



2018 Air Quality Annual Status Report (ASR)

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

June 2018

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Three Rivers District Council

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Contact:

Ellis Marshall-Padkin

Ricardo Energy & Environment

Gemini Building, Harwell, Didcot, OX11 0QR,
United Kingdom

t: +44 (0) 1235 75 3061

e: ellis.marshall-padkin@ricardo.com

Ricardo is certificated to ISO9001, ISO14001
and OHSAS18001

Author:

Ellis Marshall-Padkin

Approved By:

Stephen Stratton

Date:

26/06/2018

Ricardo Energy & Environment reference:

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Three Rivers District Council

Local Authority Officer	John Scott
Department	Community & Environmental Services
Address	Three Rivers House Northway Rickmansworth WD3 1RL
Telephone	01923 776611
E-mail	enquiries@threerivers.gov.uk
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Executive Summary: Air Quality in Our Area

Air Quality in Three Rivers District Council

Air pollution is associated with a number of adverse health impacts. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas^{1,2}. The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion³.

Three Rivers is a sub-urban district of 88.8 square kilometres located in south-west Hertfordshire. It borders Watford and Hertsmere boroughs to the east, Buckinghamshire County (Chiltern and South Bucks Districts) to the west, St Albans City & District and Dacorum Borough to the north, and the London Boroughs of Hillingdon and Harrow are to the south.

The key road links through the District are the M1 and M25 motorways, which are significant sources of local air pollutant emissions. There are no significant pollutant sources within the district apart from road traffic emissions.

Three Rivers District Council (TRDC) monitors nitrogen dioxide (NO₂) and particulate matter (PM₁₀). In April 2016 TRDC commenced the monitoring of fine particulate matter (PM_{2.5}) at a point of relevant exposure near to Junction 18 of the M25 within Chorleywood NO₂ AQMA using AQ Mesh monitoring. A further AQ Mesh monitoring site has been commissioned at a location of relevant exposure on the A412, Uxbridge Road, in Rickmansworth during 2017. The AQ Mesh monitoring data for 2017 indicated that the annual mean PM₁₀ objective and 24-hour objective could be exceeded at J18 M25. The AQ Mesh monitoring data also indicated that the 24-hour objective could be exceeded at Rickmansworth Road (Mill End 1).

The current number of diffusion tube sites in 2017 across TRDC is now nine, which includes two new triple sites on the A412 Uxbridge Road (Belfry House, Mill End 1 & Long Lane, Mill End 2), where relevant exposure is suspected. These have been in place since April 2017.

¹ Environmental equity, air quality, socioeconomic status and respiratory health, 2010

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

³ Defra. Abatement cost guidance for valuing changes in air quality, May 2013

The levels of NO₂ recorded for 2017 when compared to 2016 show a slight decrease in annual mean concentrations at the majority of the established monitored locations. The diffusion tube monitoring results indicate that the annual or hourly-mean air quality objective for nitrogen dioxide was not exceeded at most of the monitoring locations in the district. However, initial monitoring which commenced in April 2017 has shown a likely exceedance of the annual mean objective of 40 µg/m³ at the triplicate site at Belfry house on Uxbridge Road (Mill End 1). All three tubes recorded exceedances of the annual mean objective, with an average concentration of 51.6 µg/m³.

TRDC's Executive Committee have approved the revocation of the NO₂ Kings Langley Air Quality Management Area (AQMA) and NO₂ and PM₁₀ Chandlers Cross AQMA, and are awaiting instructions from the Department of Environment, Food and Rural Affairs (DEFRA) upon how to revoke the AQMAs. Once these AQMAs are revoked, there will be two remaining AQMAs in Chorleywood (for NO₂ and PM₁₀).

In terms of air pollution, TRDC is very similar to other outer London suburbs. The majority of our population lives close to the M25 and many workers commute into London or around the motorway network. Road transport emissions are the major contribution to the burden of air pollution encountered in our district. As a result, TRDC works to support Highways England, who are responsible for the motorway network, with developing and implementing measures to improve air pollution associated with the M25. Further information regarding Air Quality in TRDC can be found at: <http://www.threerivers.gov.uk/service/air-quality>.

Actions to Improve Air Quality

TRDC has developed an Air Quality Action Plan (AQAP) for the years 2015-2020 which highlighted the commitment TRDC has to continue to work towards improving air quality within the district. The measures in this AQAP aim to encourage reductions in emissions from road traffic, industry and homes. There is also a commitment to keep the community and our partners well informed about air quality and the actions to reduce pollution or minimise its effects on vulnerable people. TRDC has previously used the airTEXT service in 2017 to inform vulnerable individuals and groups across the district when air pollution levels are high. From 2018 onwards TRDC now also uses the Hertfordshire Air Quality Forecast to communicate air quality information across the district, as the contract with airTEXT closes in 2019.

TRDC has also developed a Green Expectations Action Plan (2017/18) which includes objectives and developing actions on:

- Minimising greenhouse gas emissions from new developments and existing properties;
- reducing the impact of carbon emissions and local air quality of travel associated with Council operations;
- developing and improving local cycling and walking routes and actively facilitate sustainable travel and
- promoting local passenger transport and work with the statutory transport providers including bus and rail operators to encourage sustainable and healthy forms of travel.

Conclusions and Priorities

The 2018 air quality Annual Status Report (ASR) identified that measured concentrations of NO₂ continue to be below the air quality objectives within the current AQMA's. Due to the continued downward trend from the established monitoring sites and measured concentrations being consistently below the annual objective for NO₂ over the last 4 years, it is recommended that a detailed assessment be undertaken to determine whether the remaining AQMA's in Chorleywood can also be revoked.

The new triplicate site located at Belfry House, Uxbridge Road (Mill End 1) has measured exceedances of the annual mean objective of 40µg/m³. The site (Tubes NB S1-S3) measured an average annual mean concentration of 51.6 µg/m³. The Council's intentions over the next year in relation to managing this exceedance are as follows:

- Proceed to a Detailed Assessment to assess the concentrations within the Uxbridge Road area to determine if there are exceedances of the annual mean objective and to determine the spatial extent of any exceedances.

Three Rivers District Council's priorities for the coming year are:

- To continue to work with Highways England as a priority activity, as the main source of emissions contributing to the original exceedance of the objectives in the AQMA's are from the M25.

- Continue to work across the Council to deliver the objectives of the Green Expectations Action Plan 2017/18.

Local Engagement and How to get Involved

It is important that members of the public appreciate the impact of their transport choices on air quality. The TRDC Action Plan highlights that the District is developing strategies to develop Sustainable Travel and Better Buses to inform how it will support the County Council's bus services. TRDC has also supported Office for Low Emissions Vehicles (OLEV) initiatives to install electric vehicle charging points; and is in the process of reorganising the terms under which the Council makes on-street and off-street parking available to include the installation of more charging points for electric vehicles.

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1 Local Air Quality Management

This report provides an overview of air quality in Three Rivers District Council (TRDC) during 2017. 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 Three Rivers District Council to improve air quality and any progress that has been made. The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

1.1 Previous LAQM Reporting

1.1.1 Annual Status Report 2017

In 2017 TRDC produced an ASR reporting monitoring from 2016. Nitrogen dioxide (NO₂) was measured at seven different sites in 2016. No annual means greater than the 40µg/m³ were measured. Overall there was a slight decrease in the annual mean concentrations of NO₂ recorded at the majority of the monitoring locations when compared to 2015.

The 2017 ASR reported TRDC executive committee had approved the revocation of the NO₂ Kings Langley Air Quality Management Area (AQMA) and NO₂ and particulate matter with an aerodynamic diameter of 10µm or less (PM₁₀) Chandlers Cross AQMA in 2015. The council was still awaiting instructions from DEFRA to revoke the AQMA's, but once revoked only two will remain in Chorleywood for NO₂ and PM₁₀.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

AQMAs are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an AQAP within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by TRDC can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=281.

Due to the continued downward trend in NO₂ and the fact that concentrations have been consistently below the annual objective for NO₂ over the last four years, it is recommended that a Detailed Assessment be undertaken for both NO₂ and PM₁₀ to ascertain whether the remaining Chorleywood AQMA's can also be revoked.

Further monitoring using NO₂ diffusion tubes commenced at the A412 in Rickmansworth from April 2017. The purpose of this monitoring is to ascertain current concentrations within residential areas, including a new school that may be impacted upon by the proposed HS2 construction works at Long Lane/ A412/ Denham Way. This monitoring will provide data for a proposed Detailed Assessment to determine whether the impacts of the HS2 will result in an additional AQMA along the A412; between the roundabout at Rectory Road/Riverside Drive and the Denham Way roundabout.

Maps of current AQMAs along with monitoring locations are shown in Appendix D. This report identifies that the measured concentrations of NO₂ continue to be below the air quality objectives within the current AQMA's.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan (inc. date of publication)
						At Declaration	Now	
Chorleywood NO ₂ AQMA	Declared 01/04/2001	NO ₂ Annual Mean	Chorleywood	Along the M25 south of Junction 18 to just north of where the motorway crosses the River Chess	YES	>40 µg/m ³	32.5-34.1(2017 Annual Mean range)	Three Rivers District Council Air Quality Action Plan 2015-2020 (pdf) www.threerivers.gov.uk/download?id=34952
Chorleywood PM ₁₀ AQMA	Declared 01/04/2001	PM ₁₀ 24-Hour Mean	Chorleywood	A slightly narrower area from just north of Junction 18,	YES	>50 µg/m ³ , exceeded more than	AQ Mesh data Annualised annual	Three Rivers District Council Air Quality Action Plan 2015-2020 (pdf) www.threerivers.gov.uk/download?id=34952

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				along the M25 to just north of where the motorway crosses the River Chess		35 times a year	mean 41.6 $\mu\text{g}/\text{m}^3$	
Chandlers Cross NO ₂ AQMA	Declared 01/04/2001	NO ₂ Annual Mean	Chandlers Cross	An area along the M25 from just west of where Chandler's Lane crosses the M25 to the beginning of Junction 19 of the motorway	YES	>40 $\mu\text{g}/\text{m}^3$	24.6 (2017 Annual Mean)	Three Rivers District Council Air Quality Action Plan 2015-2020 (pdf) www.threerivers.gov.uk/download?id=34952
Chandlers Cross PM ₁₀ AQMA	Declared 01/04/2001	PM ₁₀ 24-Hour Mean	Chandlers Cross	A slightly narrower area along the M25 from just west of	YES	>50 $\mu\text{g}/\text{m}^3$, exceeded more than	Not measured	Three Rivers District Council Air Quality Action Plan 2015-2020 (pdf) www.threerivers.gov.uk/download?id=34952

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				where Chandler's Lane crosses the M25 to the beginning of Junction 19		35 times a year		
Kings Langley NO ₂ AQMA	Declared 01/04/2001	NO ₂ Annual Mean	Kings Langley	An area surrounding where the M25 crosses the railway extending 74m either side of the centreline	YES	>40 µg/m ³	27.1 (2017 Annual Mean)	Three Rivers District Council Air Quality Action Plan 2015-2020 (pdf) www.threerivers.gov.uk/download?id=34952

Three Rivers District Council does not confirm the information on UK-Air regarding their AQMA(s) is up to date.

*The updated 2015-2020 AQAP has been provided to Defra, but is not yet updated on the UK-Air website.

2.2 Progress and Impact of Measures to address Air Quality in Three Rivers District Council

Defra's appraisal of last year's ASR concluded as follows

<i>"The Local Authority have 5 current AQMA's, declared as follows: AQMA Name"</i>	<i>Pollutants and Air Quality Objectives</i>	<i>Current Exceedances of objectives</i>
1 Chorleywood AQMA	NO ₂ annual mean	None
2 Chorleywood AQMA	PM ₁₀ 24-hour mean	None
3 Chandlers Cross AQMA	NO ₂ annual mean	None
4 Chandlers Cross AQMA	PM ₁₀ 24-hour mean	None
5 Kings Langley AQMA	NO ₂ annual mean	None

These AQMA's have continued monitoring results that are significantly below objective levels, even when results do not appear to have been corrected for relevant exposure. The latest monitoring review continues to highlight that there are no exceedances within any of the existing AQMA's where monitoring for NO₂ has taken place. The Council are proposing to carry out Detailed Assessments in AQMA1&2, and have requested guidance from Defra on revoking the remaining AQMAs.

Further monitoring is expected to take place in Rickmansworth as background monitoring in advance of works related to the HS2 rail project and is a possible future site for an AQMA. On the basis of the evidence provided by the local authority, the conclusions reached are acceptable for all sources and pollutants.

TRDC has taken forward a number of direct measures during the current reporting year of 2017 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in the TRDC AQAP. Key completed measures since the last ASR, are:

- A sensor AQ Mesh monitoring station for PM_{2.5} and PM₁₀ has been installed on the A412 Uxbridge Road, at a position that replicates relevant exposure.
- Two new triple exposure NO₂ sites have been installed on the A412 Uxbridge Road, also at positions of relevant exposure.

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

- A Detailed Assessment of the area of the A412 Uxbridge Road where early indications are that an AQMA for NO₂ and PM₁₀ may be required at locations where house frontages are less than 1.5 metres from the kerbside. This to inform the need, or otherwise, for a new AQMA(s). Source apportionment could further inform whether a diversion of HGV freight from this route, via M25 Junction 18, might bring the area into compliance without compromising any new receptors on the diversion route.
- A Detailed Assessment to determine the continuing need, or otherwise, for the remaining NO₂ and PM₁₀ AQMAs at M25 Junction 18 Chorleywood. Annual mean NO₂ concentrations consistently indicate that this objective is not being breached at the monitoring location.
- The administrative task of simply revoking the remaining spent AQMAs at Chandlers Cross and Kings Langley.

Table 2.2 – Progress on Measures to Improve Air Quality by TRDC

Measure No.	Measure	EU Category	EU Classification	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date
1	AirTEXT	Public Information	Via other mechanisms	Complete	April 2015 –April 2018	-	Exposure of most vulnerable	Operational	April 2018
2	2x indicative PM _{2.5} AQ Monitors	Other	Other	Complete	April 2017	PM _{2.5} AQ data	Inform future projects id required	Equipment installed	TBC
3	LTP, Walking, Cycling and bus strategy	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	Ongoing	Ongoing	Decrease in private car use	NO ₂ /PM ₁₀ /PM _{2.5}	Ongoing	Ongoing
4	Improvement of bus network	Transport Planning and Infrastructure	Bus route improvements	Complete	Ongoing	Increased Bus use	NO ₂ /PM ₁₀ /PM _{2.5}	Ongoing	TBC
5	OLEV initiative	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV	complete	Ongoing	Increased electric vehicle ownership	NO ₂ /PM ₁₀ /PM _{2.5}	One charging point installed	TBC

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			recharging, Gas fuel recharging						
6	Additional cycle routes	Transport Planning and Infrastructure	Cycle network	complete	Ongoing	Increase cycling	NO ₂ /PM ₁₀ / PM _{2.5}	Ongoing	TBC
7	Alternative routes via green ways	Transport Planning and Infrastructure	Other	complete	Ongoing	Use of greenways	Reduce exposure	Ongoing	TBC

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

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

Three Rivers District Council is taking the following measures to address PM_{2.5} and key benefits to reducing PM_{2.5} emissions will come from the Air Quality Action Plan and Green Expectations Action Plan 2017/18.

The Action Plan includes:

- Continue to promote the installation of electric vehicle charging points, through working with planning and development departments to encourage new developments to take up charge points.

The Green Expectations Plan includes:

- Objective 16 - The Council will seek to reduce the impact of carbon emissions and local air quality of travel associated with Council operations.
- Objective 17 - The Council will develop and improve local cycling and walking routes and actively facilitate sustainable travel through the provision and promotion of new infrastructure.

TRDC is currently undertaking sensor monitoring using AQ Mesh monitoring instruments to better understand PM_{2.5} concentrations within the area. Further details are provided in Section 3.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out the monitoring undertaken by TRDC and how it compares with the relevant air quality objectives. Three Rivers District Council undertook monitoring with AQ Mesh sensor instrumentation at two sites. One on Rickmansworth Rd, Chorleywood M25 J18 from April 2016 and the other at Mill End 1, Belfry House from April 2017. Table A.1 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C. Available monitoring data from the AQ Mesh monitoring sites are presented in Figure 3.1 and Figure 3.2.

3.1.2 Non-Automatic Monitoring Sites

TRDC undertook non-automatic (passive) monitoring of NO₂ at 13 sites during 2017. During 2017 monitoring commenced at two new triplicates sites ((NB) S1-3 and (NB) S4-6). As data capture at NB (S1-S3) was lower than 75%, annual mean concentrations were annualised in accordance with TG.16. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and annualisation are included in Appendix C.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO₂)

During 2017, concentrations measured at monitoring locations (NB) S1-S3; located at Belfry House, Uxbridge Road (Mill End 1) all measured annual mean concentrations greater than the 40µg/m³ objective. The exceedences measured were as follows:

- Tube (NB) S1 – 53.1 $\mu\text{g}/\text{m}^3$
- Tube (NB) S2 – 53.2 $\mu\text{g}/\text{m}^3$
- Tube (NB) S3 – 48.5 $\mu\text{g}/\text{m}^3$

Results remained above the annual mean objective following distance correction of the diffusion tube results. Distance corrected annual mean concentrations are reported in Appendix B. As monitoring at this location commenced in April 2017, annual mean concentrations at (NB) S1-S3 were annualised in accordance with the method outlined in Local Air Quality Management Technical Guidance (TG16). Further details on the annualisation can be found in Appendix C. As no location exceeded $60\mu\text{g}/\text{m}^3$, it is unlikely that the hourly NO_2 objective was breached. There are no continuous automatic NO_2 analysers in the District, using the reference chemiluminescence method of monitoring.

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of $40\mu\text{g}/\text{m}^3$. For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B. Distance corrected annual mean concentrations at the nearest location of relevant exposure are also presented in Appendix B.

Two further triple exposure NO_2 diffusion tube monitoring locations (NB S1-3 & NB S4-6) were installed in April 2017, on the A412. The purpose of this extension to our monitoring network was to support a future bid for funding to carry out a more detailed assessment of the need (or otherwise) for an AQMA at the A412 between the roundabout at Rectory Road/Riverside Drive and the Denham Way roundabout in Rickmansworth. This residential area and a new school will be impacted by the HS2 construction works at Long Lane/ A412/ Denham Way. The A412 is a heavily used and very narrow freight route for access to the M25 at J17 and it becomes severely congested whenever adverse traffic conditions pertain on the north western sector of the M25.

3.2.2 Particulate Matter (PM_{10} and $\text{PM}_{2.5}$)

TRDC commenced the monitoring of PM_{10} and $\text{PM}_{2.5}$ in April 2016 using an AQMesh monitoring sensor unit near to Junction 18 of the M25 within the Chandlers Cross AQMA, and in April 2017 another AQ Mesh sensor instrument was installed at Mill End 1 at Belfry House, Uxbridge Road. The monitoring of $\text{PM}_{2.5}$ was undertaken in

partnership with the Public Health Department of Hertfordshire County Council to provide localised data for the air quality Public Health Outcomes Framework (PHOF) indicator. Available monitoring data from the AQ Mesh monitoring sites are presented in Figure 3.1 and Figure 3.2. Annual concentrations and data capture are presented in Table A. 4 in Appendix A. The AQ Mesh monitoring data indicated that there may be an exceedance of the annual mean PM₁₀ objective and 24-hour mean at J18 M25. This location is within the existing AQMA. The AQ mesh monitoring data at Rickmansworth Road (Mill End 1) indicated that there are potential exceedances of the PM₁₀ 24-hour mean objective.

Figure 3.1: AQ Mesh Monitoring Data – J18 M25 (1297150)

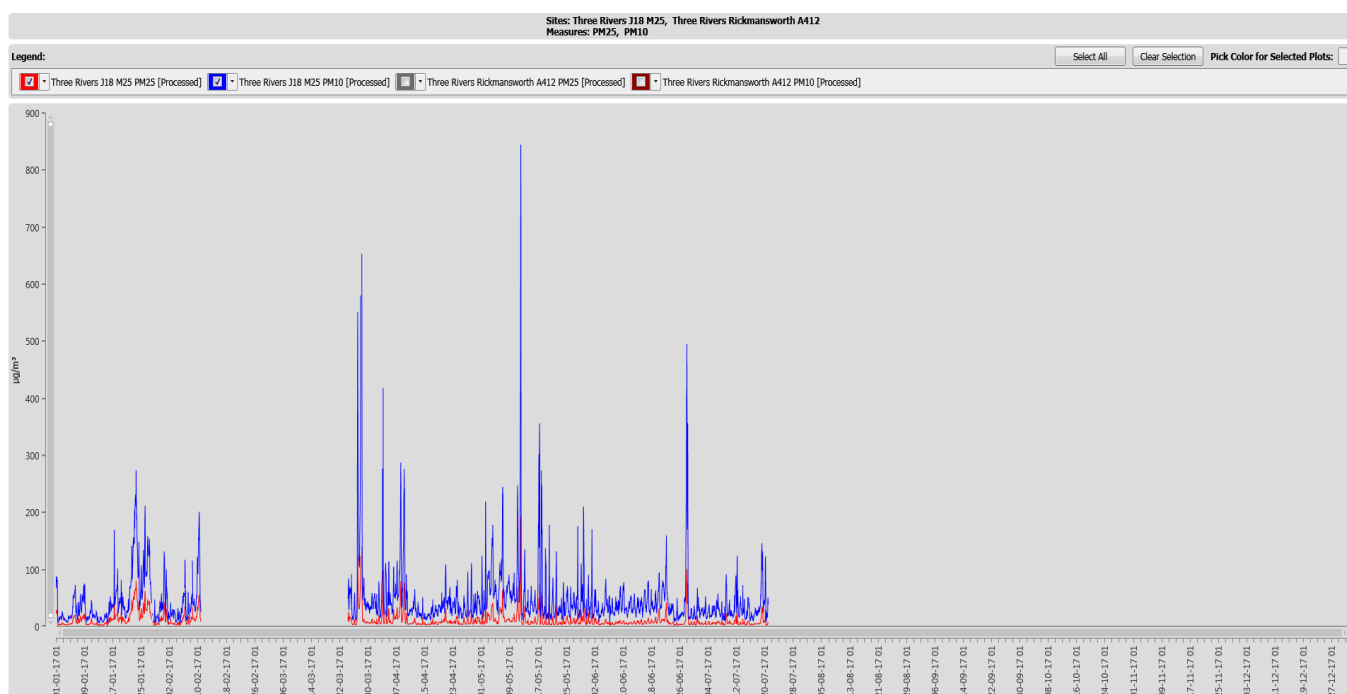
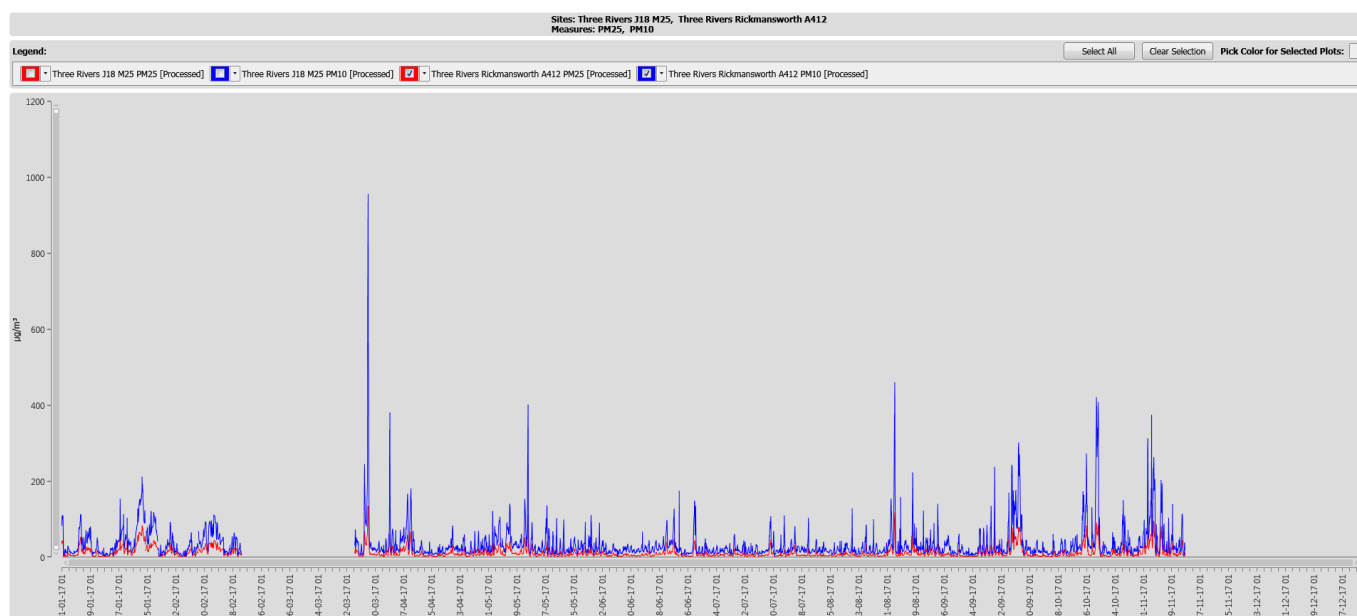


Figure 3.2 AQ Mesh Monitoring Data – Rickmansworth A412 (1298150)



3.2.3 Conclusions from Monitoring Data

During 2017, annual mean concentrations below $40 \mu\text{g}/\text{m}^3$ were measured at the monitoring locations within the current AQMAs. The new monitoring locations at Belfry House (Mill End 1) and A412 Long Lane (Mill End 2) were installed to ascertain current concentrations within residential areas including a new school that will be impacted upon by the proposed HS2 construction works at Long Lane/ A412/ Denham Way. This monitoring will provide data for a proposed Detailed Assessment bid to determine whether the impacts of the HS2 will result in an additional AQMA along the A412 between the roundabout at Rectory Road/Riverside Drive and the Denham Way roundabout.

Concentrations measured at Mill End 1 exceeded the annual mean objective of $40 \mu\text{g}/\text{m}^3$. The following concentrations were measured during 2017 as tubes (NB) S1-S3 at Mill End 1 - please note that annual means have been annualised in accordance with TG.16. Distance correction annual mean concentrations are provided in brackets for reference, following distance correction, tubes (NB) S1-S3 still measured exceedances of the annual mean objective:

- Tube (NB) S1 – $53.1 \mu\text{g}/\text{m}^3$ (50.8)

- Tube (NB) S2 – 53.2 $\mu\text{g}/\text{m}^3$ (50.9)
- Tube (NB) S3 – 48.5 $\mu\text{g}/\text{m}^3$ (46.4)

It is the intention of TRDC to proceed to a Detailed Assessment to determine if an AQMA is required to be declared and the spatial extent of any exceedances.

The AQ Mesh monitoring data indicated that there may be an exceedance of the annual mean PM_{10} objective and 24-hour mean at J18 M25. This location is within the existing AQMA. The AQ mesh monitoring data at Rickmansworth Road (Mill End 1) indicated that there are potential exceedances of the PM_{10} 24-hour mean objective. As outlined above it is the intention of TRDC to proceed to a Detailed Assessment to determine if an AQMA is required to be declared and the spatial extent of any exceedances.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
AQMesh 1	Junction 18 (M25), Chorleywood	Other	504161	196285	PM ₁₀ , PM _{2.5}	YES	Sensor unit (AQMesh)*	2	1	3
AQMesh 2	Belfry House Uxbridge Road (Mill End 1)	Kerbside	505263	194250	PM ₁₀ , PM _{2.5}	NO	Sensor unit (AQMesh)*	<0.5m	1.5	2

Notes:

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

(2) N/A if not applicable.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
S1 (NA)	Watford Road, Croxley Green	Roadside	507134	195283	NO ₂	NO	3	1	NO	2.5
S2 (NA)	Chandlers Cross	Roadside	506430	198590	NO ₂	YES	97	17	NO	2.5
S3 (NA)	The Retreat Kings Langley	Suburban	508100	201800	NO ₂	YES	7	4	NO	2.5
S4 (NA)	Sunrise Senior Living/ Junction 18 M25, Chorleywood	Roadside	504162	196286	NO ₂	YES	2	1	NO	2.5
S5 (NA)	"	Roadside	504162	196286	NO ₂	YES	2	1	NO	2.5
S6 (NA)	"	Roadside	504162	196286	NO ₂	YES	2	1	NO	2.5
S7 (NA)	Rickmansworth Fire Station, Rectory Road	Roadside	505500	194400	NO ₂	NO	30	10	NO	2.5
S1 (NB)	Belfry House Uxbridge Road (Mill End 1)	Kerbside	505264	194251	NO ₂	NO	<0.5	1.5	NO	2.9
S2 (NB)	"	Kerbside	505264	194251	NO ₂	NO	<0.5	1.5	NO	2.9
S3 (NB)	"	Kerbside	505264	194251	NO ₂	NO	<0.5	1.5	NO	2.9
S4 (NB)	A412 Long Lane (Mill End 2)	Kerbside	504104	193684	NO ₂	NO	<0.5	1.8	NO	2.4
S5 (NB)	"	Kerbside	504104	193684	NO ₂	NO	<0.5	1.8	NO	2.4
S6 (NB)	"	Kerbside	504104	193684	NO ₂	NO	<0.5	1.8	NO	2.4

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2017 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2013	2014	2015	2016	2017
S1 (NA)	Kerbside	Diffusion Tube	100	100	33	28	26	25.9	27.3
S2	Urban Background	Diffusion Tube	100	100	29	26	27.3	26.1	24.6
S3	Urban Background	Diffusion Tube	100	100	31	26	26.6	30.1	27.1
S4	Kerbside	Diffusion Tube	100	100	36	34	34.3	30	32.5
S5	Kerbside	Diffusion Tube	100	100	35	34	35.2	34.4	33.1
S6	Roadside	Diffusion Tube	92	92	37	37	35.7	34.5	34.1
S7	Suburban	Diffusion Tube	100	100	30	27	25.9	28.2	27.1
S1 (NB)	Kerbside	Diffusion Tube	89	67	-	-	-	-	53.1*
S2	Kerbside	Diffusion Tube	89	67	-	-	-	-	53.2*
S3	Kerbside	Diffusion Tube	89	67	-	-	-	-	48.5*
S4	Kerbside	Diffusion Tube	100	75	-	-	-	-	28.7
S5	Kerbside	Diffusion Tube	100	75	-	-	-	-	29.7
S6	Kerbside	Diffusion Tube	100	75	-	-	-	-	30.0

- ☒ Diffusion tube data has been bias corrected
- ☒ Annualisation has been conducted where data capture is <75%
- ☒ If applicable, all data has been distance corrected for relevant exposure

Notes:

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

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

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

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

(3) Means for diffusion tubes have been corrected for bias.

*All means have been “annualised” as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

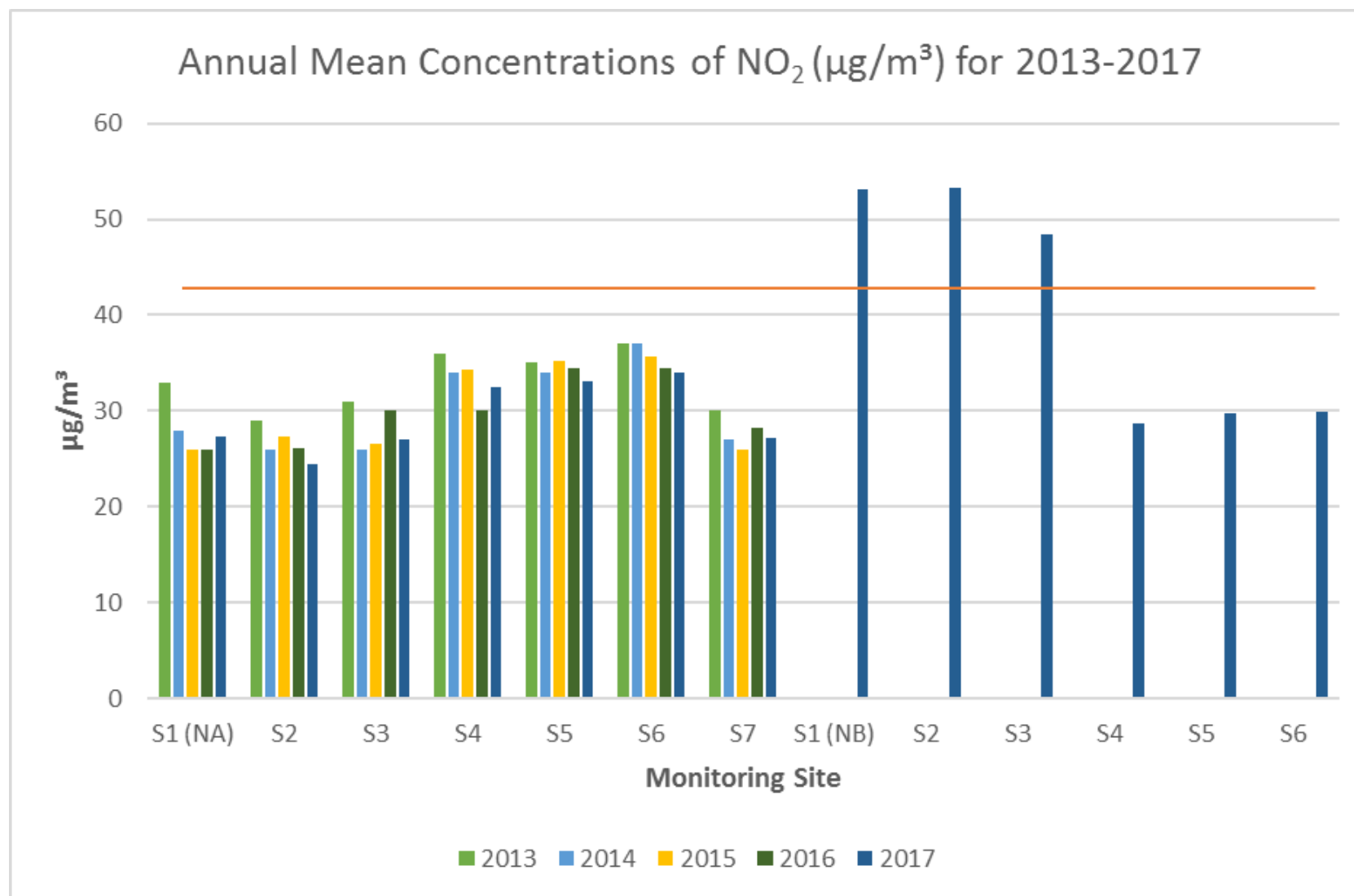
Figure A. 1 - Trends in Annual Mean NO₂ Concentrations

Table A. 4 - Annual PM Monitoring Results 2017

Site ID	Site Name	X OS Grid Ref	Y OS Grid Ref	PM ₁₀			PM _{2.5}	
				Annual Average	No Daily Exceedances	Data Capture	Annual Average	Data Capture
AQMesh 1 (1297150)	Junction J18 (M25), Chorleywood	504161	196285	46.9 (41.6)	41	43.4%	11.4 (9.3)	43.4%
AQMesh 2 (1298150)	Belfry House Rickmansworth A412 Uxbridge Road (Mill End 1)	505263	194250	34.5	48	77.6%	12.6	77.6%

() Data in brackets is the annual average concentration annualised in accordance with method outlined in TG.16

Appendix B: Full Monthly Diffusion Tube Results for 2017

Table B.1 – NO₂ Monthly Diffusion Tube Results - 2017

Site ID	NO ₂ Mean Concentrations (µg/m ³)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.77) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
S1(NA)	56.1	43.8	39.8	30.9	25.6	28.2	24.3	31.8	31.7	42.5	33.1	38.1	35.5	27.3	23.8
S2	50.3	43.4	38.4	22.3	28.1	26.2	27.6	27.9	27.7	32.8	24.2	33.7	31.9	24.6	*Distance to receptor >50m
S3	52.4	41.3	36.9	32.8	27.4	25.6	27.7	30.6	29.5	38.8	40.4	38.5	35.2	27.1	24.2
S4	60.3	46.3	46.3	35.5	36.5	34.5	41.1	42.3	41.2	44.4	34.4	44.4	42.3	32.5	29.8
S5	62.5	50.2	39.8	36.9	0	35.9	36.9	40.8	39.4	47.4	39.7	43.1	43.0	33.1	30.2
S6	67.8	56.3	47.4	31.6	42.6	34.4	37.9	35.6	39.1	47.5	49.2	41.5	44.2	34.1	31
S7	57.7	41.8	37.5	27.6	31.4	31.3	24.8	32	29.7	37.4	35.9	35.5	35.2	27.1	21.4
S1(NB)	No Data	No Data	No Data	61.1	-	71	33.2	51.6	58.7	65.9	57.8	64.5	58.0	53.1*	50.8
S2	No Data	No Data	No Data	55.6	-	67	31.4	58.3	58.9	62.7	66.3	64.6	58.1	53.2*	50.9
S3	No Data	No Data	No Data	53.4	-	70.1	35.4	20.8	56.8	67.6	62.6	56.4	52.9	48.5*	46.4
S4	No Data	No Data	No Data	31.8	34.6	36.9	47.3	32.1	33.6	44.1	31	44.1	37.3	28.7	27.9
S5	No Data	No Data	No Data	32.1	36.3	32.7	50.2	32.5	37.7	40.8	43.9	40.8	38.6	29.7	28.8
S6	No Data	No Data	No Data	30.7	36.4	35.5	50.3	34.9	37.7	45	41.6	38.1	38.9	30.0	29.1

- ☒ Local bias adjustment factor used
- ☒ National bias adjustment factor used
- ☒ Annualisation has been conducted where data capture is <75%

Notes:

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

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

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

(2) Distance corrected to nearest relevant public exposure.

*All means have been “annualised” as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

Diffusion Tube Bias Adjustment Factors

Three Rivers District Council does not run a local triplicate co-location study therefore the national factor is applied. This is identified from the review and assessment help desk website for ESG Didcot 2017 (v3.18). The preparation method is 50% TEA/acetone. Results of the last four years were:

2014: 0.81

2015: 0.79

2016: 0.77

2017: 0.77

Figure C. 1- National BIAS Adjustment

National Diffusion Tube Bias Adjustment Factor Spreadsheet					Spreadsheet Version Number: 03/18					
Follow the steps below in the correct order to show the results of relevant co-location studies					This spreadsheet will be updated at the end of June 2018					
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods					LAQM Helpdesk Website					
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet										
This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.										
The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.					Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.					
Step 1:		Step 2:	Step 3:	Step 4:						
Select the Laboratory that Analyses Your Tubes from the Drop-Down List		Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor ² shown in blue at the foot of the final column.						
If a laboratory is not shown, we have no data for this laboratory.		If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data.	If you have your own co-location study then see footnote ¹ . If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMhelpdesk@uk.bureauveritas.com or 0800 0327953						
Analysed By ¹	Method	Year ²	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m ³)	Automatic Monitor Mean Conc. (Cm) (µg/m ³)	Bias (B)	Tube Precision ³	Bias Adjustment Factor (A) (Cm/Dm)
ESG Didcot	50% TEA in acetone	2017	R	Leeds City Council 7	11	38	27	39.8%	S	0.72
ESG Didcot	50% TEA in acetone	2017	R	Slough Borough Council	12	45	35	26.4%	G	0.79
ESG Didcot	50% TEA in acetone	2017	UB	Slough Borough Council	12	32	25	28.6%	G	0.78
ESG Didcot	50% TEA in acetone	2017	UB	Slough Borough Council	11	39	33	19.2%	G	0.84
ESG Didcot	50% TEA in acetone	2017	R	Tunbridge Wells	12	56	40	38.2%	G	0.72
ESG Didcot	50% TEA in acetone	2017		Overall Factor ² (27 studies)				Use		0.77

QA/QC of diffusion tube monitoring

AIR is an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). The AIR PT scheme started in April 2014, which combined two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme.

Defra and the Devolved Administrations advise that the diffusion tubes used for LAQM should be obtained from laboratories that have demonstrated satisfactory performance in the AIR NO₂ PT scheme.

Summary of Laboratory Performance in AIR NO₂ Proficiency Testing Scheme (April 2016 – March 2018) show that the ESG Didcot (formerly Harwell Scientific services) achieved the following percentage (%) of results through 2017, which were subsequently determined to be **satisfactory**. (Jan-Feb 100%, April-May 100%, July-August 100%, September-October 100%, January-February 2018 100%). (Reference: <https://laqm.defra.gov.uk/assets/AIR-PT-Rounds-13-to-24-Apr-2016-Feb-2018.pdf>).

Annualisation

Short term to long term adjustment of measurements with annual data capture less than 75%. For triplicate sites (NB) S1-S3, Belfry House, Uxbridge Road (Mill End 1) where the annual data capture was less than 75%, the short term period means were adjusted to annual means using the method recommended in TG(16) Box 7.9. Details of the annualisation calculations for tubes (NB) S1-S3 can be found in Table C.1 below.

Table C. 1 Annualisation of NO₂ Automatic Data

Background Site	Annual Mean 2017	Period Mean 2017	Ratio (Am/Pm)
Chilbolton	11	9.7	1.1
Wicken Fen	10	8.0	1.2
Average Ra			1.2
Period Mean (NB) S1 (µg/m ³)			44.6
Period Mean (NB) S2 (µg/m ³)			44.7
Period Mean (NB) S3 (µg/m ³)			40.7
Annual Mean (BIAS adj and annualised) (NB) S1 (µg/m ³)			53.1
Annual Mean (BIAS adj and annualised) (NB) S2 (µg/m ³)			53.2
Annual Mean (BIAS adj and annualised) (NB) S3 (µg/m ³)			48.4


Distance correction for NO₂ measurements

Distance correction of NO₂ diffusion tube measurements used the NO₂ fall-off with distance calculator available on the LAQM website and discussed in Paragraphs 7.77-7.79 of LAQM.TG16. The spreadsheet is shown in Figure C. 2 below. Background concentration concentrations were sourced from the Defra background 1km x 1km maps⁴.

Table B.1 presents the 2017 NO₂ diffusion tube measurements as distance corrected to the nearest exposure.

⁴ Background maps, available at: <https://uk-air.defra.gov.uk/data/laqm-background-home>

Figure C. 2 -Distance Correction for NO₂ measurements (Version 4.2)



Enter data into the pink cells

Site Name/ID	Distance (m)		NO ₂ Annual Mean Concentration (µg/m ³)		
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor
S1 (NA)	1.0	4.0	14.8	27.3	23.8
S2 (NA)	17.0	*	22.6	24.6	*
S3(NA)	4.0	11.0	17.0	27.1	24.2
S4(NA)	1.0	3.0	20.2	32.5	29.8
S5(NA)	1.0	3.0	20.2	33.1	30.2
S6(NA)	1.0	3.0	20.2	34.1	31.0
S7(NA)	10.0	40.0	16.2	27.1	21.4
S1 (NB)	1.5	2.0	16.2	53.1	50.8
S2(NB)	1.5	2.0	16.2	53.2	50.9
S3(NB)	1.5	2.0	16.2	48.5	46.4
S4(NB)	1.8	2.3	13.9	28.7	27.9
S5(NB)	1.8	2.3	13.9	29.7	28.8
S6(NB)	1.8	2.3	13.9	30.0	29.1

* Distance to relevant receptor >50m therefore unable to use distance drop off calculation

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

Figure D. 1 - Air Quality Management Areas Chorleywood NO₂ and PM₁₀

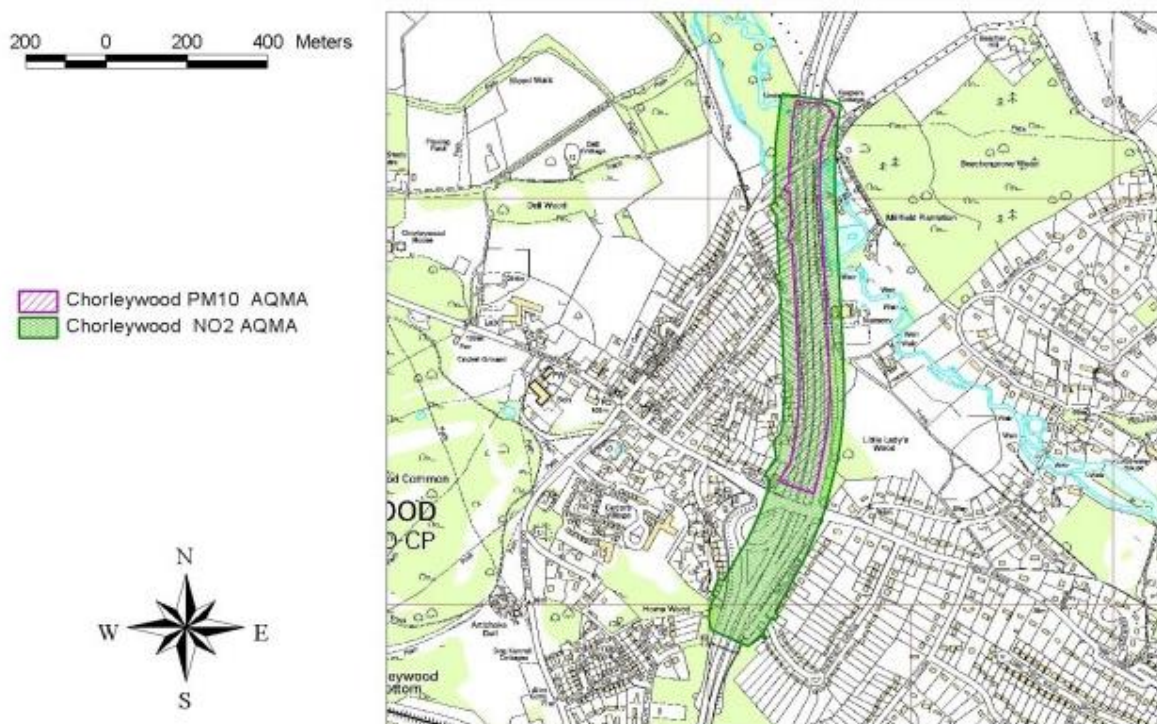


Figure D. 2 -Air Quality Management Areas Chandlers Cross NO₂ and PM₁₀

NB. Both NO₂ AND PM₁₀ AQMA's awaiting revocation

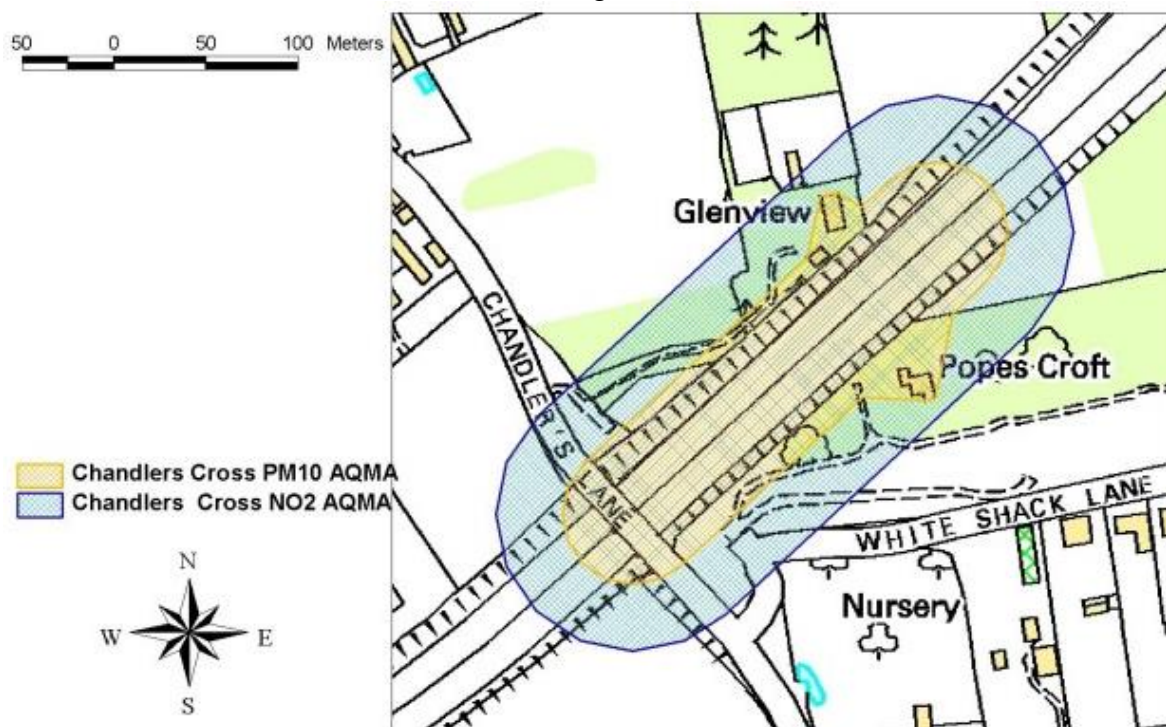
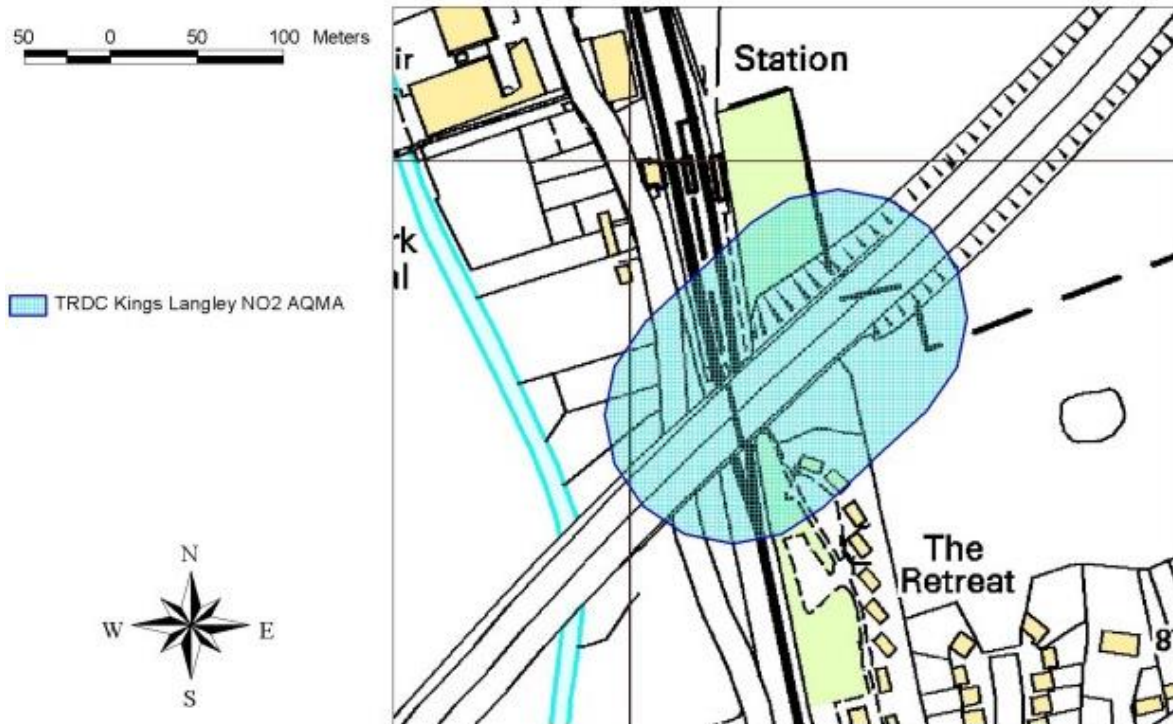


Figure D. 3-Air Quality Management Area Kings Langley NO₂

NB. AQMA awaiting revocation



(Defra, 2016)

Figure D. 4 - Map of The Retreat, Abbots Langley diffusion tube (DT) site (NA) S3

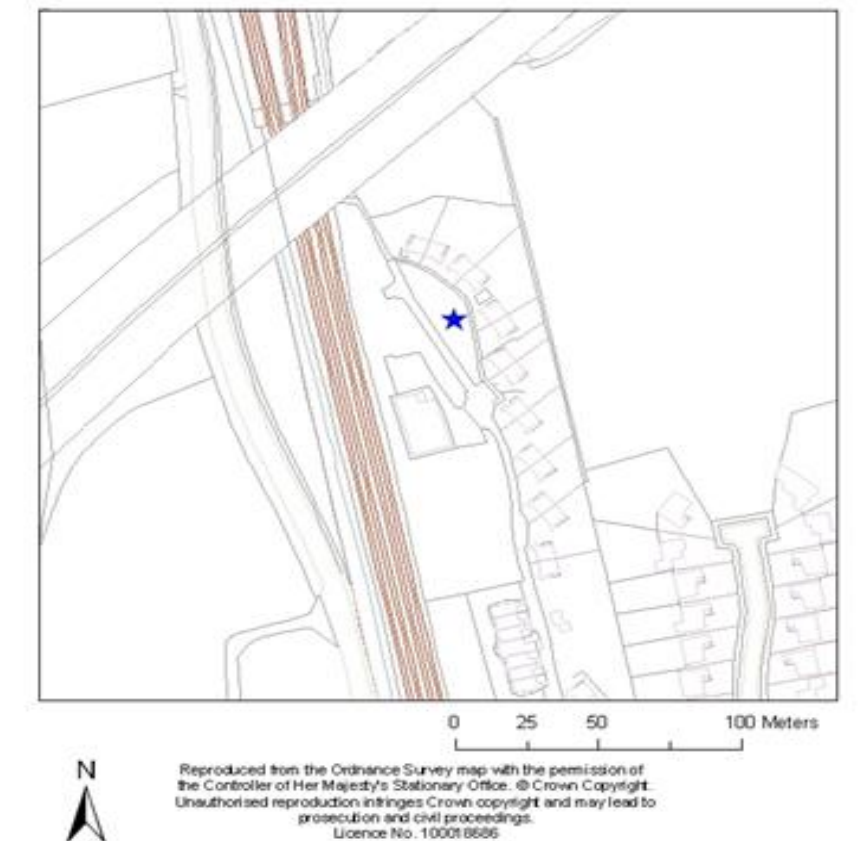


Figure D. 5 - Map of Junction 18 (M25) Chorleywood DT sites (NA) S4, S5 & S6

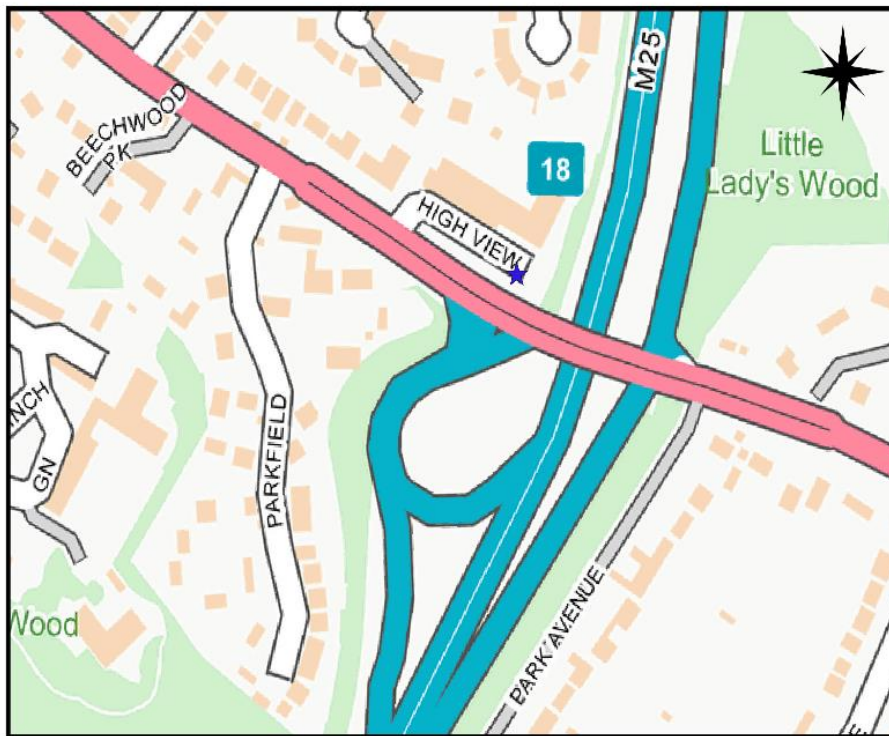


Figure D. 6- Map of Glen View, Chandlers Cross DT site (NA) S2



Figure D. 7- Map of Watford Road, Croxley Green DT site (NA) S1

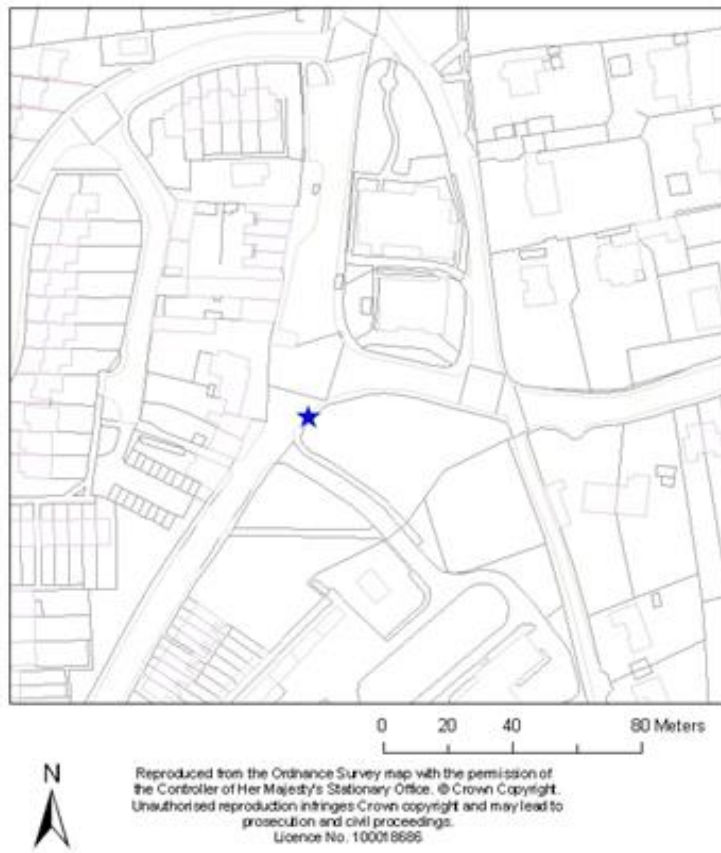


Figure D. 8- Map of Rectory Road, Rickmansworth DT site (NA) S7

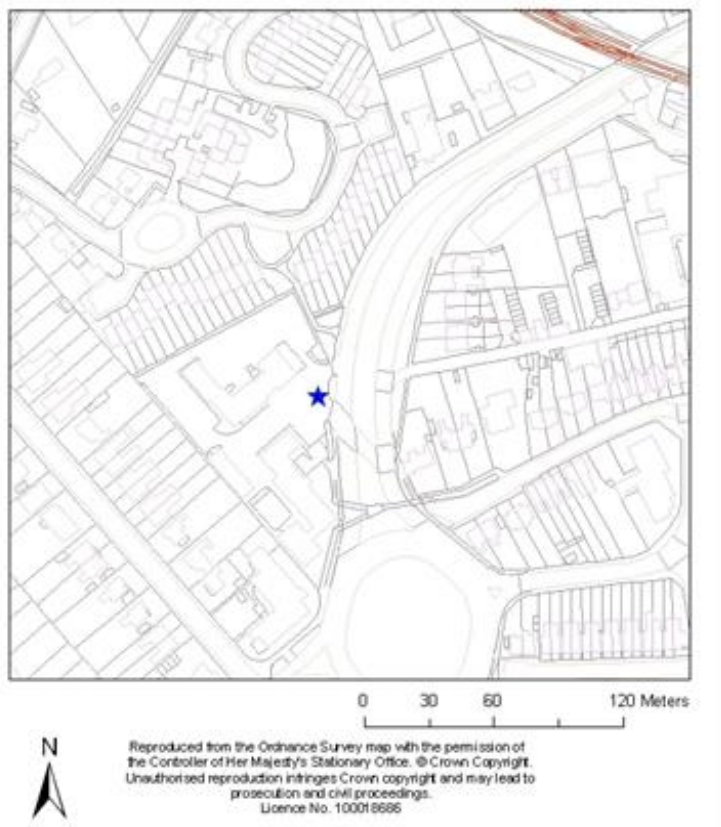


Figure D. 9- Map AQMesh monitoring site, Junction 18 (M25), Chorleywood

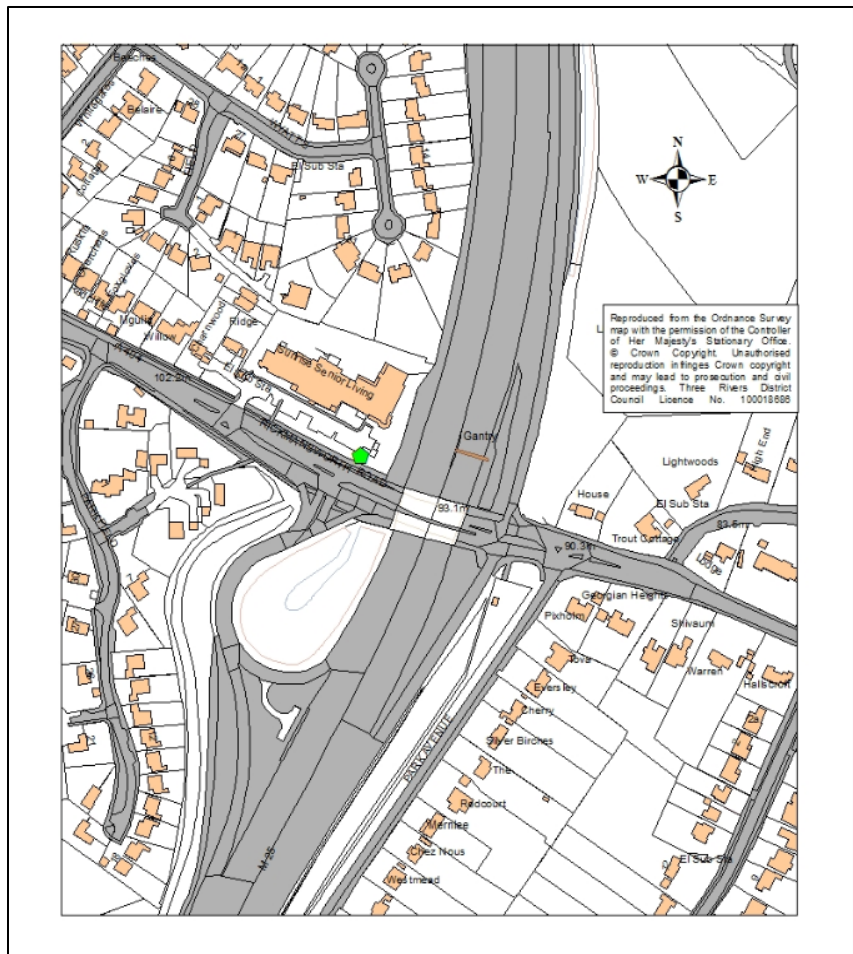


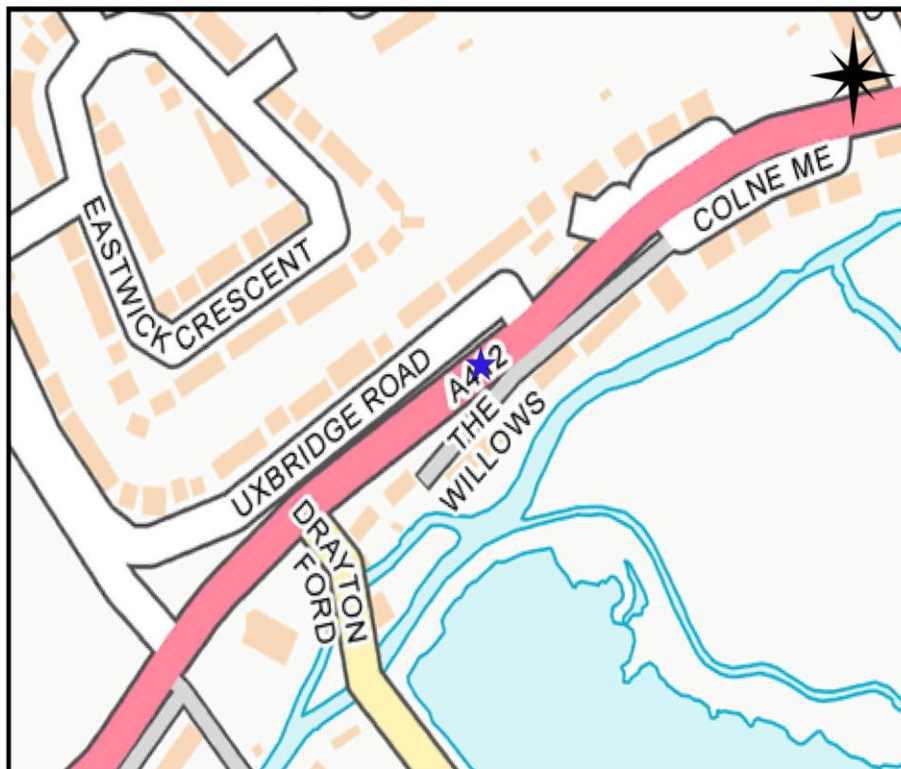
Figure D. 10 - Map AQMesh monitoring site, Belfry House, Uxbridge Rd (Mill End 1)



Figure D. 11- Map of Uxbridge Road, Belfry House DT Triplicate site (NB) S1-S3



Figure D. 12 - Map of A412 Long Lane (Mill End 2) DT Triplicate site (NB) S4-S6



Appendix E: Summary of Air Quality Objectives in England

Table E.1 Air Quality Objectives in England

Pollutant	Air Quality Objective ⁵	
	Concentration	Measured as
Nitrogen Dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	50 µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m ³	Annual mean
Sulphur Dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean

⁵ 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	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control

References

LAQM Technical Guidance TG.16, 2018, DEFRA, Available at:

<https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf>



Ricardo
Energy & Environment

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com