



2022 Air Quality Annual Status Report (ASR)

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

Date: June, 2022

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

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

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 Council (Chiltern and South Bucks Areas) 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 latest estimated population of Three Rivers is 93,966 (mid-2020) (Source: ONS, Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland).

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

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

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

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

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

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

The latest monitoring data shows a general trend of decreasing concentrations of NO₂. This is in line with the national trend. Defra recently reported that “between 2007 and 2019 inclusive, the annual mean NO₂ concentration at roadside sites reduced by an average of 1.8 µg/m³ each year. This reduction was observed at most long-running monitoring sites across the UK; which could be a consequence of the large reduction in road transport emissions of NO₂ over the same period in the UK, as newer vehicles subject to stricter emissions standards enter the transport fleet”.

In 2021, NO₂ concentrations increased at most sites, when compared to 2020 (including at High View in the Chorleywood AQMA). However, there is a general trend of reduction over the last 5 years. There are no new major sources of emissions in the Borough. The Council has not introduced any new AQMAs, Action Plans or strategies. The Council will be drafting a new AQAP in January 2023.

Actions to Improve Air Quality

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

The 2019 Clean Air Strategy⁵ sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero⁶ sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

New Local Plan

Three Rivers District Council is preparing a new Local Plan that will set out a vision and policy framework for the future levels of growth within the District up until 2038.

⁵ Defra. Clean Air Strategy, 2019

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

Climate Emergency & Sustainability Strategy.

The strategy outlines how the Council aims to deliver and facilitate the changes needed to tackle the twin crises of climate change and biodiversity decline in the District while enabling greener, healthier lifestyles and a thriving local economy, in collaboration with local residents, businesses, community groups, voluntary organisations and partners.

The Strategy will embed the climate and ecological emergencies into the culture and decision making of the Council, reduce carbon emissions through regular measurement, minimise energy consumption and promote a transition to renewable energy. It will also enable and encourage sustainable modes of travel to reduce reliance on carbon-fuelled transport and improve local air quality.

Local initiatives

Ev charging points

There are now more than fifty electric charging points available to the public in Three Rivers.

Cycling

Three Rivers District Council has promoted its Cycling Strategy for nearly 40 years, introducing many new improvements to make cycling easier and to improve walking conditions.

Buses

Three Rivers District Council supports the Intalink partnership.

Free Air Pollution Alerts

Three Rivers District Council, 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.

Conclusions and Priorities

NO₂ concentrations increased at most sites, when compared to 2020 (including at High View in the Chorleywood AQMA). However, there is a general trend of reduction over the last 5 years.

The annual mean concentration at High View (S6(NA)) was 22.3 ug/m³.

There were no exceedances of the air quality objective for NO₂, with respect to annual mean concentrations.

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 made changes to Three Rivers District Council's diffusion tube network in April 2022. WBC will collect 12 months monitoring data before drafting a new AQAP.

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 Three Rivers District Council 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. Three Rivers District Council has also supported Office for Low Emissions Vehicles (OLEV) initiatives to install electric vehicle charging points.

Local Responsibilities and Commitment

This ASR was prepared by the Environmental Health Department of Watford Borough Council.

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

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

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1 Local Air Quality Management

This report provides an overview of air quality in Three Rivers during 2021. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by 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 are presented in Table E.1.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

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

- NO₂ annual mean;
- PM₁₀ 24-hour mean.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
Chorleywood NO ₂ AQMA	Declared 01/04/2001	NO ₂ Annual Mean	Along the M25 south of Junction 18 to just north of where the motorway crosses the River Chess	YES	>40	22.3	Three Rivers District Council Air Quality Action Plan, July 2013	https://www.airqualityengland.co.uk/local-authority/hnb-reports
Chorleywood PM ₁₀ AQMA	Declared 01/04/2001	PM ₁₀ 24 Hour Mean	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	PM ₁₀ concentrations are no longer monitored at this location	Three Rivers District Council Air Quality Action Plan, July 2013	https://www.airqualityengland.co.uk/local-authority/hnb-reports

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

☒ Three Rivers District Council confirm that all current AQAPs have been submitted to Defra.

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

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

The report is well structured and concise, and provides the information specified in the Guidance. The following comments are designed to help inform future reports.

1. The Council should remove the example references in red text to the automatic monitoring sites (CM1, CM2) in the ASR Excel workbook prior to submission to avoid confusion, as no automatic monitoring is undertaken.
2. Please correct section 3.1.1 of the report where the number of diffusion tube sites is stated – it should say seven sites, rather than nine.
3. The Council no longer monitor for PM₁₀, despite having an AQMA designated for this pollutant, with the outcomes of a detailed assessment conducted in 2018 suggesting that PM₁₀ concentrations are predicted to remain close to the AQO. As such, it is recommended that the Council monitor for PM₁₀, but if not possible (e.g. due to budgetary constraints) then the Council should provide detailed justification for this. The Council could also consider lower cost indicative particulate monitoring as a compromise solution.
4. The latest AQAP was published in 2015, therefore it has now exceeded the 5-year period recommended by Defra after which an updated plan should be released. The Council have stated that WBC are currently undertaking a review of the AQAP, and that a new AQAP is planned for January 2023, although the Council should aim to bring this forward if possible.
5. Detailed mapping of the AQMA is provided that includes the monitoring location within, along with detailed maps of each monitoring location, which is welcomed. Figures showing trends in NO₂ concentration are also provided.
6. Appendix F provides a brief summary on the impact of COVID-19 pandemic on air quality, with a notable decrease in NO₂ concentrations compared to 2019 values shown, although there were no challenges or opportunities resulting from the wide-ranging impacts of the pandemic identified.

WBC has addressed the matters raised following Defra's appraisal:

1. The example references have been removed from the ASR Excel workbook.
2. The number of diffusion tube sites in section 3.1.1 was corrected prior to the report being published.
3. WBC have obtained quotes on behalf of TRDC for repairing/servicing the existing AQMesh sensors and for purchasing a new low cost sensor.
4. WBC made changes to TRDCs diffusion tube network in April 2022. WBC will collect 12 months monitoring data before drafting a new AQAP.

Three Rivers District Council has taken forward a number of direct measures during the current reporting year of 2021 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. Seven measures are included within Table 2.2, with the type of measure and the progress Three Rivers District Council have made during the reporting year of 2021 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on these measures can be found in the Three Rivers District Council Air Quality Action Plan, July 2013. Key completed measures are:

- 2 x indicative PM_{2.5} AQ Monitors (now removed);
- OLEV initiative;
- AirTEXT;
- LTP, Walking, Cycling and bus strategy;
- Improvement of bus network;
- Additional cycle routes;
- Alternative routes via green ways.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Three Rivers District Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of the Chorleywood NO₂ and PM₁₀ AQMAs.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	AirTEXT	Public Information	Via other mechanisms	2015	2018	TRDC	TRDC	NO	Funded	< £10k	Completed	Exposure of most vulnerable	Hits on Hertfordshire Air Quality Forecast website	Operational	TRDC has signed up to the Herts & Beds Pollution Alert System. The contract has recently been extended for a further 2 years.
2	2 x indicative PM2.5 AQ Monitors	Other	Other	2017	2017	TRDC	HCC	NO	Funded	£10k - 50k	Completed	Inform future projects id required	PM2.5 AQ Data	Equipment installed	The equipment was installed in 2017, monitoring ceased in the same year. The equipment was removed and placed in storage on 5th December 2019.
3	LTP, Walking, Cycling and bus strategy	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2015	2020	TRDC/HCC	TRDC/HCC	NO	Funded	£100k - £500k	Completed	NO2/PM10/PM2.5	Decrease in private car use	Ongoing	Three new cycling/walking schemes were introduced in 2020/21.
4	Improvement of bus network	Transport Planning and Infrastructure	Bus route improvements	2015	2020	TRDC/HCC	TRDC/HCC	NO	Funded	£100k - £500k	Completed	NO2/PM10/PM2.5	Increased bus use	Ongoing	In 2017, TRDC funded a new route and extra journeys to enable residents of South Oxhey to better access leisure facilities, shops and rail stations. 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	2015	2020	TRDC/OLEV	OLEV	NO	Funded	£10k - 50k	Completed	NO2/PM10/PM2.5	Increased electric vehicle ownership	Ongoing	One charging point has been installed at the Community Way Car Park off Barton Way, Croxley Green.
6	Additional cycle routes	Transport Planning and Infrastructure	Cycle network	2015	2020	TRDC/HCC	TRDC/HCC	NO	Funded	£50k - £100k	Completed	NO2/PM10/PM2.5	Increase cycling	Ongoing	Three new cycling/walking schemes

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
															introduced in 2020/21.
7	Alternative routes via green ways	Transport Planning and Infrastructure	Other	2015	2020	TRDC/HCC	TRDC/HCC	NO	Funded	£50k - £100k	Completed	Reduce exposure	Use of greenways	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). There is clear evidence that PM_{2.5} has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

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.

The following is taken from the Hertfordshire Local Authorities Report on Particulate Matter (PM_{2.5}) in Ambient Air in 2020 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 (new method) for England (2020) is 5.6%. The PHOF data is available at:

https://fingertips.phe.org.uk/profile/public-health-outcomes-framework/data#page/4/gid/1000043/pat/159/par/K02000001/ati/15/are/E92000001/iid/93861/age/230/sex/4/cat/-1/ctp/-1/yr/1/cid/4/tbm/1/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}:

An Officer of the Council attends the Hertfordshire and Bedfordshire Air Quality Forum.

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 Air Quality (Domestic Solid Fuels Standards (England) Regulations 2020 are to be enforced by the relevant local authority. Hertfordshire County Council are the relevant local authority.

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

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

3.1 Summary of Monitoring Undertaken

3.1.1 Non-Automatic Monitoring Sites

Three Rivers District Council undertook non- automatic (i.e. passive) monitoring of NO₂ at 7 sites during 2021. Table A.2 in Appendix A presents the details of the non-automatic sites.

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

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO₂)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO₂ annual mean concentrations for the past five years with the air quality objective of 40µg/m³. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

Figure A.1 presents trends in NO₂ annual mean concentrations at diffusion tube sites WF02 to WF50 between the years 2017 to 2021. There were no exceedances of the annual mean objective. There was an increase in concentrations at most sites, when compared to 2020. However, there is a general trend of reduction over the last 5 years.

Figure A.2 presents trends in NO₂ annual mean concentrations at diffusion tube location S6(NA) in the Chorleywood AQMA between the years 2017 to 2021. In 2021, there were no exceedances of the annual mean objective. There was an increase in concentrations at this site, when compared to 2020. However, there is a general trend of reduction over the last 5 years.

There will be no changes to existing AQMA's or the declaration of a new AQMA.

In April 2022, the Council deployed twelve additional diffusion tubes and relocated eleven diffusion tubes. This brings the total number of diffusion tubes deployed around the District to twenty-five. There are now five tubes deployed in the Chorleywood AQMA. The Council intends to review monitoring locations on a periodic basis.

Appendix A: Monitoring Results

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube Co-located with a Continuous Analyser?	Tube Height (m)
S1 (NA)	Watford Road, Croxley Green	Kerbside	507134	195283	NO2	No	8.0	1.0	No	2.7
S2 (NA)	Chandlers Cross	Rural	506430	198590	NO2	No	97.0	17.0	No	2.5
S3 (NA)	The Retreat, Kings Langley	Urban Background	508100	201800	NO2	No	7.0	4.0	No	2.5
S4 (NA), S5 (NA), S6 (NA)	Sunrise Senior Living/ Junction 18 M25, Chorleywood	Kerbside	504162	196286	NO2	Yes - Chorleywood AQMA	17.0	1.0	No	2.5
S7 (NA)	Rickmansworth Fire Station, Rectory Road	Other	505500	194400	NO2	No	30.0	10.0	No	2.5
S1 (NB), S2 (NB), S3 (NB)	Belfry House Uxbridge Road (Mill End 1)	Kerbside	505264	194251	NO2	No	7.0	1.5	No	3.1
S4 (NB), S5 (NB), S6 (NB)	A412 Long Lane (Mill End 2)	Kerbside	504104	193684	NO2	No	30.0	1.8	No	2.1

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

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2021 (%) ⁽²⁾	2017	2018	2019	2020	2021
S1 (NA)	507134	195283	Kerbside	100.0	100.0	27.3	27.6	26.4	17.4	19.3
S2 (NA)	506430	198590	Rural	100.0	100.0	24.6	26.5	21.2	16.5	16.3
S3 (NA)	508100	201800	Urban Background	100.0	100.0	27.1	27.7	25.1	17.5	18.9
S4 (NA), S5 (NA), S6 (NA)	504162	196286	Kerbside	100.0	100.0	34.1	30.5	33.4	21.5	22.3
S7 (NA)	505500	194400	Other	100.0	100.0	27.1	27.7	26.0	18.0	19.4
S1 (NB), S2 (NB), S3 (NB)	505264	194251	Kerbside	100.0	100.0	48.5	39.0	41.0	28.0	28.1
S4 (NB), S5 (NB), S6 (NB)	504104	193684	Kerbside	100.0	100.0	30.0	29.8	29.8	22.9	22.9

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

☒ Diffusion tube data has been bias adjusted.

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

Notes:

The annual mean concentrations are presented as µg/m³.

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**.

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

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

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

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

Figure A.1 – Trends in Annual Mean NO₂ Concentrations

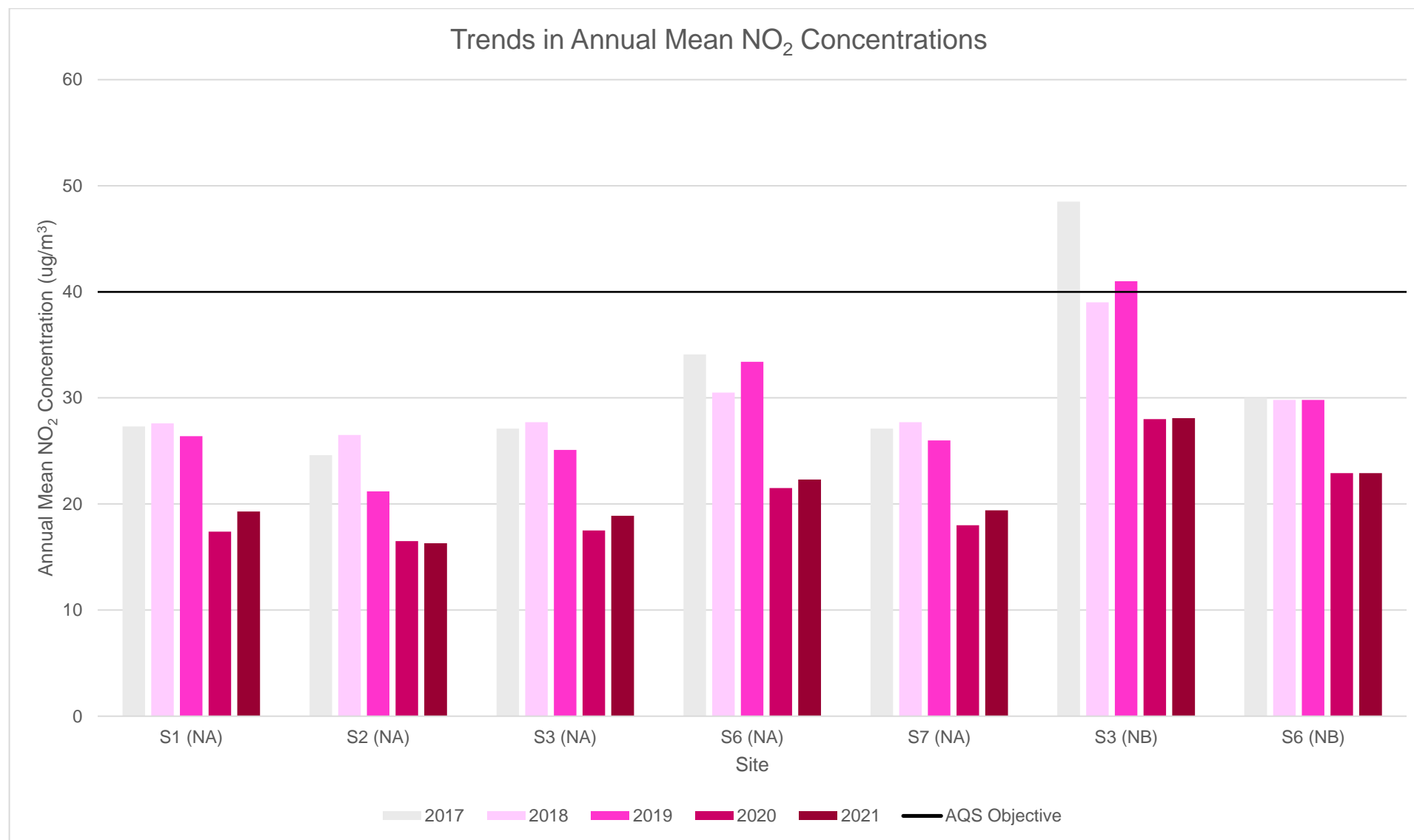
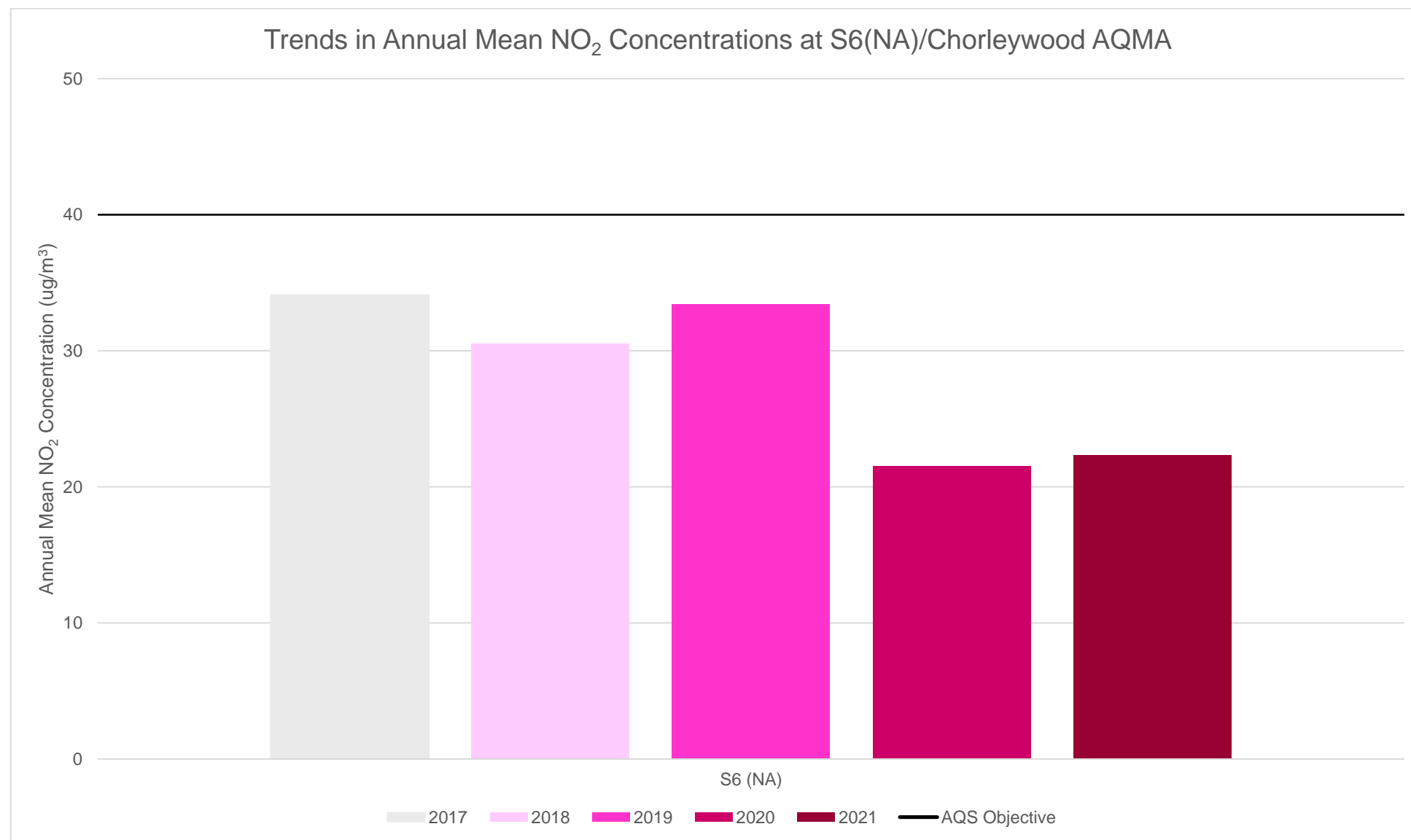


Figure A.2 - Trends in Annual Mean NO₂ Concentrations at S6(NA)/Chorleywood AQMA



Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO₂ 2021 Diffusion Tube Results (µg/m³)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.78)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
S1 (NA)	507134	195283	28.3	28.9	22.8	24.7	21.6	18.4	17.4	17.0	27.7	27.3	32.6	29.5	24.7	19.3	-	
S2 (NA)	506430	198590	26.2	26.3	16.9	19.5	19.6	16.2	15.7	14.8	24.1	22.9	22.0	26.9	20.9	16.3	-	
S3 (NA)	508100	201800	29.4	25.3	26.9	25.4	19.7	18.4	19.3	21.6	24.5	25.0	31.0	25.0	24.3	18.9	-	
S4 (NA)	504162	196286	30.0	33.7	22.9	26.8	27.3	24.3	23.1	23.0	31.7	30.3	28.8	32.3	-	-	-	Triplicate Site with S4 (NA), S5 (NA) and S6 (NA) - Annual data provided for S6 (NA) only
S5 (NA)	504162	196286	33.2	33.6	24.1	28.6	26.8	24.1	25.2	21.9	34.1	33.6	29.3	32.8	-	-	-	Triplicate Site with S4 (NA), S5 (NA) and S6 (NA) - Annual data provided for S6 (NA) only
S6 (NA)	504162	196286	33.3	36.2	24.0	30.6	29.1	23.8	25.7	24.9	31.3	32.5	26.8	27.9	28.5	22.3	-	Triplicate Site with S4 (NA), S5 (NA) and S6 (NA) - Annual data provided for S6 (NA) only
S7 (NA)	505500	194400	30.5	28.5	16.0	27.3	23.2	22.7	20.2	17.0	32.9	25.5	27.8	27.6	24.9	19.4	-	
S1 (NB)	505264	194251	43.5	37.6	31.7	36.6	34.0	32.2	28.6	24.0	39.1	38.1	40.6	38.9	-	-	-	Triplicate Site with S1 (NB), S2 (NB) and S3 (NB) - Annual data provided for S3 (NB) only
S2 (NB)	505264	194251	47.8	39.5	34.9	37.1	40.1		32.3			39.1	42.2	43.2	-	-	-	Triplicate Site with S1 (NB), S2 (NB) and S3 (NB) - Annual data provided for S3 (NB) only
S3 (NB)	505264	194251	41.4	33.7	31.0	35.3	31.4		29.3	27.1		37.4	37.7	41.1	36.0	28.1	-	Triplicate Site with S1 (NB), S2 (NB) and S3 (NB) - Annual data provided for S3 (NB) only
S4 (NB)	504104	193684	37.4	33.6	21.9	26.8	30.6	19.9	27.6	22.6	32.4	32.9	34.2	31.9	-	-	-	Triplicate Site with S4 (NB), S5 (NB) and S6 (NB) - Annual data provided for S6 (NB) only
S5 (NB)	504104	193684	36.8	32.4	26.1	29.4	17.3	25.5	25.8	16.0	32.8	33.6	35.6	34.8	-	-	-	Triplicate Site with S4 (NB), S5 (NB) and S6 (NB) - Annual data provided for S6 (NB) only
S6 (NB)	504104	193684	36.5	33.2	25.1	30.1	27.0	25.5	26.7	22.0	31.4	34.2	33.1	34.0	29.4	22.9	-	Triplicate Site with S4 (NB), S5 (NB) and S6 (NB) - Annual data provided for S6 (NB) only

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

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

☒ National bias adjustment factor used.

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

☒ Three Rivers District Council confirm that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

Notes:

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

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

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Three Rivers District Council During 2021

Three Rivers District Council has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by Three Rivers District Council During 2021

Three Rivers District Council has not completed any additional works within the reporting year of 2021.

QA/QC of Diffusion Tube Monitoring

Diffusion tubes were supplied by SOCOTEC in 2021. The method of preparation used was 50% TEA (triethanolamine) in acetone.

SOCOTEC are UKAS accredited. Diffusion Tubes were analysed in accordance with SOCOTEC's standard operating procedure ANU/SOP/1015. This method meets the guidelines set out in DEFRA's 'Diffusion Tubes For Ambient NO₂ Monitoring: Practical Guidance.'

SOCOTEC participate in the AIR PT intercomparison scheme for comparing spiked Nitrogen Dioxide diffusion tubes. SOCOTEC currently holds the highest rank of a satisfactory laboratory.

In the most recent round (AIR PT AR042 January-March 2021), 100% of results submitted were determined to be satisfactory.

SOCOTEC were considered to have good diffusion tube precision in 2020.

Monitoring was completed in adherence with the 2021 Diffusion Tube Monitoring Calendar.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Three Rivers District Council recorded data capture of 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2021 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO₂ continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Three Rivers District Council have applied a national bias adjustment factor of 0.78 to the 2021 monitoring data. A summary of bias adjustment factors used by Three Rivers District Council over the past five years is presented in Table C.1.

The national bias adjustment factor was taken from spreadsheet version no. 03/22. Twenty-three studies are applicable to the factor.

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	National	03/22	0.78
2020	National	03/21	0.77
2019	National	Not recorded	0.75
2018	National	Not recorded	0.76
2017	National	03/18	0.77

NO₂ Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO₂ concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO₂ fall-off with

distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO₂ concentrations corrected for distance are presented in Table B.1.

No diffusion tube NO₂ monitoring locations within Three Rivers required distance correction during 2021.

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

Figure D.1 - Map of Watford Road, Croxley Green DT site (NA) S1

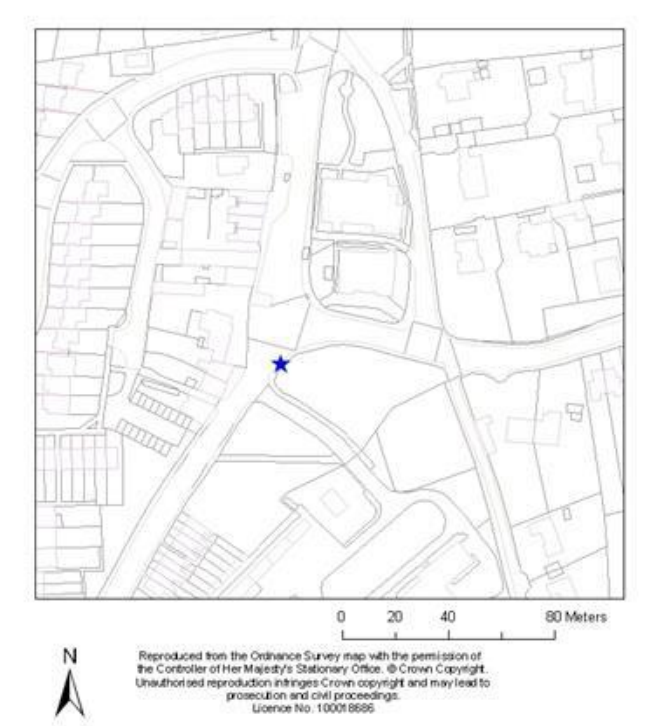


Figure D.2 - Map of Glen View, Chandlers Cross DT site (NA) S2

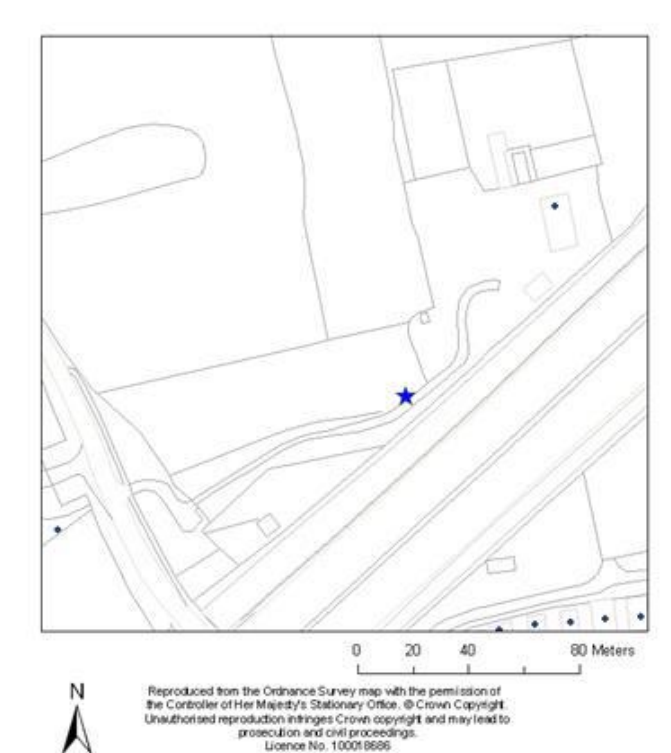


Figure D.3 - Map of The Retreat, Abbots Langley diffusion tube (DT) site (NA) S3

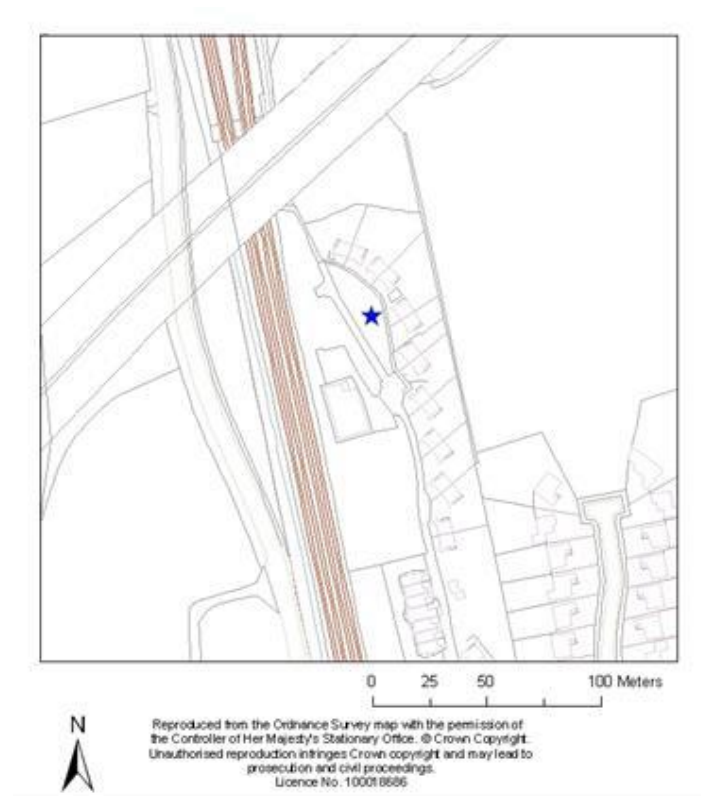


Figure D.4 - Map of Junction 18 (M25) Chorleywood DT sites (NA) S4, S5 & S6

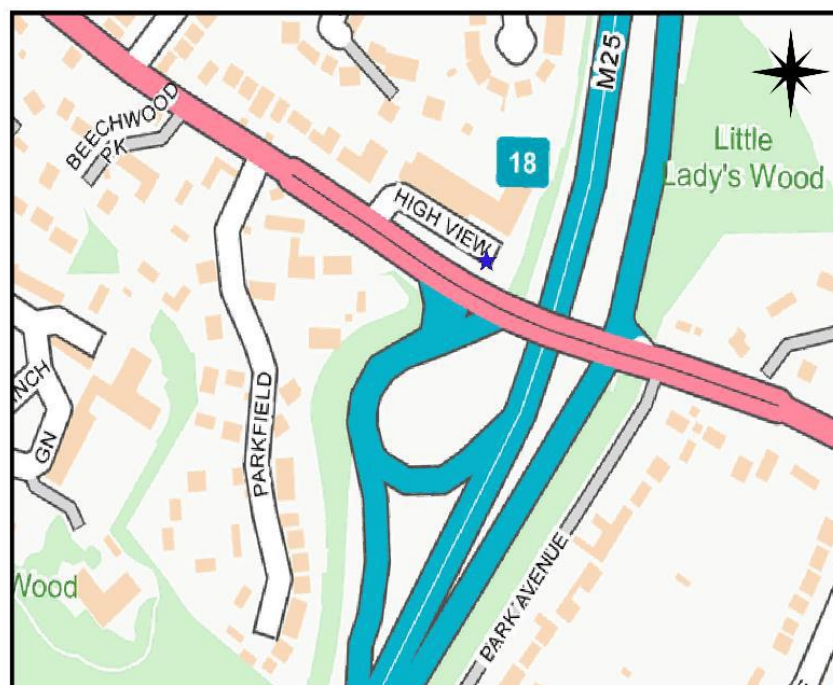


Figure D.5 - Map of Rectory Road, Rickmansworth DT site (NA) S7

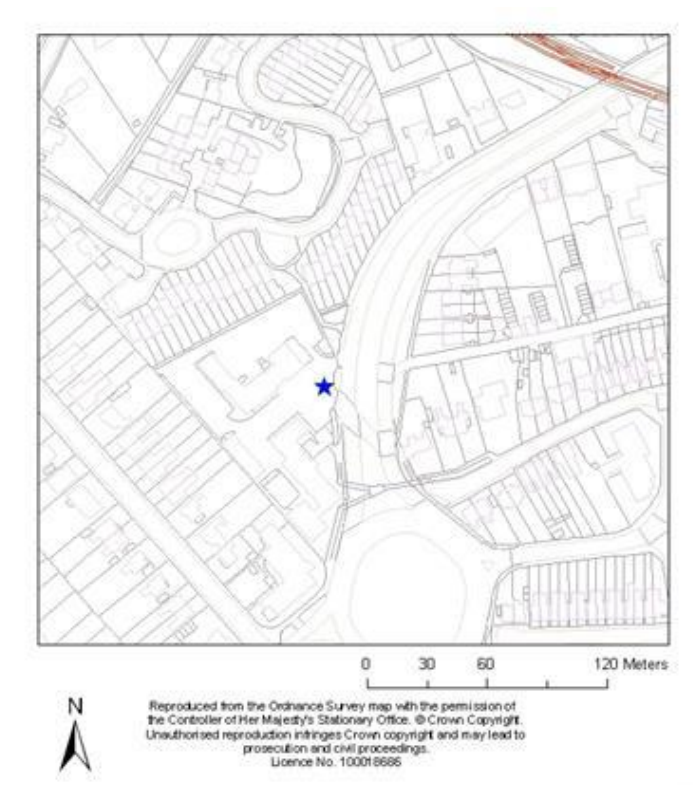


Figure D.6 - Map of Uxbridge Road, Belfry House DT Triplicate site (NB) S1-S3



Figure D.7 - Map of A412 Long Lane (Mill End 2) DT Triplicate site (NB) S4-S6



Figure D.8 - Air Quality Management Areas Chorleywood NO₂ and PM₁₀

200 0 200 400 Meters

Chorleywood PM10 AQMA
Chorleywood NO2 AQMA



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England⁷

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

*The current air quality objectives are set out in the Air Quality (England) Regulations 2000, as amended by the Air Quality (England) Regulations 2002. These regulations provide the statutory basis for the air quality objectives under LAQM in England. There is not currently an air quality objective for PM_{2.5}.

Local Authorities in England have a role in working towards reducing emissions and concentrations of PM_{2.5}. There is an exposure reduction objective for PM_{2.5} of 25ug/m³ as an annual mean (to be achieved by 2020 and maintained thereafter). There is also a target of a 15% reduction in concentrations at urban background sites between 2010 and 2020. These objectives were included in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland published in 2007.

⁷ 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	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control

References

Carr, D. (2022) Hertfordshire Local Authorities Report on Particulate Matter (PM_{2.5}) in Ambient Air in 2020 for Hertfordshire County Council Public Health. Available from: <https://www.airqualityengland.co.uk/local-authority/hnb-reports>.

Department for Environment, Food & Rural Affairs (2021). *Local Air Quality Management Technical Guidance (TG16)*. London. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.

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Firmin, B. (2021) *Three Rivers District Council 2021 Air Quality Annual Status Report (ASR)*. Watford Borough Council. Report Ref. TRDC/BF/ASR/2021_FINAL. Available from: <https://www.airqualityengland.co.uk/local-authority/hnb-reports>.

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