

Worcestershire **Regulatory Services**

Supporting and protecting you

2018 Air Quality Annual Status Report (ASR)

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

November 2018

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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 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.

No AQMA's have been declared in the Malvern Hills District.

Monitoring data shows that there is a significant decrease in NO₂ concentrations at all locations when comparing 2017 results with those from 2016. The highest concentration of NO₂ was monitored at location UP1 with a value of 30.1µg/m³. This is virtually 25% below the annual mean objective of 40µg/m³ for nitrogen dioxide. The lowest monitored concentration recorded in the district was 8.09µg/m³ at urban background location M3N.

Given that all monitored concentrations are well below the annual mean objective for NO₂ it is highly unlikely that there have been any exceedances of the 1-hour mean objective for NO₂ at any monitoring sites.

Six monitoring locations were decommissioned at the end of 2016 due to low concentrations of NO₂ (measuring between 20 - 25 µg/m³). These locations were referred to as UP2, M12, M9N, M13, M15, and M16 in the 2017 ASR. A new location was established close to the junction of Worcester Road with Howsell Road due to new development in the area and observation of regular queuing traffic. This location is referred to as M2 and recorded a concentration of 17.57µg/m³ during 2017.

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

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

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

Actions to Improve Air Quality

In 2013, WRS produced a countywide Air Quality Action Plan (AQAP) for Worcestershire which was adopted by Malvern Hills District Council (MHDC) on 29th October 2013. WRS have produced two updates to the AQAP, the latest in September 2016. For details of all measures completed, in progress or planned, please refer to the 'Air Quality Action Plan Progress Report for Worcestershire April 2015-2016'. A copy of this, the previous update, and the AQAP, is available to view or download at

<http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx>

In 2014, WRS set up the Worcestershire Air Quality Steering Group and sub-groups to facilitate progressing implementation of prioritised actions identified in the AQAP. To date the Malvern Hills area does not form a specific part of the AQAP as there is no current AQMA in the area. However the general actions to improve air quality detailed in the AQAP apply across Worcestershire as a whole, including the Malvern Hills area.

Conclusions and Priorities

There are currently no AQMAs declared in the Malvern Hills District.

The priorities for Malvern Hills District Council are to continue to monitor nitrogen dioxide at key points across the area. To this end the tube rationalisation conducted at the end of 2016 led to decommissioning of a number of tubes where concentrations had been recorded well below the annual mean objective. An additional location was also established in an area identified as having significant traffic flow and relevant receptors that had not been previously monitored. Malvern Hills District Council will continue to review and assess air quality within the area.

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:
 - http://www.worcestershire.gov.uk/info/20007/travel_and_roads
 - <https://www.gov.uk/government/publications/smarter-choices-main-report-about-changing-the-way-we-travel>
- 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:
 - <http://www.energysavingtrust.org.uk/transport/driving-advice>
 - <https://www.theaa.com/driving-advice/fuels-environment/drive-smart>
 - <https://www.vehicle-certification-agency.gov.uk/fcb/smarter-driving-tips.asp>
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Table of Contents

Executive Summary: Air Quality in Our Area	i
Air Quality in Malvern Hills District	i
Actions to Improve Air Quality	ii
Conclusions and Priorities	ii
Local Engagement and How to get Involved	ii
1 Local Air Quality Management	1
2 Actions to Improve Air Quality	2
2.1 Air Quality Management Areas.....	2
2.2 Progress and Impact of Measures to address Air Quality in Malvern Hills District 3	
2.3 PM _{2.5} – Local Authority Approach to Reducing Emissions and/or Concentrations.....	4
3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance	5
3.1 Summary of Monitoring Undertaken	5
3.1.1 Automatic Monitoring Sites	5
3.1.2 Non-Automatic Monitoring Sites.....	5
3.2 Individual Pollutants	5
3.2.1 Nitrogen Dioxide (NO ₂).....	5
Appendix A: Monitoring Results	7
Appendix B: Full Monthly Diffusion Tube Results for 2017	10
Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC	12
Appendix D: Map(s) of Monitoring Locations and AQMAs	13
Appendix E: Summary of Air Quality Objectives in England	15
Glossary of Terms	16
References	17

1 Local Air Quality Management

This report provides an overview of air quality in the Malvern Hills District during 2017. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

There is no history of any AQMA being declared in the Malvern Hills District. Concentrations continue to fall well below the annual mean objective for nitrogen dioxide at measured locations.

For reference, maps of all monitoring locations within the Malvern Hills District area are available in Appendix D.

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

There have been no exceedances of the annual mean objective for nitrogen dioxide at any monitoring location across the Malvern Hills District in 2016. Concentrations have remained well below the objective.

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 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

<http://www.worcsregservices.gov.uk/media/2294583/WRS-AQAP-Progress-Report-2015-16.pdf>

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 DEFRA national background maps to determine projected PM_{2.5} concentrations within the Malvern Hills District for the 2016 calendar year. The average total PM_{2.5} at 577 locations (centre points of 1km x 1km grids) across the Malvern Hills District is 8.09µg/m³, with a minimum concentration of 7.01µg/m³ and a maximum concentration of 10.44µg/m³. This indicates that PM_{2.5} concentrations within the Malvern Hills District are well below the annual average EU limit value for PM_{2.5} of 25µg/m³.

As outlined in Policy Guidance LAQM.PG16 WRS have discussed the role of the DoPH and the details of PM_{2.5} levels across the County with the Director of Public Health for Worcestershire County Council. The DoPH has not confirmed to WRS that they are advocating or supporting any specific actions to reduce PM_{2.5} concentrations across the County at this time.

In light of the above no additional actions are currently planned by Malvern Hills District Council in relation to the reduction of PM_{2.5} levels. However it is anticipated that any actions taken to improve NO₂ levels across the District will likely result in a linked improvement in PM_{2.5} levels.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

No automatic monitoring has been undertaken in the Malvern Hills district during 2017.

3.1.2 Non-Automatic Monitoring Sites

Malvern Hills District Council undertook non- automatic (passive) monitoring of NO₂ at 7 sites during 2017. Table A.1 in Appendix A shows the details of the sites. This represents a decrease of five monitoring locations across the area. UP2 (High Street, Upton), M12 (Church Street), and M9N (Worcester Road, Malvern) were all decommissioned because they had measured significantly below the annual mean objective for a number of years. M13 (Pickersleigh Road), M15 (Upper Howsell Road) and M16 (Newtown Road, Malvern) were decommissioned because measured concentrations of NO₂ were also very low. A new monitoring location was established outside Satler Court on Howsell Road close to the junction with the Worcester Road.

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” and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO₂)

During 2017 Malvern Hills District Council monitored annual mean nitrogen dioxide concentrations using seven passive diffusion tubes at different locations. This was an decrease of five locations to the previous year. This was due to monitored levels of

nitrogen dioxide falling well below the annual mean objective with concentrations ranging from the low to mid twenties.

No exceedance of the annual mean objective for NO₂ was recorded. The highest concentration of NO₂ was at location UP1 with a value of 30.1µg/m³ which is nearly 25% below the objective. The lowest value of 8.09µg/m³ was recorded at background location M3N. The new location M2 recorded well below the objective with a value of 17.57µg/m³.

It should be noted that monitoring results within Malvern Hills District area demonstrate a significant decrease in concentrations at all monitoring locations in 2017, consistent with trends across Worcestershire. This is attributed to the low bias adjustment factor of 0.77 applied to raw NOx tube data as required.

Following discussion with other Local Authorities and the National Physics Laboratory, WRS are aware that Defra produced national bias adjustment factors for 2017 are significantly lower than in previous years. Consequently this significantly reduces adjusted measurements of local nitrogen dioxide tubes well below local trends. No satisfactory explanation has been provided to WRS as to why this is the case and it does not provide confidence in the adjusted 2017 results. Therefore, in WRS opinion, the 2017 data should not be relied upon as indicative of local trends. However given that concentrations within the district have measured consistently below the objectives this is not considered to be cause for concern.

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.

For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B.

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 are included in Appendix C.

Appendix A: Monitoring Results

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
UP1	2 Old Street	Roadside	385171	240555	NO2	No	0	2	No	2.10m
UP3	15 Old Street, Upton	Roadside	385157	240508	NO2	No	0	1.25	No	1.98m
M3N	Teme Avenue	Urban Background	379790	245677	NO2	No	7	1	No	2.20m
M2	Santler Court, Howsell Road	Roadside	378320	247570	NO2	No	5	1	No	2.20m
M5N	Richmond Road	Roadside	378520	247753	NO2	No	0.5	4.5	No	2.30m
M11	Old Post Office, Powick	Roadside	383231	251684	NO2	No	7	2.1	No	2.10m
M14	278 Worcester Road, Malvern, WR14 1BD	Roadside	379156	248248	NO2	No	0	5.85	No	3.2m

Notes:

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

(2) N/A if not applicable.

Table A.2 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2017 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2013	2014	2015	2016	2017
UP1	Roadside	Diffusion Tube	100	100	38.00	31.73	32.99	35.90	30.10
UP3	Roadside	Diffusion Tube	50	100	43.00⁽¹⁾	35.07	32.80	34.80	28.66
M3N	Urban Background	Diffusion Tube	100	100	14.00	12.46	10.34	11.60	8.09
M2	Roadside	Diffusion Tube	100	100					17.57
M5N	Roadside	Diffusion Tube	100	100	33.00	27.05	25.68	27.50	22.76
M11	Roadside	Diffusion Tube	100	100		31.76	29.99	33.60	25.95
M14	Roadside	Diffusion Tube	100	100				23.00	17.67

Diffusion tube data has been bias corrected

Annualisation has been conducted where data capture is <75%

Notes:

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

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

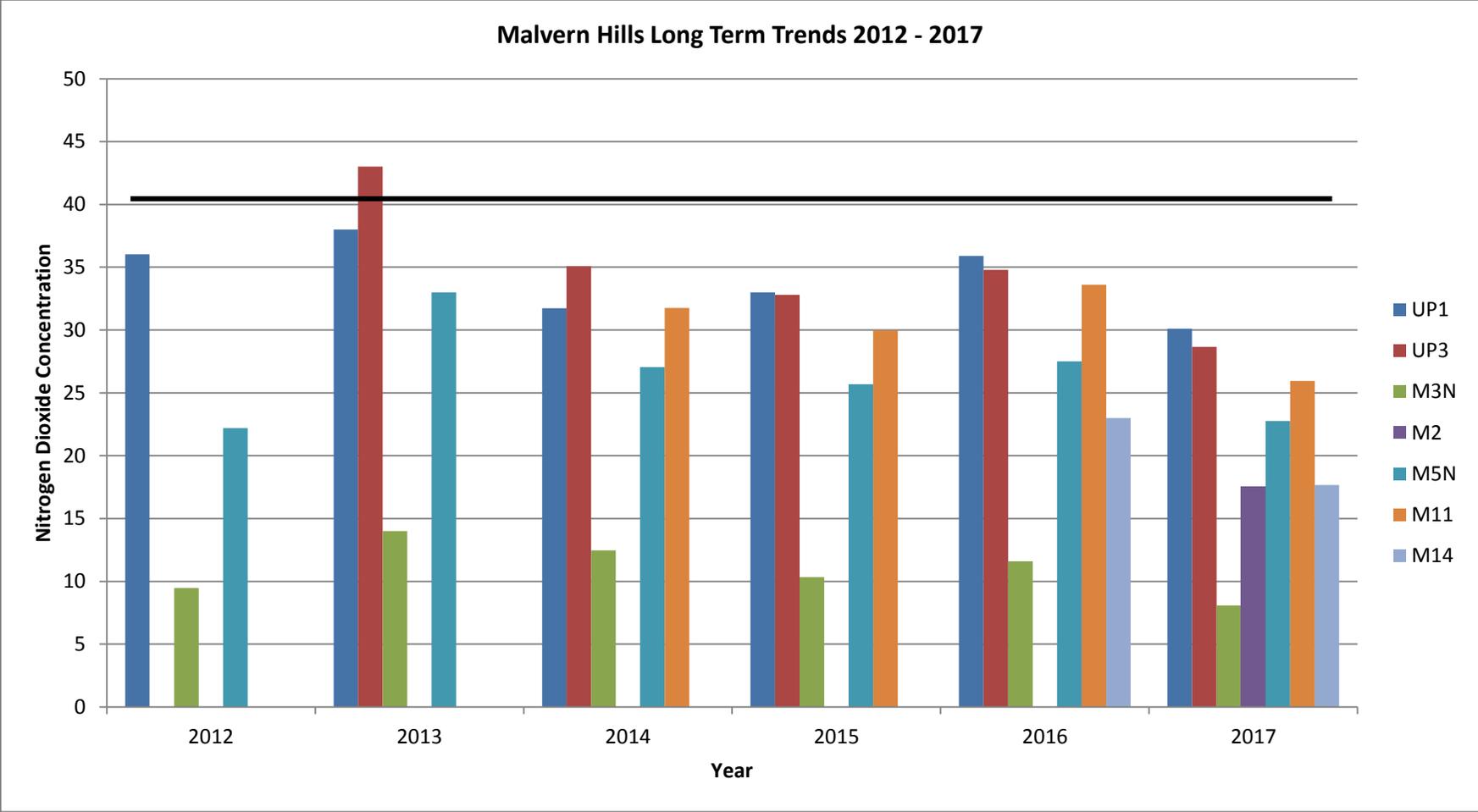
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(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.

Nb – The figure for UP3 in 2013 was based on the annualisation of 6 months data and therefore did not represent a true reflection of concentrations at that location.

Figure A.1 – Trends in Annual Mean NO₂ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2017

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

Site ID	NO ₂ Mean Concentrations (µg/m ³)												Annual Mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (0.77) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
UP1	44.84	42.26	41.12	40.70	33.02	35.26	33.79	33.99	34.86	40.44	43.92	44.89	39.09	30.1	30.10
UP3	48.44	42.38	39.11	40.40	37.58	31.83	30.45	30.76	34.08	34.86	39.71	37.05	37.22	28.66	28.66
M3N	20.80	14.63	11.40	6.56	8.37	4.88	5.95	6.68	8.60	10.06	12.22	15.95	10.51	8.09	8.09
M2	33.49	26.64	25.11	23.43	23.12	19.76	18.47	14.10	18.63	23.94	23.08	24.11	22.82	17.57	17.57
M5N	45.06	30.17	35.50	23.86	24.15	25.89	22.61	26.70	26.26	28.38	31.74	34.44	29.56	22.76	22.76
M11	36.39	45.30	40.91	29.20	31.41	26.23	27.53	26.70	30.56	36.76	36.63	36.80	33.7	25.95	25.95
M14	34.50	26.31	25.67	20.45	25.19	17.92	17.22	18.70	20.52	24.26	22.35	22.35	22.95	17.67	17.67

- Local bias adjustment factor used
- National bias adjustment factor used
- Annualisation has been conducted where data capture is <75% - no annualisation required
- Where applicable, data has been distance corrected for relevant exposure – not distance corrected due to concentrations being well below the objective

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.

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

QA/QC Data

Factor from Local Co-location Studies (if available)

No local co-location studies for nitrogen dioxide have been undertaken in 2017.

Diffusion Tube Bias Adjustment Factors

The following UKAS accredited company provides Redditch Borough Council with nitrogen dioxide diffusion tubes and analysis:

Somerset Scientific Services,
Unit 2A,
Westpark 26
Chelston
Wellington
Somerset
TA21 9AD

01823 355906

sssmailbox@somerset.gov.uk

The 20% Triethanolamine (TEA) / De-ionised Water preparation method is used. The bias adjustment factor applied to the results in 2017 was 0.77 (Spreadsheet Version No. 09/18) which were derived from the national studies.

QA/QC of Automatic Monitoring

No Automatic Monitoring Data is available for 2017.

QA/QC of Diffusion Tube Monitoring

Under the AIR NO₂ PT (formerly WASP) Scheme Somerset Scientific Services performed 100% satisfactory for the period January to August 2017 and 75% for the period September to October 2017 (no data for the period November to December 2017). Tube precision was 'Good' throughout 2017.

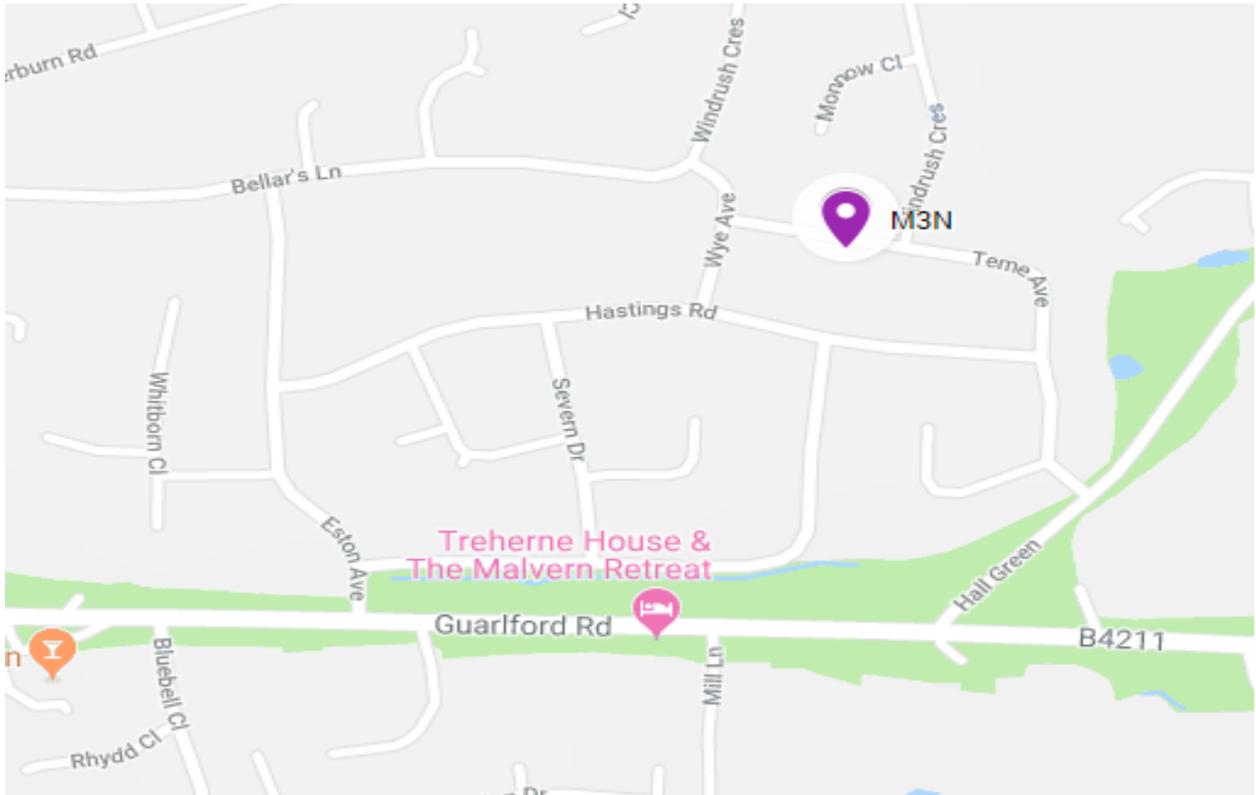
Appendix D: Map(s) of Monitoring Locations and AQMAs



Monitoring locations in Malvern Link



Monitoring Location at Powick



Monitoring Location Malvern Background



Monitoring Locations Upton upon Severn

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective ⁴	
	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

⁴ 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

1. DEFRA (2016) 'Local Air Quality Management Policy Guidance LAQM PG.(16)'
2. DEFRA (2016) 'Local Air Quality Management Technical Guidance LAQM TG.(16)'
3. DEFRA (2017) 'National Diffusion Tube Bias Adjustment Factor Spreadsheet v.03/16'
4. Worcestershire Regulatory Services (2013) 'Air Quality Action Plan for Worcestershire'
5. Worcestershire Regulatory Services (2015) 'Air Quality Action Plan Progress Report for Worcestershire April 2013-April 2015'
6. Worcestershire Regulatory Services (2016) 'Air Quality Action Plan Progress Report for Worcestershire April 2015 – March 2016'
7. Worcestershire Regulatory Services (2017) 'Malvern Hills District Council Annual Status Report 2017'