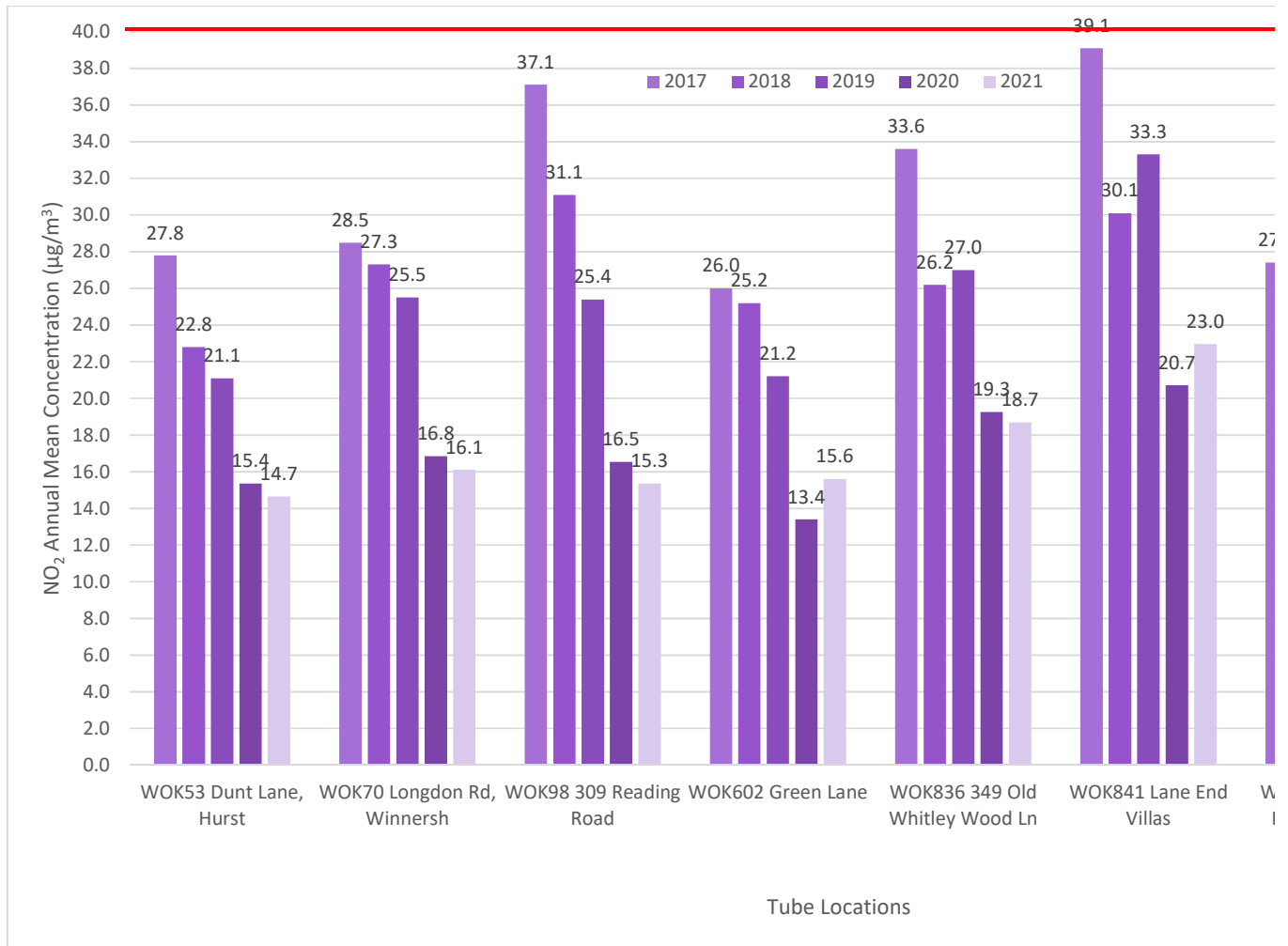
Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.1.3 Nitrogen Dioxide (NO₂)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO₂ annual mean concentrations for the past five years with the air quality objective of 40µg/m³. Note that the concentration data presented 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 2021 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.



Graph A.3 – Trends in Annual Mean NO2 Concentrations in the M4 AQMA

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

The traffic is monitored at two places in Wokingham Borough Council A4 Bath Road and the A329 Reading Road.

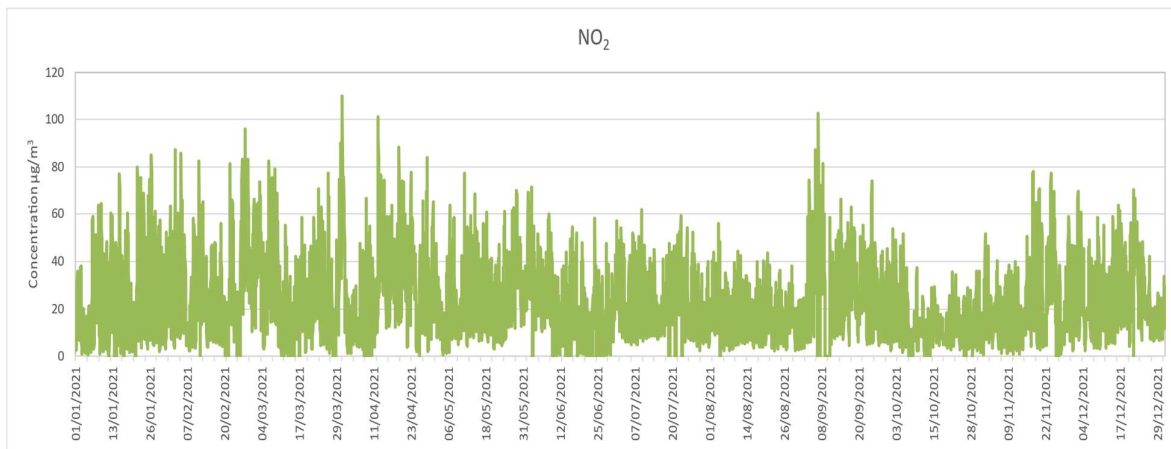
3.1.4 Continuous Monitoring Wokingham – Peach Street

An Annual Mean NO₂ concentration of 24.2µg/m³ was recorded by the Wokingham automatic monitoring (CM2) unit in 2021. This shows that within the Wokingham Town Centre AQMA, NO₂ levels were not exceeding the objective limit at the CM2. This is a decrease on the 2019 result (33.0µg/m³) pre-pandemic years, and the data capture was a good rate of 97.5%. However as expected it has increased slightly from 22.3µg/m³ in 2020, when the Country had 2 major lockdowns. This evidence helps indicate that traffic is the main contributor to NO₂ in Wokingham Town Centre.

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 Oxford and Reading New Town.

Figure 3.1 shows the annual trend over the last year. The 200µg/m³ hourly mean objective was met: so we had no exceedances. This is a decrease from 10 in 2017 and 15 in 2018.

Graph 3.1 - Wokingham Daily NO₂ 2021



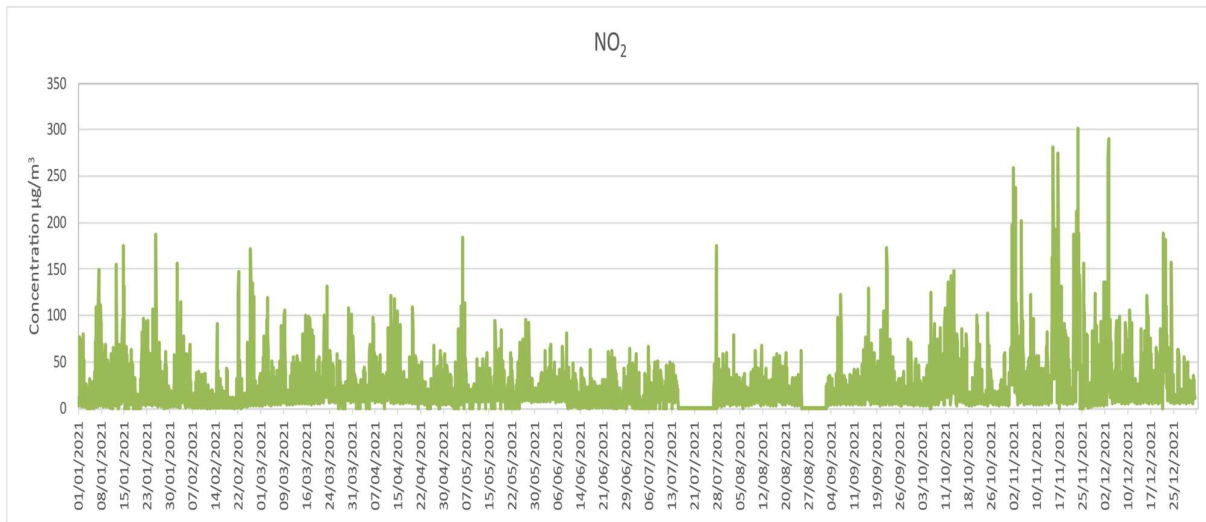
3.1.5 Continuous Monitoring Twyford – Cross Roads

An Annual Mean NO₂ concentration of 23.5 µg/m³ was recorded by the Twyford automatic monitoring unit (CM3) in 2021. This is a decrease from the NO₂ recorded in 2019, (29.9µg/m³), and an increase from 22.1µg/m³ measured in 2020. This shows that within the Twyford Village AQMA at the crossroads, the NO₂ levels were not exceeding the objective limit (40 µg/m³). The data capture was a good rate of 93.3%. This NO₂ data once again indicates that traffic is the main contributor to NO₂ in Wokingham Town Centre.

There were no exceedances of the 200µg/m³ hourly mean objective recorded, which is below the Air Quality Objective of 18 exceedances per year.

The Twyford and Wokingham continuous monitors also presented good correlation between Diffusion Tubes (passive data) and the continuous monitoring.

Graph 3.2 - Twyford Daily NO₂ 2021



3.1.6 Wokingham Borough Diffusion Tube Data

The Annual Mean Objective of 40µg/m³ was not exceeded at any of the monitoring sites, within the Borough. The 1 site within Wokingham Town Centre AQMA, WOK838 Giggling Spring, Shute End, which exceeded in 2019, this year (2021) measure 36.5µg/m³ and measured 41.8µg/m³ in 2019. The 2021 level increased from 28.6µg/m³ in 2020. All the sites within the Twyford Crossroads AQMA were below the objective including, WOK850, 887, 888 - 19 High Street, which exceeded in 2019 (42.8µg/m³) measured 32.5µg/m³ in 2021 and 31.0µg/m³ in 2020. Therefore, there has only been a slight increase this year compared to 2020. All mean concentrations were less than 60µg/m³ which therefore indicates no exceedances of the 1-hour NO₂ objective.

3.1.7 M4 AQMA Diffusion Tube Data

There were no exceedances of the Annual Mean Objective within the AQMA, and all sites decreased in NO₂. All the sites within the AQMA had reduced this year mainly due to the pandemic. The NO₂ at 5 of the sites has decreased since 2020, and 3 have increased

WOK602 (13.4µg/m³ in 2020 to 15.6µg/m³ in 2021), WOK841 20.7µg/m³ in 2020 to 23.0µg/m³ in 2021), & WOK846 (20.7µg/m³ in 2020 to 23.0µg/m³ in 2021), see Graph 3.1.

The M4 has had a speed limit of 50/60/70mph in place during much of 2018, 2019, 2020 & 2021 which may also account for the reduction in levels. The levels have continued to decrease in the AQMA and now the future revocation may need to be carried out, but only once we have at least 3 years of Pandemic free data and the M4 Smart Motorway has been completed. Even though Wokingham boroughs section has been completed, we still may have the impact of the road closures

Monitoring within and outside this AQMA will continue in 2022.

3.1.8 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 no site exceeded the Annual Mean (40µg/m³) Objective in 2021, however 5 years ago (2017) 3 locations did, these site were:

WOK838 Giggling Spring, Shute End –This site represents relevant exposure and the NO₂ at the site has decreased from 44.0µg/m³ in 2017 to 36.5µg/m³ 2021, (which is an increased from 28.6µg/m³ in 2020).

WOK844 Buckingham Court –This site represents relevant exposure and the NO₂ at the site has decreased from 45.0µg/m³ in 2017 to 31.2µg/m³ in 2021, (which is an increased from 31.2µg/m³ in 2020).

WOK857 Rectory Road –This site represents relevant exposure and the NO₂ at the site has decreased 49.1µg/m³ in 2017 to 31.9µg/m³ in 2021, (which is an increased from 29.0µg/m³ in 2020).

All the sites in this AQMA increase in NO₂ in 2021, however none of the sites have increase past 2019. The NO₂ was expected to rise this year due to the increase of traffic, and this data also helps us correlate NO₂ to traffic fumes.

Monitoring within and outside this AQMA will continue in 2022.

3.1.9 Twyford Crossroads AQMA Diffusion Tube Data

The Twyford Crossroads AQMA has 5 Diffusion Tubes sites, 3 of the sites are triplicated and one these is co-located with a Continuous Monitor. Within this AQMA no site exceeded the Annual Mean Objective in 2021.

In 2021 WOK (850, 887 & 888) 19 High Street has decreased in concentration since 2017 when exceeded the AQO, from a triplicated average of $44.9\mu\text{g}/\text{m}^3$ to $32.5\mu\text{g}/\text{m}^3$ in 2021, at the roadside. The NO_2 at this site has increase slightly from $31.0\mu\text{g}/\text{m}^3$ in 2020 to $32.5\mu\text{g}/\text{m}^3$ in 2021, which follows the trend of the traffic has increasing.

Within the Twyford AQMA all of the sites decreased in NO_2 from 2019 (pandemic free year), one of which was a triplicate. However, all of the sites have increased from 2020 to 2021, apart from the triplicate located at the continuous monitor which decreased. The general increase was to be expected as the traffic has increased.

The WOK864 1 Waltham Road 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 increase from $23.3\mu\text{g}/\text{m}^3$ in 2020 to $27.8\mu\text{g}/\text{m}^3$ in 2021. However, the site has reduced over all from $41.8\mu\text{g}/\text{m}^3$ in 2017, therefore the AQMA boundary does not need to be extended at this time.

Monitoring within and outside this AQMA will continue in 2022.

3.1.10 Outside of the AQMAs

Within the rest of Wokingham Borough, the sites met the NO_2 Annual Mean Objective of $40\mu\text{g}/\text{m}^3$. All of the sites have decreased from the last none pandemic year 2019 NO_2 levels, and 8 sites have decreased since 2020. However, the 41 remaining sites have all increased in NO_2 during 2021.

None of the diffusion tube (passive monitoring sites) within the Borough were recorded above $60\mu\text{g}/\text{m}^3$ which would indicate no exceedances of the 1 hour objective.

3.1.11 Particulate Matter (PM_{10})

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

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

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

3.1.13 Sulphur Dioxide (SO₂)

No particulate matter (SO₂) 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? Which 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 Wokingham	Chemiluminescent	3	1.5	1.5
CM3	Twyford Cross Roads	Kerbside	332200	433540	NO ₂	YES Twyford	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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube Co-located with a Continuous Analyser?	Tube Height (m)
WOK11	Direction Grp, Robinhood Lane,	Roadside	478133	170598	NO ₂	No	4.0	2.4	No	2.3
WOK19	Thames St, Sonning	Roadside	475583	175704	NO ₂	No	22.0	2.0	No	2.3
WOK52	Westend Flats, Peach St	Roadside	481521	168750	NO ₂	No	3.0	1.9	No	2.4
WOK53	Dunt Lane, Hurst	Roadside	479771	171093	NO ₂	Wokingham AQMA	28.0	1.2	No	2.0
WOK70	Longdon Rd, Winnersh	Roadside	478011	170135	NO ₂	Wokingham AQMA	25.0	1.7	No	2.4
WOK71	38 King St Lane, Winnersh	Roadside	477907	170191	NO ₂	No	20.0	3.1	No	2.4
WOK98	309 Reading Road	Roadside	478611	170225	NO ₂	Wokingham AQMA	0.0	11.8	No	1.7
WOK505	Church Road	Roadside	474444	172062	NO ₂	No	10.0	1.8	No	2.2
WOK509	Henley Bridge	Roadside	476414	182648	NO ₂	No	7.0	4.7	No	2.3
WOK602	Green Lane	Roadside	478739	170107	NO ₂	Wokingham AQMA	3.0	1.7	No	1.7
WOK803	3 Wellington Road	Roadside	480651	168544	NO ₂	No	3.0	1.1	No	2.3
WOK805	18 Barkham Road	Roadside	480547	168543	NO ₂	No	0.0	5.7	No	1.9

WOK817	London Rd (298)	Roadside	483231	168817	NO ₂	No	11.5	2.1	No	2.2
WOK825	54 High St Wargrave	Roadside	478541	178634	NO ₂	No	0.0	2.2	No	2.1
WOK827	Station Rd, Twyford	Kerbside	479047	175831	NO ₂	No	3.0	1.0	No	2.3
WOK829	Long Acre Thames St	Roadside	475806	175577	NO ₂	No	0.0	1.7	No	2.3
WOK835	14 Robinhood Lane	Roadside	478192	170672	NO ₂	No	8.0	1.5	No	2.2
WOK836	349 Old Whitley Wood Ln	Roadside	472346	168684	NO ₂	Wokingham AQMA	7.5	1.2	No	2.3
WOK838	Giggling Spring, Shute End	Roadside	480995	168726	NO ₂	Wokingham AQMA	0.0	2.8	No	2.3
WOK841	Lane End Villas	Roadside	473130	168783	NO ₂	Wokingham AQMA	4.5	0.2	No	2.4
WOK844	Buckingham Court	Roadside	481492	168775	NO ₂	Wokingham AQMA	1.3	1.2	No	2.4
WOK846	4 Hatch Farm Cottages	Roadside	477131	170019	NO ₂	Wokingham AQMA	0.0	39.0	No	7.8
WOK857	Rectory Rd, Wokingham	Roadside	481031	168725	NO ₂	Twyford AQMA	0.3	1.2	No	2.4
WOK861	Mill Lane (by bridge)	Roadside	476997	170107	NO ₂	Twyford AQMA	0.0	2.0	No	1.8
WOK863	3 Wargrave Rd, Twyford	Roadside	478768	176012	NO ₂	Wokingham AQMA	12.6	1.0	No	2.4
WOK864	1 Waltham Rd, Twyford	Roadside	478887	175945	NO ₂	Twyford AQMA	1.9	0.9	No	2.4
WOK866	58 Denmark Street	Roadside	481033	168300	NO ₂	Twyford AQMA	0.0	3.4	No	1.8

WOK867	21 Denmark St, Wok	Roadside	481104	168444	NO ₂	No	0.0	5.0	No	2.5
WOK869	Mullie (26) High Street	Roadside	478681	175998	NO ₂	Wokingham AQMA	0.5	1.4	No	2.5
WOK870	Hunt & Nash Church St	Roadside	478813	175975	NO ₂	No	0.5	0.5	No	2.5
WOK872	Registry Office, Reading Rd	Roadside	480816	168793	NO ₂	No	0.8	1.6	No	2.5
WOK873	27 The Terrace	Roadside	480863	168787	NO ₂	Twyford AQMA	0.3	2.6	No	2.4
WOK874	Broad St, Wokingham	Roadside	481182	168603	NO ₂	Wokingham AQMA	0.0	0.0	No	2.5
WOK871 , WOK875 , WOK876	15 London Rd, Twyford 3	Roadside	478830	176025	NO ₂	No	0.8	1.6	No	2.4
WOK 877	Almshouses, London Rd	Roadside	478904	176060	NO ₂	Wokingham AQMA	0.8	1.6	No	2.5
WOK 878	17 Wargrave Rd Twyford	Roadside	478719	176100	NO ₂	Twyford AQMA	1.7	3.2	No	2.5
WOK 882	Sign Whitley Wd Ln	Roadside	472299	168677	NO ₂	Twyford AQMA	4.2	2.0	No	2.5
WOK 883	Evendons Pri Sch	Roadside	480483	167011	NO ₂	No	3.0	1.0	No	2.2
WOK 850, WOK 887 , WOK 888	19 High St Twyford 3	Roadside	478733	175985	NO ₂	Twyford AQMA	0.3	1.2	No	2.2
WOK 889	1 Waltham Rd 2	Roadside	478887	175945	NO ₂	No	0.3	1.2	No	2.2
WOK890	1 Waltham Rd 3	Roadside	478887	175945	NO ₂	Twyford AQMA	0.0	3.4	No	2.4

WOK891	6 Budd Grove	Roadside	477498	170218	NO ₂	Twyford AQMA	0.0	3.4	No	2.4
WOK 892	3A Wellington Rd	Roadside	480547	168543	NO ₂	Twyford AQMA	10.0	1.0	No	2.4
WOK 893	6 Barkham Rd	Roadside	480571	168569	NO ₂	Twyford AQMA	0.0	2.5	No	2.4
WOK 894	181 Outfield Crescent	Roadside	480737	168442	NO ₂	No	0.0	2.5	No	2.4
WOK 895	47 Barkham Road	Roadside	480375	168399	NO ₂	No	0.0	1.0	No	2.0
WOK 896	1A Alderman Wiley Close, Wokingham	Roadside	480703	168682	NO ₂	No	0.0	8.0	No	2.0
WOK 879, WOK 880, WOK 881	Peach Street CM Unit 3	Roadside	481359	168606	NO ₂	No	3.0	1.5	No	2.0
WOK 884, WOK 885, WOK 886	Twyford CM Unit 3	Roadside	478765	175999	NO ₂	No	3.0	1.5	No	2.0

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: Automatic Monitoring (µg/m³)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2021 (%) ⁽²⁾	2017	2018	2019	2020	2021
CM2 Peach Street Wokingham	481348	168603	Roadside	100	97.5	38.1	32.9	33	22.3	24.2
CM3 Twyford Cross Roads	478765	176003	Kerbside	100	93.3			29.9	22.1	23.5

Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.

Reported concentrations are those at the location of the monitoring site (annualised, as required), i.e. prior to any fall-off with distance correction.

Notes:

The annual mean concentrations are presented as µg/m³.

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

All means have been “annualised” as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

(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%).

Table A.4 – Annual Mean NO₂ Monitoring Results: Non-Automatic Monitoring (µg/m³)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2021 (%) ⁽²⁾	2017	2018	2019	2020	2021
WOK11	478133	170598	Roadside	100	100.0	35.4	29.2	32.0	20.9	20.3
WOK19	475583	175704	Roadside	100	92.3	31.1	26.5	28.9	18.7	19.9
WOK52	481521	168750	Roadside	100	100.0	34.9	29.2	30.3	21.4	22.8
WOK53	479771	171093	Roadside	100	82.7	27.8	22.8	21.1	15.4	14.7
WOK70	478011	170135	Roadside	100	92.0	28.5	27.3	25.5	16.8	16.1
WOK71	477907	170191	Roadside	100	100.0	33.1	30.0	31.9	21.2	21.4
WOK98	478611	170225	Roadside	100	100.0	37.1	31.1	25.4	16.5	15.3
WOK505	474444	172062	Roadside	100	100.0	38.3	36.9	36.5	31.0	29.2
WOK509	476414	182648	Roadside	100	100.0	28.1	23.8	23.9	16.4	16.7
WOK602	478739	170107	Roadside	100	92.6	26.0	25.2	21.2	13.4	15.6
WOK803	480651	168544	Roadside	100	100.0	32.1	30.7	30.7	19.5	22.0

WOK805	480547	168543	Roadside	100	100.0	25.9	23.7	25.0	17.1	18.3
WOK817	483231	168817	Roadside	100	100.0	33.1	28.8	21.6	14.0	15.3
WOK825	478541	178634	Roadside	100	90.1	35.6	29.5	31.1	21.3	23.2
WOK827	479047	175831	Kerbside	100	100.0	27.9	21.4	20.6	14.6	15.2
WOK829	475806	175577	Roadside	100	100.0	33.3	28.0	28.6	20.7	23.1
WOK835	478192	170672	Roadside	100	92.3	32.4	27.9	26.6	19.3	21.2
WOK836	472346	168684	Roadside	100	100.0	33.6	26.2	27.0	19.3	18.7
WOK838	480995	168726	Roadside	100	100.0	44.0	41.3	41.8	28.6	36.5
WOK841	473130	168783	Roadside	100	100.0	39.1	30.1	33.3	20.7	23.0
WOK844	481492	168775	Roadside	100	100.0	45.0	36.0	38.6	25.9	31.2
WOK846	477131	170019	Roadside	100	100.0	27.4	25.6	21.6	14.0	15.2
WOK857	481031	168725	Roadside	100	100.0	49.1	39.3	39.9	29.0	31.9
WOK861	476997	170107	Roadside	100	100.0	34.1	26.3	23.2	14.9	14.8
WOK863	478768	176012	Roadside	100	100.0	39.7	34.6	30.7	21.7	22.8
WOK864	478887	175945	Roadside	100	92.9	41.8	35.7	36.9	23.3	27.8

WOK866	481033	168300	Roadside	100	100.0	27.6	23.6	25.3	15.9	17.7
WOK867	481104	168444	Roadside	100	100.0	27.6	23.1	23.7	13.4	18.1
WOK869	478681	175998	Roadside	100	100.0	30.7	28.1	27.1	18.9	19.4
WOK870	478813	175975	Roadside	100	100.0	34.0	29.3	29.0	20.2	22.0
WOK872	480816	168793	Roadside	100	100.0	38.1	33.2	32.4	23.0	25.5
WOK873	480863	168787	Roadside	100	100.0	26.5	24.6	24.7	17.3	19.3
WOK874	481182	168603	Roadside	100	92.9	26.9	27.9	28.9	20.0	21.7
WOK871										
WOK875	478830	176025	Roadside	100	75.0	31.8	27.4	27.3	19.7	21.5
WOK876										
WOK 877	478904	176060	Roadside	100	83.0	26.9	22.9	22.9	14.9	16.6
WOK 878	478719	176100	Roadside	100	92.9	30.2	25.2	25.7	17.4	18.3
WOK 882	472299	168677	Roadside	100	100.0	39.5	33.4	32.6	20.7	23.8
WOK 883	480483	167011	Roadside	100	100.0		31.1	29.1	19.6	22.4
WOK 850, WOK 887, WOK 888	478733	175985	Roadside	100	100.0	44.9	42.6	42.8	31.0	32.5

WOK 889	478887	175945	Roadside	100	100.0		35.3	37.9	24.9	26.6
WOK890	478887	175945	Roadside	100	100.0		35.6	36.2	25.2	27.0
WOK891	477498	170218	Roadside	100	92.3			22.2	14.3	16.9
WOK 892	480547	168543	Roadside	100	100.0				15.4	18.7
WOK 893	480571	168569	Roadside	100	100.0				18.5	20.4
WOK 894	480737	168442	Roadside	100	100.0				13.3	14.4
WOK 895	480375	168399	Roadside	100	92.3				13.5	16.4
WOK 896	480703	168682	Roadside	100	100.0				15.4	14.9
WOK 879, WOK 880, WOK 881	481359	168606	Roadside	100	100.0	39.2	33.4	36.7	24.0	27.6
WOK 884, WOK 885, WOK 886	478765	175999	Roadside	100	100.0			29.9	21.9	22.6

Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.

Diffusion tube data has been bias adjusted.

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 correction.

Notes:

The annual mean concentrations are presented as $\mu\text{g}/\text{m}^3$.

Exceedances of the NO_2 annual mean objective of $40\mu\text{g}/\text{m}^3$ are shown in **bold**.

NO_2 annual means exceeding $60\mu\text{g}/\text{m}^3$, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

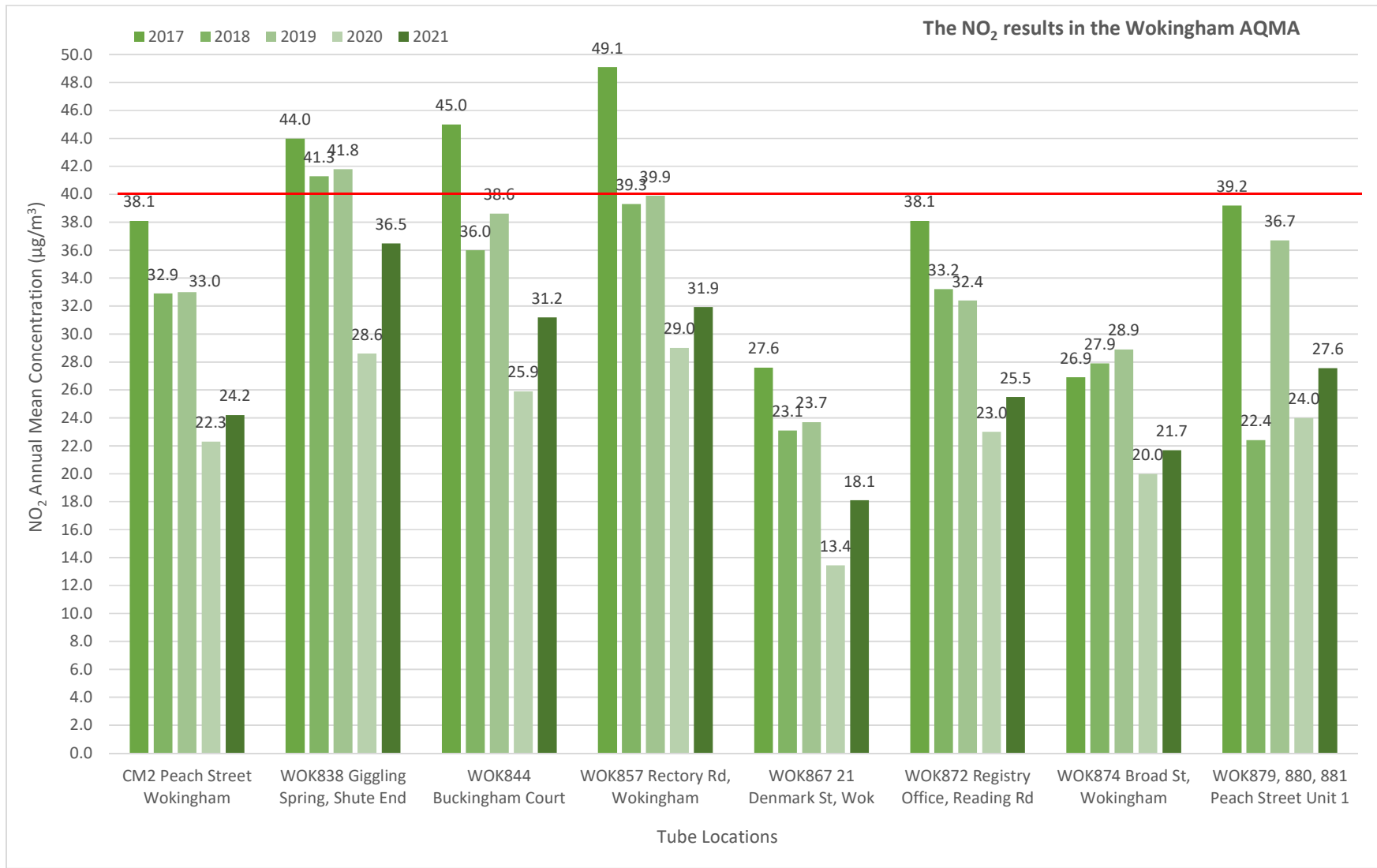
Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

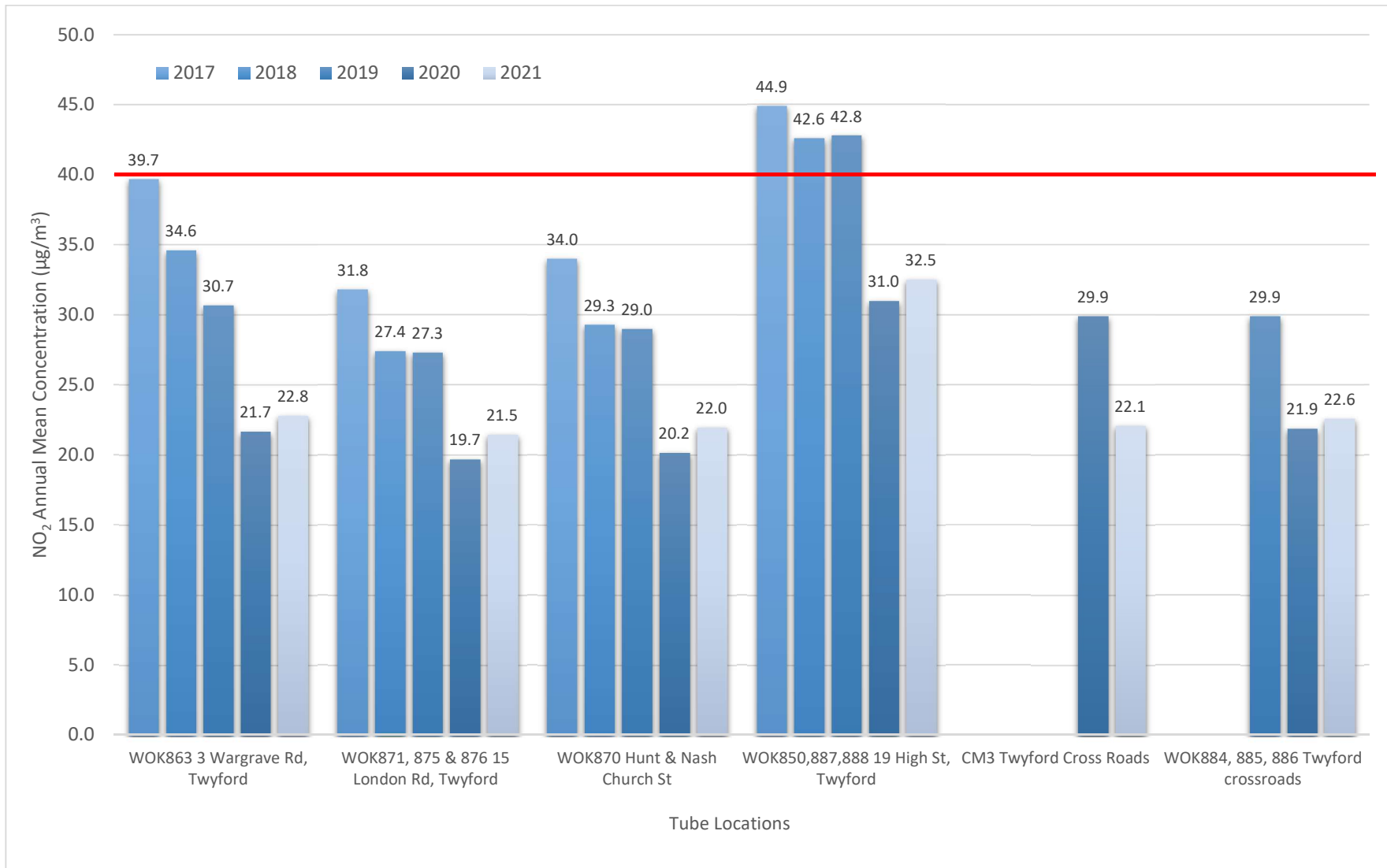
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

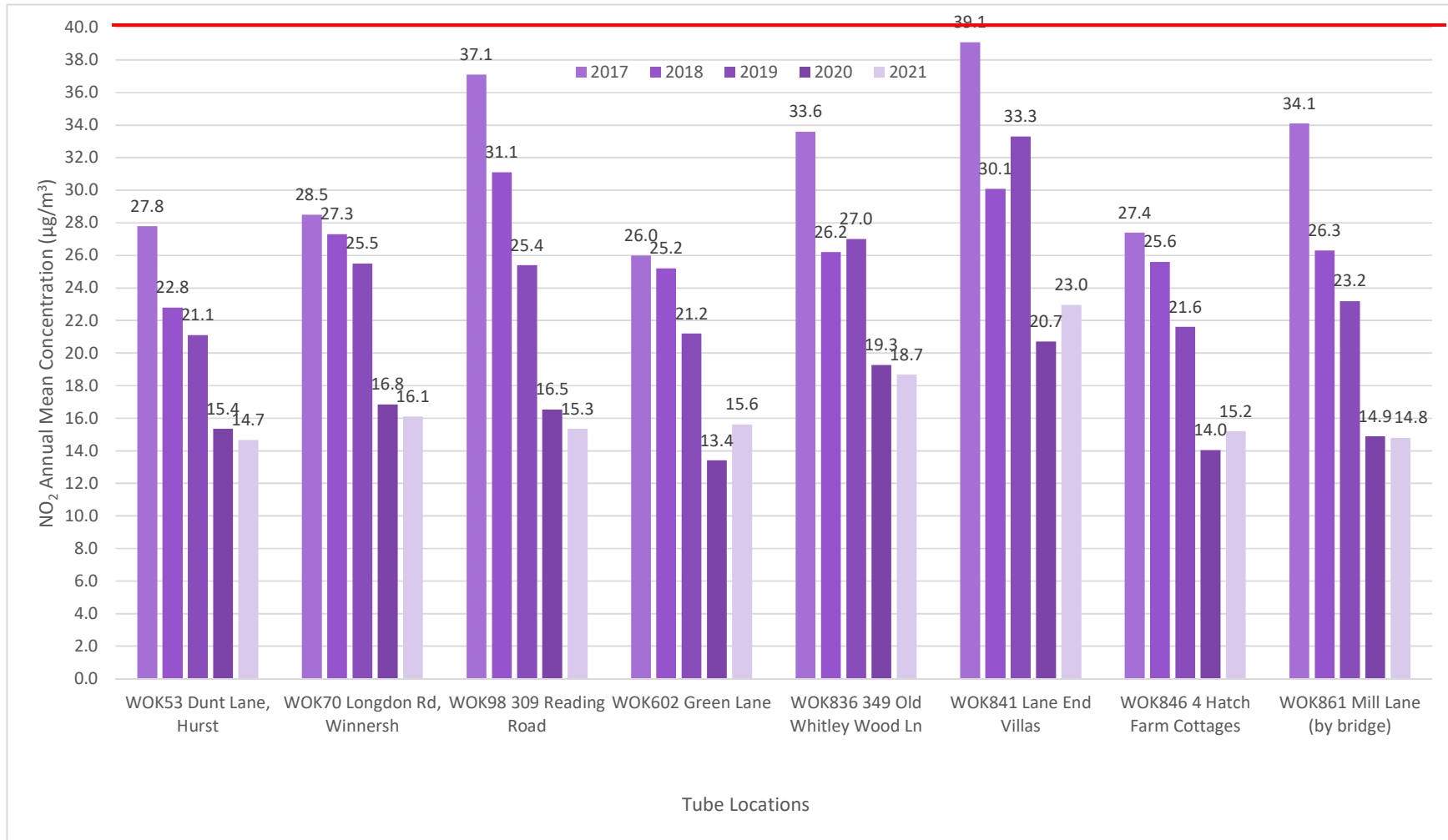
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Graph A.1 – Trends in Annual Mean NO₂ Concentrations in the Wokingham AQMA



Graph A.2 – Trends in Annual Mean NO₂ Concentrations in the Twyford AQMA





Graph A.3 – Trends in Annual Mean NO₂ Concentrations in the M4 AQMA

Table A.5 – 1-Hour Mean NO₂ Monitoring Results, Number of 1-Hour Means > 200µg/m³

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2021 (%) ⁽²⁾	2017	2018	2019	2020	2021
CM2 Peach Street Wokingham	481348	168603	Roadside	100	97.5	10	15	0	0 (112.34)	0
CM3 Twyford Cross Roads	478765	176003	Kerbside	100	93.3				0	0

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m³ have been recorded.

Exceedances of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

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

(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 5

Appendix B: Full Monthly Diffusion Tube Results for 2021 (Table B.1 – NO2 2021 Diffusion Tube Results (µg/m3))

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.83)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
WOK11	478133	170598	22.4	28.4	25.2	24.9	22.0	20.4	22.5	19.1	27.0	27.2	30.8	23.1	24.4	20.3	-	
WOK19	475583	175704	24.3	22.3	24.3	19.9		20.9	21.3	19.0	29.7	25.5	30.6	25.6	23.9	19.9	-	
WOK52	481521	168750	26.1	30.5	28.3	26.7	27.0	23.4	24.1	19.8	31.8	29.6	33.2	28.1	27.4	22.8	-	
WOK53	479771	171093	21.3	22.4	18.3	12.9	15.4	11.7		12.5		20.1	21.1	20.2	17.6	14.7	-	
WOK70	478011	170135		22.5	19.7	16.9	16.1	14.9	17.7	13.9	22.1	20.4	26.1	22.1	19.3	16.1	-	
WOK71	477907	170191	27.2	31.6	25.1	26.4	23.0	21.2	23.3	20.3	29.1	23.9	30.5	25.9	25.6	21.4	-	
WOK98	478611	170225	21.7	24.2	21.8	16.2	17.3	13.2	13.4	11.9	19.7	19.6	23.0	18.9	18.4	15.3	-	
WOK505	474444	172062	34.1	37.1	35.1	37.9	30.5	35.3	34.0	29.9	39.1	34.6	39.4	33.7	35.0	29.2	-	
WOK509	476414	182648	22.5	21.4	17.5	17.4	18.3	17.2	16.8	17.1	23.4	21.0	25.1	22.3	20.0	16.7	-	
WOK602	478739	170107	19.1		19.4	23.9	15.8	15.7	17.9	19.5	22.9	14.6	19.9	17.7	18.7	15.6	-	
WOK803	480651	168544	27.5	29.8	28.8	26.7	27.4	25.5	25.6	19.6	30.9	20.8	27.3	27.5	26.4	22.0	-	
WOK805	480547	168543	24.1	28.1	23.8	21.4	21.0	18.6	19.9	15.4	25.8	19.8	23.5	21.8	21.9	18.3	-	
WOK817	483231	168817	20.4	19.5	18.2	18.1	15.5	15.3	15.8	13.4	23.4	18.6	23.2	19.0	18.4	15.3	-	
WOK825	478541	178634	30.6	26.9	27.5	26.1	26.1	27.2	24.9	24.3	30.0	27.0	36.1		27.9	23.2	-	
WOK827	479047	175831	21.7	19.9	21.6	17.0	16.9	14.2	14.7	11.9	18.3	19.0	22.4	21.3	18.2	15.2	-	
WOK829	475806	175577	27.6	23.3	28.8	29.1	27.2	28.5	25.2	22.2	31.9	28.6	34.4	26.0	27.7	23.1	-	
WOK835	478192	170672	26.0	27.2		24.2	24.9	24.8	23.5	19.0	28.2	25.8	31.3	25.1	25.5	21.2	-	
WOK836	472346	168684	23.8	22.3	30.0	19.0	24.1	17.9	17.9	15.7	25.0	24.2	25.4	23.7	22.4	18.7	-	
WOK838	480995	168726	40.2	45.3	42.4	43.7	47.8	46.0	43.7	32.5	52.3	40.8	55.5	35.3	43.8	36.5	-	
WOK841	473130	168783	29.2	27.5	29.5	28.0	25.3	26.0	23.7	22.2	29.0	25.1	36.7	28.3	27.6	23.0	-	
WOK844	481492	168775	32.0	34.1	36.4	33.4	38.0	38.7	37.1	30.9	44.2	40.4	47.8	36.1	37.4	31.2	-	

WOK8 46	477131	170019	18.9	21.7	19.9	17.8	15.2	18.4	15.9	16.5	21.3	15.8	18.7	18.9	18.2	15.2	-	
WOK8 57	481031	168725	38.4	42.4	37.7	37.9	39.6	36.8	40.2	28.2	46.7	37.4	41.8	32.7	38.3	31.9	-	
WOK8 61	476997	170107	18.0	20.8	18.4	17.3	16.3	15.2	17.3	11.2	20.6	18.3	19.9	19.8	17.8	14.8	-	
WOK8 63	478768	176012	31.1	26.4	28.7	28.1	24.2	26.4	24.5	20.7	29.9	24.9	37.1	26.5	27.4	22.8	-	
WOK8 64	478887	175945	32.7	30.8	30.3	28.6	32.6	28.4	27.5	22.3		58.4	41.8	33.0	33.3	27.8	-	
WOK8 66	481033	168300	21.3	23.5	21.4	18.1	18.6	18.9	18.5	17.2	23.5	23.6	26.8	22.9	21.2	17.7	-	
WOK8 67	481104	168444	21.7	23.2	22.4	21.1	16.9	18.8	17.5	16.5	25.2	22.2	30.4	24.7	21.7	18.1	-	
WOK8 69	478681	175998	21.2	24.5	22.4	20.8	23.8	21.7	21.4	16.2	28.1	24.8	29.1	25.2	23.3	19.4	-	
WOK8 70	478813	175975	28.8	28.1	25.2	25.0	25.7	25.0	23.4	21.3	29.3	26.9	32.0	25.4	26.3	22.0	-	
WOK8 71	478830	176025	30.5			25.4	23.6	22.9	19.2	18.6	27.9		54.8	28.0	-	-	-	Triplicate Site with WOK871 , WOK875 and WOK876 - Annual data provided for WOK876 only
WOK8 72	480816	168793	31.0	34.2	31.6	27.4	29.2	28.2	26.8	22.8	35.0	34.9	37.1	28.9	30.6	25.5	-	
WOK8 73	480863	168787	24.3	26.0	25.9	27.5	21.5	22.7	21.0	18.1	0.7	36.5	31.1	22.1	23.1	19.3	-	
WOK8 74	481182	168603	24.9	27.9	24.9	26.5	23.1	22.7	18.6	17.4		39.4	34.1	26.9	26.0	21.7	-	
WOK8 75	478830	176025	28.1			24.9	22.7	23.3	21.8	19.2	26.3		33.6	21.9	-	-	-	Triplicate Site with WOK871 , WOK875 and WOK876 - Annual data provided for WOK876 only
WOK8 76	478830	176025	29.8			23.1		22.6	20.8	19.3	27.1		31.4	25.2	25.7	21.5	-	Triplicate Site with WOK871 , WOK875 and WOK876 - Annual data provided for WOK876 only
WOK 877	478904	176060	25.4	24.1	21.5	18.1	17.4	16.3	16.2	13.0			25.7	21.2	19.9	16.6	-	
WOK 878	478719	176100	24.5	27.2	21.4	20.6	19.4	18.9	20.0	15.5		23.0	27.1	24.0	22.0	18.3	-	
WOK 882	472299	168677	30.0	28.3	22.3	25.5	28.9	25.2	27.7	23.3	32.6	31.6	37.0	29.5	28.5	23.8	-	
WOK 883	480483	167011	28.1	28.9	25.5	23.5	24.7	23.9	26.4	22.7	30.7	26.4	32.7	29.2	26.9	22.4	-	
WOK 850	478733	175985	37.7	36.4	39.1	34.5	38.9		38.0	34.5	43.1	43.4	44.9		-	-	-	Triplicate Site with WOK 850, WOK 887 and WOK 888 - Annual data provided for WOK 888 only
WOK 887	478733	175985	40.9	39.0	40.3	34.2	39.7	36.3	36.4	34.6	45.6	37.3	46.7	38.9	-	-	-	Triplicate Site with WOK 850, WOK 887 and WOK 888 - Annual data provided for WOK 888 only
WOK 888	478733	175985	37.5	38.0	41.0	34.6	40.6	38.4			43.5	40.3	46.4	37.3	39.0	32.5	-	Triplicate Site with WOK 850, WOK 887 and WOK 888 - Annual data provided for WOK 888 only
WOK 889	478887	175945	31.7	32.0	30.8	28.3	31.9	28.3	28.0	22.0	20.9	56.1	39.8	33.0	31.9	26.6	-	

WOK890	478887	175945	32.8	32.7	26.4	28.5	32.1	26.9	28.4	23.4	25.7	61.2	38.2	33.1	32.4	27.0	-	
WOK891	477498	170218	21.2	21.7	19.6	17.0	15.7		25.2	14.3	21.0	20.3	26.0	20.8	20.3	16.9	-	
WOK892	480547	168543	22.3	24.2	22.9	23.1	19.4	19.5	19.3	14.4	25.0	24.6	34.4	20.5	22.5	18.7	-	
WOK893	480571	168569	25.8	31.6	26.2	22.4	22.0	22.0	22.1	17.7	29.6	23.6	27.2	23.3	24.5	20.4	-	
WOK894	480737	168442	18.7	20.4	19.2	17.6	15.4	13.5	13.7	10.8	19.4	17.7	22.4	19.0	17.3	14.4	-	
WOK895	480375	168399	19.9	21.0	19.5	19.5		30.7	14.9	13.1	20.0	16.5	23.5	17.7	19.7	16.4	-	
WOK896	480703	168682	21.0	17.0	20.7	18.1	15.8	14.5	13.6	12.1	19.2	19.0	23.8	19.5	17.8	14.9	-	
WOK879	481359	168606	34.3	28.8	32.9	29.8	34.7	29.9	32.2	26.5	38.9	34.9	38.5	30.2	-	-	-	Triplicate Site with WOK 879, WOK 880 and WOK 881 - Annual data provided for WOK 881 only
WOK880	481359	168606	32.3	36.6	35.8	31.5	32.4	31.0	31.4	23.9	38.7	35.5	38.1	32.2	-	-	-	Triplicate Site with WOK 879, WOK 880 and WOK 881 - Annual data provided for WOK 881 only
WOK881	481359	168606	32.5	38.5	33.6	29.6	34.1	30.9	31.5	25.3	38.7	32.7	37.5	34.3	33.1	27.6	-	Triplicate Site with WOK 879, WOK 880 and WOK 881 - Annual data provided for WOK 881 only
WOK884	478765	175999	31.2	28.4	29.6	27.2	25.0	24.7	22.8	20.0	29.5	25.0	32.3	25.1	-	-	-	Triplicate Site with WOK 884, WOK 885 and WOK 886 - Annual data provided for WOK 886 only
WOK885	478765	175999	31.7	28.3	29.2	27.8	26.6	24.7	23.1	21.2	29.7	27.2	30.7	27.5	-	-	-	Triplicate Site with WOK 884, WOK 885 and WOK 886 - Annual data provided for WOK 886 only
WOK886	478765	175999	32.2	28.8	27.8	27.6	25.3	25.3	23.8	20.3	29.8	25.4	33.5	27.6	27.1	22.6	-	Triplicate Site with WOK 884, WOK 885 and WOK 886 - Annual data provided for WOK 886 only

All erroneous data has been removed from the NO₂ diffusion tube dataset presented in Table B.1.

Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.

Local bias adjustment factor used.

National bias adjustment factor used.

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

Wokingham Borough Council confirm that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

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**.

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Wokingham Borough Council During 2021

Wokingham Borough Council has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by Wokingham Borough Council During 2021

An additional study of PM₁₀ and PM_{2.5} was initiated by PPP and carried out by TRL in 2021 across Wokingham and Twyford and used MCERTS certified Osiris⁷ indicative instruments.

The monitors were situated at 4 locations across the Wokingham Borough which were Peach Street, Wokingham, Winnersh, Lower Earley and Twyford. The 12 month monitoring commenced between August & October 2021. Table shows the results taken in 2021 which includes PM_{2.5} and PM₁₀. A full analysis will be provided in the next ASR.

Table C.1 Statistics of period monitoring across Wokingham in 2021.

Table C.1 – PM_{2.5} & PM₁₀ results from the Study in Wokingham

	Winnersh		Peach Street		Lower Earley		Twyford	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Average	11.6	6.2	11.9	6.8	9.2	6.3	15.6	6.1
Period Data Capture (%)	100	100	99.8	99.8	100	100	93.5	93.3

⁷ <https://turnkey-instruments.com/product/osiris/>

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 Annualisation

As annualisation is required for any site with data capture less than 75% but greater than 25%. Diffusion Tube WOK876, which was located at 15 London Road, Twyford required annualisation as only 8 months (66.6%) of the data was captured. The details of the calculation method undertaken is provided in Table C.. The raw data annual mean was 24.9 $\mu\text{g}/\text{m}^3$ and the annualised data annual mean was 24.6 $\mu\text{g}/\text{m}^3$

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR has been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Wokingham Borough Council have applied a local bias adjustment factor of 0.83 to the 2021 monitoring data. A summary of bias adjustment factors used by Wokingham Borough Council over the past five years is presented in Table C..

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 local co-located sites combined are used as bias adjustment factor. 0.83 was applied. A copy of the co-location spreadsheet used is provided below.

In determining the bias adjustment factor for the 2021 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 weekly or fortnightly – the Wokingham are town centre & Twyford Village Cross Roads co-location study is monthly.
- For co-location sites with “good” precision for the diffusion tubes and with high quality chemiluminescence results – It can be seen from Figure C.4 below that both the

Wokingham Town Centre & Twyford Village Cross Roads co-location study achieved “good” precision, and “good Data Capture” both at 99%. The chemiluminescence monitors 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 (2020).
- 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 97.5% in 2020 (Figure C.2)) & the data capture from the Twyford Village Cross Roads automatic monitor was 93.3% in 2021 (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 both the automatic analyser in Twyford (93.3%) and Wokingham (97.5%) that the combined back Local Bias Adjustment Factor was of 0.83 was used.

Table C.2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	Local	-	0.83

2020	National	-	0.81
2019	National	09/20	0.88
2018	Local	-	0.95
2017	Local	-	0.92

NO₂ Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO₂ concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO₂ fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO₂ concentrations corrected for distance are presented in (Table B.1).

No diffusion tube NO₂ monitoring locations within Wokingham Borough Council required distance correction during 2021.

QA/QC of Automatic Monitoring

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 a month, 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 converter 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 21st December 2021. 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 the Wokingham analyser to be 98.5% efficient at an NO₂ concentration of 303 ppb. This is a good result.

To ensure that the analyser was sampling only ambient air the instrument was leak checked. The result was satisfactory, indicating that the analyser sampling systems was free of significant leaks. The analyser exhibited good steady state responses to both zero and span (calibration) gases with acceptable levels of variation (noise).

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 be investigated at the next service, which has been done accordingly by TRL engineers. 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 on-site standards stability (the gas concentration stabilities). 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 supplier's stated concentrations. The results of the recalculations are presented in Table C.3

Table C.3 Wokingham Town Centres Recalculated Concentrations

TRL Wokingham – NO cylinder 21901300088296				
	NOx (ppb)	% change from stated	NO (ppb)	% change from stated
Manufacturers Stated Concentration	464	---	464	---
Recalculated concentration (21/12/20)	494	6.4	491	5.9
Recalculated concentration (21/12/21)	477	2.8	473	1.9

The recalculated results for the site NO cylinder 21901300088296 indicate the concentrations are 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 21st December 2021. 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 the Twyford analyser to be 90.9% efficient at an NO₂ concentration of 300 ppb. Our repeat tests show the converter in the Twyford analyser to be 90.0% efficient at an NO₂ concentration of 167 ppb. This is outside the recommended range and a poor result.

To ensure that the analyser was sampling only ambient air the instrument was leak checked. The results were satisfactory, indicating that the analyser sampling systems were free of significant leaks. The analyser exhibited good steady state responses to both zero and span (calibration) gases with acceptable levels of variation (noise).

The 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 was outside the $\pm 10\%$ advisory limit and it was recommended this is investigated at the next service.

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.4.

Table C.4 Twyford Village Cross Roads Recalculated Concentrations

TRL Twyford – NO cylinder 21901300088296				
	NO_x (ppb)	% change from stated	NO (ppb)	% change from stated
Manufacturers Stated Concentration	464	---	464	---
Recalculated concentration (07/12/20)	450	-3.1	476	2.6
Recalculated concentration (21/12/21)	475	2.4	479	3.3

The recalculated results for the site NO cylinder 21901300088296 indicate the concentrations are stable, within the definition adopted above, and can therefore reliably be used to scale ambient data.

OSIRIS PM Analyser

To ensure that a true particulate matter measurement is made, the total flow through for the OSIRIS analyser must be 0.6 litres per minute. Our audits tests stipulate the measured flow should agree with the analyser system flow set point within $\pm 10\%$. Volumetric flow tests were carried out on the instrument, the measured flows showed poor agreement with the system flow set points, with the measured flow underlying the system flow set point by 38%, it was recommended this is addressed.

All the recommendations of the audit have been investigated accordingly by TRL engineers.

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.

Automatic Monitoring Annualisation

All automatic monitoring locations within Wokingham Borough Council recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

NO₂ Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO₂ concentration at the nearest location relevant for exposure has been estimated using the NO₂ fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO₂ concentrations corrected for distance are presented in (Table B.1).

No automatic NO₂ monitoring locations within Wokingham Borough Council required distance correction during 2021.

Table C.5 – Annualisation Summary (concentrations presented in $\mu\text{g}/\text{m}^3$)

Site ID	Annualisation Factor Swindon	Annualisation Factor Oxford	Annualisation Factor Reading	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
WOK 876	0.9835	0.9679	1.0099	0.9871	24.9	24.6

Table C.6 – Local Bias Adjustment Calculation

	Local Bias Adjustment Input 1	Local Bias Adjustment Input 2
Periods used to calculate bias	12	12
Bias Factor A	0.74 (0.64 - 0.88)	0.95 (0.83 - 1.12)
Bias Factor B	35% (14% - 56%)	5% (-11% - 21%)
Diffusion Tube Mean ($\mu\text{g}/\text{m}^3$)	33.1	27.1
Mean CV (Precision)	4.2%	2.7%
Automatic Mean ($\mu\text{g}/\text{m}^3$)	24.5	25.8
Data Capture	99%	99%
Adjusted Tube Mean ($\mu\text{g}/\text{m}^3$)	24 (21 - 29)	26 (23 - 30)

Notes:

A combined local bias adjustment factor of 0.83 has been used to bias adjust the 2021 diffusion tube results.

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

Figure D.1 – Map of Wokingham Town Centre AQMA

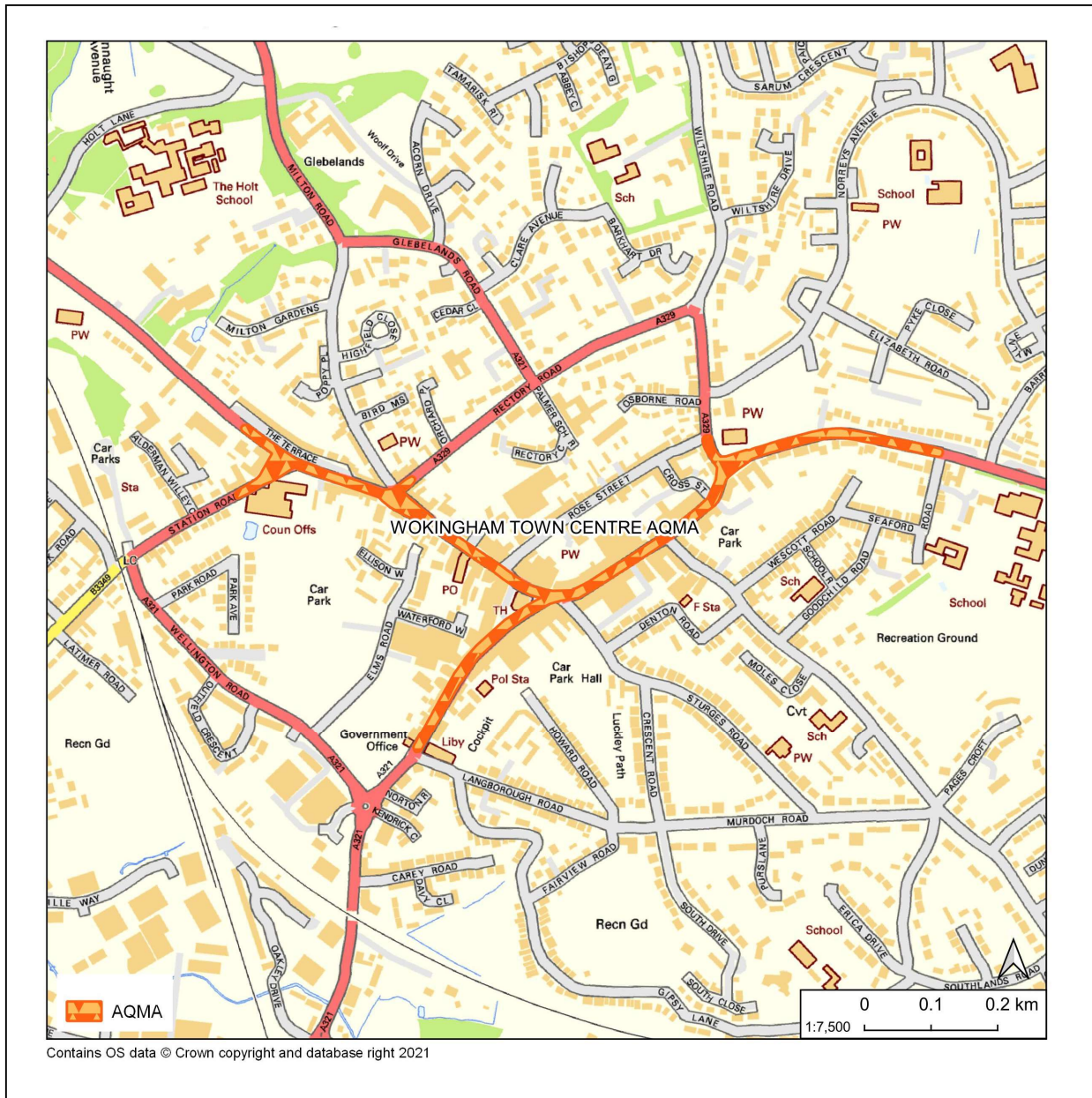


Figure D.2 – Map of Twyford Crossroads AQMA

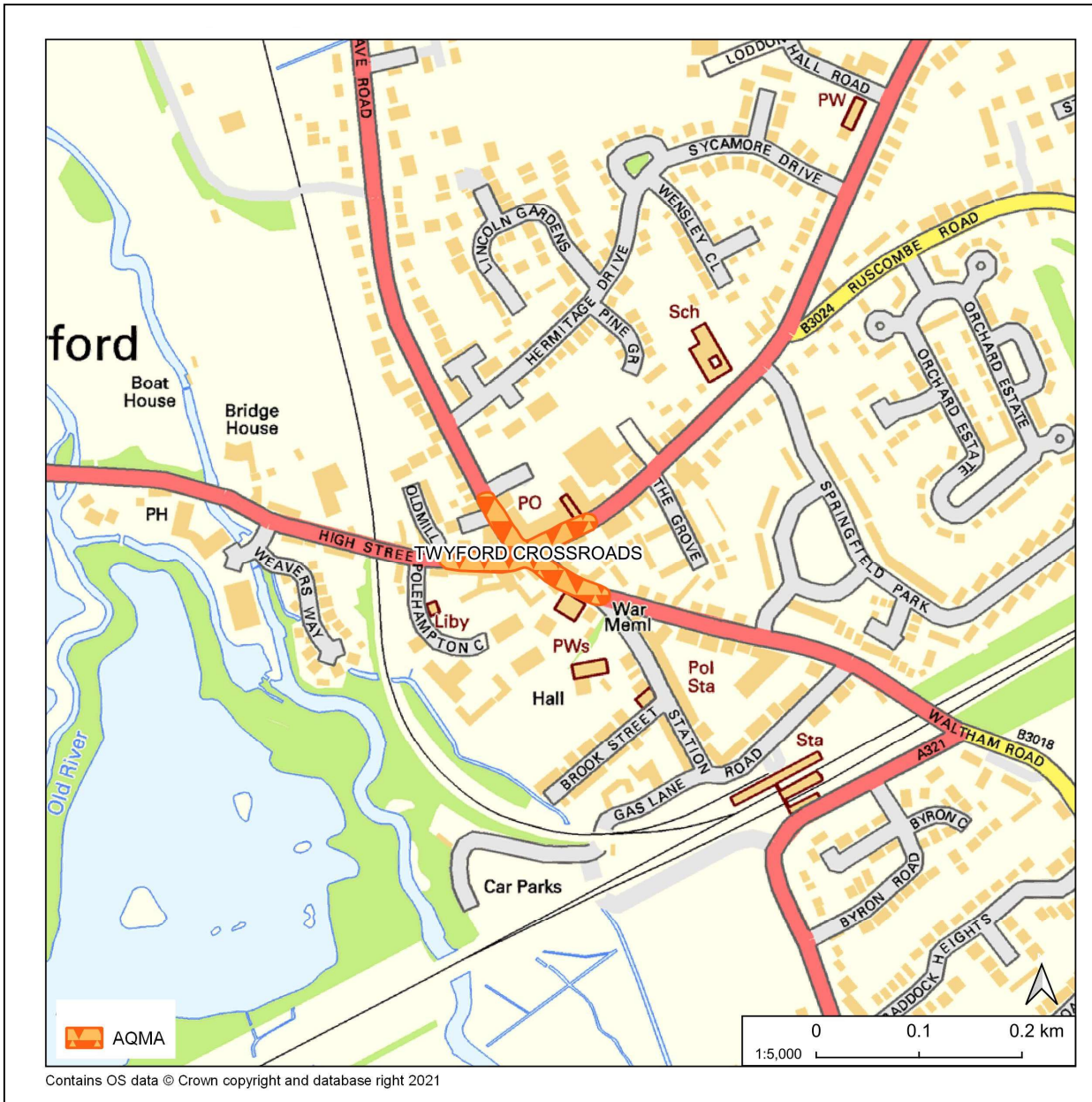


Figure D.3 – Map of M4 AQMA



Figure D.4 - Wokingham Town Centre AQMA Air Quality Monitoring Locations

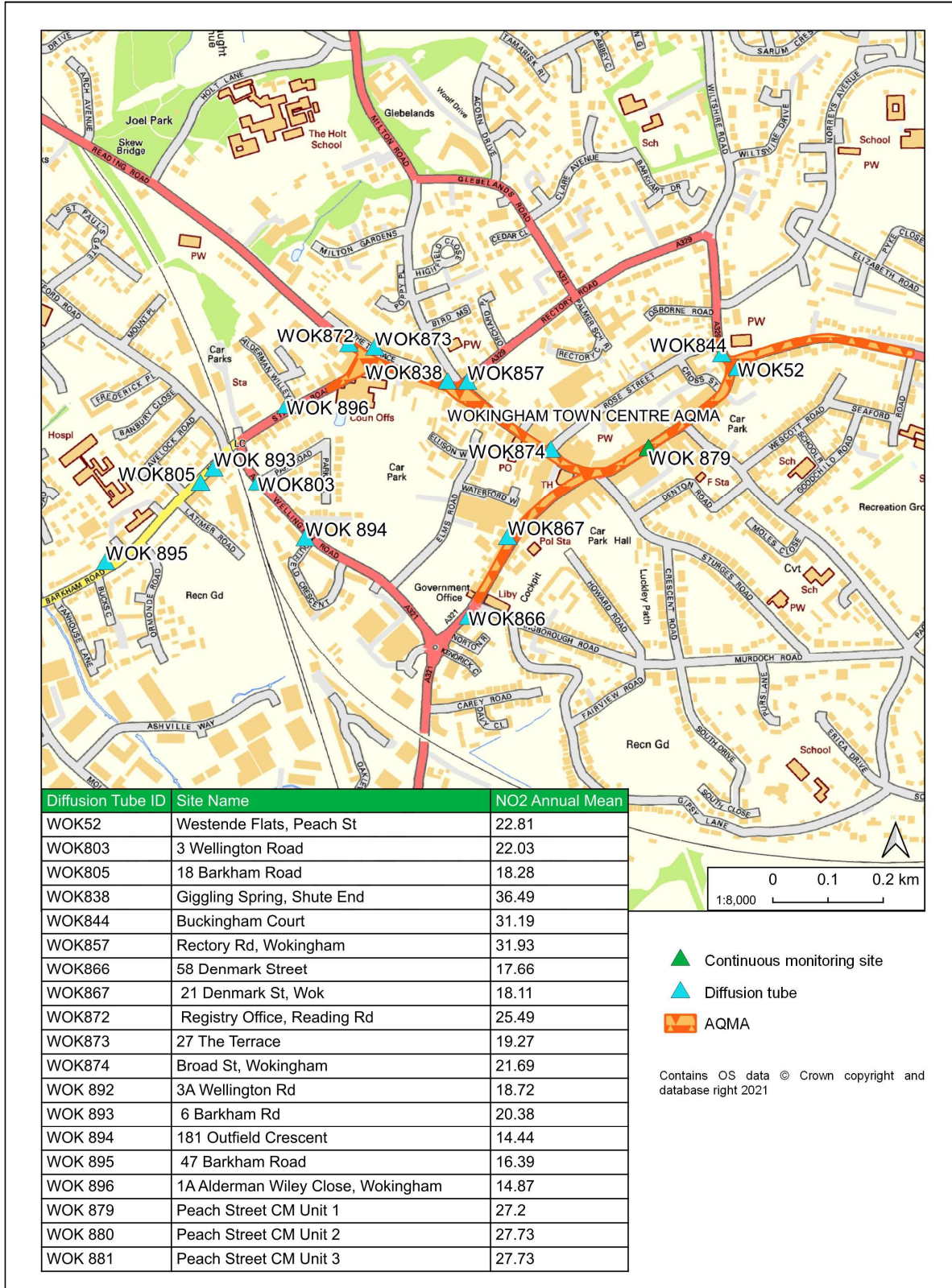


Figure D.5 – Twyford Crossroads AQMA Air Quality Monitoring Locations

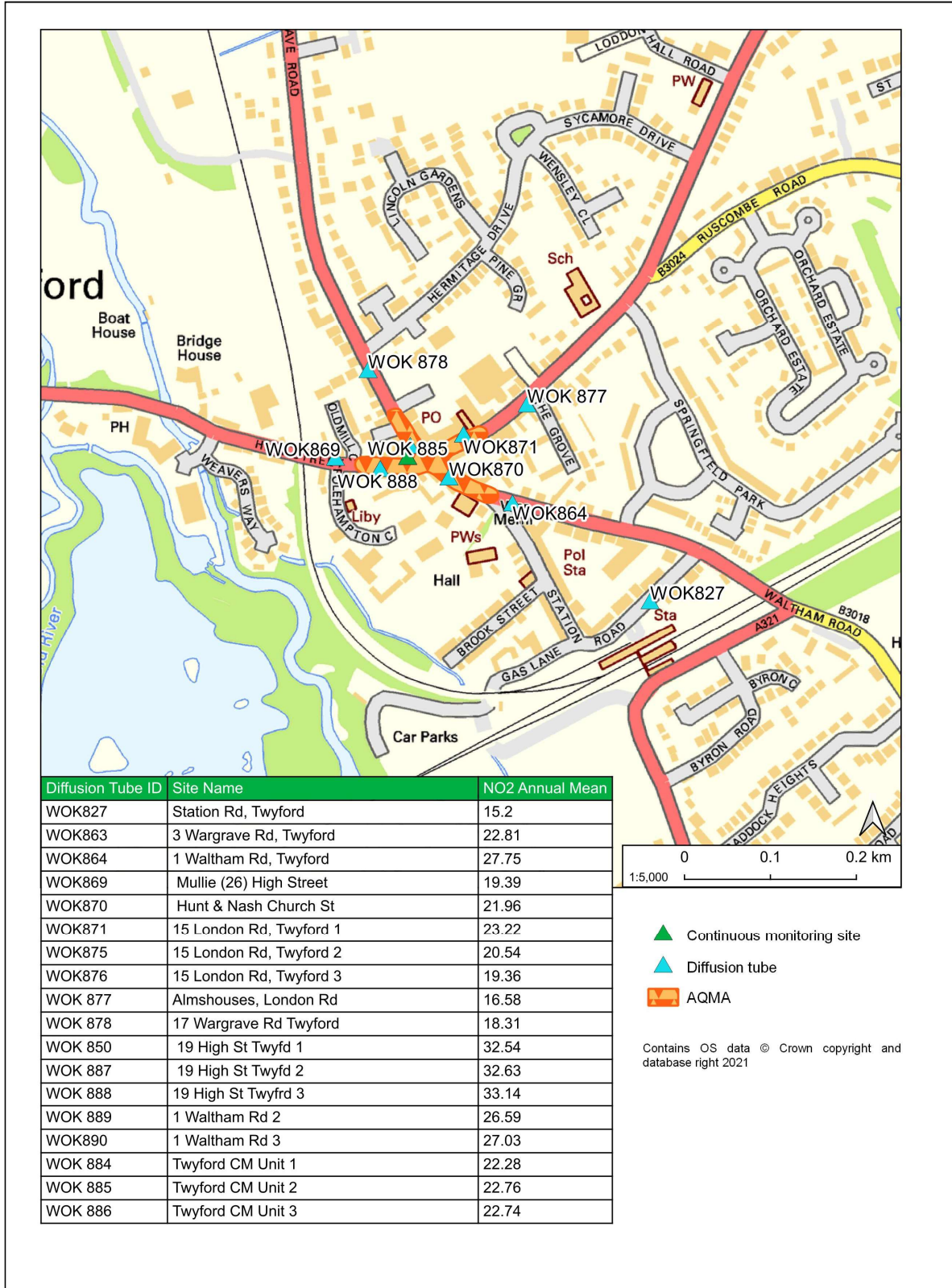


Figure D.6 – Map of M4 (West) Air Quality Monitoring Locations

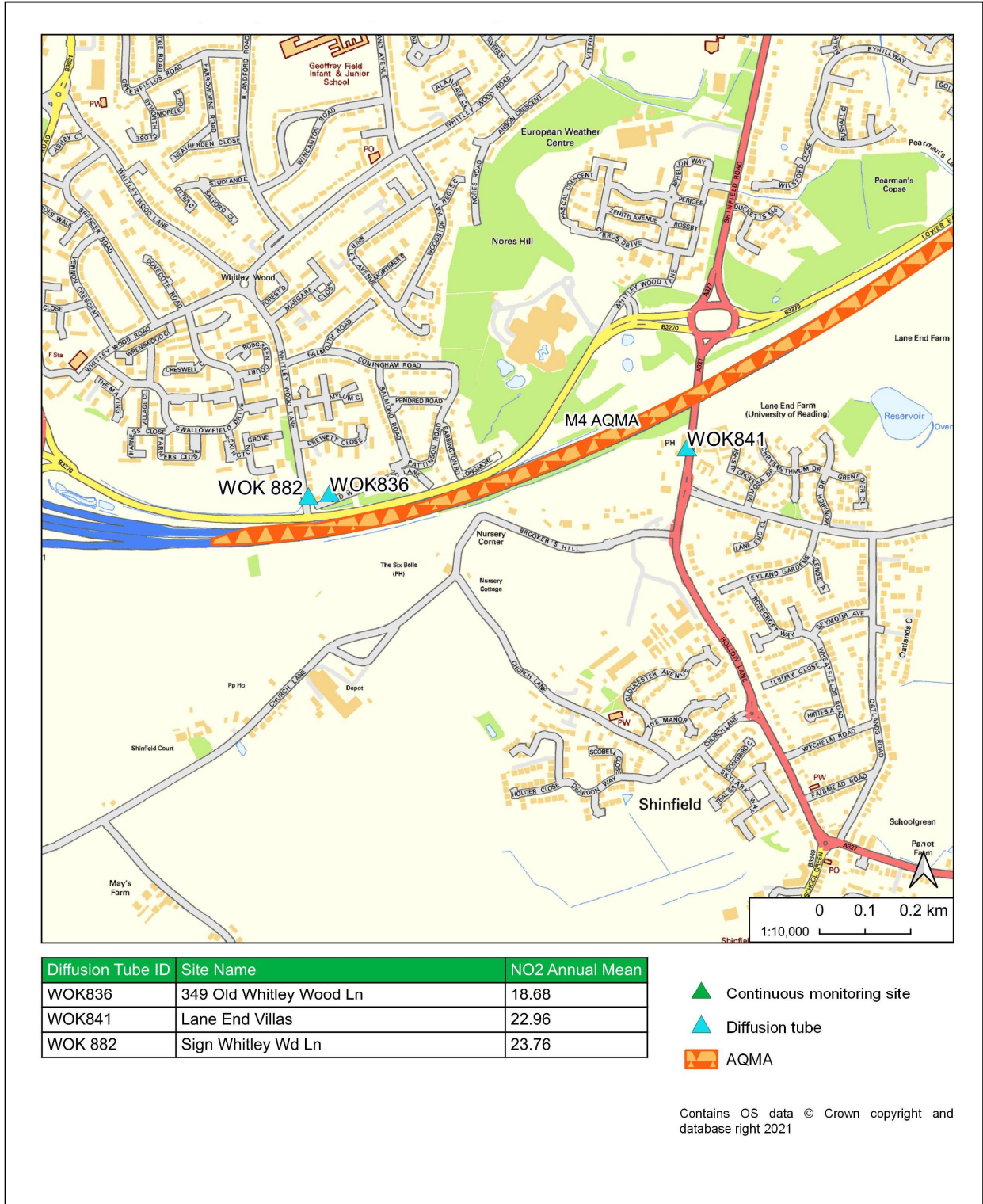


Figure D.7 – Map of M4 (East) Air Quality Monitoring Locations

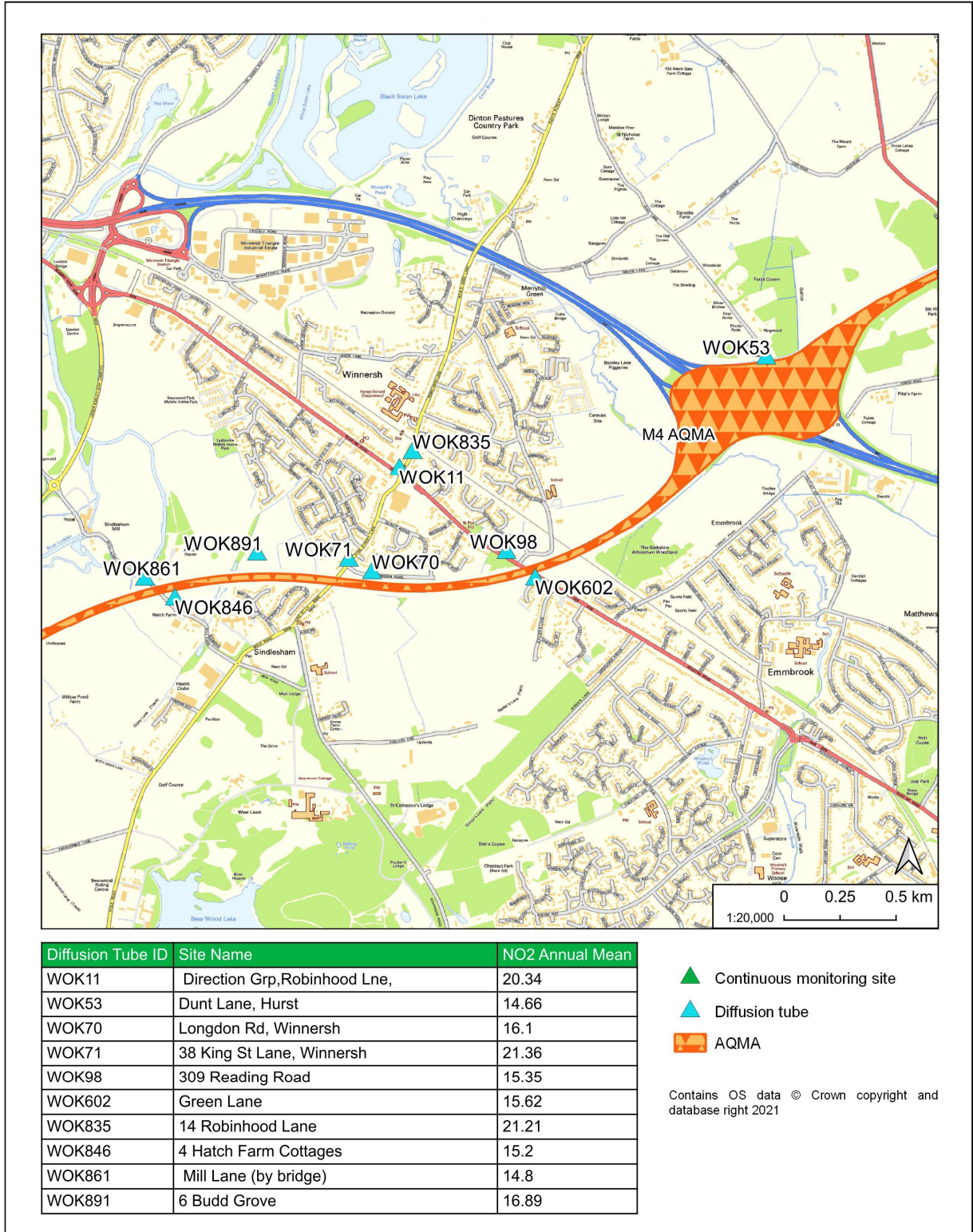


Figure D.8 – Map of (883) Evendons Primary School

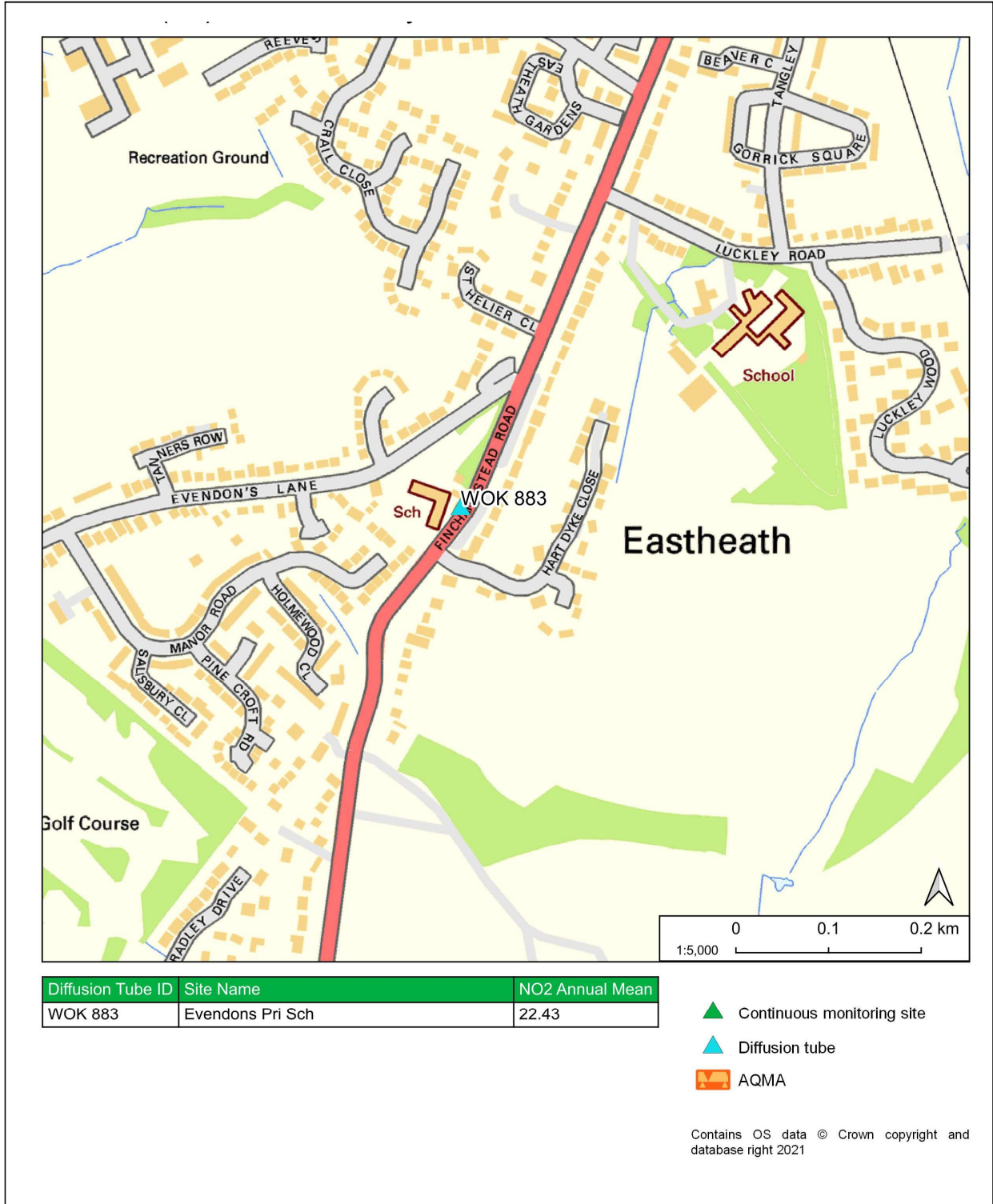


Figure D.9 – Map of (825) 54 High St Wargrave

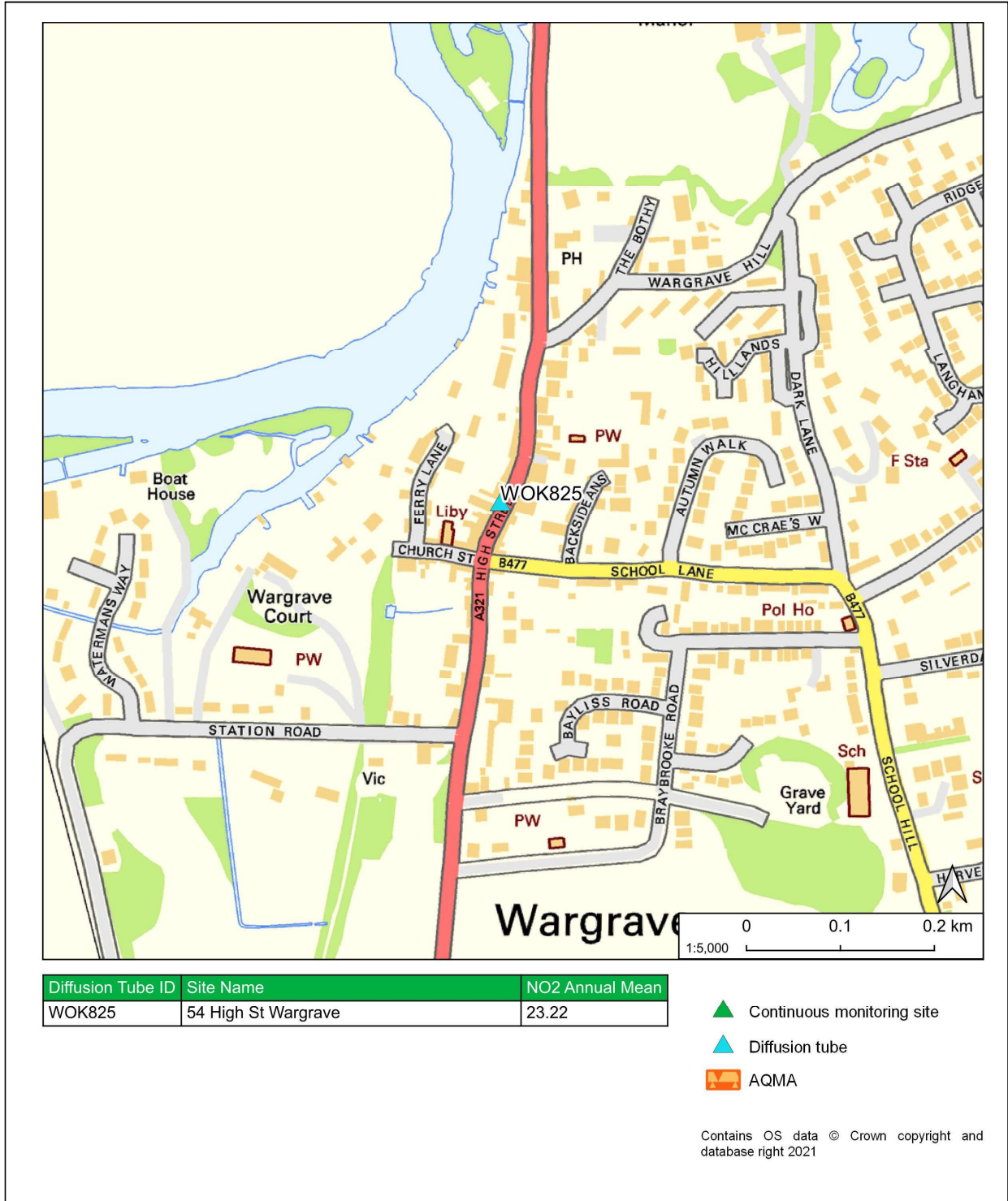


Figure D.10 – Map of (817) 298 London Rd

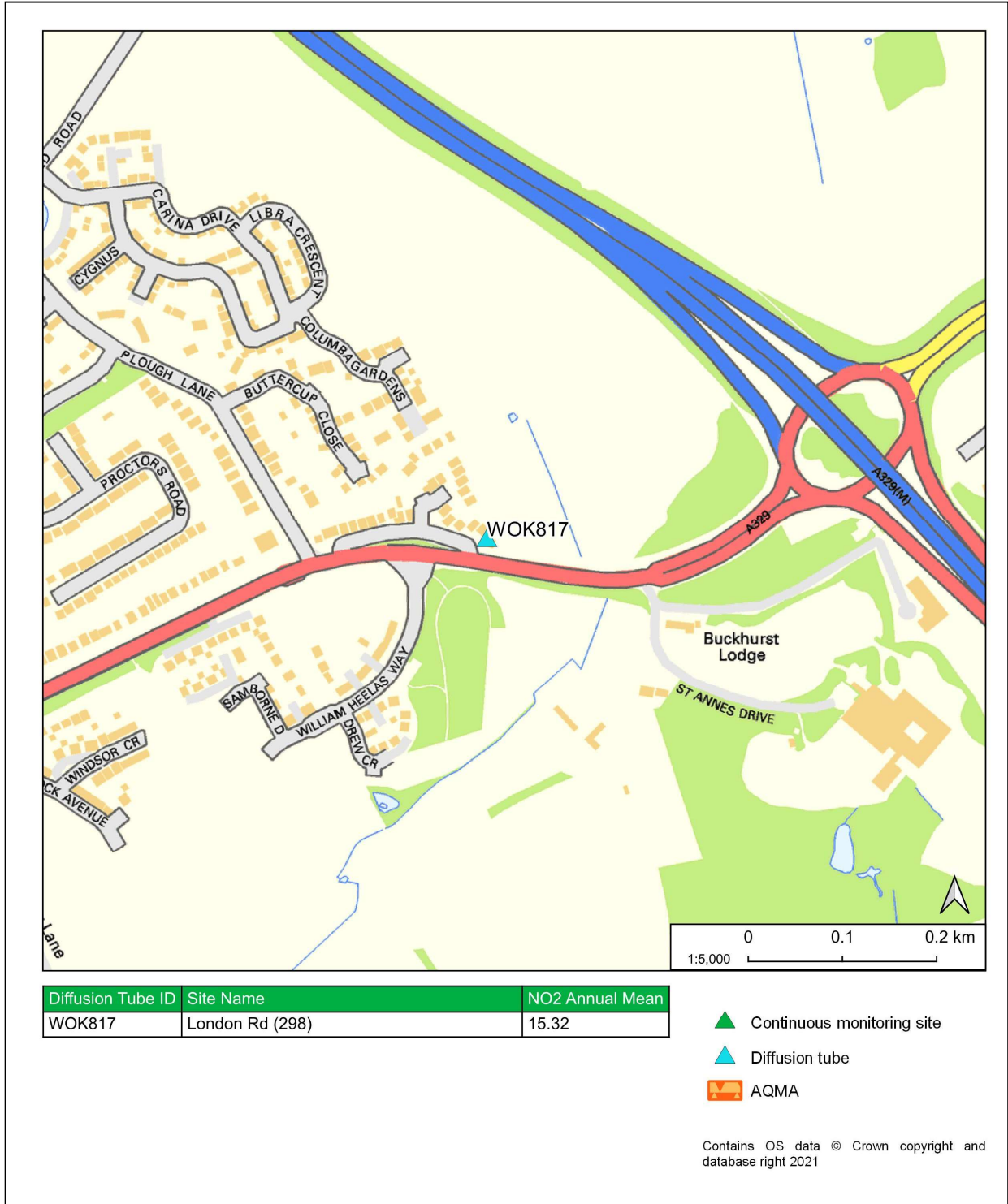


Figure D.11 – Map of (509) Henley Bridge

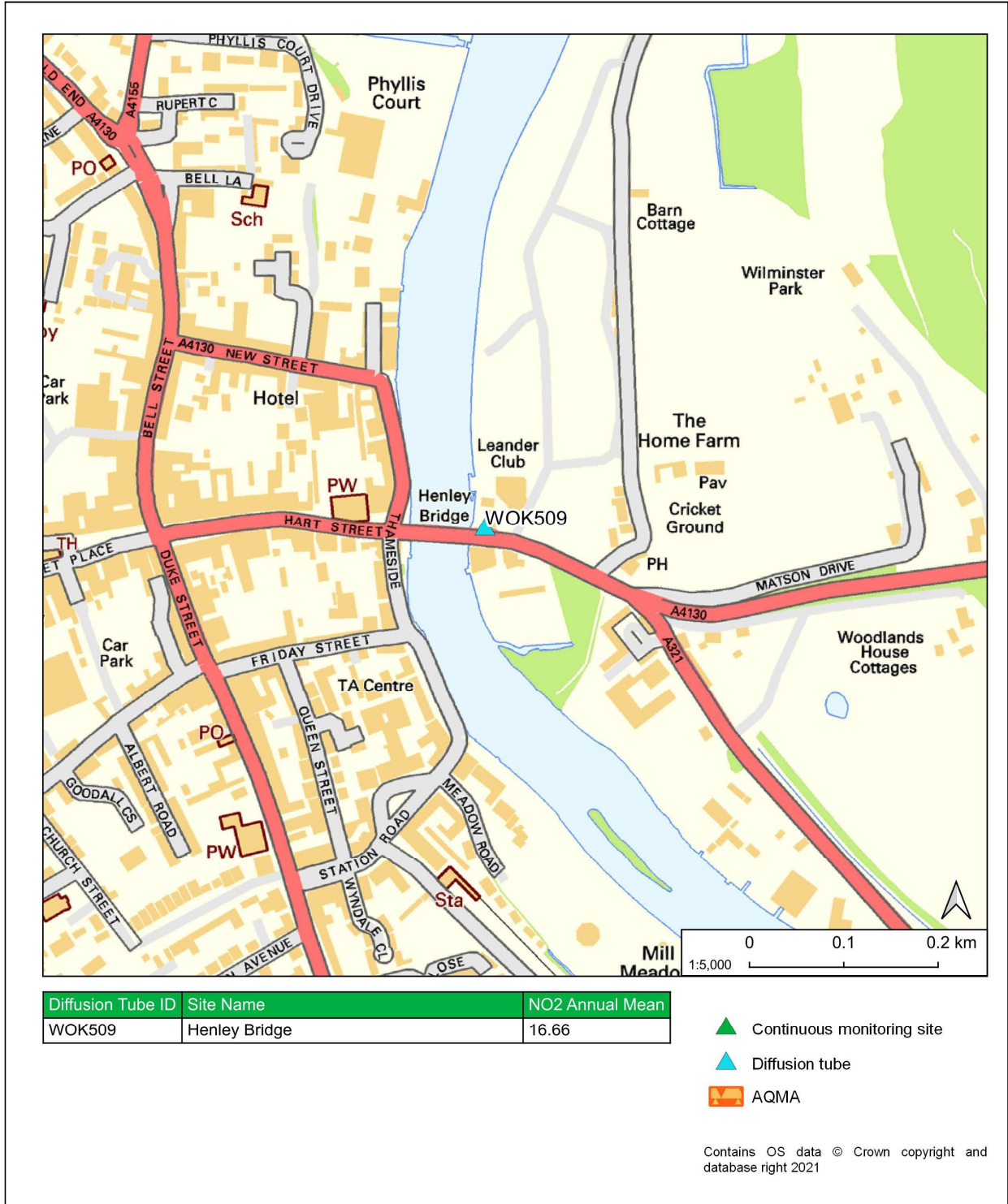


Figure D.12 – Map of (505) Church Road



Figure D.13 – Map of Sonning Air Quality Monitoring Locations

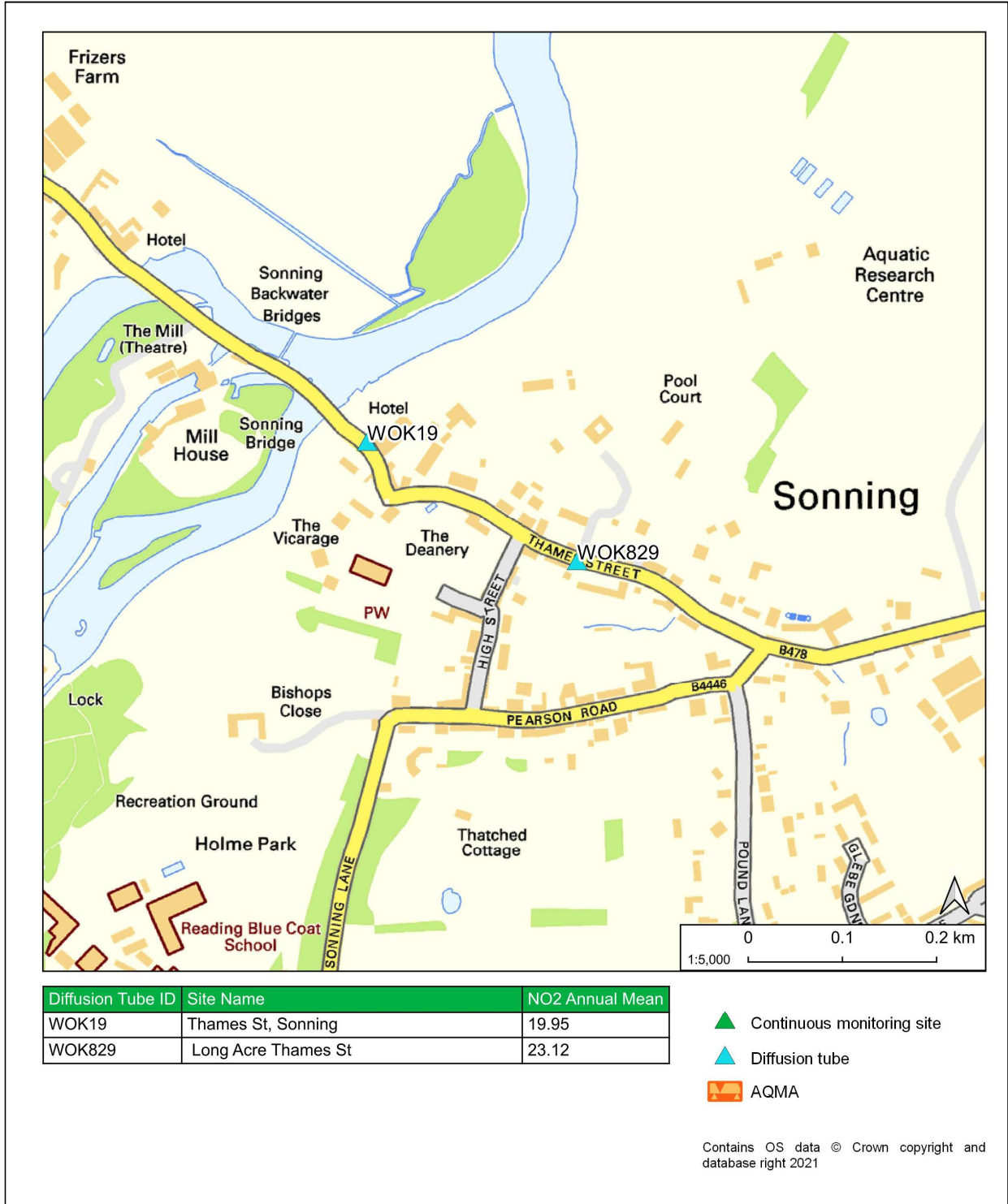
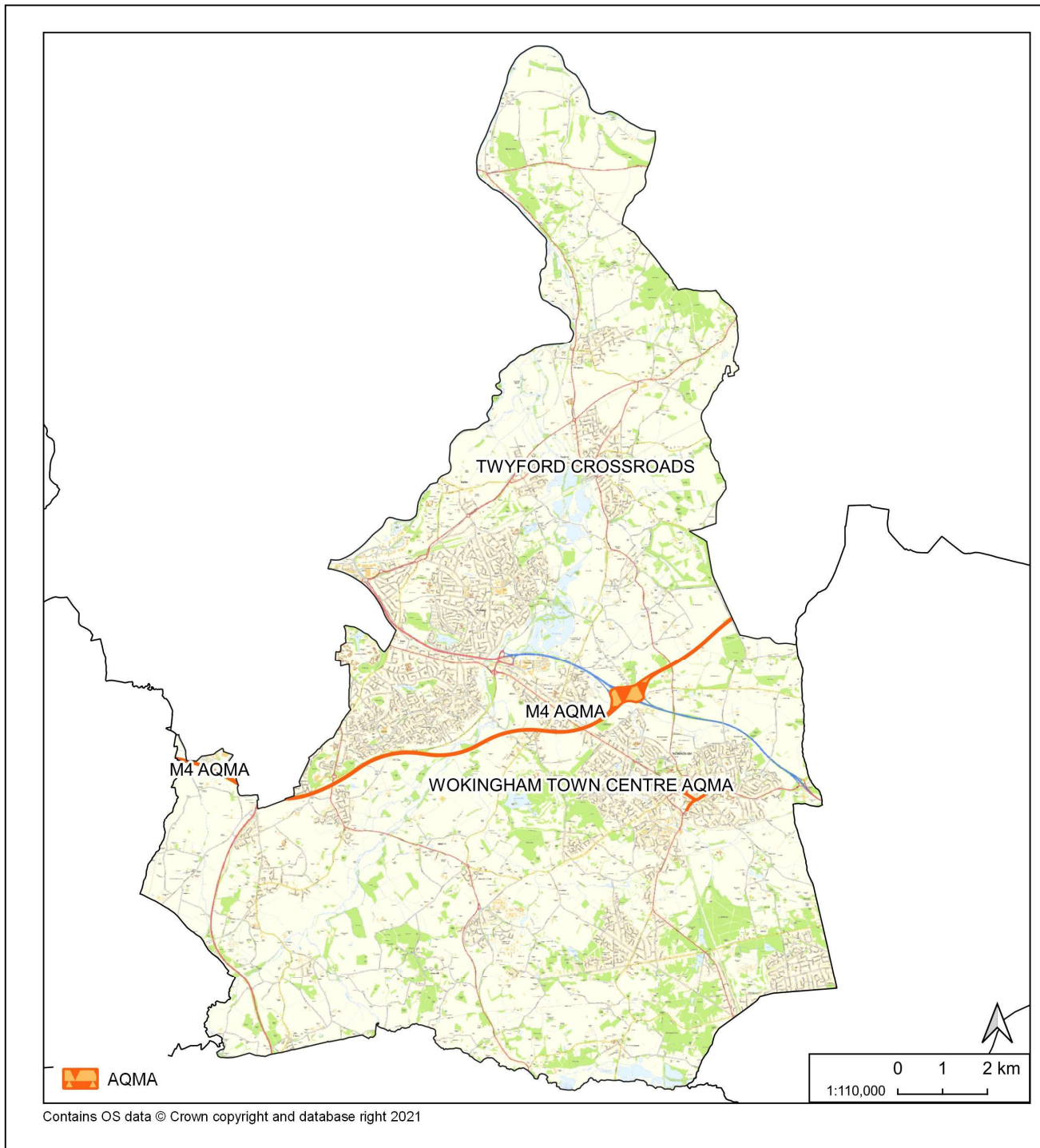


Figure D.14 – Map of Wokingham



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England⁸

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO ₂)	200µg/m ³ not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO ₂)	40µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	50µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean
Particulate Matter (PM ₁₀)	40µg/m ³	Annual mean
Sulphur Dioxide (SO ₂)	350µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean
Sulphur Dioxide (SO ₂)	125µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean
Sulphur Dioxide (SO ₂)	266µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean

⁸ The units are in micrograms 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	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
LEZ	Low Emission Zone
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide

References

- Local Air Quality Management Technical Guidance LAQM.TG16. April 2021. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG16. May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Annual Screening Report 2021, Wokingham Borough Council, Public Protection Partnership.