2021 Air Quality Annual Status Report (ASR)

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

June 2021

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Executive Summary: Air Quality in Our Area

Air Quality in Malvern Hills District

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 ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

The Malvern Hills District experiences good air quality. No Air Quality Management Areas (AQMAs) have been declared in the Malvern Hills District to date. Monitoring data over previous years, carried out at numerous locations identified as representing worst-case conditions, has been well below the national objectives for nitrogen dioxide.

Monitoring data shows that there is a decrease in nitrogen dioxide concentrations at all locations when monitoring data for 2020 is compared with that from 2019. An average decrease of 23.1% (5.1µg/m^3) can been seen on average across the District between 2020 and 2019.

[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 2020

[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 highest concentration of nitrogen dioxide in 2020 was 21.5µg/m^3 monitored at location UP1. The lowest concentration of nitrogen dioxide in 2020 was 6.6µg/m^3 monitored at location M3N.

As all monitored concentrations are well below the annual mean objective for nitrogen dioxide it is highly unlikely that there have been any exceedances of the 1-hour Objective for Nitrogen Dioxide at any monitoring sites.

WRS has not identified any major new sources of emissions in 2020.

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 Strategy[5] sets out the case for action, with goals even more ambitious than EU requirements to reduce exposure to harmful pollutants. The Road to Zero[6] 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.

No specific actions have been progressed to improve air quality in the Malvern Hills District as there is currently no declared AQMA in the area. However, the general actions to improve air quality detailed in the current Worcestershire AQAP apply across Worcestershire as a whole, including the Malvern Hills area. Please refer to the Air Quality Action Plan Progress Report for Worcestershire 2015-2016, available at Air Quality Action Plan - Worcestershire Regulatory Services (worcsregservices.gov.uk)

[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

Conclusions and Priorities

There are currently no AQMAs declared in the Malvern Hills District. Concentrations at identified worse-case scenario locations have been recorded well below the objectives for nitrogen dioxide.

The priorities for Malvern Hills District Council are to continue to monitor nitrogen dioxide at key points across the area. WRS, on behalf of the district council, will continue to review and comment on planning applications where air quality is a relevant concern.

Local Engagement and How to get Involved

There are a number of ways members of the public can help to improve local air quality:

- Walk or cycle around the District instead of driving
- Worcestershire County Council have launched a car sharing website, LiftShare, to help people find others journeying to the same destinations to share journeys and costs, and reduce traffic and emissions. Visit this link for more information: https://liftshare.com/uk/community/worcestershire
- General travel planning advice is available on Worcestershire County Council's website (including walking, cycling and bus maps and timetables) and Government website:
  - Travel and Roads | Worcestershire County Council
    Smarter choices: changing the way we travel - GOV.UK (www.gov.uk)

- If you have to drive follow fuel efficient driving advice, often known as 'Smarter Driving Tips', to save on fuel and reduce your emissions. A number of websites promote such advice including:
  - Save money and emissions through ecodriving - Energy Saving Trust
  - How to drive economically - Eco-driving tips | AA (theaa.com)
  - Fuel Consumption & CO2 Databases | Vehicle Certification Agency (vehicle-certification-agency.gov.uk)

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1 Local Air Quality Management

This report provides an overview of air quality in Malvern Hills District Council during 2020. 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 Malvern Hills 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 (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Malvern Hills District Council currently does not have any declared AQMAs. Concentrations continue to fall well below the annual mean objective for nitrogen dioxide at measured locations. For reference, maps of Malvern Hills District's monitoring locations are available in Appendix D.

2.2 Progress and Impact of Measures to address Air Quality in Malvern Hills District

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

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

1. *The report provides a clear breakdown of historical data (and maps) of each monitoring site.*
2. *The Council could reference the Public Health Outcomes Framework in future reports, in particular indicator 3.01 – the Fraction of Mortality attributable to particulate air pollution.*
3. *Table A.2 states the data capture for all sites in 2019 is 100% however, from Table B.1 this is not the case. This should be corrected before publication.*
4. *QA/QC of monitoring data is good. The national bias adjustment factor of 0.78 was used and distance correction was applied for 4 sites not located at relevant exposure. Calculations were provided.*

The above points are noted.

No specific actions have been progressed to improve air quality in the Malvern Hills District as there is currently no declared AQMA in the area. However, the general actions to improve air quality detailed in the current Worcestershire AQAP apply across Worcestershire as a whole, including the Malvern Hills area. Please refer to the Air Quality Action Plan Progress Report for Worcestershire 2015-2016, available at Air Quality Action Plan - Worcestershire Regulatory Services (worcsregservices.gov.uk)

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.

WRS has reviewed the 2018 based DEFRA national background maps to determine projected PM2.5 concentrations with the Malvern Hills District for the 2020 calendar year. The average total PM2.5 at 577 locations (centre points of 1km x 1km grids) across the Malvern Hills District is 7.4µg/m^3, with a minimum concentration of 6.6µg/m^3 and a maximum concentration of 9.2µg/m^3.

This indicates that PM2.5 concentrations within the Malvern Hills District are well below the annual average EU limit value for PM2.5 of 25µg/m^3.

There are no smoke control areas in the Malvern Hills District area.

WRS has reviewed the fraction of mortality attributable to particulate air pollution (indicator 3.01) as published by Public Health England as part of the Public Health Outcomes Framework. The fraction of mortality attributable to particulate emissions in Worcestershire in 2019 (the most recent year available) was 4.8%. This falls below the national figure for England (5.1% in 2019) and below the figure for the West Midlands region (5.3% in 2019). Recent trend data is not available for Worcestershire due to a lack of data points with valid values.

As outlined in Policy Guidance LAQM.PG16 WRS has discussed the role of the DoPH, and the details of PM2.5 levels across the County, with the Director of Public Health at Worcestershire County Council. A new Air Quality Partnership led by the Director of Public Health at Worcestershire County council, and supported by WRS, was set up in 2019 to

discuss potential actions to improve air quality across the County and determine an action plan for implementation. The group comprises officers from the County and District authorities from public health, air quality, strategic planning, sustainability, highways and transport disciplines, and also representatives from the NHS and Highways England. The group met initially in May 2019 to discuss terms and references and in September to discuss potential actions. Further discussions and work to formalise an action plan were proposed to continue in 2020 however at the time of report writing the work of the group has been postponed indefinitely due to the Covid-19 pandemic.

No additional actions are currently planned by Malvern Hills District Council in relation to the reduction of PM2.5 levels. However, it is anticipated that any actions taken to improve NO_2 levels across Worcestershire will likely result in a linked improvement in PM2.5 levels.

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

This section sets out the monitoring undertaken within 2020 by Malvern Hills District Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2016 and 2020 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Malvern Hills District Council did not undertake any automatic monitoring during 2020.

3.1.2 Non-Automatic Monitoring Sites

Malvern Hills District Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 8 sites during 2020. Table A. 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 33%), and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A3 and Table A4 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. 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 2020 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B1 includes distance corrected values only where relevant.

Changes to the Diffusion Tube Monitoring Network in 2020

There have been two changes to the diffusion tube monitoring network during 2020. The following tubes were decommissioned:

Diffusion Tube ID	Location	Easting	Northing
MAL 1	50 Church Road, Malvern	378488	247968
MAL 2	Lamppost 8 Opposite St. Matthias Church	378383	247947

These two tubes were commissioned in 2019 at the request of Worcestershire County Council following the installation of new traffic calming measures in the area. Complaints relating to air quality as a result of the new traffic calming measures had been received from members of the public and as a result Worcestershire County Council asked WRS to monitor the area for 12 months. NO_2 concentrations for the tubes in 2019 were very low (11.9µg/m^3 and 15.3µg/m^3 respectively), as a result the tubes were removed from the monitoring network for 2020.

Exceedances of the Air Quality Objectives in 2020

There has been no exceedance of the Nitrogen Dioxide Annual Mean Air Quality Objective at any location across the Malvern Hills District area in 2020.

Trends across the Malvern Hills District area

Appendix A, Figure A1 Chart 1 presents annual mean nitrogen dioxide concentrations at diffusion tube monitoring locations across the District between 2016 and 2020. Please note that the concentrations presented have been bias-adjusted and annualised where necessary; they have not been corrected for distance where locations are not representative of relevant exposure.

A comparison of monitored levels of nitrogen dioxide across the Malvern Hills District between 2019 and 2020 shows a general decrease across the District at all locations. An average decrease in concentration of 23.1% (5.1µg/m^3) can be observed across the District as a whole.

Diffusion Tube ID	2019	2020	Difference 2019 to 2020 ug/m3	% change 2019 to 2020
UP1	30.9	21.5	-9.5	-30.7%
UP3	26.3	20.9	-5.4	-20.5%
M3N	8.2	6.6	-1.6	-19.8%
M2	19.1	15.7	-3.4	-18.0%
M5N	21.1	16.4	-4.8	-22.6%
M11	25.2	20.7	-4.5	-17.7%
M14	18.8	13.5	-5.4	-28.5%
TEN 1	22.9	16.6	-6.3	-27.5%
Average	**21.6**	**16.5**	**-5.1**	**-23.1%**

Appendix A: Monitoring Results

Table A.1 – 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)
UP1	2 Old Street, Upton WR8 0HA	Roadside	385171	240555	NO2	No	0.0	2.0	No	2.1
UP3	15 Old Street, Upton	Roadside	385157	240508	NO2	No	0.0	1.3	No	2.0
M3N	10 Teme Avenue, Malvern	Urban Background	379790	245677	NO2	No	7.0	1.0	No	2.2
M2	Junction of Howsell Rd with Worcs Rd (Santler Court)	Roadside	378320	247570	NO2	No	5.0	1.0	No	2.2
M5N	Richmond Road - Link Wines WR14 1NE	Roadside	378520	247753	NO2	No	0.5	4.5	No	2.3
M11	Old Post Office, Powick	Roadside	383231	251684	NO2	No	7.0	2.1	No	2.1
M14	278 Worcester Road, Malvern	Roadside	379156	248248	NO2	No	0.0	5.9	No	3.2
TEN 1	opp Kings Head Public House, Cross Street	Roadside	359475	268053	NO2	No	0.0	1.0	No	2.0

(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 NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3)

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 2020 (%) (2)	2016	2017	2018	2019	2020
UP1	385171	240555	Roadside	100	51.9	35.9	30.1	33.7	30.9	21.5
UP3	385157	240508	Roadside	100	51.9	34.8	28.7	32.4	26.3	20.9
M3N	379790	245677	Urban Background	100	51.9	11.6	8.1	10.0	8.2	6.6
M2	378320	247570	Roadside	100	51.9		17.6	24.4	19.1	15.7
M5N	378520	247753	Roadside	100	51.9	27.5	22.8	26.3	21.1	16.4
M11	383231	251684	Roadside	100	51.9	33.6	25.9	31.4	25.2	20.7
M14	379156	248248	Roadside	100	51.9	23.0	17.7	22.2	18.8	13.5
TEN 1	359475	268053	Roadside	100	51.9				22.9	16.6

☒ **Annualisation has been conducted where data capture is <75% and >33% 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/m^3.

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

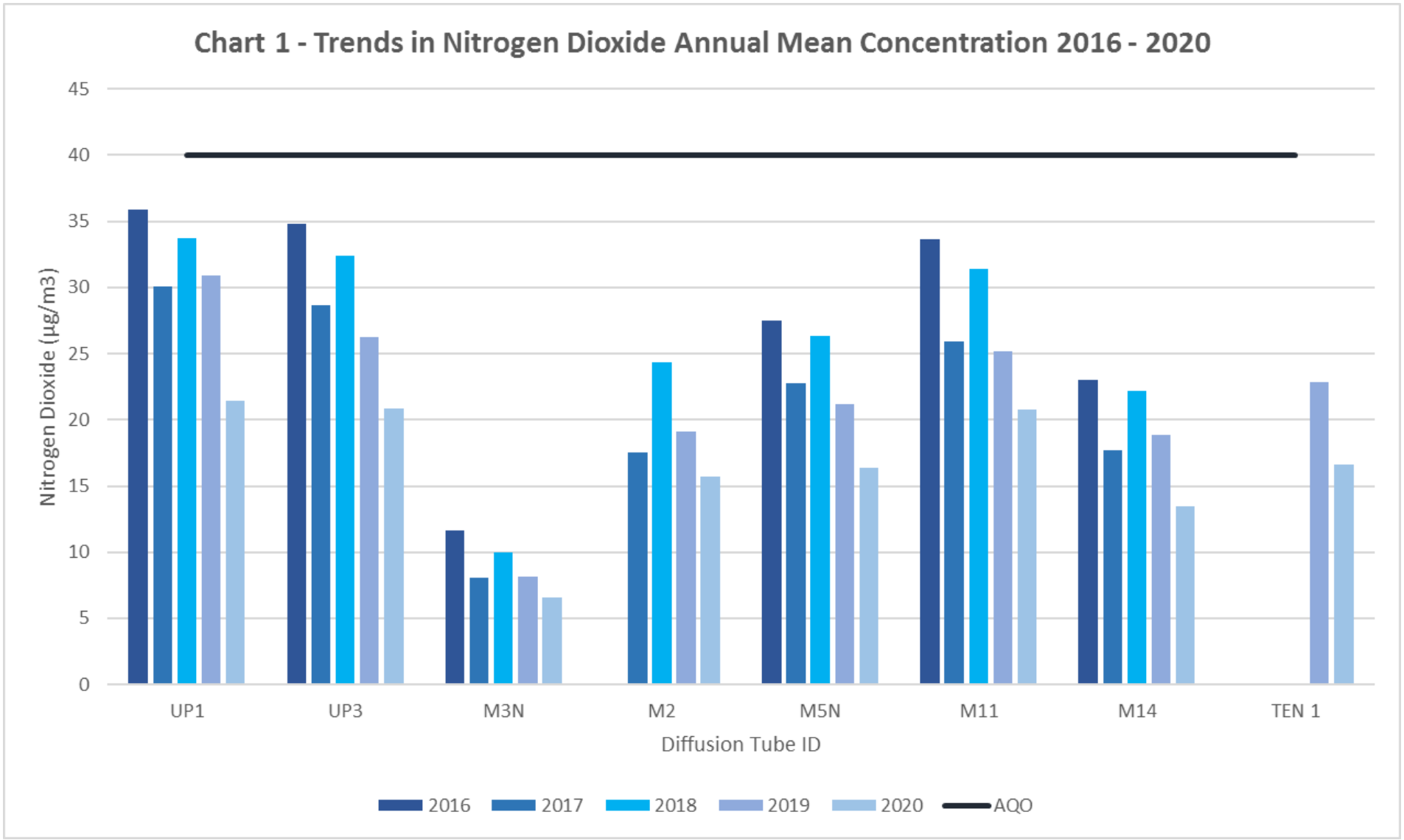
Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

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

Figure A.1 – Trends in Annual Mean NO_2 Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2020

Table B.1 – NO_2 2020 Diffusion Tube Results (µg/m^3)

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 (0.81)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
UP1	385171	240555							23.0	27.7	29.1	28.3	30.2	28.1	27.7	21.5	-	
UP3	385157	240508							18.7	27.1	27.7	24.4	30.7	33.3	27.0	20.9	-	
M3N	379790	245677							4.0	6.1	7.7	7.5	13.1	12.6	8.5	6.6	-	
M2	378320	247570							12.8	20.7	22.8	20.1	21.7	23.3	20.3	15.7	-	
M5N	378520	247753							17.2	20.4	21.3	22.7	21.7	23.5	21.2	16.4	-	
M11	383231	251684							16.7	27.0	27.0	28.3	27.5	34.4	26.8	20.7	-	
M14	379156	248248							10.2	17.1	18.8	15.8	20.4	22.0	17.4	13.5	-	
TEN 1	359475	268053							13.1	22.4	21.3	21.1	25.0	25.8	21.5	16.6	-	

☒ **All erroneous data has been removed from the NO_2 diffusion tube dataset presented in Table B.1**

☒ **Annualisation has been conducted where data capture is <75% and >33% in line with LAQM.TG16**

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

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

☒ **WRS confirm that all 2020 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 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 Malvern Hills District During 2020

Malvern Hills District Council has not identified any new sources relating to air quality within the reporting year of 2020.

Additional Air Quality Works Undertaken by Malvern Hills District Council During 2020

Malvern Hills District Council has not completed any additional works within the reporting year of 2020.

QA/QC of Diffusion Tube Monitoring

The following UKAS accredited company provided Malvern Hills District Council with nitrogen dioxide diffusion tubes and analysis in 2020:

Gradko International Limited
St. Martins House
77 Wales Street
Winchester
SO23 0RH

diffusion@gradko.com

The 20% Triethanolamine (TEA) / De-ionised Water preparation method is used.

Gradko International Limited participate in the AIR NO_2 Proficiency Testing Scheme (AIR-PT). The most recent results for Gradko International Limited under the AIR-PT Scheme demonstrated performance was 75% satisfactory for the periods January to February 2020 and September to October 2020. No results were reported to the AIR-PT Scheme for Gradko International Limited for the periods May to June 2020 and July to August 2020 due to the impact of the Covid-19 pandemic. Tube precision was 'Good' throughout 2020.

All monitoring undertaken has been completed in accordance with the 2020 Diffusion Tube Monitoring Calendar, i.e. on or within ± 2 days of the specified date.

Excluded Diffusion Tube Data

In 2020 Malvern Hills District Council changed diffusion tube supplier part way through the calendar year. In addition, Malvern Hills District Council experienced several months where diffusion tubes were not exposed due to the impact of the Covid-19 pandemic.

Tubes were exposed as follows:

Months	Tubes Exposed?	Tube Supplier
Jan- Feb	Yes	Somerset Scientific Services
March – June	No	n/a
July – December	Yes	Gradko International Limited

Diffusion tube data for January to February 2020 has been omitted from diffusion tube data processing and reporting. Data capture for tubes supplied by Somerset Scientific Services during 2020 is <33% and as such it cannot be annualised in accordance with the methodology outlined in LAQM.TG.16 and subsequently cannot be bias-adjusted in accordance with the methodology for bias-adjusting data from two laboratories as outlined in LAQM.TG.16.

Confirmation regarding this approach was sought from the LAQM Helpdesk which confirmed via email on 20th May 2021 that the January to February diffusion tube data for 2020 should be excluded from data processing and reporting due to insufficient data capture.

For information the raw diffusion tube data for January to February 2020 is provided below:

Diffusion Tube ID	Raw Nitrogen Dioxide Concentration (µg/m^3)	
	January 2020	February 2020
UP1	38.37	38.31
UP3	33.84	31.70
M3N	11.59	5.98
M2	23.43	16.39
M5N	29.71	25.00
M11	34.65	21.18
M14	21.75	12.79
TEN1		19.2

Tube data for July to December 2020 represents >33% data capture for tubes supplied by a single laboratory (Gradko International Limited) and as such has been annualised and bias-adjusted in accordance with the methodologies outlined in LAQM.TG.16. Further information is provided below.

Diffusion Tube Annualisation

In 2020 all diffusion tube monitoring locations within the Malvern Hills District had data capture of more than 33% but less than 75% and therefore all required annualisation.

Annualisation calculations have been carried out using the Diffusion Tube Data Processing Tool (v1.0). Hourly NO_2 data for the period 8th January 2020 to 6th January 2021 from four AURN background automatic monitoring sites within a distance of less than 50 miles has been selected for use in the Tool. The selected AURN automatic monitoring sites are:

- Leominster (suburban background)
- West Bromwich Kendrick Park (urban background)
- Birmingham Ladywood (urban background)
- Leamington Spa (urban background)

A summary of annualisation factors and results are provided in Table C.2 below.

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 regarding the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

WRS has applied a national bias adjustment factor of 0.81 to the 2020 monitoring data using the Diffusion Tube Data Processing Tool (v1.0). A summary of bias adjustment factors used by WRS for the Malvern Hills District over the past five years is presented in Table C.1

WRS has used a national bias adjustment factor as no co-location automatic monitoring studies are conducted in the vicinity and as such it is not possible to derive a local bias adjustment factor. WRS has determined the appropriate national bias adjustment factor using Version 03/21 of the Defra published National Diffusion Tube Bias Adjustment Spreadsheet. Eighteen studies are applicable to the national bias adjustment factor for the laboratory used in 2020. A screenshot of the National Bias-Adjustment Factor Spreadsheet (v03/21) depicting the appropriate adjustment factor is provided below:

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/21

Follow the steps below in the correct order to show the results of relevant co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2021
LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List
If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List
If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List
If a year is not shown, we have no data[2]

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953

Analysed By[1]	Method (Triangle use your selection, choose [All] from the pop-up list)	Year[2] (Triangle use your selection, choose [All])	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
Aberdeen Scientific Services	20% TEA in water	2020		Overall Factor[3] (7 studies)				Use		0.77
Edinburgh Scientific Services	50% TEA in acetone	2020		Overall Factor[3] (2 studies)				Use		0.88
Glasgow Scientific Services	20% TEA in water	2020		Overall Factor[3] (10 studies)				Use		0.96
Gradko	20% TEA in water	2020		Overall Factor[3] (18 studies)				Use		0.81
Gradko	50% TEA in acetone	2020		Overall Factor[3] (14 studies)				Use		0.82
Lambeth Scientific Services	50% TEA in acetone	2020		Overall Factor[3] (5 studies)				Use		0.96
Milton Keynes Council	20% TEA in water	2020		Overall Factor[3] (4 studies)				Use		0.83
SOCOTEC Didcot	20% TEA in water	2020		Overall Factor[3] (6 studies)				Use		0.74
SOCOTEC Didcot	50% TEA in acetone	2020		Overall Factor[3] (22 studies)				Use		0.77
SOCOTEC Glasgow	20% TEA in water	2020		Overall Factor[3] (1 study)				Use		0.79
SOCOTEC Glasgow	50% TEA in acetone	2020		Overall Factor[3] (1 study)				Use		0.79
Somerset County Council	20% TEA in water	2020		Overall Factor[3] (2 studies)				Use		0.76
South Yorkshire Air Quality Samplers	50% TEA in acetone	2020		Overall Factor[3] (1 study)				Use		0.77
Staffordshire Scientific Services	20% TEA in water	2020		Overall Factor[3] (15 studies)				Use		0.85
Tayside Scientific Services	20% TEA in water	2020		Overall Factor[3] (1 study)				Use		0.75

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2020	National	03/21	0.81
2019	National	03/20	0.78
2018	National	03/19	0.89
2017	National	03/18	0.77
2016	National	03/17	0.89

NO_2 Fall-off with Distance from the Road

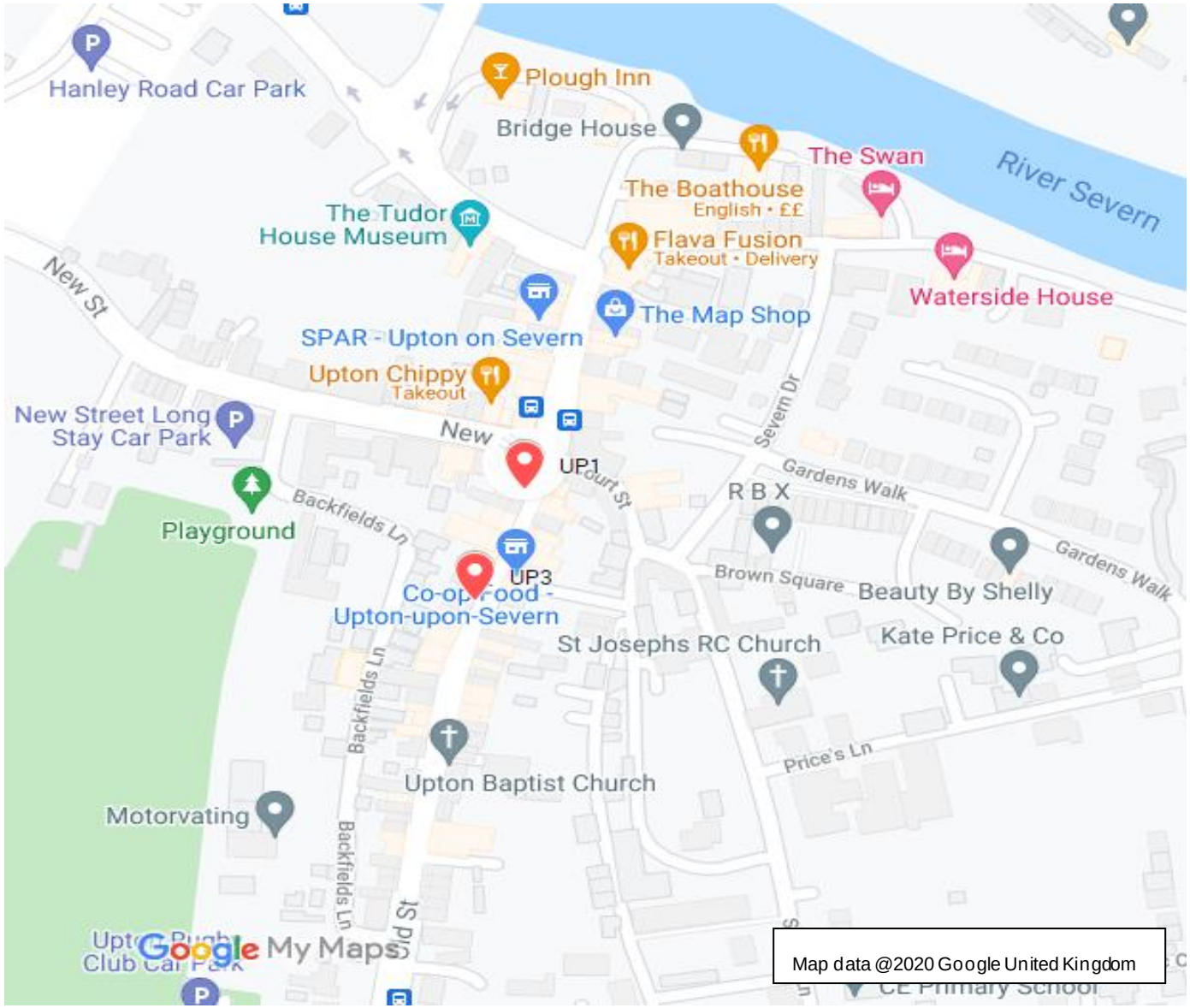
No diffusion tube NO_2 monitoring locations within the Malvern Hills District required distance correction during 2020. i.e. none were 36µg/m^3 or above at locations not representative of relevant exposure.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Leominster	Annualisation Factor West Bromwich Kendrick Park	Annualisation Factor Birmingham Ladywood	Annualisation Factor Leamington Spa	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
UP1	1.0072	0.9526	0.9258	0.9350	0.9551	27.7	26.5	
UP3	1.0072	0.9526	0.9258	0.9350	0.9551	27.0	25.8	
M3N	1.0072	0.9526	0.9258	0.9350	0.9551	8.5	8.1	
M2	1.0072	0.9526	0.9258	0.9350	0.9551	20.3	19.3	
M5N	1.0072	0.9526	0.9258	0.9350	0.9551	21.2	20.2	
M11	1.0072	0.9526	0.9258	0.9350	0.9551	26.8	25.6	
M14	1.0072	0.9526	0.9258	0.9350	0.9551	17.4	16.6	
TEN 1	1.0072	0.9526	0.9258	0.9350	0.9551	21.5	20.5	

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

Diffusion Tube Location ID



Diffusion Tube Location ID

Diffusion Tube Location ID

Diffusion Tube Location ID

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[7]

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO_2)	40µg/m^3	Annual mean
Particulate Matter (PM_{10})	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
Particulate Matter (PM_{10})	40µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
Sulphur Dioxide (SO_2)	125µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
Sulphur Dioxide (SO_2)	266µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[7] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Appendix F: Impact of COVID-19 upon LAQM

COVID-19 has had a significant impact on society. Inevitably, COVID-19 has also had an impact on the environment, with implications to air quality at local, regional and national scales.

COVID-19 has presented various challenges for Local Authorities with respect to undertaking their statutory LAQM duties in the 2021 reporting year. Recognising this, Defra provided various advice updates throughout 2020 to English authorities, particularly concerning the potential disruption to air quality monitoring programmes, implementation of Air Quality Action Plans (AQAPs) and LAQM statutory reporting requirements. Defra has also issued supplementary guidance for LAQM reporting in 2021 to assist local authorities in preparing their 2021 ASR. Where applicable, this advice has been followed.

Despite the challenges that the pandemic has given rise to, the events of 2020 have also provided Local Authorities with an opportunity to quantify the air quality impacts associated with wide-scale and extreme intervention, most notably in relation to emissions of air pollutants arising from road traffic. The vast majority (>95%) of AQMAs declared within the UK are related to road traffic emissions, where attainment of the annual mean objective for nitrogen dioxide (NO_2) is considered unlikely. On 23rd March 2020, the UK Government released official guidance advising all members of public to stay at home, with work-related travel only permitted when absolutely necessary. During this initial national lockdown (and to a lesser extent other national and regional lockdowns that followed), marked reductions in vehicle traffic were observed; Department for Transport (DfT) data[8] suggests reductions in vehicle traffic of up to 70% were experienced across the UK by mid-April, relative to pre COVID-19 levels.

This reduction in travel in turn gave rise to a change of air pollutant emissions associated with road traffic, i.e. nitrous oxides (NO_x), and exhaust and non-exhaust particulates (PM). The Air

[8] Prime Minister's Office, COVID-19 briefing on the 31st of May 2020

Quality Expert Group (AQEG)[9] has estimated that during the initial lockdown period in 2020, within urbanised areas of the UK reductions in NO_2 annual mean concentrations were between 20 and 30% relative to pre-pandemic levels, which represents an absolute reduction of between 10 to 20µg/m^3 if expressed relative to annual mean averages. During this period, changes in $PM_{2.5}$ concentrations were less marked than those of NO_2. $PM_{2.5}$ concentrations are affected by both local sources and the transport of pollution from wider regions, often from well beyond the UK. Through analysis of AURN monitoring data for 2018-2020, AQEG have detailed that $PM_{2.5}$ concentrations during the initial lockdown period are of the order 2 to 5µg/m^3 lower relative to those that would be expected under business-as-usual conditions.

As restrictions are gradually lifted, the challenge is to understand how these air quality improvements can benefit the long-term health of the population.

Impacts of COVID-19 on Air Quality within Malvern Hills District Council

Traffic Data

During the Covid-19 pandemic Worcestershire County Council has collated travel and traffic data for the County. This data has been compared with normal baseline data to give an indication of the impact of Covid-19 lockdowns and restrictions on traffic flows and travel behaviours. Data was gathered from County and DfT sources and included nine live traffic monitors in the Worcester City area and nine further monitors across the County.

County traffic data shows that changes in traffic flows and patterns largely followed the trends seen nationally.

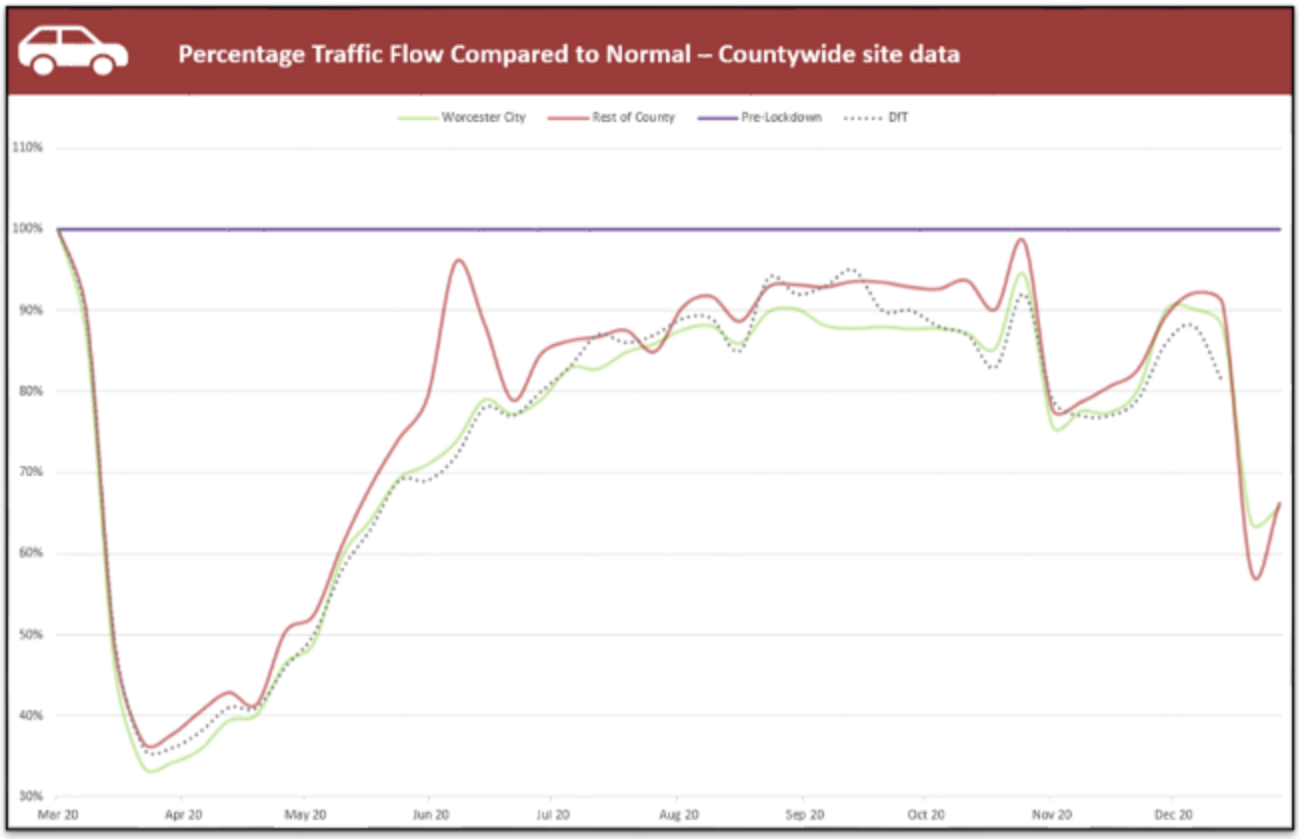
[9] Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK, June 2020

Traffic volumes across the County dropped as low as 34% of normal baseline conditions during the March/April 2020 lockdown and as low as 63% of normal baseline conditions during December 2020.

Due to a combination of Covid-19 restrictions and a laboratory change diffusion tube data for January to June 2020 is not available for the Malvern Hills District and as such it is not possible to comment on any monthly changes in nitrogen dioxide concentrations for the first six months of 2020, including any changes experienced as a result of reductions in traffic associated with the first national lockdown.

A comparison of annual mean nitrogen dioxide concentrations across the Malvern Hills District between 2019 and 2020 shows a general decrease across the District at all locations. An average decrease in concentration of 23.1% (5.1µg/m^3) can be observed across the District as a whole.

Whilst Covid-19 restrictions and subsequent reductions in traffic volumes will have influenced nitrogen dioxide concentrations in the area the AQMA has experienced a general downward trend in annual mean nitrogen dioxide concentrations over the period 2016 to 2019 and as such it is not possible to quantify the impact of traffic changes as a result of Covid-19 restrictions on nitrogen dioxide concentrations locally with the data available.



Opportunities Presented by COVID-19 upon LAQM within the Malvern Hills District

No LAQM specific related opportunities have arisen as a consequence of Covid-19 within the Malvern Hills District.

Challenges and Constraints Imposed by COVID-19 upon LAQM within the Malvern Hills District

The following challenges and constraints imposed by Covid-19 impacted the LAQM work of the Council:

- Passive monitoring Data Capture – diffusion tubes were not exposed for the months March 2020 to June 2020 due to a combination of laboratory closures and a WRS decision not to deploy officers to change tubes due to Covid-19 restrictions. This has affected data capture during 2020, resulting in monitoring sites having to be annualised. **Small/Medium impact**

- Defra Diffusion Tube Exposure Calendar - during months where diffusion tubes were exposed the calendar was adhered to. **No impact**

- Diffusion Tube Storage - during months where diffusion tubes were sent for analysis they were stored and analysed in accordance with laboratory guidance. **No impact**

- Diffusion tube bias-adjustment - in 2019 diffusion tubes were supplied and analysed by Somerset Scientific Services and the national bias-adjustment factor for that laboratory used. The 2019 bias-adjustment factor for Somerset Scientific Services was based on 2 studies. Between July and December 2020 diffusion tubes were supplied and analysed by Gradko International Limited and the national bias-adjustment factor for Gradko used. The 2020 bias-adjustment factor for Gradko is based on 18 studies. **No impact**

- The work of the Worcestershire Air Quality Partnership was due to continue in 2020 however at the time of report writing the work of the group has been postponed indefinitely due to the Covid-19 pandemic. **Small impact.** A small impact is assigned in this case as Malvern Hills District does not have any AQMAs or other identified areas of poor air quality requiring action.

Table F 1 – Impact Matrix

Category	Impact Rating: None	Impact Rating: Small	Impact Rating: Medium	Impact Rating: High
Automatic Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Automatic Monitoring – QA/QC Regime	Adherence to requirements as defined in LAQM.TG16	Routine calibrations taken place frequently but not to normal regime. Audits undertaken alongside service and maintenance programmes	Routine calibrations taken place infrequently and service and maintenance regimes adhered to. No audit achieved	Routine calibrations not undertaken within extended period (e.g. 3 to 4 months). Interruption to service and maintenance regime and no audit achieved
Passive Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Passive Monitoring – Bias Adjustment Factor	Bias adjustment undertaken as normal	<25% impact on normal number of available bias adjustment colocation studies (2020 vs 2019)	25-50% impact on normal number of available bias adjustment studies (2020 vs 2019)	>50% impact on normal number of available bias adjustment studies (2020 vs 2019) and/or applied bias adjustment factor studies not considered representative of local regime
Passive Monitoring – Adherence to Changeover Dates	Defra diffusion tube exposure calendar adhered to	Tubes left out for two exposure periods	Tubes left out for three exposure periods	Tubes left out for more than three exposure periods
Passive Monitoring – Storage of Tubes	Tubes stored in accordance with laboratory guidance and analysed promptly.	Tubes stored for longer than normal but adhering to laboratory guidance	Tubes unable to be stored according to be laboratory guidance but analysed prior to expiry date	Tubes stored for so long that they were unable to be analysed prior to expiry date. Data unable to be used
AQAP – Measure Implementation	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP
AQAP – New AQAP Development	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP

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 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 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
WRS	Worcestershire Regulator Services

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