



2020 Air Quality Annual Status Report (ASR)

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

June 2020

Three Rivers District Council

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Executive Summary: Air Quality in Our Area

Air Quality in Three Rivers

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas^{1,2}.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion³.

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.

In terms of air pollution, Three Rivers District Council (TRDC) is very similar to other outer London suburbs. The majority of the 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.

From 1st May 2019, TRDC delegated certain Environmental Health functions to Watford Borough Council (WBC) including local air quality management.

Actions to Improve Air Quality

TRDC developed an Air Quality Action Plan (AQAP) for the years 2015-2020 which highlighted the Council's commitment to continue to work towards improving air quality within the district. The measures in this AQAP aimed to encourage reductions in emissions from road traffic, industry and homes. There was also a commitment to keep the community and partners well informed about air quality and the actions to reduce pollution or minimise its effects on vulnerable people.

WBC has undertaken a review of the existing AQAP (2015-2020), this review is considered an interim measure. The review includes updates on the measures included in the existing plan and updates in relation to revoked AQMAs. This review

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

has been undertaken to ensure that the existing plan reflects the current situation. WBC intends to draft a new AQAP in January 2022.

Walking and Cycling

TRDC has promoted its Cycling Strategy for nearly 40 years, introducing many new improvements to make cycling easier and to improve walking conditions, often in partnership with Hertfordshire County Council and other key organisations.

TRDC wants to enable and encourage people of all abilities to use their bike to get around - particularly people who do not usually cycle. TRDC also wants to make walking easier for everyone.

TRDC has published its local cycling and walking knowledge base on its website to help residents make more journeys by walking and cycling.

TRDC has delivered revolutionary off-grid solar street lights to improve walking and cycling in the Country Park at its Langley Lane entrance, to complete the low-traffic route between Rickmansworth and Leavesden. These emit zero CO₂ emissions and the innovative light columns help protect the environment.

They will save two tonnes of CO₂ emissions per light over 25 years compared with conventional street lights. This route connects Leavesden with the Grand Union Canal via the South Way shared cycleway. It is a key feature of the Three Rivers Cycling Strategy which is designed to make it easy for people to walk or cycle around the district.

TRDC Cycling Strategy

TRDC has developed and promoted its Cycling Strategy since 1981 with visible success in creating and improving the cycle routes it promotes across the district.

Recent projects include the upgrades to the Grand Union Canal towpath in partnership with other local authorities and the Canal and River Trust, and the South Way cycleway.

This towpath now provides a level traffic-free route connecting Croxley Green, West Watford, Hunton Bridge, Kings Langley and Nash Mills with a wider, well promoted route.

The South Way Cycleway connects the improved towpath with Abbots Langley, Leavesden and into Garston on a nearly traffic-free shared footway and bridleway.

The Ebury Way

The Ebury Way is an important local traffic-free path for cyclists, walkers, and horse-riders. It is heavily used by people travelling to school, work and for recreation.

It forms part of the largely traffic-free National Cycle Network created by Sustrans, the NCN Route 6 from London Paddington to Keswick, via *Watford, Luton, Milton*

Three Rivers District Council

Keynes, Northampton, Market Harborough, Leicester, Derby, Nottingham, Worksop, Sheffield, Manchester, Blackburn, Preston, Lancaster, Kendal and Windermere.

This path uses the old Ebury Railway embankment to cross the Colne, Chess and Gade rivers as well as the Grand Union Canal. Cycling is permitted along the whole length but horse-riders are restricted to the eastern part between Moor Lane Crossing and Rickmansworth.

Grand Union Canal towpath

This key route for people cycling and walking connects many local settlements including Rickmansworth, Croxley Green, Watford, Hunton Bridge and Kings Langley. It is a shared surface, used by many people for a variety of waterside activities and managed by the Canal and River Trust (CRT).

The new wide level surface was delivered by TRDC and partners, with around 9 kilometres (about 5.5 miles) of Grand Union towpath upgraded since 2013. The Grand Union Canal towpath also runs southwards from Rickmansworth towards Harefield and on, into central London where it joins the Regents Canal running through the heart of the Capital.

Partners include the CRT and Hertfordshire County Council, which released planning obligation funding collected by the District Council - to improve local infrastructure in response to new property development.

Green Street, Chorleywood

This cycle track created in 2009 connects St Clement Danes School and the edge of Chorleywood with Station Approach using a quiet service road and shared footway. This route enables cyclists and walkers to easily travel between the village centre, the station and the school - without using busy Green Street.

Mill End

The cycle route provides a clearly signed link on quieter roads to between Maple Cross, Mill End and Rickmansworth avoiding main roads.

New and current schemes

Leavesden Cycle Hub

TRDC in partnership with Watford Cycle Hub and One YMCA launched a brand new Cycle Hub in Leavesden in 2018; providing a new 'one-stop shop' for everything to do with bikes.

Located in the new Community building in Leavesden Country Park off of College Road in Abbots Langley, Leavesden Cycle Hub offers a range of facilities including servicing and repairs, bike hire, bike registering, reconditioned bike sales and cycle tuition for children and adults.

New cycle parking

New parking is being introduced around the District. Cycle stands have been installed outside stations and at busy shopping parades and town centres. The District Council has created 50 new cycle parking spaces at Rickmansworth Station, the latest transport hub to provide rail users with the highest quality of two-tier cycle parking. Extra parking is planned at other Stations that were identified in the Council's Strategic Review of Cycle Parking.

Improving connections

TRDC is currently developing proposals to improve connections between:

- Abbots Langley and Bedmond - Proposed local route to make it easier to walk and bike, with a focus on school travel;
- Rickmansworth and Chorleywood - Proposed alternative routes to busy main road;
- Carpenders Park and Bushey High Street - Proposed links to existing Greenways Network;
- Kings Langley (Primrose Hill) and Apsley, on to Hemel Hempstead - Final link in Grand Union Canal towpath route, connecting local settlements.

Bikeability audits of local paths

An audit classifying roads, paths and crossings in terms of the UK National Cycle Training Standard (Bikeability) Level needed to be able to ride in comparative safety.

Buses

The Council supports the Intalink partnership.

The Council also promotes the Better Buses programme, through which the District Council contributes to over 80,000 bus journeys each year. This helps people to reach local shops, schools and workplaces and reduces the need for car trips.

Electric Charging Points

An electric vehicle charging point is installed at Community Way Car Park, off Barton Way, Croxley Green WD3 3SU.

Stationary vehicle idling

TRDCs climate change pledge commits the council to use all practical means to reduce the impact of council services on the environment.

The council is tackling the levels of air pollution created by road traffic by encouraging motorists, including the council's drivers, to stop vehicle idling. By reducing the idling of all road vehicle engines – including private cars, taxis, private hire vehicles, public

sector vehicles, buses, coaches, vans, lorries the Council believes that this will make a difference by cutting carbon emissions and reducing the impact on the environment.

TRDC have started by making its staff and contractors aware of the implications of letting their vehicles idle unnecessarily. TRDC would also like other motorists to take note and switch their engines off once they reach their destinations.

Parking

Through its Parking Management role, the Council keeps roads and pavements clear for people to walk and cycle by facilitating informal local parking using permeable, grass-topped surfacing, often in South Oxhey. The Council has consulted with thousands of people this year to shape new parking improvement schemes - making local roads safer for people walking and cycling, as well as to prioritise parking for local people, as well as visitors to key local facilities and businesses.

Free Air Pollution Alerts

TRDC, along with ten other Hertfordshire and Bedfordshire Local Authorities has signed up to a notification service called 'Herts & Beds Air Pollution Alert System'. The system is provided by Ricardo Energy and Environment. The service provides a text or email alert straight to your mobile when levels of air pollution in your area increase to a moderate level or above.

This service sits alongside a website that provides 'at-a-glance' air quality information for Hertfordshire and Bedfordshire. Coloured markers on a map pinpoint exact areas and give an immediate pollution summary ranging from 1-10.

The Councils Senior Transport Planner reports the following:

- TRDC continues to allocate £40,000 a year to support the Dial-A-Ride (DAR) bus scheme to provide passenger transport (reducing private car use);
- TRDC has funded the introduction of 3 new cycling/walking schemes in 2020/21.

Hertfordshire County Council's Strategy & Programme Manager reports the following:

Listed below are some of the Highway improvement schemes that had been implemented or completed in 2019 and which contribute towards improving conditions for walking, cycling and public transport usage. This list does not include any maintenance schemes (such as footway resurfacing or subway maintenance).

- Ebury Roundabout 2 parallel pedestrian and cycle crossings installed with link to Ebury Road and Nightingale Road (scheme ref ITP170006);
- Maple Cross School – 2 new zebra crossings on Hornhill Road and Woodland Road (scheme ref ITP180029);
- Holy Rood School – School crossing patrol relocation (scheme ref SAR180019-c).

Not specific to Three Rivers, Hertfordshire County Council's principle activities and achievements on air quality in 2019, delivered by the Public Health and Environment & Infrastructure departments, were:

- Adoption of the Air Quality Strategy and Implementation Plan. Available here: <https://www.hertfordshire.gov.uk/services/health-in-herts/healthy-places/healthy-places.aspx#air>;
- Collaboratively produced the third annual PM2.5 monitoring report for the county. This report is produced by the Herts and Beds Air Quality Forum for Hertfordshire Public Health and is on the Forum's website;
- Hertfordshire's Public Health Board ran a workshop for Health and Social Care in conjunction with District and Borough colleagues late in 2019 on Air Quality in a bid to raise awareness of the issue in the wider health sector;
- Hertfordshire Public Health has supported the communications for the countywide Air Alert Scheme, which is now up and running. The Air Alert scheme is funded by district and borough councils and coordinated through the Herts and Beds Air Quality Forum. This included funding an article on the scheme in the Environment Times and promotion to health partner organisations via the Public Health Board Workshop;
- Clean Air Day – a campaign day coordinated and supported by HCC countywide as part of the annual national campaign, which some authorities take part in;
- General campaigns and communications with an air quality focus from HCC's teams including the Active & Safer Travel Team.

Conclusions and Priorities

NO₂ monitoring ceased in 2018. WBC resumed the monitoring of NO₂ by diffusion tube in May 2019.

Monitoring of particulate matter ceased in 2017. In 2019, TRDC requested that WBC remove the two inactive AQ Mesh Sensors from their monitoring locations, these instruments were removed and placed in storage on 5th December 2019.

NO₂ concentrations decreased at more than half of the Council's monitoring locations.

NO₂ concentrations increased within the Chorleywood NO₂ AQMA, however, no exceedances of the annual mean objective were recorded.

NO₂ concentrations also increased at Mill End 1. After applying the distance correction to the annualised and bias corrected data, there were no exceedances of the AQS objective.

In July 2020, WBC will have gathered 12 months diffusion tube data (where the Nitrogen Dioxide Diffusion Tube Monitoring Calendar of Suggested Exposure Periods will have been followed), at this point WBC will undertake a review of monitoring

locations. WBC will review current locations, traffic count data and congestion hotspot information supplied by Hertfordshire County Council will be utilised to identify possible new locations. WBC intends to make any changes in January 2021.

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 AQAP 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.

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1 Local Air Quality Management

This report provides an overview of air quality in Three Rivers during 2019. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by 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.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Three Rivers District Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at <http://uk-air.defra.gov.uk/aqma/list>. Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA(s). For reference, a map of Three Rivers District Council's monitoring locations is available in Appendix D.

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		
						At Declaration		Now		Name	Date of Publication	Link
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	33.0	µg/m ³	Three Rivers District Council Air Quality Action Plan	2015-2020	Not currently on Council's website
Chorleywood PM ₁₀ AQMA	Declared 01/04/2001	PM ₁₀ 24 Hour Mean	Chorleywood	A slightly narrower area from just north of Junction 18, along the M25 to just north of where the motorway crosses the River Chess	YES	>50, exceeded more than 35 times in a year	µg/m ³	PM ₁₀ concentrations are no longer monitored at this location	µg/m ³	Three Rivers District Council Air Quality Action Plan	2015-2020	Not currently on Council's website

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

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

Defra's appraisal of last year's ASR concluded that the report was well structured and provided the information specified in the Guidance. The comments below were designed to assist in the development of future reports:

1. Exceedances were seen at S1 (NB) and S2 (NB), these sites are not within an AQMA. It is recommended that the Council discuss what actions they intend to take regarding the exceedances seen at these sites.
2. A detailed assessment was carried out on the Chorleywood AQMA. The Council discuss the conclusions of the assessment however it would have been beneficial for the Council to also include the results of the assessment in the Appendix.
3. It would be useful if Section 2.3 could make reference to the Public Health Outcomes Framework, and the local indicator for PM_{2.5} in the district. The Council may wish to consider comparing the '3.01 - Fraction of mortality attributable to particulate air pollution indicator' value for Three Rivers to nearby LAs and National indicator values. This can be found in the link below. <https://fingertips.phe.org.uk/profile/public-health-outcomesframework/data#page/0/gid/1000043/pat/6/par/E12000005/ati/101/-are/E07000194>.
4. The Council do not monitor for SO₂ and have not conducted continuous monitoring of NO₂, though they still include tables for these pollutants/results in their appendix (I.e. Table A.8 and Table A.9). If the Council do not monitor for certain pollutants it is recommended that the Council omit the generic text (i.e. on page 19) and tables that refer to these results.
5. The Council have two continuous monitors which monitor for PM₁₀ and PM_{2.5}. These pollutants were not monitored in 2018 and it is unclear to why this is. In future, if monitoring for certain pollutants temporarily or permanently cease, can the Council please provide an explanation to this.
6. The latest AQAP was published in 2015, this means next year (2020) will mark the 5-year period recommended by Defra after which an updated plan should be released. It is advised that Council begin to draft a new updated AQAP which will reflect the changes in AQMA designations within the district.

Conclusions have been brought forward from last year's appraisal and actioned in this ASR:

1. In last year's report, WBC advised that the TRDC would continue to measure NO₂ concentrations at this location for 12 months, before considering proceeding to detailed assessment. WBC has corrected the distance to relevant exposure measurements at this location that were found to be incorrect. Further commentary is provided in section 3.2.1.
2. The detailed assessment can be viewed at the following webpage: <https://www.airqualityengland.co.uk/local-authority/hnb-reports>.
3. I believe that this has now been addressed.
4. This has been addressed in this year's report.
5. No explanation was provided by TRDC as to why the monitoring of PM₁₀ and PM_{2.5} by AQ Mesh had ceased and no data captured since 2017. In 2019, TRDC requested that WBC remove the two inactive AQ Mesh Sensors from their monitoring locations, these instruments were removed and placed in storage on 5th December 2019.
6. WBC has undertaken a review of the existing AQAP (2015-2020), this review is considered an interim measure. The review includes updates on the measures included in the existing plan and updates in relation to revoked AQMAs. This review has been undertaken to ensure that the existing plan reflects the current situation. WBC intends to draft a new AQAP in January 2022.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	AirTEXT	Public Information	Via other mechanisms	Apr-15	TRDC	TRDC	Hits on Air Quality England website	Exposure of most vulnerable	Operational	Apr-18	Current three year contract is due to end in 2022.
2	2 x indicative PM _{2.5} AQ Monitors	Other	Other	Apr-17	TRDC	TRDC	PM _{2.5} AQ Data	Inform future projects id required	Equipment installed	Apr-17	Equipment installed, however monitoring ceased in 2017.
3	LTP, Walking, Cycling and bus strategy	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	?	HCC/TRDC	HCC/TRDC	Decrease in private car use	NO ₂ /PM ₁₀ /PM _{2.5}	Ongoing	?	Three new cycling/walking schemes introduced in 2020/21
4	Improvement of bus network	Transport Planning and Infrastructure	Bus route improvements	?:	HCC/TRDC	HCC/TRDC	Increased bus use	NO ₂ /PM ₁₀ /PM _{2.5}	Ongoing	?	TRDC continues to support the Dial-A-Ride (DAR) bus scheme to provide passenger transport (reducing private car use).
5	OLEV initiative	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	?	HCC/TRDC	HCC/TRDC	Increase electric vehicle ownership	NO ₂ /PM ₁₀ /PM _{2.5}	One charging point installed	?	One charging point installed
6	Additional cycle routes	Transport Planning and Infrastructure	Cycle network	?	HCC/TRDC	HCC/TRDC	Increase cycling	NO ₂ /PM ₁₀ /PM _{2.5}	Ongoing	?	Three new cycling/walking schemes introduced in 2020/21
7	Alternative routes via green ways	Transport Planning and Infrastructure	Other	?	HCC/TRDC	HCC/TRDC	Use of greenways	Reduce exposure	Ongoing	?	No information provided

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).

Exposure to high concentrations of particulate matter can exacerbate lung and heart conditions, significantly affecting quality of life, increasing hospital admissions and deaths. Children, the elderly and those with pre-existing respiratory and cardiovascular disease, are known to be more susceptible to the health impacts from air pollution.

Inhalation of particulate matter can have adverse impacts on human health, the greatest impact is believed to be from long term exposure to PM_{2.5}, which increase age-specific mortality risk, particularly from cardiovascular causes.

There is clear evidence that PM_{2.5} has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

The following is taken from the Hertfordshire Local Authorities Report on Particulate Matter (PM_{2.5}) in Ambient Air in 2018 for Hertfordshire County Council Public Health:

Poor air quality is considered to be the largest environmental risk to the public's health and contributes to:

- Cardiovascular disease;
- Lung cancer;
- Respiratory diseases;
- Increased chance of hospital admissions and visits to Emergency Departments.

There is growing evidence that air pollution is a significant contributor to preventable ill health and early death.

Whilst legal limits are in place, evidence suggests that health effects can still occur below these limits. This is recognised by the World Health Organisation, which sets lower pollutant exceedance thresholds than some EU limits adopted into UK legislation.

The only specific indicator for air pollution is included within the Public Health Outcomes Framework and relates to particulate matter (PM) with a diameter of 2.5µm or smaller (Public Health Outcome Indicator (PHOI) 3.01).

PHOI 3.01 is 'the fraction of annual all-cause mortality attributable to long-term exposure to current levels of anthropogenic particulate pollution.' The indicator is based on an estimated amount of PM_{2.5} derived by Defra modelling from local measurement, one site in Borehamwood, Hertfordshire and another in Sandy, Bedfordshire. That data is then adjusted by way of population to give a population weighted figure before its use in deriving the PHOI.

The PM_{2.5} focussed PHOI reflects the adverse impact that this type of air pollution can have on public health as a result of the fine particles being carried deep into the lungs where they can cause inflammation and a worsening of heart and lung diseases.

However, it is important to recognise that the figures published for PHOI 3.01 are estimates and therefore cannot be used for performance monitoring; they can only provide an indication of the scale of the issue. Further information on the use of health related air quality data is available at

<https://www.hertshealthevidence.org/documents/thematic/airqualitydatafaq-briefing-2019-07.pdf>.

It is for this reason that this report no longer makes direct reference to the PHOI figures, but uses the population weighted Defra modelled PM_{2.5} concentrations in their place.

The fraction of mortality attributable to particulate air pollution for Hertfordshire (2018) is 5.6%. The PHOF data is available at:

https://fingertips.phe.org.uk/profile/public-health-outcomes-framework/data#page/3/gid/1000043/pat/6/par/E12000006/ati/202/are/E10000015/iid/30101/age/230/sex/4/cid/4/page-options/ovw-do-0_car-ao-1_car-do-0.

Three Rivers District Council is taking the following measures to address PM_{2.5}:

The Council will ensure compliance with the Environmental Permitting Regulations and will promote the use of cleaner fuels in wood burning stoves to help reduce PM_{2.5} concentrations.

The Council will require that developers follow good construction practice to minimise fugitive dusts.

It is anticipated that:

- Measures to reduce emissions of NO_x by encouraging a move away from internal combustion engine vehicles to ultra-low emission vehicles (ULEV) will reduce PM_{2.5} emissions from exhausts;
- Measures to reduce road travel altogether will reduce PM_{2.5} emissions from brake and tyre wear and dust re-suspension.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Non-Automatic Monitoring Sites

Three Rivers District Council undertook non- automatic (passive) monitoring of NO₂ at 9 sites during 2019, this included three triplicate sites. Table A.1 in Appendix A shows the details of the sites.

WBC resumed the monitoring of NO₂ by diffusion tube in May 2019. However, diffusion tubes were deployed from 21st May 2019 to 5th July 2019 (a total of 46 days). As the NO₂ Diffusion Tube Calendar of Suggested Exposure Periods was not followed, these results have not been included in the statistics.

WBC has corrected a number of distance to relevant exposure measurements that were found to be incorrect. The 2018 Fall-Off-With-Distance-from-Roads calculations have been updated and included in Appendix C.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), are included in Appendix C.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO₂)

Table A.2 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³. Note that the concentration data presented in Table A.2 represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

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

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

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

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

NO₂ concentrations decreased at more than half of the Council's monitoring locations. Figure A.1 shows trends in Annual Mean NO₂ concentrations over the last 5 years.

NO₂ concentrations increased within the Chorleywood NO₂ AQMA, however, no exceedances of the annual mean objective were recorded (this is a triplicate site, the average annual mean concentration was 33ug/m³).

Figure A.2 shows trends in Annual Mean NO₂ concentrations at S4(NA), S5(NA) & S6(NA)/Chorleywood AQMA. Figure A.3 show a decreasing trend in average annual mean concentrations over the last 5 years.

NO₂ concentrations also increased at Mill End 1, this is a triplicate site, the average annual mean concentration was 42ug/m³. After applying the distance correction to the annualised and bias corrected data, there were no exceedances of the AQS objective the average annual mean concentration with distance correction was 32.4ug/m³).

As part of the Council's review of diffusion tube locations, the Council intends to identify a more suitable location for the diffusion tubes at Mill End 1. The tubes are currently attached to signpost at a bus stop, the signpost is less than 30cm from a solid brick wall.

There are other diffusion tubes that WBC will look to redeploy at more suitable locations for example tubes that are located beneath a row of large conifers, behind a large fence (S4(NA), S5(NA) & S6(NA)).

In January 2020, WBC moved diffusion tubes at three locations, to ensure that the tubes were no longer behind road signs (S1(NA), S4 (NB), S5(NB) & S6(NB)) and above the wall at Mill End 1 (S1(NB), S2(NB) & S3(NB)).

There were no exceedances above 60 ug/m³.

Appendix A: Monitoring Results

Table A.1 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	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	8	1	NO	2.5
S2 (NA)	Chandlers Cross	Roadside	506430	198590	NO ₂	NO	97	17	NO	2.5
S3 (NA)	The Retreat, Kings Langley	Suburban	508100	201800	NO ₂	NO	7	4	NO	2.5
S4 (NA)	Sunrise Senior Living/Junction 18 M25, Chorleywood	Roadside	504162	196286	NO ₂	YES	17	1	NO	2.5
S5 (NA)	"	Roadside	504162	196286	NO ₂	YES	17	1	NO	2.5
S6 (NA)	"	Roadside	504162	196286	NO ₂	YES	17	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	7	1.5	NO	2.9
S2 (NB)	"	Kerbside	505264	194251	NO ₂	NO	7	1.5	NO	2.9
S3 (NB)	"	Kerbside	505264	194251	NO ₂	NO	7	1.5	NO	2.9
S4 (NB)	A412 Long Lane (Mill End 2)	Kerbside	504104	193684	NO ₂	NO	30	1.8	NO	2.4

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Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	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)
S5 (NB)	"	Kerbside	504104	193684	NO ₂	NO	30	1.8	NO	2.4
S6 (NB)	"	Kerbside	504104	193684	NO ₂	NO	30	1.8	NO	2.4

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 – Annual Mean NO₂ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2019 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ^{(3) (4)}				
							2015	2016	2017	2018	2019
S1 (NA)	507134	195283	Roadside	Diffusion Tube	50%	50%	26.0	25.9	27.3	27.6	26.4
S2 (NA)	506430	198590	Roadside	Diffusion Tube	50%	50%	27.3	26.1	24.6	26.5	21.2
S3 (NA)	508100	201800	Suburban	Diffusion Tube	50%	50%	26.6	30.1	27.1	27.7	25.1
S4 (NA)	504162	196286	Roadside	Diffusion Tube	50%	50%	34.3	30.0	32.5	32.0	33.6
S5 (NA)	504162	196286	Roadside	Diffusion Tube	50%	50%	35.2	34.4	33.1	31.3	32.1
S6 (NA)	504162	196286	Roadside	Diffusion Tube	50%	50%	35.7	34.5	34.1	30.5	33.4
S7 (NA)	505500	194400	Roadside	Diffusion Tube	50%	50%	25.9	28.2	27.1	27.7	26.0
S1 (NB)	505264	194251	Roadside	Diffusion Tube	42%	42%			53.1	41.8	41.4
S2 (NB)	505264	194251	Kerbside	Diffusion Tube	33%	33%			53.2	43.9	43.7
S3 (NB)	505264	194251	Kerbside	Diffusion Tube	33%	33%			48.5	39.0	41.0
S4 (NB)	504104	193684	Kerbside	Diffusion Tube	50%	50%			28.7	30.3	28.9
S5 (NB)	504104	193684	Kerbside	Diffusion Tube	50%	50%			29.7	30.4	30.5
S6 (NB)	504104	193684	Kerbside	Diffusion Tube	50%	50%			30.0	29.8	29.8

☒ Diffusion tube data has been bias corrected

- ☒ **Annualisation has been conducted where data capture is <75%**
- ☒ **Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance adjustment**

Notes:

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

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

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

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

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

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

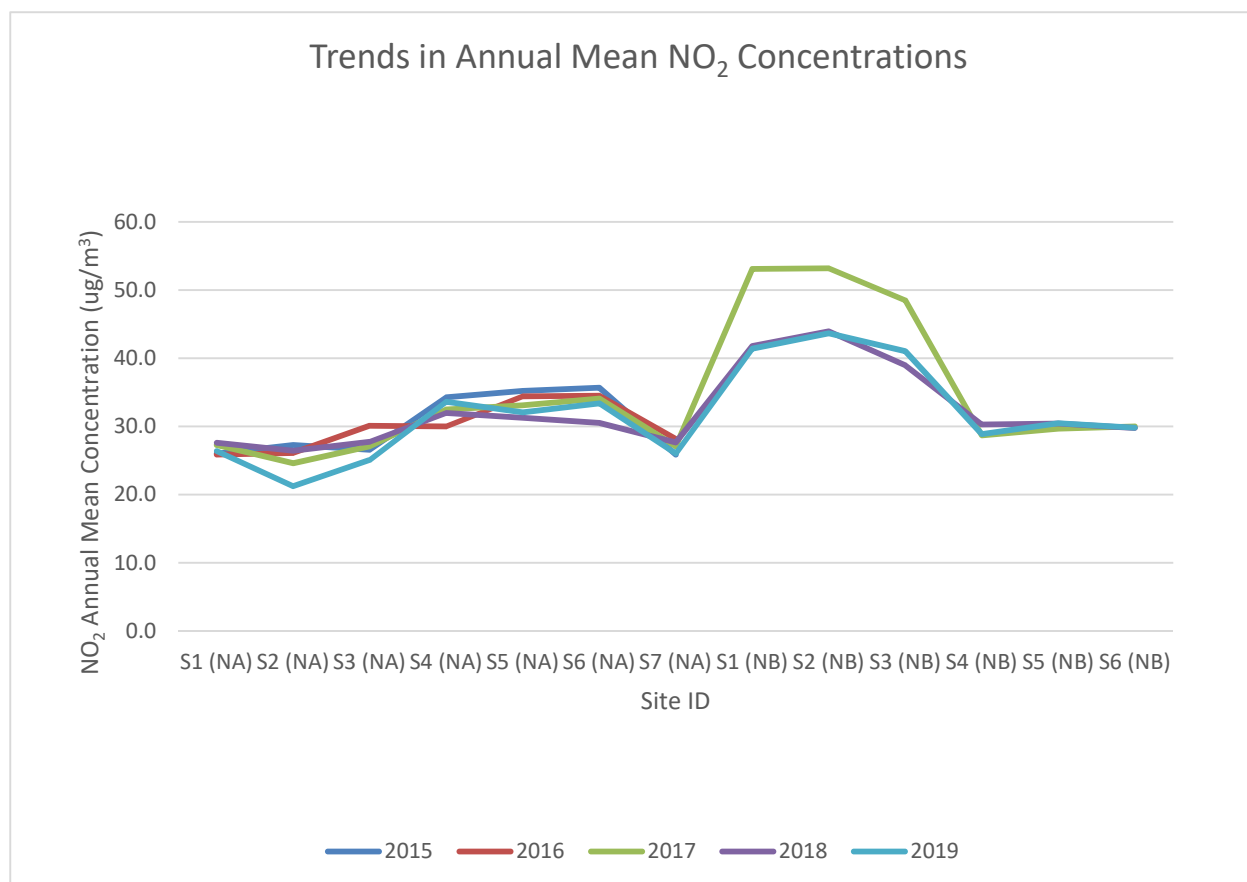
Figure A.1 – Trends in Annual Mean NO₂ Concentrations

Figure A.2 – Trends in Annual Mean NO₂ Concentrations (ug/m³) (Bias adjusted and annualised) at S4(NA), S5(NA) & S6(NA)/Chorleywood AQMA

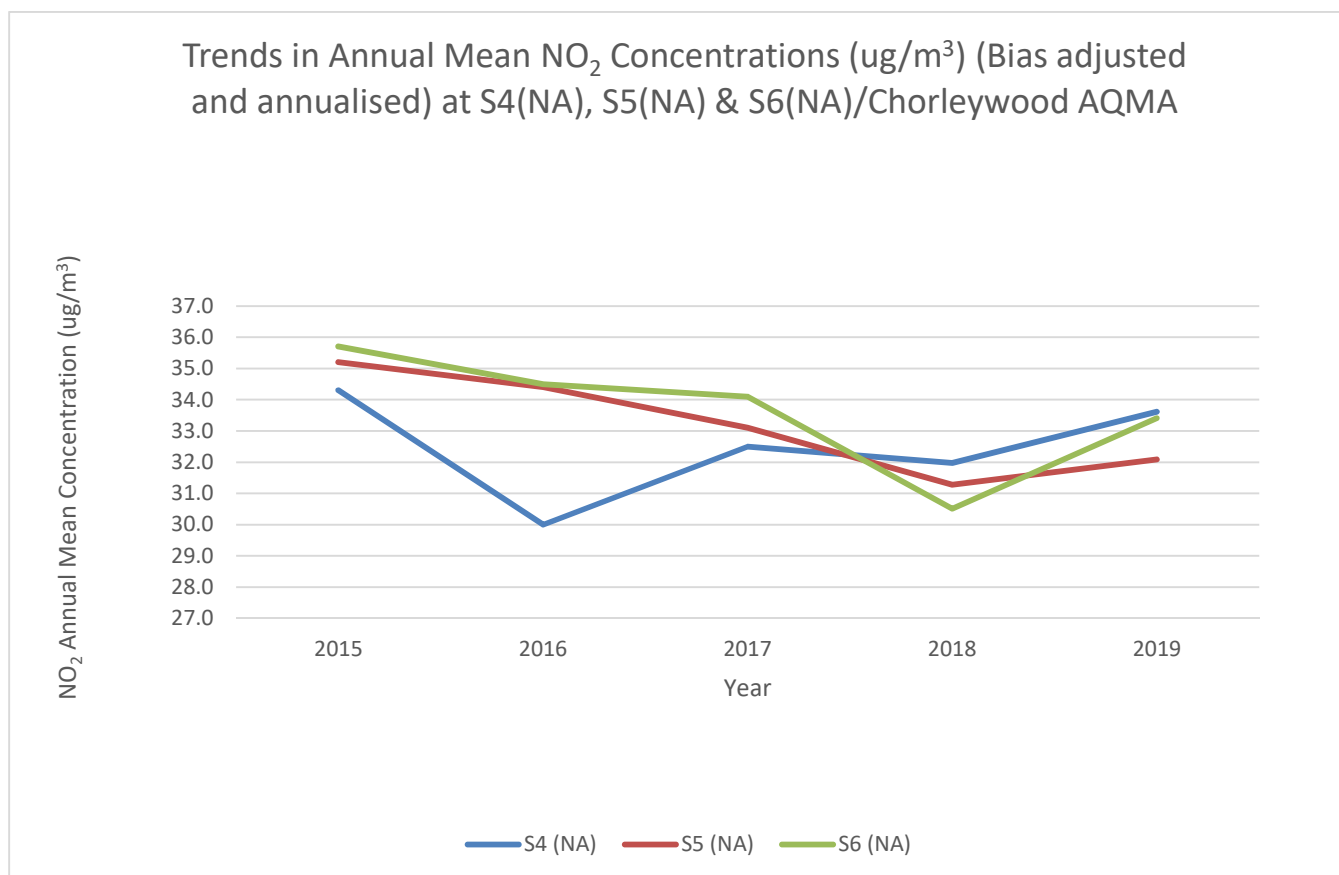
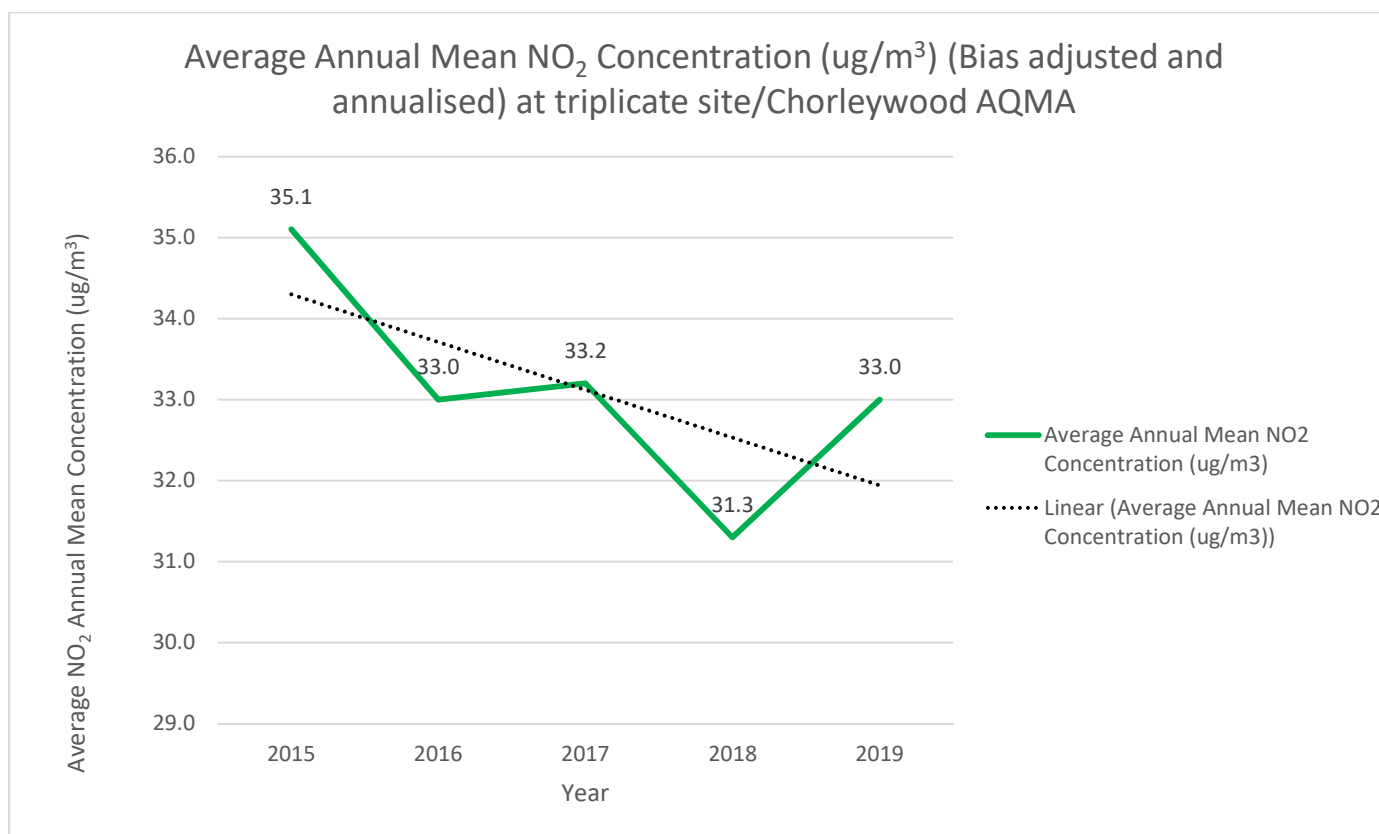


Figure A.3 – Average Annual Mean NO₂ Concentrations (ug/m³) (Bias adjusted and annualised) at triplicate site/Chorleywood AQMA



Appendix B: Full Monthly Diffusion Tube Results for 2019

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO ₂ Mean Concentrations (µg/m ³)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (0.75) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
S1 (NA)	507134	195283							22.7	26.1	31.0	32.7	46.5	36.4	32.6	26.4	
S2 (NA)	506430	198590							21.0	24.2	25.7	14.6	38.6	33.1	26.2	21.2	
S3 (NA)	508100	201800							25.6	27.6	28.5	29.2	40.9	34.1	31.0	25.1	
S4 (NA)	504162	196286							34.7	40.3	39.8	39.4	46.3	48.5	41.5	33.6	
S5 (NA)	504162	196286							35.2	37.0	40.9	38.5	41.6	44.5	39.6	32.1	
S6 (NA)	504162	196286							34.7	41.0	40.6	37.4	50.4	43.4	41.3	33.4	
S7 (NA)	505500	194400							23.7	25.5	30.9	32.5	47.4	32.6	32.1	26.0	
S1 (NB)	505264	194251								49.6	46.5	54.9	64.6	55.0	54.1	41.4	32.0
S2 (NB)	505264	194251								52.8	55.2		66.8	53.5	57.1	43.7	33.4
S3 (NB)	505264	194251								47.1	51.9		62.1	53.5	53.7	41.0	31.7
S4 (NB)	504104	193684							31.8	37.8	37.0	34.1	47.0	39.0	37.8	28.9	
S5 (NB)	504104	193684							33.7	39.5	38.9	37.5	48.3	41.3	39.9	30.5	
S6 (NB)	504104	193684							33.9	37.1	36.6	38.7	47.2	40.3	39.0	29.8	

☐ Local bias adjustment factor used

☒ National bias adjustment factor used

- ☒ Annualisation has been conducted where data capture is <75%
- ☒ Where applicable, data has been distance corrected for relevant exposure in the final column

Notes:

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

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

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

(2) Distance corrected to nearest relevant public exposure.

Data excluded from data set:

Site ID	21/05/2019- 05/07/2019
S1(NA)	23.0
S2(NA)	23.2
S3(NA)	25.0
S4(NA)	36.5
S5(NA)	34.1
S6(NA)	36.3
S7(NA)	25.2
S1(NB)	47.9
S2(NB)	46.7
S3(NB)	46.6
S4(NB)	31.9
S5(NB)	31.6
S6(NB)	35.0

46 days

Average concentrations at triplicate sites:

Chorleywood AQMA	33.0ug/m ³
Mill End 1	42.0ug/m ³
Mill End	29.7ug/m ³

Average concentration at triplicate site after distance correction:

Mill End 1	32.4ug/m ³
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Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

Diffusion tubes are supplied and analysed by Socotec, formerly Environmental Scientifics Group (ESG) Didcot, a UKAS accredited laboratory. The Council uses 50% TEA (triethanolamine) in acetone diffusion tubes.

QA/QC

Socotec participated in the following AIR NO₂ PT rounds during 2019:

AIR PT AR030 January - February 2019;
AIR PT AR031 April – May 2019;
AIR PT AR033 July-August 2019;
AIR PT AR034 September-October 2019.

For the January-February round, 87.5% of results submitted were determined to be satisfactory. For all the other rounds, 100% of results submitted were determined to be satisfactory.

Bias adjustment

A national bias adjustment factor was used. The national bias adjustment factor for 2019 is 0.75.

A database of bias adjustment factors determined from Local Authority co-location studies throughout the UK has been collated by the Local Air Quality Management Helpdesk. Using orthogonal regression, combined bias adjustment factors have been calculated for each laboratory, year and preparation method combination for which data are available.

The Diffusion Tube Bias Adjustment Factors Spreadsheet for April 2020 was used. The bias correction factors used are shown in Table 2.3, and the national spread sheet can be found at:

<http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

Annualisation

During 2019 the valid data capture for all monitoring locations was below 75%. Therefore the calculated annual average was annualised according to the method outlined in boxes 7.9 and 7.10 in LAQM TG16. Data from three background monitoring sites with more than 85% data capture is required for this calculation. The chosen sites are listed below. These sites were chosen as they are the nearest background sites with sufficient data capture. The calculated ratio is then used to adjust the calculated annual mean before it is bias adjusted.

UKA00266 Hillingdon monitoring

The monitoring station is within a self-contained, air-conditioned housing located on an open grass area approximately 2.5 metres from the kerb of a residential road. The site is bordered on three sides by residential roads and on the fourth by the busy M4 motorway, which is approximately 30 metres from the station and above the height of the inlet. The general area is open and protected from the M4 by trees.

UKA00644 Borehamwood Meadow Park

Located near a bowling club in a residential part of Borehamwood, Hertfordshire. Surrounded by residential areas and parkland. The nearest road is 137m from the site.

UKA00518 Oxford St Ebbe's

The monitoring station is located within a self-contained, air conditioned housing within the grounds of St Ebbe's School, White House Road. The nearest road a minor road approximately 5 metres from the station. The surrounding area comprises of open fields and residential dwellings.

Month	Start Date	End Date	Hillingdon (B1)	B1 when D1 is Available	St Ebbe's (B1)	B1 when D1 is Available	Borehamwood (B1)	B1 when D1 is Available	S1(NA) (D1)
Jan	09/01/2019	06/02/2019	40.69		21.13		30.10		
Feb	06/02/2019	06/03/2019	48.03		20.90		32.52		
March	06/03/2019	03/04/2019	29.67		14.99		18.95		
Apr	03/04/2019	01/05/2019	32.20		16.82		20.28		
May	01/05/2019	05/06/2019	24.18		17.38		15.14		
June	05/06/2019	03/07/2019	20.35		17.33		12.93		
July	03/07/2019	07/08/2019	20.23	20.23	11.05	11.05	13.02	13.02	22.70
Aug	07/08/2019	04/09/2019	24.59	24.59	8.39	8.39	14.06	14.06	26.10
Sept	04/09/2019	02/10/2019	27.68	27.68	12.20	12.20	17.06	17.06	31.00
Oct	02/10/2019	06/11/2019	31.76	31.76	12.99	12.99	21.45	21.45	32.70
Nov	06/11/2019	04/12/2019	38.92	38.92	22.94	22.94	30.90	30.90	46.50
Dec	04/12/2019	08/01/2020	34.03	34.03	14.67	14.67	24.76	24.76	36.40
Average			31.03	29.53	15.90	13.71	20.93	20.21	32.57
Ratio									1.08

Month	Start Date	End Date	Hillingdon (B1)	B1 when D1 is Available	St Ebbe's (B1)	B1 when D1 is Available	Borehamwood (B1)	B1 when D1 is Available	S1(NB) (D1)
Jan	09/01/2019	06/02/2019	40.69		21.13		30.10		
Feb	06/02/2019	06/03/2019	48.03		20.90		32.52		
March	06/03/2019	03/04/2019	29.67		14.99		18.95		
Apr	03/04/2019	01/05/2019	32.20		16.82		20.28		
May	01/05/2019	05/06/2019	24.18		17.38		15.14		
June	05/06/2019	03/07/2019	20.35		17.33		12.93		
July	03/07/2019	07/08/2019	20.23		11.05		13.02		
Aug	07/08/2019	04/09/2019	24.59	24.59	8.39	8.39	14.06	14.06	49.60

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Sept	04/09/2019	02/10/2019	27.68	27.68	12.20	12.20	17.06	17.06	46.50
Oct	02/10/2019	06/11/2019	31.76	31.76	12.99	12.99	21.45	21.45	54.90
Nov	06/11/2019	04/12/2019	38.92	38.92	22.94	22.94	30.90	30.90	64.60
Dec	04/12/2019	08/01/2020	34.03	34.03	14.67	14.67	24.76	24.76	55.00
Average			31.03	31.40	15.90	14.24	20.93	21.64	54.12
Ratio									1.02

Month	Start Date	End Date	Hillingdon (B1)	B1 when D1 is Available	St Ebbe's (B1)	B1 when D1 is Available	Borehamwood (B1)	B1 when D1 is Available	S2(NB) (D1)
Jan	09/01/2019	06/02/2019	40.69		21.13		30.10		
Feb	06/02/2019	06/03/2019	48.03		20.90		32.52		
March	06/03/2019	03/04/2019	29.67		14.99		18.95		
Apr	03/04/2019	01/05/2019	32.20		16.82		20.28		
May	01/05/2019	05/06/2019	24.18		17.38		15.14		
June	05/06/2019	03/07/2019	20.35		17.33		12.93		
July	03/07/2019	07/08/2019	20.23		11.05		13.02		
Aug	07/08/2019	04/09/2019	24.59	24.59	8.39	8.39	14.06	14.06	52.80
Sept	04/09/2019	02/10/2019	27.68	27.68	12.20	12.20	17.06	17.06	55.20
Oct	02/10/2019	06/11/2019	31.76		12.99		21.45		
Nov	06/11/2019	04/12/2019	38.92	38.92	22.94	22.94	30.90	30.90	66.80
Dec	04/12/2019	08/01/2020	34.03	34.03	14.67	14.67	24.76	24.76	53.50
Average			31.03	31.31	15.90	14.55	20.93	21.69	57.08
Ratio									1.02

Nitrogen Dioxide fall off with distance calculations

These calculations were carried out on all measurements within AQMAs located near relevant exposure, where the annual mean was exceeded or was within 10% of the objective.

2019

Enter data into the pink cells

Site Name/ID	Distance (m)		NO ₂ Annual Mean Concentration (µg/m ³)			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
S1(NB)	1.5	8.5	16.6	41.4	32.0	
S2(NB)	1.5	8.5	16.6	43.7	33.4	
S3(NB)	1.5	8.5	16.6	41.0	31.7	

2018

Updated to take into account corrected receptor to kerb measurements.

Enter data into the pink cells

Site Name/ID	Distance (m)		O ₂ Annual Mean Concentration (µg/m ³)			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
S4 (NA)	1.0	18.0	20.0	32.0	25.0	
S5 (NA)	1.0	18.0	20.0	31.3	24.7	
S6 (NA)	1.0	18.0	20.0	30.5	24.4	
S1 (NB)	1.5	8.5	16.0	41.8	32.0	
S2 (NB)	1.5	8.5	16.0	43.9	33.3	
S3 (NB)	1.5	8.5	16.0	39.0	30.2	

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

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

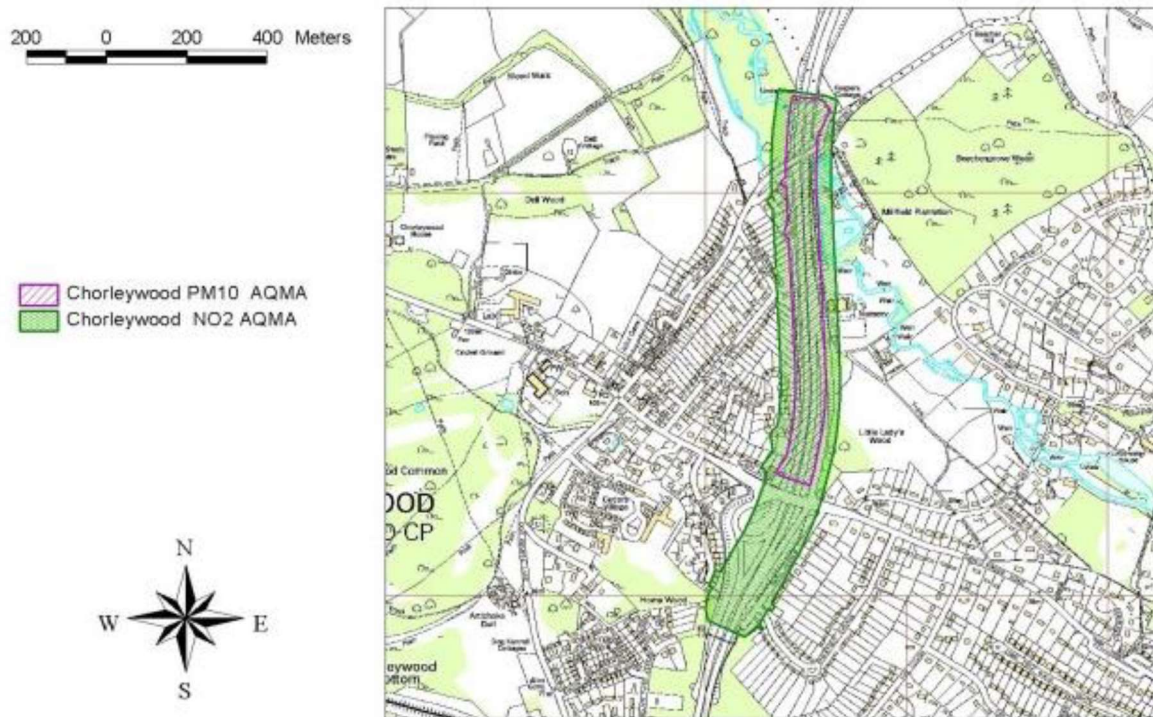


Figure D. 2 - Map of The Retreat, Abbots Langley diffusion tube (DT) site (NA) S3

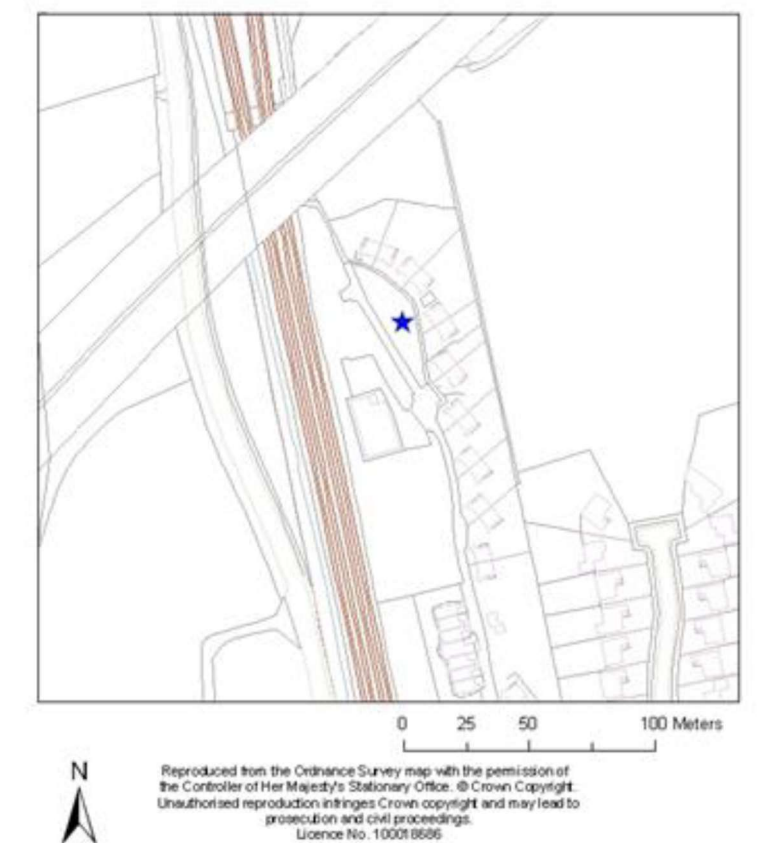


Figure D. 3 - Map of Junction 18 (M25) Chorleywood DT sites (NA) S4, S5 & S6

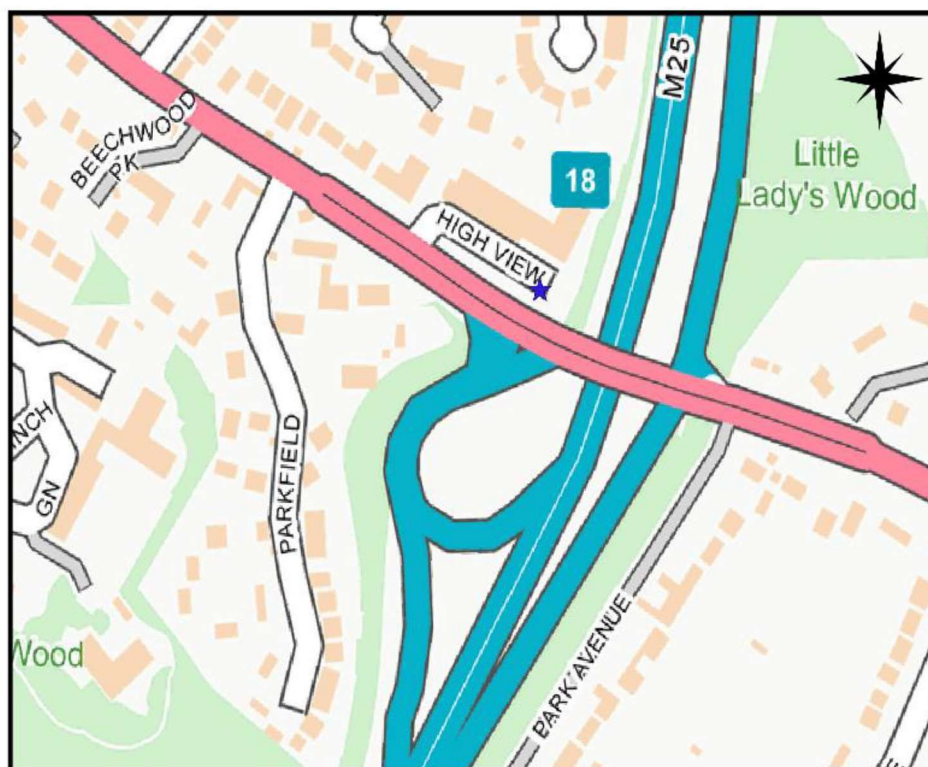


Figure D. 4 - Map of Glen View, Chandlers Cross DT site (NA) S2

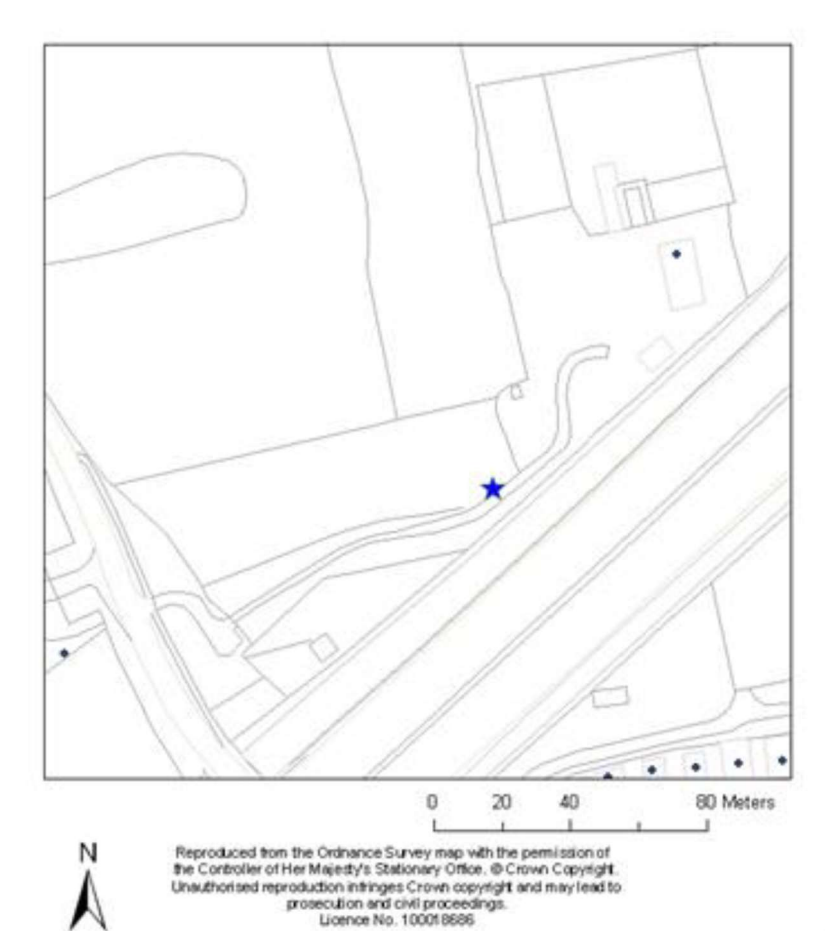


Figure D. 5- Map of Watford Road, Croxley Green DT site (NA) S1

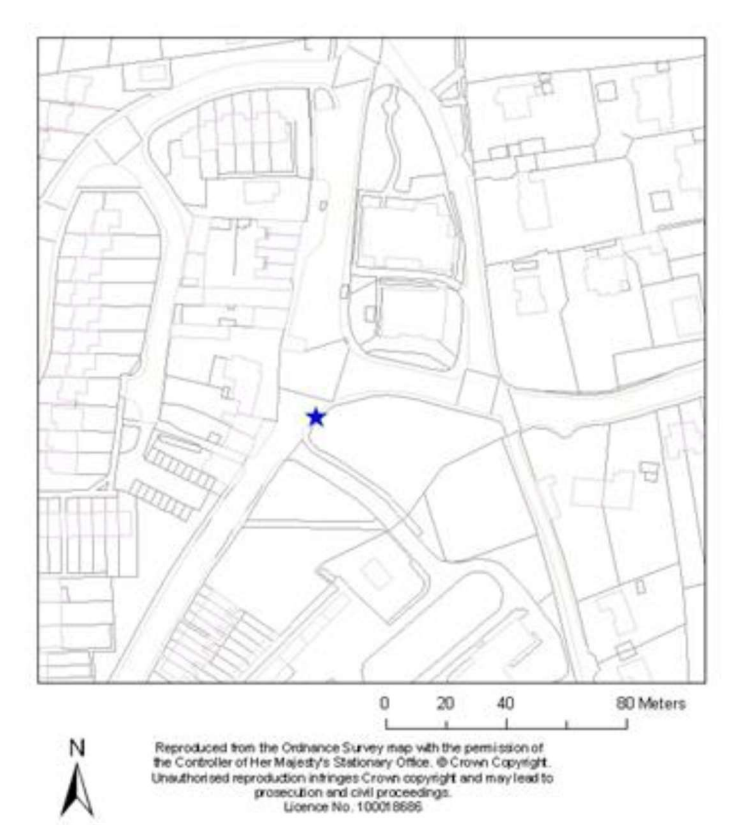


Figure D. 6 - Map of Rectory Road, Rickmansworth DT site (NA) S7

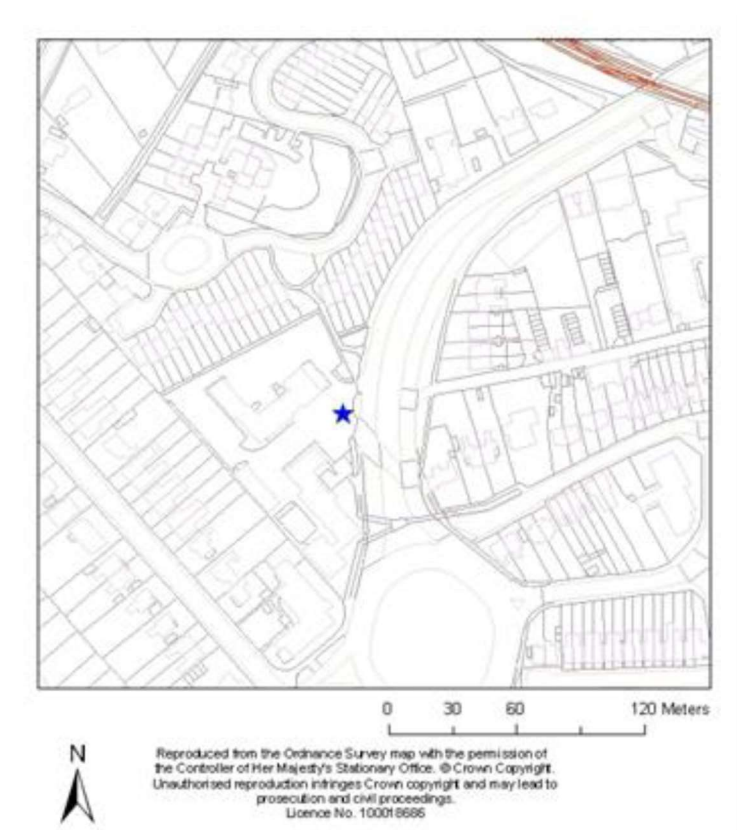
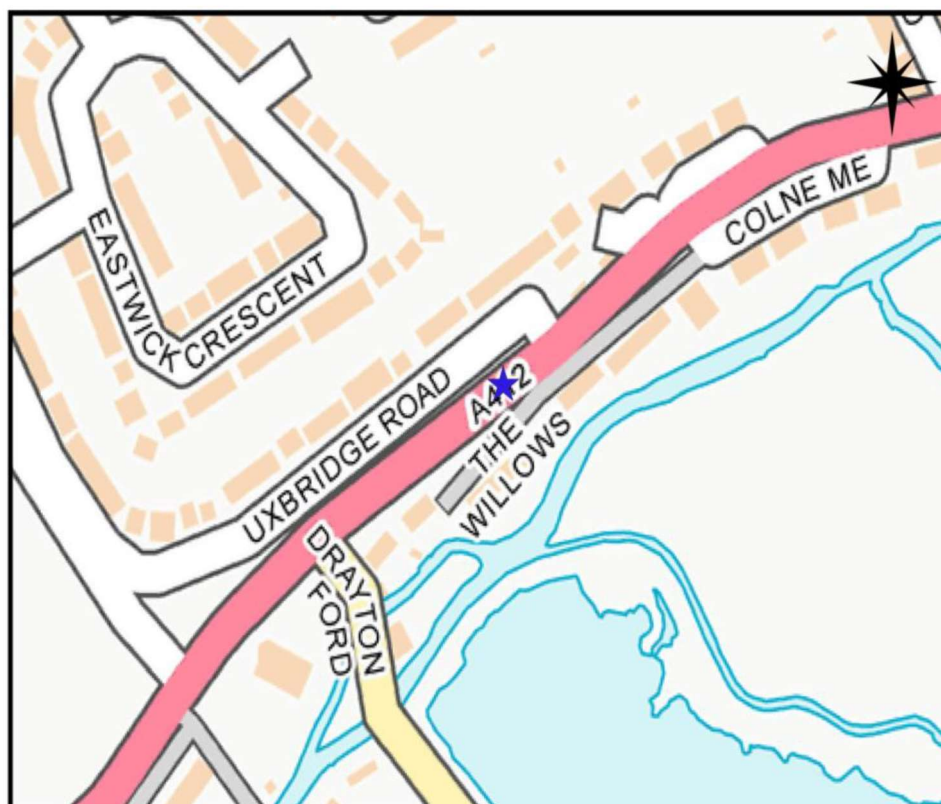


Figure D. 7 - Map of Uxbridge Road, Belfry House DT Triplicate site (NB) S1-S3



Figure D. 8 - 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 ⁶	
	Concentration	Measured as
Nitrogen Dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	50 µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m ³	Annual mean
Sulphur Dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean

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

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide

References

Department for Environment, Food & Rural Affairs (2018). *Local Air Quality Management Technical Guidance (TG16)*. London. Her Majesty's Stationary Office.

Firmin, B. (2019) *Three Rivers District Council 2019 Air Quality Annual Status Report (ASR)*. Watford Borough Council. Report Ref. TRDC/BF/ASR/2019_FINAL_v2. Available from: <https://www.airqualityengland.co.uk/local-authority/hnb-reports>.

Three Rivers District Council Air Quality Action Plan 2015-2020 (2015 Ed.).

<http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

<https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>