Worcestershire
Regulatory Services
Supporting and protecting you

2019 Air Quality Annual Status Report (ASR)

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

June 2019

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Executive Summary: Air Quality in Our Area

Air Quality in Worcester City

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 billion[3].

Worcestershire Regulatory Services (WRS) is a shared service formed from the Environmental Health and Licensing departments of the six Worcestershire District Councils. Responsibility for managing (monitoring and reporting of) local air quality transferred from the partnership councils to WRS in April 2011.

Three Air Quality Management Areas (AQMA) were declared by Worcester City Council in 2009 for exceedances of the annual average mean objective for nitrogen dioxide (NO_2):

- Dolday/Bridge Street AQMA declared 1st March 2009;
- Lowesmoor/Rainbow Hill AQMA declared 1st March 2009; and
- Newtown Road AQMA declared 1st March 2009.

[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

There have been no measured exceedances of NO_2 in the Newtown Road AQMA since 2007, and the AQMA was revoked by the council on 30th July 2014.

A further AQMA was declared by the council for the St Johns area of Worcester for exceedance of the annual mean objective for NO_2 on 26th September 2014.

Details of declaration and plans of the AQMAs can be found on the following pages of WRS website: http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-management-areas.aspx

A Detailed Assessment of an area within London Road and Sidbury, Worcester was completed by Air Quality Consultants (AQC) on behalf of Worcester City Council in July 2017. The AQC report concluded that an area at the western end of London Road should be declared as an AQMA. A copy of AQC (July 2017) 'Detailed Assessment of Air Quality along London Road, Worcester' (ref: J2829A/1/F1) is available to download from WRS website at http://www.worcsregservices.gov.uk/pollution/air-quality/local-air-quality-progress-reports.aspx.

Long term trend measurements and automatic analyser results up to 2018 within Foregate Street, The Butts and The Tything, Worcester indicate that requirement for a new AQMA declaration of this combined study area would likely be confirmed by Detailed Assessment. Worcester City Council has chosen to move directly onto options for declaration of AQMA in this study area in line with Defra 2016 Policy Guidance LAQM.PG(16).

WRS produced a report with 5 potential options for AQMA areas in the city for consideration by Worcester City Council. On the 8th January 2018 the Council's Environment & Licensing committee decided in favour of declaration of the whole district as an AQMA.

A public consultation period on the proposal for a district wide AQMA was undertaken between February and April 2018.

The draft legal declaration order for a district wide AQMA and order for revocation of the existing AQMAs was approved by Worcester City Council Environmental and Licensing committee on 10th December 2018. The orders will be formalised and provided to Defra in due course.

Monitoring results within Worcester City Council area demonstrate increases in NO_2 at all monitored locations across the district between 2017 and 2018, consistent with trends across Worcestershire. This is in large part attributed to the low bias adjustment factor of 0.77 applied to 2017 raw NOx tube data and in WRS opinion, the 2017 data should not be relied upon as indicative of local trends.

Comparing the bias adjusted 2018 monitored results with an average of 2014 to 2016 data, overall the results show a slight downward trend.

Like many parts of the UK, poor air quality in Worcester City is linked to areas with high volumes of traffic, congestion and ‘street canyon’ landscapes (where height of buildings is greater than width of road). Worcestershire County Council has responsibility for strategic transport issues in the county and published the fourth Local Transport Plan in 2017. WRS continues to liaise with the County Council in the development of countywide plans to ensure that remediation of the AQMAs remain a strategic transport priority. Over the past seven years WRS has experienced closer working ties with the County Council’s Strategic Transport Team and it is anticipated that collaboration on their strategic policies and improvement schemes at the early planning stages will ensure that air quality improvements remain a priority across all of Worcestershire infrastructure. WRS has also experienced increased liaison with the Director of Public Health (DoPH) department within the County Council in the last 24 months including assisting with air quality aspects of the ‘Health and Well Being Plan for Worcester City’ (see link below) and the Worcester City Task and Finish

Group.
https://www.worcester.gov.uk/documents/10499/8372623/WCC+Health+and+Wellbeing+Plan.pdf/edb68e3c-731b-c1f3-d22b-5a7868204e0d

Actions to Improve Air Quality

Key measures progressed in 2018:

1. **City Centre Masterplan**

Worcester City Council has commissioned the development of a Masterplan for its City Centre, to drive regeneration, economic diversification and growth. Following stakeholder engagement in autumn 2017, a draft Masterplan has been produced by consultants Node on behalf of the council. A public consultation on the draft Masterplan was undertaken from 15th October to 12th November 2018. Details of the draft plan can be found via the following link: https://www.worcester.gov.uk/masterplan.

Addressing congestion and movement issues within the city, which impact on local air quality, are at the core of the Masterplan ambitions. The geographical area of the Masterplan boundary encompasses the Dolday AQMA, Lowesmoor and The Butts, Foregate Street and The Tything area. Rainbow Hill, London Road and St Johns areas are outside the boundary of the Masterplan.

In general, potential beneficial actions on local air quality within the Masterplan are considered to be:

- development opportunities that include the replacement of numerous surface level car parks with multi storey car parking at strategic points; and
- development opportunities and public realm enhancements supporting more active movements around the city e.g. walking and cycling.

2. Worcester City Council Task & Finish Group

On 26th July 2017 Worcester City Council Environmental and Licensing Group voted to set up a Task and Finish Group to look into actions to improve air quality in the city. The group comprised council members from three political parties, council officers, representatives of the Director of Public Health and Worcestershire County Council Highways. WRS Technical Services officers provided technical advice and expertise on air pollution and potential measures to the group.

The group met four times between January and July 2018 and discussed options for improving air quality in the following subjects:

- Lowering Emission Strategy
- Improving Emissions from Taxis
- Electric Vehicles and Charging Infrastructure
- Clean Air Zones (Charging and Non Charging)
- A Strategy for Freight in the City
- A Bus Quality Partnership - Prioritising uptake of low emission vehicles
- Future car parking strategy - Promotion of public transport and centre fringe car parks

In 2018, WRS prepared a summary report of Worcester City Task & Finish Group work and recommendations for future air quality improving measures. The final report was approved by Worcester City Council Environment and Licensing Committee in January 2019. Details of the approved recommendations can be found in section 2.2 of the main report.

The recommendations of the report will form much of the content of a future Lowering Emission Strategy and a new Air Quality Action Plan for Worcester City following formal declaration of the city wide boundary AQMA.

Worcestershire County Council Highways Improvements

- **LTP4 Worcester schemes from National Productivity Investment Fund (NPIF)** – The St Johns Scheme and Dolday signal upgrades have been completed. Croft Road zebra crossing to a signalised crossing is virtually complete at the time of writing. London Road improvements at the Wylds Lane/Sebright Junction and Waitrose Junction have now been completed, which have involved equipment upgrades and full revalidation of both junctions to optimise efficiency. A detailed design has been identified for the Sidbury/Commandery Junction with delivery due to commence in July 2019.

- **Local Transport Plan Scheme W1 (Worcester Rainbow Hill/Astwood Road/Bilford Road/Blackpole Road Key Corridor of Improvement)** – Worcestershire County Council is currently looking to bring forward this scheme in 2019. This will initially involve a full study of this congested corridor, which includes Lowesmoor and Rainbow Hill. It is expected that this study will identify a number of schemes to improve traffic flow, which should act to mitigate unreliable journey times and poor air quality along this corridor. This study will be commissioned in 2019 and delivery of resultant schemes will be pursued upon study completion.

- **Electric Vehicle Infrastructure Strategy** – Worcestershire County Council are currently considering introduction of an EV strategy for Worcestershire. This will consider all ULEVs including electric, hydrogen, and Compressed Natural Gas (CNG). It is anticipated that County Council will consult with stakeholders such as WRS and the district councils on requirements and potential policy later in 2019.

Conclusions and Priorities

Worcester City Council undertook non- automatic (passive) monitoring of NO_2 at 38 sites during 2018. Eleven monitoring locations within existing AQMA's and The Butts/Foregate Street/Tything and London Road study areas recorded exceedances of the long term objective for NO_2 in 2018, with one other location in the Dolday/Bridge Street AQMA recording less than 1µg/m^3 below the objective.

Monitoring results demonstrate increases in NO_2 at all monitored locations across the district between 2017 and 2018, consistent with trends across Worcestershire. This is attributed to the low bias adjustment factor of 0.77 applied to 2017 raw NOx tube data as required.

WRS are aware that Defra published 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 adjusted 2017 data should not be relied upon as indicative of local trends.

Given the above it is considered more appropriate to compare the adjusted 2018 monitored results with an average of 2014 to 2016 data which demonstrates a downward trend at 20 monitoring locations averaging 2.16 µg/m^3 reduction. However 15 monitoring locations demonstrated an increase of on average 1.20 µg/m^3 increase. Overall the results show a slight downward trend.

Worcester City Council's priorities for 2019 are:

- Declare council boundary wide AQMA and revoke existing AQMA's.
- Finalise and adopt City Centre Masterplan and Transport Strategy.

- Begin work on progressing Environment and Licensing Committee recommendations from the final Task and Finish Group report.
- Work will begin on producing a new AQAP for Worcester City following declaration of a district wide AQMA to incorporate the recommendations of the Environment and Licensing Committee.

WRS on behalf of Worcester City Council continue to monitor existing locations in 2019 to assess any improvements or degradation in NO_2 concentrations. Further update on monitoring, improving actions and strategic plans progress will be provided in 2020 Annual Status Report.

The principal challenges and barriers to implementation that Worcester City anticipates facing are resourcing and funding sources for potential significant actions and measures such as implementation of a Lowering Emission Strategy (LES).

The 2017 'UK plan for tackling roadside nitrogen dioxide' outlines Government's approach and preferred options for mitigation of national areas of poor air quality detailing 29 local authorities required to produce strategies to accelerate compliance with the air quality objectives in their areas. A further 33 local authorities have since been required to produce feasibility studies on accelerating compliance following a High Court order. In autumn budget 2017, the chancellor announced a £220 million Clean Air Fund to support those local authorities and the people and businesses affected by these local plans. Worcester City Council is not one of these named councils and therefore has not been prioritised for access to that funding.

Local Engagement and How to get Involved

Following direct contact WRS were invited by Defra LAQM Team to join their Local Authority Air Quality Advisory Group (LAQAG), formed in 2017. The group consists of a network of local authority officials acting as an informal sounding board by Defra to enable development of better informed strategy and policy proposals across the two

areas of work in air quality- local authorities and domestic combustion. It is an advisory body and not a decision-making body.

WRS is also a member of Central England Environmental Protection Managers Group (CEEPG) which provides a strategic overview and direction for the delivery of Environmental Protection Services across the area of Central England covered by participating authorities. CEEPG responsibilities covers all environmental health matters regarding air quality, noise, contaminated land and LAPPC/IPPC including cooperation and coordination with the Environment Agency and Public Health England.

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

- **Walk or cycle, leave you car at home:** Leaving your car at home and walking or cycling instead will benefit in three ways - increased exercise, reduced pollution exposure and will reduce individual's pollution emissions;
- **Turn off your engine when stationary or parked,** don't 'idle', particularly outside sensitive receptors such as schools, hospitals, care homes and residential properties;
- 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://worcestershire.liftshare.com/;
- Contact Worcestershire County Council for help and advice on a **Travel Plan** for your business. General travel planning advice is available on Worcestershire County Council's website (including walking, cycling and bus maps and timetables);
- **Hold meetings by Conference Call** by phone or Skype rather than driving to meetings. This reduces fuel and other travel costs, vehicle maintenance and hire cost, increases productivity through reduction in hours lost through unnecessary travel;

- Facilitate **Flexible Working Arrangements** for non-front line staff to work remotely from home or nearer home facilities for one or more days a week thus removing or reducing any journey to work. This reduces congestion which has beneficial impacts for delivery times, reduced business costs and thus economic benefits. Additionally, provides social benefits through improved work life balance for employees, reduces local air quality and reduced emergency vehicle response times.
- **Switch Fleet to Low Emission Vehicles**: The government is providing £80m funding to encourage installation of EV charging points until 2020. Eligible businesses, charities and public sector organisations with off street parking for staff or vehicles fleets can apply for vouchers to redeem costs of electric vehicle charge-points. There is a limit of 1 voucher per applicant; however, applicants with a 'franchise' may apply for up to 20 franchisees. There is an approved charge points list and a list of authorised installers. https://www.gov.uk/government/collections/government-grants-for-low-emission-vehicles#workplace-charging-scheme
- 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/travel/driving-advice

- http://www.theaa.com/driving-advice/fuels-environment/drive-smart

- http://www.dft.gov.uk/vca/fcb/smarter-driving-tips.asp

- **Reduce air pollution from open fires and wood-burning stoves.** Advice is available from Defra on choosing the right stove, using the right fuels and maintenance enabling householders to reduce their impact on their health and air quality from open fires and wood burning stoves. Further information is available on the Smokeless Zones and Public Advice pages on WRS website.

Air pollution can affect all of us over our lifetime however certain groups will be more sensitive to the effects of air pollution. Vulnerable groups include adults and children with lung or heart conditions such as asthma, chronic bronchitis, emphysema and

chronic obstructive lung disease (COPD)[4,5]. Senior citizens are more likely to be affected by respiratory diseases and children are more likely to be affected by air pollution due to relatively higher breathing and metabolic rates as well as a developing lung and immune system.

Vulnerable individuals and groups can keep informed of:

- Current levels and forecasts of air pollution from Defra at https://uk-air.defra.gov.uk/.
- If you are sensitive to the effects of air pollution, it may be appropriate to limit the length of time spent in areas of local poor air quality – see advice from Defra at https://uk-air.defra.gov.uk/air-pollution/daqi.
- If you are on social media, sign up to the WRS Twitter feed. WRS tweet when pollution is forecast by Defra to be moderate to very high.

Further information for the general public on reducing your family's exposure to poor air quality in Worcestershire and how individuals, business and schools can assist with reducing their impact on local air quality can currently be found at http://www.worcsregservices.gov.uk/pollution/air-quality/public-advice.aspx .

[4] http://www.breathelondon.org/

[5] https://www.londonair.org.uk/LondonAir/guide/MyActionsForMe.aspx

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1 Local Air Quality Management

This report provides an overview of air quality in Worcester City Council during 2018. 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 Worcester City Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Worcester City Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-management-areas.aspx.

Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA(s).

A Detailed Assessment of an area within London Road and Sidbury, Worcester was completed by Air Quality Consultants (AQC) on behalf of Worcester City Council in July 2017. The AQC report concluded that an area at the western end of London Road should be declared as an AQMA. A copy of AQC (July 2017) 'Detailed Assessment of Air Quality along London Road, Worcester' (ref: J2829A/1/F1) is available to download from WRS website at http://www.worcsregservices.gov.uk/pollution/air-quality/local-air-quality-progress-reports.aspx.

Long term trend measurements and automatic analyser results up to 2017 within Foregate Street, The Butts and The Tything, Worcester indicate that requirement for a new AQMA declaration of this combined study area would likely be confirmed by Detailed Assessment. Following the fast track AQMA declaration option set out in Defra 2016 Policy Guidance LAQM.PG(16) Worcester City Council considered it appropriate to move directly onto options for declaration of AQMA in this study area.

WRS produced a report with 5 potential options for AQMA areas in the city for consideration by Worcester City Council. On the 8th January 2018 the Council's Environment & Licensing committee decided in favour of declaration of the whole district as an AQMA.

A public consultation period on the proposal for a council boundary wide AQMA was undertaken between February and April 2018. Two responses were received within the consultation period: from Worcestershire County Council Highways department and Highways England.

The draft legal declaration order for a district wide AQMA and order for revocation of the existing AQMAs was approved by Worcester City Council Environmental and Licensing committee on 10th December 2018. The orders will be formalised and provided to Defra in due course.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan		
						At Declaration	Now	Name	Date of Publication	Link
Bridge Street/ Dolday AQMA	20/03/2009	NO2 Annual Mean	Worcester City	City Centre one way system	NO	39.3 µg/m^3	47.73 µg/m^3	Air Quality Action Plan for Worcestershire	Sep-13	http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx
Lowesmoor/ Rainbow Hill AQMA	20/03/2009	NO2 Annual Mean	Worcester City	A key bus and commuter corridor into City	NO	44.3 µg/m^3	41.17 µg/m^3	Air Quality Action Plan for Worcestershire	Sep-13	http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx
St Johns AQMA	26/09/2014	NO2 Annual Mean	Worcester City	Key corridor on west side of city and River Severn	NO	43 µg/m^3	42.73 µg/m^3	AQAP Progress Report April 2015-16	Sep-16	http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx

☒ **Worcester City Council confirm the information on UK-Air regarding their AQMA(s) is up to date**

2.2 Progress and Impact of Measures to address Air Quality in Worcester City Council

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

Defra Report Submission Website reports current status as 'waiting to be checked by appraisal team'.

Worcester City Council has taken forward a number of direct measures during the current reporting year of 2018 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. More detail on these measures can be found in the Worcestershire Air Quality Action Plan and updates at http://www.worcsregservices.gov.uk/pollution/air-quality/air-quality-action-plan.aspx.

Key completed measures in 2018 are:

1. **City Centre Masterplan**

Worcester City Council has commissioned the development of a Masterplan for its City Centre, to drive regeneration, economic diversification and growth. Following stakeholder engagement in autumn 2017, a draft Masterplan has been produced by consultants Node on behalf of the council. A public consultation on the draft Masterplan was undertaken from 15th October to 12th November 2018. The final Masterplan is due to be adopted by Places and Economic Committee in 2019 following the outcome of the consultation. Details of the draft plan can be found via the following link: https://www.worcester.gov.uk/masterplan.

Addressing congestion and movement issues within the city, which impact on local air quality, are at the core of the Masterplan ambitions. The geographical area of the Masterplan boundary encompasses the Dolday AQMA, Lowesmoor and The Butts, Foregate and The Tything area. Rainbow Hill, London Road and St Johns areas are outside the boundary of the Masterplan.

In general, potential beneficial actions on local air quality within the Masterplan are considered to be:

- Development opportunities that include the replacement of numerous surface level car parks with multi storey car parking at strategic points; and
- Development opportunities and public realm enhancements supporting more active movements around the city e.g. walking and cycling.

2. Worcester City Council Task & Finish Group

On 26th July 2017 Worcester City Council Environmental and Licensing Group voted to set up a Task and Finish Group to look into actions to improve air quality in the city. The group comprised council members from three political parties, council officers, representatives of the Director of Public Health (DoPH) and Worcestershire County Council Highways.

WRS Technical Services officers facilitated the group, and provided technical advice and expertise on air pollution and potential measures to the group. This included significant review of latest literature and developments in each subject area, and presentation of available data and potential impacts of various measures in the context of local areas.

The group met four times between January and July 2018 and discussed options for improving air quality in the following subjects:

- Lowering Emission Strategy
- Improving Emissions from Taxis
- Electric Vehicles and Charging Infrastructure
- Clean Air Zones (Charging and Non Charging)
- A Strategy for Freight in the City

- A Bus Quality Partnership - Prioritising uptake of low emission vehicles
- Future car parking strategy - Promotion of public transport and centre fringe car parks

In 2018, WRS prepared a summary report of Worcester City Task & Finish Group work and recommendations for future air quality improving measures. The final report was approved by Worcester City Council Environment and Licensing Committee in January 2019. The approved recommendations are as follows:

Every decision that the Council makes should be considered for the impact that it has on the air quality. Recent changes to Committee Report templates require consideration for Health and Safety implications and this should include air quality).

(i) That the Council consider instructing all Departments to consider Air Quality impacts (as a Health and Safety implication) in the development of every Council Policy, formal Decisions and key projects made by the Council.

In relation to electric vehicle (EV) infrastructure, there is a need to target residential streets where residents would be restricted in having electric vehicles because they rely on on-street parking or shared parking provision and where areas of poor air quality could significantly benefit. If installation of EV infrastructure can be identified as viable in a section of the city, options for funding should be explored and bids prepared. WRS Officers will be able to work with City Council colleagues to identify air quality impact:

(ii) That the Council consider instructing Officers from Place and Community Services Directorate to consider the feasibility of installing Electrical Vehicle Infrastructure for residential streets in the most appropriate locations for air quality;

The important role car parking provision plays in supporting the economy of the city centre as well as impacting on air quality is recognised. The location and form of Parking Provision within the City Centre Master Plan should be considered in relation to air quality impact by Parking Services with support from WRS and Worcestershire County Council Highways Department.

(iii) That the Council consider instructing Parking Services to take full consideration of air quality in proposals for car parking in the City Centre;

In order to continue to lead by example, the City Council should investigate whether the operation of ULEV pool cars could be procured for the use by Council staff in addition to the ULEVs currently used for specific roles.

(iv) That the Council consider instructing the Facilities and Assets Team to investigate the feasibility of procurement and operation of ULEV pool cars and report their findings to the Council;

As the Licensing Authority the Council has control on the standard of taxi's operating in the City. The financial and air quality impact should be explored and where appropriate support funding bids:

(v) That the Committee instruct WRS to investigate the feasibility and impact of imposing an emission standard for Taxis licensed by the City Council;

In order to demonstrate the Council's Commitment to progress its Air Quality Action Plan, improve air quality and support potential funding bids to do this, it is recommended that a Low Emission Strategy is drafted and presented for potential adoption by the Council.

(vi) That the Committee instruct WRS to draft a Low Emission Strategy for adoption by the Council to include all the recommendations agreed by the Committee.

It is anticipated the recommendations of the report will form much of the content of a new AQAP for Worcester City following formal declaration of the city wide boundary AQMA in 2019.

Worcester City Council's priorities for the next 12 months are:

- Declare council boundary wide AQMA and revoke existing AQMA's.
- Finalise and adopt Worcester City Centre Masterplan and Transport Strategy.
- Begin work on progressing Environment and Licensing Committee recommendations from the final Task and Finish Group report.
- Work will begin on producing a new AQAP for Worcester City following declaration of a district wide AQMA to incorporate the recommendations of the Environment and Licensing Committee.

The principal challenges and barriers to implementation that Worcester City anticipates facing are resourcing and funding sources for potential significant improving actions and measures, such as implementation of a Lowering Emission Strategy for example.

In July 2017 Defra and DfT Joint Air Quality Unit (JAQU) published their detailed 'UK plan for tackling roadside nitrogen dioxide'. Within this plan, and the previous 2015 plan, 5 authorities were mandated to implement a CAZ in addition to Greater London, and a further 23 local authorities were required to produce strategies to accelerate compliance with the air quality objectives in their areas following the governments preferred options for mitigation e.g. CAZ Framework.

A further 33 local authorities have since been required to produce feasibility studies on accelerating compliance following a High Court order. In the autumn budget 2017, the chancellor announced a £220 million Clean Air Fund to support those local authorities and the people and businesses affected by these local plans.

Worcester City Council is not one of these named councils and therefore has not been prioritised for access to that funding. There is no comparable funding for local authorities not named in those UK plans that have similar, sometimes even worse, areas of poor air quality identified under the LAQM regime. However, the most effective solutions to resolving areas of poor air quality within these non-mandated local authority boundaries, such as Worcester City, are likely to be the same as outlined in UK plans requiring significant resource to enact. For example a Lowering Emission Strategy or Clean Air Zone will require a working group to implement these projects, and potentially sub groups working on specific actions drawing on expertise and interest from many local authority disciplines (such as highways, planning, environmental, sustainability) and local businesses and affected groups contributing such as bus companies, taxi companies, freight representatives, retailers, and residential representatives. These are significant projects requiring significant resource including funding.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, it is anticipated that further additional measures will be required in subsequent years to achieve compliance and enable the revocation of the proposed district wide AQMA.

2.2.1 Worcestershire County Council Highways Improvements

- **LTP4 Worcester schemes from National Productivity Investment Fund (NPIF)** – The St Johns Scheme and Dolday signal upgrades have been completed. Croft Road zebra crossing to a signalised crossing is virtually complete at the time of writing. London Road improvements at the Wylds Lane/Sebright Junction and Waitrose Junction have now been completed, which have involved equipment upgrades and full revalidation of both junctions to optimise efficiency. A detailed design has been identified for the Sidbury/Commandery Junction with delivery due to commence in July 2019.

- **Local Transport Plan Scheme W1 (Worcester Rainbow Hill/Astwood Road/Bilford Road/Blackpole Road Key Corridor of Improvement)** – Worcestershire County Council is currently looking to bring forward this scheme in 2019. This will initially involve a full study of this congested corridor, which includes Lowesmoor and Rainbow Hill. It is expected that this study will identify a number of schemes to improve traffic flow, which should act to mitigate unreliable journey times and poor air quality along this corridor. This study will be commissioned in 2019 and delivery of resultant schemes will be pursued upon study completion.

- **Electric Vehicle Infrastructure Strategy** – Worcestershire County Council are currently considering introduction of an EV strategy for Worcestershire. This will consider all ULEVs including electric, hydrogen, and Compressed Natural Gas (CNG). It is anticipated that WCC will consult with stakeholders such as WRS and the district councils on requirements and potential policy in 2019.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
NAWC1	Develop and implement Worcester City Centre Masterplan and complementing Low Emission Strategy	Traffic Management	UTC, Congestion management, traffic reduction	Worcestershire County Council, Worcester City Council, WRS	2015 - 18	Unknown	Masterplan - potentially reduced vehicle movements in some key areas through car parking provision strategy, realm enhancements supporting walking and cycling. Uptake of ULEV through implementation of Council Task & Finish Group recommendations ii), iv), v) and vi) Low Emission Strategy	Reduced emissions - not quantifiable at this time.	Consultation on Draft Masterplan for Worcester City ended 12/11/18. Worcester City Task & Finish Group recommendations for AQ improving measures required including future LES approved by Environmental and Licensing Committee in Jan 2019.	Masterplan improvements 20+ years. Lowering Emission Strategy and delivery of Task & Finish Group recommendations not yet determined.	Masterplan at early stages. Long time to implementation
5.2.10	Installing electric vehicle charging points	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	Worcester City Council, Worcestershire County Council	2013 - 2019	2014 onwards	Increase in availability of EV charging points and corresponding increase in use of electric vehicles	0 to 40%	Recommendations for installation of EV Charging Points on relevant planning consents formalised in SPD. Council Task & Finish Group recommendation ii) 'consider feasibility of installing EV charging infrastructure for residential streets in appropriate locations for air quality'	WRS 'Technical Guidance Note for Planning' published in 2018. Timeline for implementation of Task & Finish Group recommendations unknown at this time.	Lack of prioritisation for funding opportunities for EV charging infrastructure for authorities unnamed in Govt AQAP.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
5.2.1	Bus Quality Partnership	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	Worcester City Council / Worcestershire County Council, First & other Local Bus Companies. Finding CBTF	2016-19	2018 onwards	Replacement of lower Euro standard buses on key city centre routes.	0 to 36%	Meetings with First Bus group July 2018	Currently unknown	Worcester is non profitable area for bus companies proving barrier to LEV investment locally. Requires LA subsidisation and/or enforcement .
5.2.2	Freight Quality Partnership – work with satellite navigation companies to route HGVs around AQMAs	Traffic Management	UTC, congestion management, traffic reduction	Worcestershire County Council	COMPLETED 2014 - 15	On-going.	Fewer HGVs travelling through AQMA	Reduces Emissions	Ongoing	On-going duty under Traffic Management	Can take time for information to filter down to users
LRH7 / 5.1.1	Alteration to traffic light phasing - Lowesmoor Improvement scheme. Renewed enforcement of an existing TRO restricting all vehicles, with the exception of buses at certain times of day	Traffic Management	Strategic highway improvements and congestion reduction	Worcestershire County Council,(MTE - self funding)	2013 - 14	completed Jan 2015	Improved flow of traffic through Lowesmoor. Reduced congestion. Reduced volume of traffic.	5 - 10%	Implemented January 2015. Initial data indicated a 74% reduction in non-permitted vehicles travelling along AQMA during restricted peak times. County Council currently exploring a number of approaches to deliver Moving Traffic Enforcement (MTE) in a number of places including Lowesmoor	No date currently for enforcement cameras. Could occur as part of Masterplan implementation of revised strategic road network	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
5.3.4	Promote flexible working arrangements	Promoting travel alternatives	Encourage/facilitate home-working	Worcestershire County Council, Superfast Worcestershire	N/A	On-going	Increase in number of people able to work from home	Reduce emissions	94% Superfast Broadband coverage across County. 69,212 properties able to access superfast broadband	96% coverage by Dec 2019	Potential reticence from companies to allow employees to WFH. Further actions on hold to prioritise emerging strategic plans and strategies.
5.1.7	Signage to avoid AQMA	Traffic Management	Other	Worcestershire County Council	Phase 4 of A4440 works 2017-2019	2019-2021	Decrease in number of strategic journeys through AQMA	Reduce emissions	Phase 3 of A4440 works due completion early spring 2019. VMS around City completed 2016	2021	Lengthy timeline to implement
5.1.4	Variable Message Systems	Traffic Management	Other	Worcestershire County Council	2015	2015 - 2016	Decrease in traffic movements through AQMA	Reduce emissions	Completed	2016	
5.1.1	Major signalling infrastructure updates at St Johns, St Clements, Croft Road, Dolday, Sidbury, Commandery Road and London Road	Traffic Management	UTC, Congestion management, traffic reduction	Worcestershire County Council, National Productivity Investment Fund	2017	2017-2019	Improve network efficiency and accessibility for all modes of transport	Reduce emissions	Funding secured	2021	
5.1.5 /LRH5	Loading and unloading restrictions during peak traffic times (Lowesmo	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	Worcester City Council	2015-2016	2018-2019	Reduced incidence of loading and unloading during peak times	Reduce emissions	None	2019	Requires introduction and implementation of TRO. On hold to prioritise emerging strategic plans and strategies

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
	or/ Rainbow Hill)										
5.1.1/DD 3	Alteration to phasing of traffic light systems/J unction review (Dolday)	Traffic Managem ent	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Worcestershire County Council, Superfast Worcestershire	2013 - 14	COMPLETED 20/04/2015	Improved Traffic Flow	Reduce emissions	Completed.	COMPLETED	
5.5.1	Produce Air Quality Supplemе ntary Planning Document	Policy Guidance and Developm ent	Air quality planning and policy guidance	WRS and Worcester City Council	2016-2017	2017 2018	Formally adoption and utilised by Worcester City Council planning authority	Reduced emissions from new Develop-ments	WRS 'Technical Guidance Note for Planning' published on website in 2018 and provided to City Council late 2017.	Currently being considered by planning authority for formal adoption by City Council	Varying views on SPD from 6 different local authorities hampering adoption of single SPD by LAs
5.2.4	Railway Enhance ments - new Worcester shire Parkway Station	Transport Planning and Infrastruct ure	Public transport improvements- interchanges stations and services	Worcestershire County Council, Worcestershire Local Enterprise Partnership	2014 - 17	2018-19	Reduce commuter traffic destined for city central stations at Shrub Hill and Foregate Street	Reduce emissions	Station should be completed during summer and ready for Entry into Service process	end of 2019	
5.2.5	Greening Council Fleets	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV	Worcester City Council, Worcestershire County Council	2018-19	2019 Onwards	Increase in number of Council fleet and contractors vehicles of higher Euro	Reduced emissions	Task & Finish group recommendation iv) Facilities & Assets Team to investigate feasibility of procurement and operation of ULEV	Unknown at this time	Current building assets unlikely to be able to support EV charging infrastructure installation due to listed status and limited parking availability for

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
			recharging, Gas fuel recharging				Standard and/or utilising alternative fuels		pool cars		pool cars and infrastructure
5.3.6	Improve cycling and walking routes in local areas	Promoting Travel Alternatives	Promotion of cycling	Worcestershire County Council, Worcestershire Network Efficiency Programme, National Productivity Investment Fund	2017	2017-2019	Uptake in commuter journeys undertaken by cycle or walking	Reduce emissions	LTP4 (2017-2030) outlines a number of planned active corridors in Worcester City. Worcestershire County Council has secured funding from the NPIF to fund systemic enhancement of the main east-west corridor through Worcester City Centre (A44) including major investment in the St Johns area of the city, and infrastructure updates at Dolday, Sidbury and London Road. The city Masterplan includes 17 Public Realm enhancements including corridors and spaces, plazas, parks, bridges and crossings designed to make the city more walking and cycling friendly.	2020 for east west corridor	Effectiveness depends on individual motivation to modal shift
5.3.1	Travel Planning	Promoting Travel Alternatives	Personalised travel planning	Worcestershire County Council	2016	2017	Increased uptake of alternative modes of transport	Reduced emissions	Worcestershire County Council is delivering PTP services on behalf of developers. Building on best practice	On-going	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
									developed by the Council this proven tool encourages modal shift in new developments towards more sustainable and space efficient forms of transport.		
5.3.2	Car Sharing	Alternatives to private car use	Car and lift sharing schemes	Worcestershire County Council	2014 – 2015 COMPLETED	Liftshare Scheme launched Autumn 2015	Increase in number of people car sharing	<1%	Liftshare Scheme launched in Autumn 2015	Liftshare website scheme launched Autumn 2015. Currently operating	Following an initial surge in interest from public, use of service has slowed down
5.6.3	Air Quality Networks	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	Worcestershire Regulatory Services, Central England Environmental Protection Group (CEEPG), DEFRA LAQM Team	2017	2017 onwards	Improved cross boundary working between local authorities in West Midlands	Reduce emissions	WRS are member of regional environmental protection managers group (CEEPG) and member of Defra LAQM Team Local Authority Advisory Group both formed in 2017.	On-going.	Differing AQ issues, priorities and resources in regional authorities
5.4.1	Smarter Driving Tips	Public Information	Via the Internet	WRS and Worcestershire County Council	2017	2017	Increase in website hits	Reduce emissions	Advice page created for all groups affected by and impacting air quality and shared with County Public Health.	Updated March 2019	Effectiveness depends on behavioural change
5.45	Raise the profile and increase awareness of air quality within the region	Other	Other	WRS, Midland Joint Advisory Council (MJAC), Central England Environmental Protection Group (CEEPG), DEFRA LAQM Team	2014	2014 onwards	Improved cross boundary knowledge sharing between local authorities in West Midlands	Reduce emissions	WRS held position of Air Quality technical coordinator for MJAC 2014-17, member of CEEPG and member of Defra LAQM Team Local Authority Advisory Group both formed in 2017.	WRS was MJAC AQ Technical Coordinator 2014-17. MJAC/CEEPG Knowledge Hub group set up in 2017 delivered by joint working between WRS	Reduced AQ officers in regional authorities and resource

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
										and Cannock Chase DC. Member of LA advisory group to Defra LAQM team following invitation 2017.	
5.1.13	Alteration to Parking Provision	Traffic Management	UTC, Congestion management, traffic reduction	Worcester City Council, Worcestershire County Council	2018 - 2019	2019 - 2034	reduced traffic movements and congestion in inner city	Reduced emissions	City Masterplan Proposal: consolidate existing multiple single level surface car parking into fewer multi story car parks at strategic points	2034	Congestion may increase in interim period between sale of existing car park land and implementation of replacement multi storey car parks
5.6.8	Forge closer links with local health agencies	Other	Other	WRS and Worcestershire County Council	N/A	On-going	Increase participation of Public Health in Worcestershire Air Quality issues including Worcester City Task & Finish group	0	WRS officers to participate with Director of Public Health in formation of new County Air Quality Partnership in May 2019	On-going	
5.4.2	Provide link to real time air quality information	Public Information	Via the Internet	WRS and Worcestershire County Council	2017	2017	Increase in WRS Twitter subscribers	0	System put in place at WRS to tweet alerts when Air pollution ≥ 4 (Moderate) in any given 5 day forecast on Defra Daily Air Quality Index and shared with County Public Health representative	On-going	Limited to Twitter users
5.4.4	Make air quality information more available and accessible	Public Information	Via the Internet	WRS	2012	2012-2016	Website hits and enquiries for information	0	All existing LAQM reports and details of AQMAs are available to public on WRS website. Advice pages for all groups affected by and	On-going	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
									impacting air quality updated March 2019.		

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 with Worcester City for the 2018 calendar year. The average total $PM_{2.5}$ at 32 locations (centre points of 1km x 1km grids) across Worcester City is 8.62µg/m^3, with a minimum concentration of 8.01µg/m^3 and a maximum concentration of 9.85µg/m^3. This indicates that $PM_{2.5}$ concentrations within Worcester City are well below the annual average EU limit value for $PM_{2.5}$ of 25µg/m^3 and the average is below World Health Organisation limits also. The whole district area of Worcester City is a Smoke Control Area.

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 DoPH at 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 Worcester City Council in relation to the reduction of $PM_{2.5}$ levels. However, it is anticipated that the following planned measures to improve NO_2 levels across the district will likely result in a linked improvement in $PM_{2.5}$ levels:

Table 2.3 – Measures to Improve $PM_{2.5}$

Measure No.	Measure
NAWC1	Develop and implement Worcester City Centre Masterplan and combined Low Emission Strategy
5.2.10	Installing electric vehicle charging points
5.2.1	Bus Quality Partnership
5.2.2	Freight Quality Partnership – work with satellite navigation companies to route HGVs around AQMAs
5.3.4	Promote flexible working arrangements
5.1.7	Signage to avoid AQMA
5.1.4	Variable Message Systems
5.2.5	Greening Council Fleets
5.3.6	Improving cycling and walking routes in local areas
5.4.1	Smarter Driving Tips
5.1.13	Alteration to Parking Provision

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Worcester City Council did not undertake any automatic (continuous) monitoring during 2018.

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3.1.2 Non-Automatic Monitoring Sites

Worcester City Council undertook non- automatic (passive) monitoring of NO_2 at 38 sites during 2018. Table A.1 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on 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 (NO_2)

Table A.2 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2018 dataset of monthly mean values is provided in Appendix B.

Table B.1 shows the bias adjusted results and results calculated for distance back to nearest sensitive receptor where monitoring positions are not representative of locations appropriate to national objectives.

Table 3.1 below provides a summary of measured exceedances or concentrations recorded within 5% of the air quality objective (AQO) for nitrogen dioxide in 2018 following adjustments for annualisation and/or distance to relevant exposure where necessary and indicates if within an existing AQMA as of 2018 or not.

Table 3.1 - Summary of measured exceedances and borderline results in 2018

Site ID	Within AQMA Y/N	AQMA or Detailed Study Area	Bias Adjusted Measurement ($\mu g/m^3$)(1)
But1	N	The Foregate, The Butts & The Tything Study area	**44.36**
But2	N	The Foregate, The Butts & The Tything Study area	**52.43**
DDASH	Y	Dolday/Bridge Street AQMA	39.30
BrS2	Y	Dolday/Bridge Street AQMA	**47.73**
Tyn2	N	The Foregate, The Butts & The Tything Study area	**46.70**
Tyn	N	The Foregate, The Butts & The Tything Study area	**47.21**
Fos	N	The Foregate, The Butts & The Tything Study area	**44.00**
Lwm1	Y	Lowesmoor/Rainbow Hill AQMA	**41.17**
StJ1	Y	St Johns AQMA	**42.73**
LR3	N	London Road	**40.7**
LR5	N	London Road	**44.06**
BkC	N	The Foregate, The Butts & The Tything Study area	**46.94**

Annualised and calculated back to relevant receptor where appropriate. Exceedances shown in bold

3.2.1.1 Trends in NO_2 Monitoring Data

Figure A.1 in Appendix A shows the five year trend for NO_2 concentrations, adjusted for bias and annualised where applicable at all monitoring locations. NB this does not represent concentrations calculated back to relevant exposure. The figure demonstrates there have been increases in NO_2 at all monitored locations across the district between 2017 and 2018, consistent with trends across Worcestershire. This is

in large part attributed to the low bias adjustment factor of 0.77 applied to 2017 raw NOx tube data.

Following discussion with other Local Authorities and the National Physics Laboratory, WRS are aware that Defra published national bias adjustment factors for 2017 were 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.

Given the above it is considered more appropriate to compare the bias adjusted 2018 with 2014 to 2016 data. When comparing with 2016 bias adjusted and annualised results, the 2018 data shows a downward trend at 27 monitoring locations averaging 1.95 µg/m^3 reduction. However 8 monitoring locations demonstrated an increase of on average 1.15 µg/m^3 increase. Overall the results indicate an average decrease of 1.24 µg/m^3 and a 3% reduction from 2016 data.

Comparing the bias adjusted 2018 with an average of 2014 to 2016 data, the results show a downward trend at 20 monitoring locations averaging 2.16 µg/m^3 reduction. However, 15 monitoring locations demonstrated an increase of on average 1.20 µg/m^3 increase. Overall the results indicate an average decrease of 0.73 µg/m^3 and 1.89% reduction.

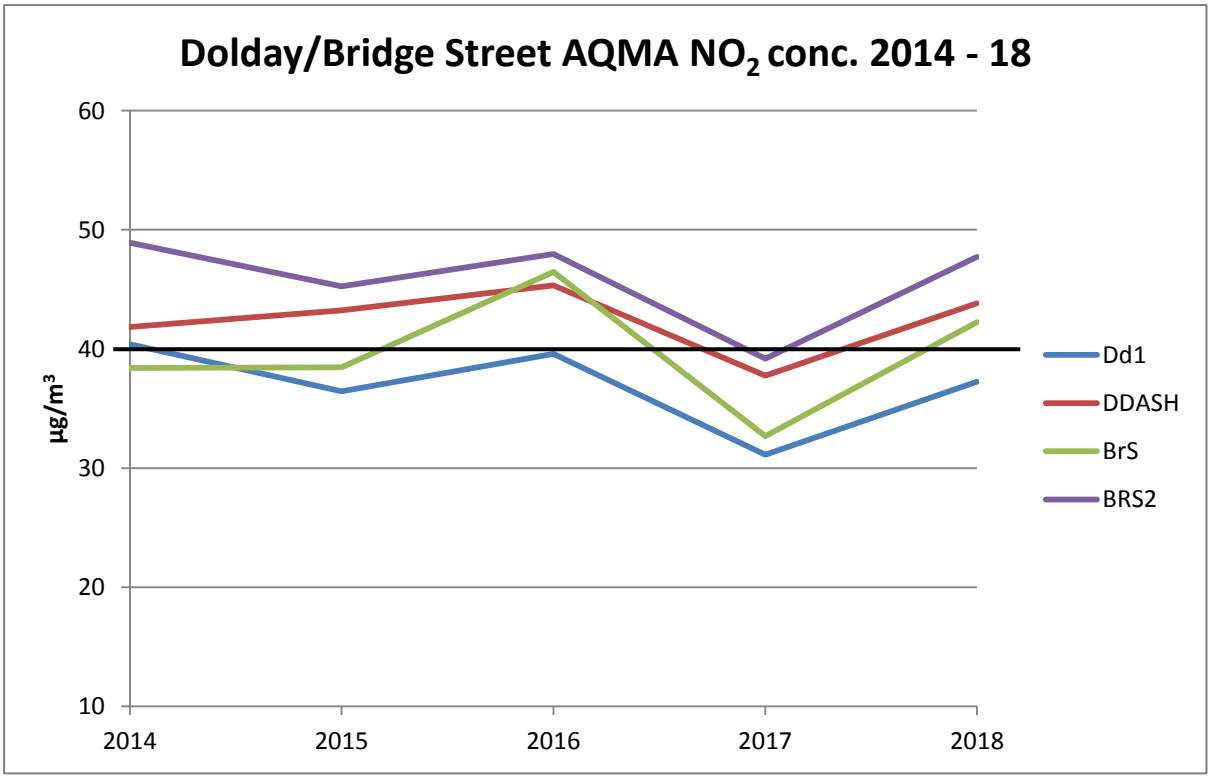
3.2.1.1 Dolday/Bridge Street AQMA

Concentrations exceeding 40 µg/m^3 have been recorded at the three monitoring locations within the AQMA in 2018. However following calculations from the monitoing locations back to relevant exposure where appropriate, only Loc.BrS2 demonstrates an exceedance of the AQO. The NO_2 concentration at relevant exposure when calculated back from monitoring Loc. DDASH remains within 5% of the AQO.

Figure 3.1 below demonstrates the five year trend for NO_2 concentrations at monitoring locations within the AQMA and Dd1 located just outside the boundary, following adjustment for bias. Concentrations within the AQMA demonstrate a similar picture to the overall trend across the district, a significant increase from 2017 measured data due to the low bias adjustment factor for 2017 as outlined above, but broadly similar to 2014 to 2016 measurements. The measured concentrations confirm the AQMA should remain in place at this time. There have been no changes to monitoring strategy within the AQMA in 2018.

The Dolday/Bridge Street AQMA will be revoked and replaced with a council boundary wide AQMA following Worcester City Councils decision in 2018.

Figure 3.1 - Long Term Trend Graph of NO_2 concentrations in Dolday/Bridge St. AQMA



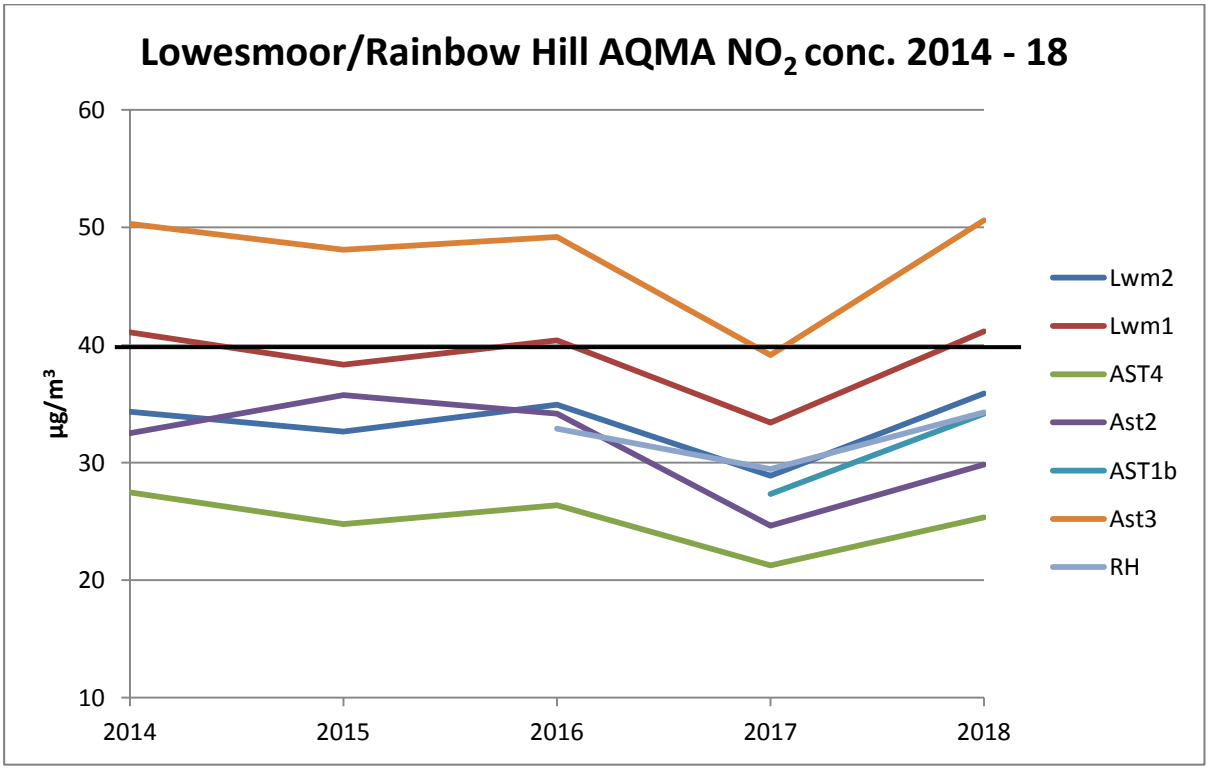
3.2.1.1 Lowesmoor/Rainbow Hill AQMA

Two locations, Loc. Lwm1 and Ast3, recorded concentrations exceeding 40 µg/m^3 within the AQMA in 2018. Loc. Ast3 recorded concentration of 37.90µg/m^3 from 50.62 µg/m^3 when taking concentrations at nearest relevant receptor into consideration.

Figure 3.2 below demonstrates the five year trend for bias adjusted NO_2 concentrations at monitoring locations within the AQMA following annualisation of 2018 Ast2 results. Concentrations within the AQMA demonstrate a similar picture to the overall trend across the district, a significant increase from 2017 measured data due to the low bias adjustment factor for 2017 as outlined above, but broadly similar to 2014 to 2016 measurements. The measured concentrations confirm the AQMA should remain in place at this time. There have been no changes to monitoring strategy within the AQMA in 2018.

The Lowesmoor/Rainbow Hill AQMA will be revoked and replaced with a council boundary wide AQMA following Worcester City Councils decision in 2018.

Figure 3.2 - Long Term Trend Graph of NO_2 concentrations in Lowesmoor/Astwood Road AQMA



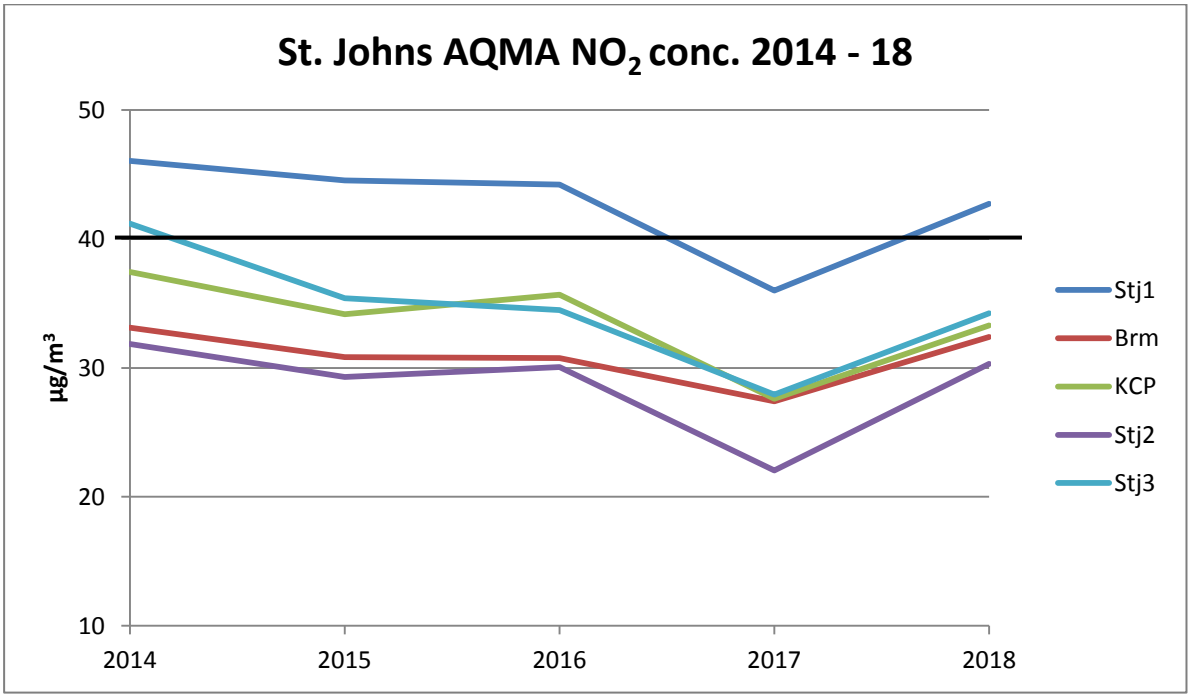
3.2.1.2 St Johns AQMA

One of the five monitoring locations, Loc. StJ1, within the St Johns AQMA measured an exceedance of the AQO in 2018.

Figure 3.3 shows NO_2 concentrations at monitoring locations within the AQMA following adjustment for bias. Concentrations within the AQMA demonstrate a similar picture to the overall trend across the district, a significant increase from 2017 measured data due to the low bias adjustment factor for 2017 as outlined above, but broadly similar to 2016 measurements. The measured concentrations confirm the AQMA should remain in place at this time. There have been no changes to monitoring strategy within the AQMA in 2018.

The St Johns AQMA will be revoked and replaced with a council boundary wide AQMA following Worcester City Councils decision in 2018.

Figure 3.3 - Long Term Trend Graph of NO_2 concentrations in St Johns AQMA



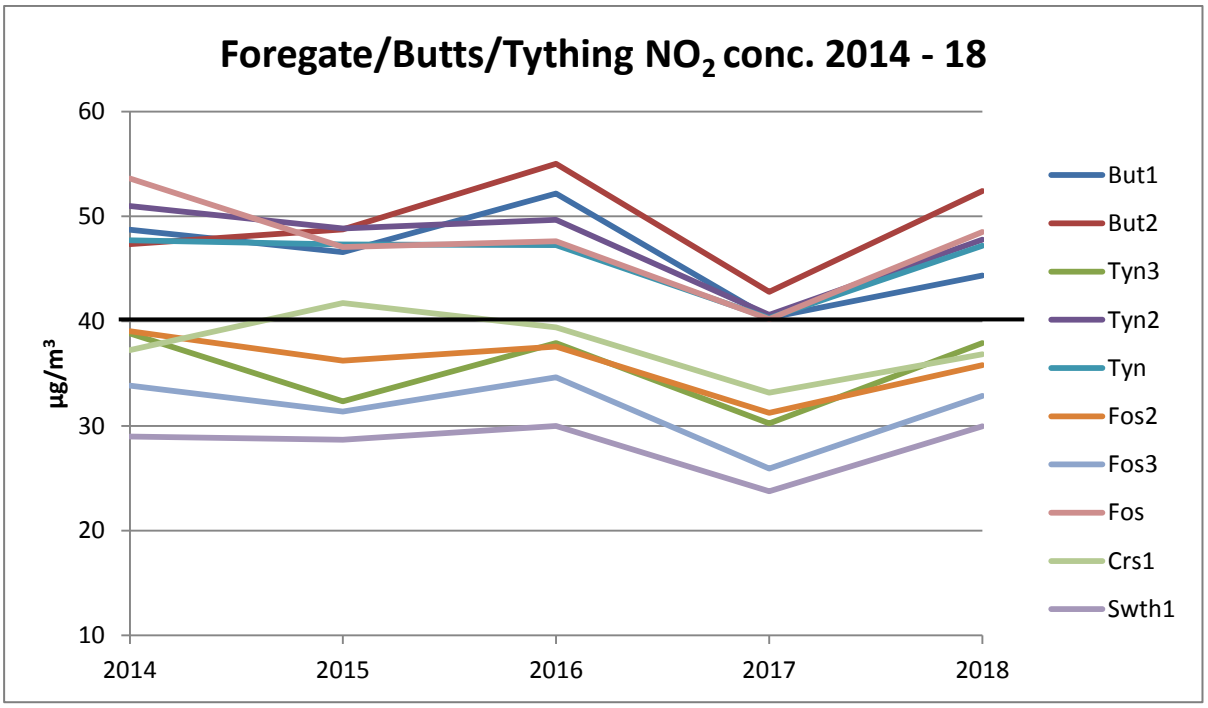
3.2.1.3 The Foregate, The Butts and The Tything, Worcester Combined Study Area

Of the eleven locations within the study area, six demonstrated exceedances of the AQO in 2018, when proximity to nearest receptors is taken into consideration. However, it should be noted 3 of these recorded measurements are at ground floor level with nearest receptors at first floor level.

Figure 3.4 below demonstrates the five year trend for NO_2 concentrations at monitoring locations within the study area following adjustment for bias. Measured concentrations demonstrate a similar picture to the overall trend across the district, a significant increase from 2017 measured data due to the low bias adjustment factor for 2017 as outlined above, but broadly similar to 2014-16 measurements. The measured concentrations confirm an AQMA covering these areas is required. The proposed council boundary wide AQMA will encompass this area.

Monitoring Loc.BkC replaced Loc.AQ1/2/3 in 2018.

Figure 3.4 - Long Term Trend Graph of NO_2 concentrations within the Foregate St./The Butts/The Tything Study Area



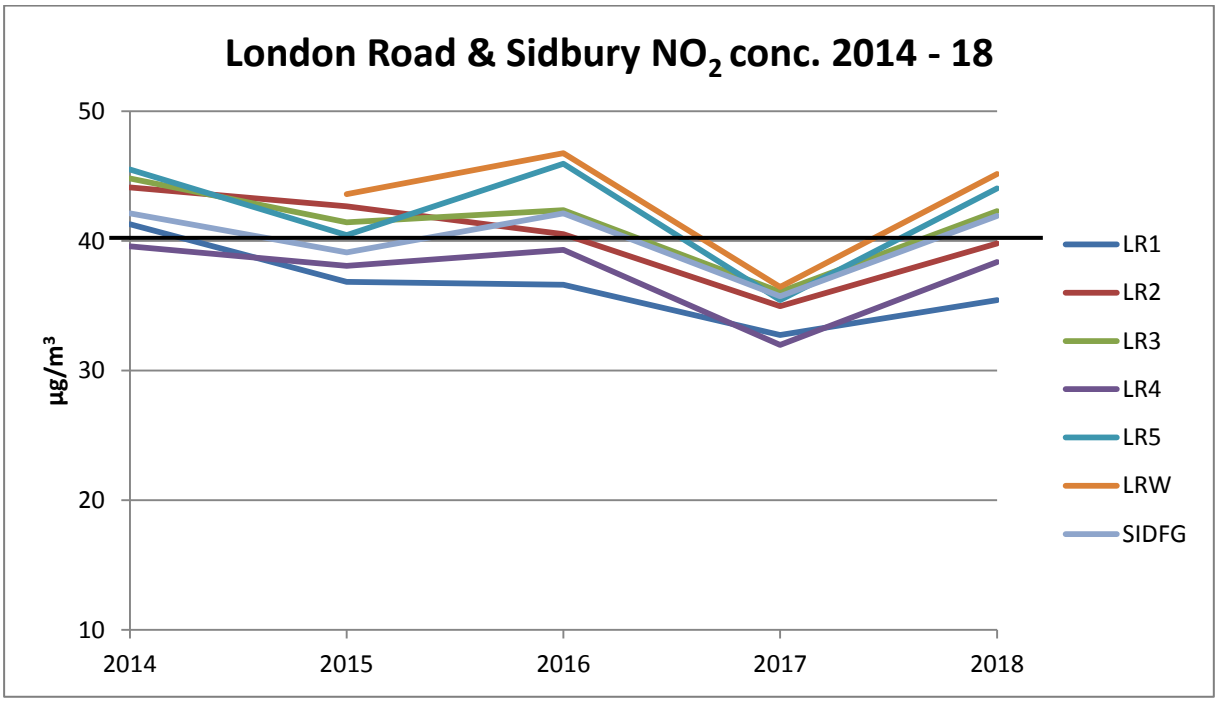
3.2.1.4 London Road/Sidbury Study Area

Four of the seven monitoring locations in London Road/Sidbury recorded concentrations exceeding 40 µg/m^3 in 2018. Following calculations for distance to relevant exposure only 2 locations, LR3 and LR5, demonstrate an exceedance of the AQO.

Figure 3.5 below demonstrates the five year trend for NO_2 concentrations at monitoring locations within this area following adjustment for bias. Concentrations within London Road and Sidbury demonstrate a similar picture to the overall trend across the district, a significant increase from 2017 measured data due to the low bias adjustment factor for 2017 as outlined above, but broadly similar to 2016 measurements. The measured concentrations confirm an AQMA covering the area identified by the AQC Detailed Assessment is required. The proposed council boundary wide AQMA will encompass this area.

There have been no changes to monitoring strategy within the London Road/Sidbury area in 2018.

Figure 3.5 - Long Term Trend Graph of NO_2 concentrations within the London Road/Sidbury Study Area



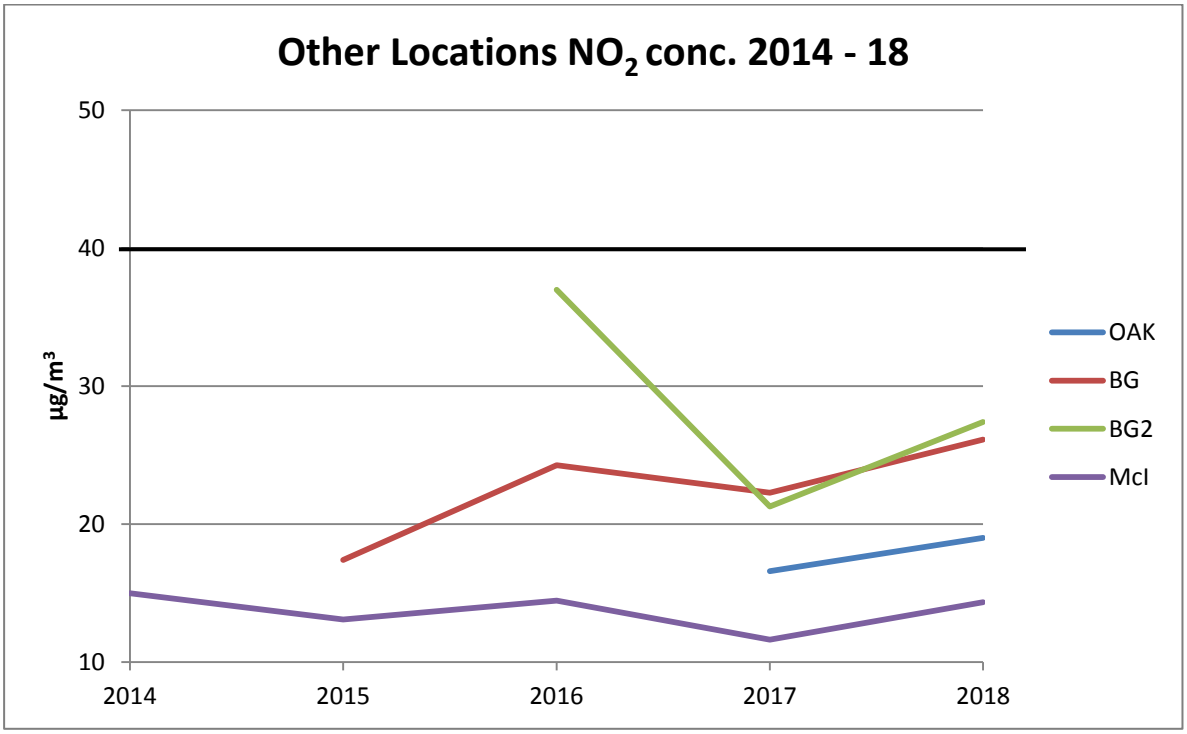
3.2.1.5 Monitoring outside's AQMA and Areas of Concern

No exceedances have been recorded at monitoring locations outside of current AQMA's and areas of concern in 2018 following bias adjustment.

Figure 3.6 below demonstrates the five year trend for NO_2 concentrations at other monitoring locations following adjustment for bias. Concentrations within the AQMA demonstrate a similar picture to the overall trend across the district with a significant increase from 2017 measured data due to the low bias adjustment factor for 2017 as outlined above. With exception of Loc.McI there is no discernible trend at these locations over the longer period.

There have been no changes to monitoring strategy in these locations.

Figure 3.6 - Long Term Trend Graph of NO_2 concentrations outside AQMA's and other areas of concern



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) (1,2)	Distance to kerb of nearest road (m) (3)	Tube collocated with a Continuous Analyser?	Height (m)
But1	Magdala Court, The Butts	Roadside	384776	255107	NO_2	No	0	1.15	No	2.5
But2	Magdala Court, The Butts	Roadside	384724	255086	NO_2	No	0	1.67	No	2.38
Dd1	Ambirak, Dolday 1 (opp. Bus Station)	Roadside	384652	254986	NO_2	Yes	N/A	2.18	No	2.17
DDASH	All Saints House	Roadside	384682	254924	NO_2	Yes	2	2.33	No	2.13
BrS	Bridge Street, John Gwen House	Kerbside	384666	254818	NO_2	Yes	2	0.66	No	2.21
BRS2	Bridge Street	Roadside	384695	254840	NO_2	Yes	1	1.96	No	2.06
Tyn3	No. 26 Upper Tything	Roadside	384679	255998	NO_2	No	0.1	2	No	2.22
Tyn2	Lamp & Flag PH Upper Tything (LP) 934	Roadside	384767	255606	NO_2	No	FF 1.29	2.28	No	2.21
Tyn	925 - HAMMERCHILDS, Upper Tything	Roadside	384833	255461	NO_2	No	FF 1.29	1.63	No	2.21
Fos2	Hewitt Recruitment, 35 Foregate Street	Roadside	384866	255367	NO_2	No	FF 1.36	3.2	No	2.14
Fos3	Café Mela, 22 Foregate Street	Roadside	384899	255329	NO_2	No	FF 1.03	2.21	No	2.47
Fos	Foregate Street / Shaw Street	Kerbside	384941	255140	NO_2	No	FF 1.19	1	No	2.47

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [1,2]	Distance to kerb of nearest road (m) [3]	Tube collocated with a Continuous Analyser?	Height (m)
Crs1	29 The Cross	Roadside	384967	255012	NO_2	No	FF 1.33	3.35	No	2.17
Swth1	St. Swithin's Street	Roadside	385013	254987	NO_2	No	FF 1.33	2.06	No	2.17
Lwm2	Lowesmoor 2 (City Walls Road end)	Roadside	385164	255134	NO_2	Yes	FF 1	1.86	No	2.5
Lwm1	Lowesmoor 1 Rainbow Hill End	Roadside	385268	255191	NO_2	Yes	FF 1	1.43	No	2.56
Stj1	1A St. Johns	Roadside	384137	254510	NO_2	Yes	FF 1.48	2.7	No	2.02
Brm2	10 Bromyard Road	Roadside	383967	254481	NO_2	No	0	8.8	No	1.9
KCP	King Charles Place	Roadside	384016	254399	NO_2	Yes	FF 1.41	2.2	No	2.09
Stj2	The Fortune House, 65 St. Johns	Roadside	384013	254356	NO_2	Yes	FF 1.53	2.22	No	1.97
Stj3	The Bell, 35 St. Johns	Roadside	384046	254424	NO_2	Yes	FF 1.53	2.05	No	1.97
McI	McIntyre Road	Suburban	383454	254606	NO_2	No	4.5	1.24	No	2.28
AST4	246 Astwood Road	Roadside	386097	256565	NO_2	No	0	9.85	No	2
Ast2	Astwood Road 2	Roadside	385990	256365	NO_2	Yes	4	1.4	No	3.66
AST1b	LP5129 170/172 Astwood Road	Roadside	386022	256401	NO_2	Yes	5.5	3.5	No	2.05
Ast3	Astwood Road 3 Rainbow Hill	Roadside	385764	255968	NO_2	Yes	6.62	1.68	No	2.26
OAK	22 Oaklands	Roadside	387810	254993	NO_2	No	0	7	No	1.85
LRW	London Road Waitrose	Kerbside	386654	253761	NO_2	No	4	0.5	No	1.85

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1,2)	Distance to kerb of nearest road (m) (3)	Tube collocated with a Continuous Analyser?	Height (m)
LR1	London Road Bargain Booze LP 6569	Roadside	385636	254158	NO_2	No	2.9	1.63	No	2.12
LR2	London Road Royal Ct LP 6561	Roadside	385428	254238	NO_2	No	3	1.45	No	2.2
LR3	London Road /Commandery Rd	Roadside	385357	254272	NO_2	No	0.5	1.77	No	2.31
LR5	London Road Bus stop SL6554 opp. Bath Road	Roadside	385325	254329	NO_2	No	0.25	1.45	No	2.22
LR4	London Road SL6565 adj. No 61	Roadside	385525	254219	NO_2	No	3.1	1.86	No	2.06
SIDFG	Sidbury Street o/s Fisher German	Roadside	385146	254474	NO_2	No	FF 3.94	2.3	No	2.16
BG	West View Broomhall Green	Urban Background	386297	252150	NO_2	No	0	36	No	1.9
BG2	Near 17 Broomhall Green	Roadside	386165	252146	NO_2	No	5.3	5.1	No	2.3
RH	Nursery Rainbow Hill LP5196	Roadside	385420	255413	NO_2	Yes	7.8	1.45	No	2.43
Bkc	Berkeley Court, Foregate Street	Roadside	384948	255111	NO_2	Yes	0.16	4.12	No	2.46

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) FF indicates sensitive receptor is located on first floor of nearest property

(3) N/A if not applicable.

Table A.2– Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2014	2015	2016	2017	2018
But1	Roadside	Diffusion Tube	100	100	**48.74**	**46.59**	**52.18**	**40.32**	**44.36**
But2	Roadside	Diffusion Tube	100	100	**51.13**	**48.75**	**55.03**	**42.80**	**52.43**
Dd1	Roadside	Diffusion Tube	92	92	**40.39**	36.44	39.60	31.12	37.24
DDASH	Roadside	Diffusion Tube	100	100	**41.86**	**43.25**	**45.34**	37.75	**43.84**
BrS	Kerbside	Diffusion Tube	92	92	38.41	38.47	**46.46**	32.68	**42.25**
BRS2	Roadside	Diffusion Tube	100	100	**48.92**	**45.26**	**47.97**	39.18	**47.73**
Tyn3	Roadside	Diffusion Tube	100	100	38.82	32.35	37.90	30.23	37.90
Tyn2	Roadside	Diffusion Tube	100	100	**50.98**	**48.86**	**49.67**	**40.61**	**47.78**
Tyn	Roadside	Diffusion Tube	100	100	**47.71**	**47.31**	**47.26**	**40.28**	**47.21**
Fos2	Roadside	Diffusion Tube	100	100	39.05	36.24	37.58	31.26	35.81
Fos3	Roadside	Diffusion Tube	100	100	33.84	31.38	34.63	25.94	32.87
Fos	Kerbside	Diffusion Tube	83	83	**53.61**	**47.08**	**47.63**	**40.19**	**48.51**
Crs1	Roadside	Diffusion Tube	100	100	37.24	**41.72**	39.41	33.18	36.83
Swth1	Roadside	Diffusion Tube	92	92	28.98	28.69	30.00	23.75	29.96
Lwm2	Roadside	Diffusion	100	100	34.32	32.63	34.92	28.88	35.87

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2014	2015	2016	2017	2018
		Tube							
Lwm1	Roadside	Diffusion Tube	92	92	**41.09**	38.34	**40.41**	33.39	**41.17**
Stj1	Roadside	Diffusion Tube	100	100	**46.06**	**44.55**	**44.21**	35.99	**42.73**
Brm2	Roadside	Diffusion Tube	100	100	33.13	30.85	30.76	27.40	32.41
KCP	Roadside	Diffusion Tube	100	100	37.45	34.17	35.67	27.60	33.29
Stj2	Roadside	Diffusion Tube	100	100	31.85	29.31	30.06	22.05	30.32
Stj3	Roadside	Diffusion Tube	100	100	**41.18**	35.42	34.48	27.93	34.25
McI	Suburban	Diffusion Tube	100	100	14.99	13.08	14.46	11.63	14.32
AST4	Roadside	Diffusion Tube	100	100	27.47	24.78	26.36	21.26	25.35
Ast2	Roadside	Diffusion Tube	67	67	32.50	35.74	34.17	24.63	29.82
AST1b	Roadside	Diffusion Tube	100	100	-	-	-	27.32	34.17
Ast3	Roadside	Diffusion Tube	100	100	**50.32**	**48.10**	**49.20**	39.14	**50.62**
OAK	Roadside	Diffusion Tube	100	100	**-**	**-**	**-**	16.58	19.00
LRW	Kerbside	Diffusion Tube	100	100	**-**	**43.61**	**46.78**	36.44	**45.18**
LR1	Roadside	Diffusion Tube	92	92	**41.30**	36.85	36.63	32.75	35.45
LR2	Roadside	Diffusion Tube	75	75	**44.14**	**42.68**	**40.53**	34.96	39.82

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2014	2015	2016	2017	2018
LR3	Roadside	Diffusion Tube	100	100	**44.82**	**41.44**	**42.37**	36.09	**42.30**
LR5	Roadside	Diffusion Tube	100	100	**45.51**	**40.46**	**45.97**	35.45	**44.06**
LR4	Roadside	Diffusion Tube	100	100	39.58	38.08	39.31	31.98	38.38
SIDFG	Roadside	Diffusion Tube	100	100	**42.13**	39.11	**42.12**	35.73	**41.93**
BG	Urban Background	Diffusion Tube	100	100	-	17.41	24.26	22.28	26.13
BG2	Roadside	Diffusion Tube	75	75	-	-	37.00	21.27	27.39
RH	Roadside	Diffusion Tube	92	92	-	-	32.87	29.45	34.26
BkC	Roadside	Diffusion Tube	100	100	-	-	-	-	**46.94**

☒ **Diffusion tube data has been bias corrected**

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

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

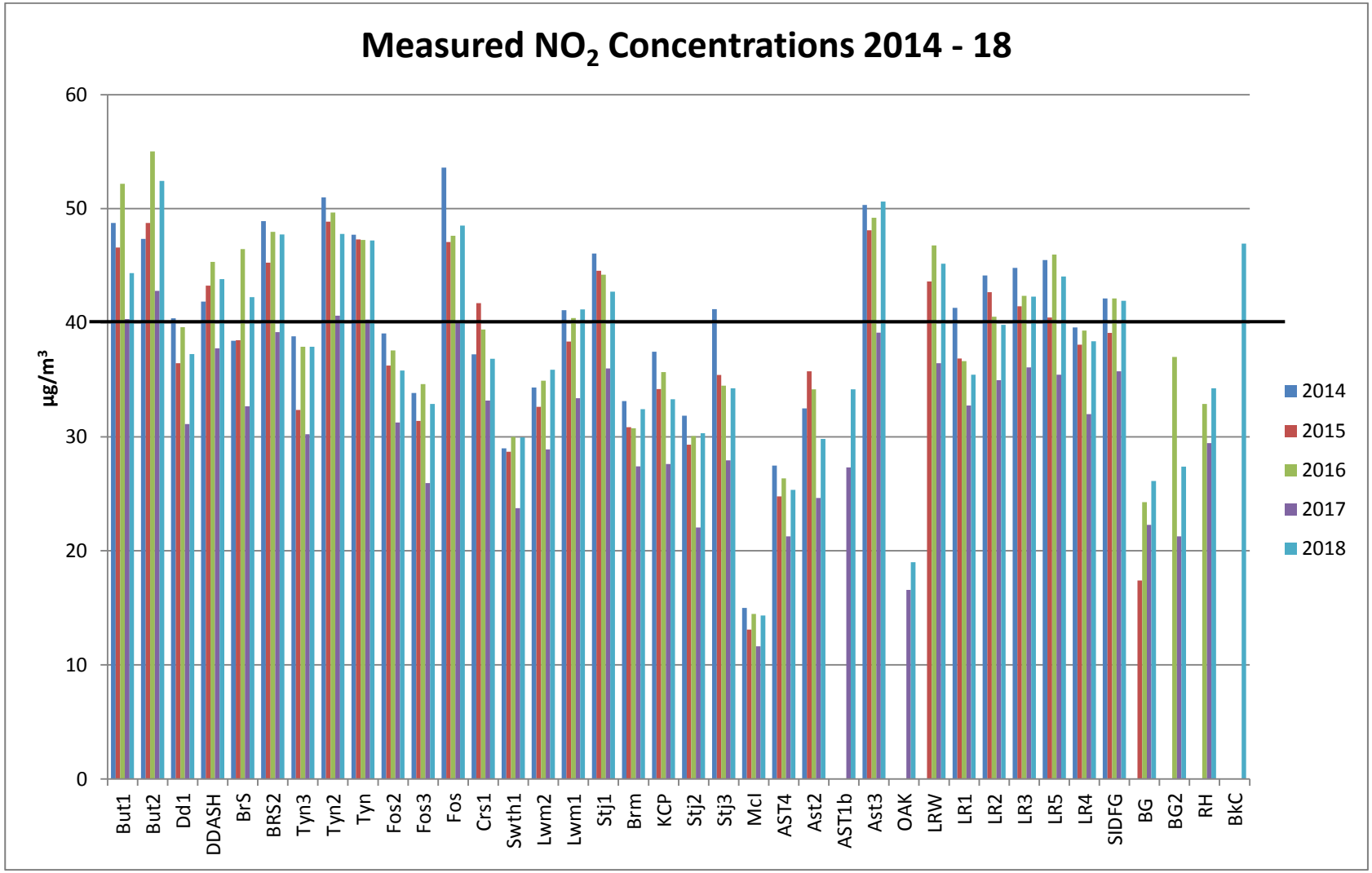
NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

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

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

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

Figure A.1 – Trends in Annual Mean NO_2 Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2018

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.89) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
But1	56.76	55.41	59.55	55.37	61.18	49.90	47.63	38.88	41.44	44.84	42.55	44.57	49.84	**44.36**	
But2	59.34	53.94	66.78	58.47	68.14	55.35	63.59	53.55	54.90	57.94	56.64	58.27	58.91	**52.43**	
Dd1	43.75	48.00	55.18	40.91	-	53.71	36.78	28.56	33.23	37.22	44.16	38.82	41.85	37.24	
DDASH	53.60	46.43	59.02	52.94	52.12	41.87	50.44	44.37	46.51	43.53	49.84	50.38	49.25	**43.84**	39.3
BrS	49.48	49.12	56.61	50.93	55.72	46.26	40.29	-	38.36	46.69	41.48	47.24	47.47	**42.25**	34.8
BRS2	55.92	54.14	67.83	56.28	64.93	51.43	52.68	43.92	44.41	47.22	53.54	51.23	53.63	**47.73**	
Tyn3	44.07	50.59	53.07	45.66	45.91	44.86	32.44	27.42	31.13	43.35	48.56	43.91	42.58	37.90	
Tyn2	62.50	52.11	60.60	54.54	54.12	46.79	51.53	47.28	52.49	52.52	52.49	57.18	53.68	**47.78**	**46.7**
Tyn	60.37	49.98	60.90	54.34	57.12	40.52	58.87	49.85	50.89	49.55	49.76	54.32	53.04	**47.21**	
Fos2	46.77	41.51	48.10	42.92	34.54	29.14	37.61	34.44	35.33	40.44	45.56	46.48	40.24	35.81	
Fos3	43.17	41.25	43.29	41.32	37.95	32.31	32.95	26.34	25.95	37.34	41.99	39.34	36.93	32.87	
Fos	57.60	54.04	63.09	60.33	60.93	-	52.10	-	46.26	50.32	48.47	51.95	54.51	**48.51**	**44.0**
Crs1	50.96	45.21	50.06	40.29	40.00	31.38	38.76	34.04	37.86	42.88	40.51	44.62	41.38	36.83	
Swth1	41.81	39.27	38.17	33.78	36.19	34.07	29.63	22.49	27.30	33.59	-	33.97	33.66	29.96	
Lwm2	45.29	46.33	49.16	41.68	41.25	37.70	34.61	28.07	33.54	38.35	44.72	42.91	40.30	35.87	

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.89) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
Lwm1	49.88	46.38	52.92	43.95	50.01	43.39	43.87	-	42.29	44.84	42.68	48.57	46.25	**41.17**	
Stj1	53.71	48.16	52.50	46.99	47.47	43.50	49.08	41.35	48.62	43.31	52.86	48.64	48.02	**42.73**	
Brm2	47.73	45.65	45.74	37.77	33.33	23.82	28.15	27.88	32.30	33.37	44.23	37.06	36.42	32.41	
KCP	39.24	43.74	42.21	38.34	38.32	29.31	36.38	33.49	36.96	37.34	36.53	37.02	37.41	33.29	
Stj2	33.08	39.18	42.15	37.34	37.55	30.30	29.39	23.80	27.29	33.93	40.43	34.34	34.06	30.32	
Stj3	38.99	41.55	48.07	40.24	41.72	35.79	36.19	29.56	29.25	38.96	43.03	38.47	38.48	34.25	
McI	21.16	21.34	21.52	16.91	12.22	10.81	10.45	10.18	10.62	16.19	23.00	18.75	16.09	14.32	
AST4	32.75	33.82	30.43	28.27	27.90	22.45	23.49	21.39	27.38	29.97	33.27	30.65	28.48	25.35	
Ast2	43.55	34.48	36.29	32.26	30.70	_	_	25.63	-	-	36.36	32.83	34.01	29.82	
AST1b	39.62	44.53	44.55	41.24	39.03	36.76	30.09	28.04	33.71	39.06	45.76	38.34	38.39	34.17	28.8
Ast3	60.13	66.20	60.57	56.63	53.94	54.89	53.10	44.80	53.01	60.80	61.32	57.12	56.88	**50.62**	37.9
OAK	27.10	24.45	25.46	21.66	17.48	14.17	16.06	16.62	18.97	22.59	26.69	24.90	21.35	19.00	
LRW	57.25	55.08	53.24	49.47	56.74	50.14	43.82	39.83	46.71	53.53	52.29	51.02	50.76	**45.18**	31.9
LR1	47.23	-	50.31	42.04	43.10	31.19	34.61	30.59	34.65	38.11	44.26	42.00	39.83	35.45	30.7
LR2	-	42.66	52.55	-	-	39.40	40.87	39.03	44.10	44.25	53.83	46.00	44.74	39.82	33.6
LR3	51.09	42.77	55.78	50.42	55.60	44.92	44.44	37.25	43.85	45.38	48.98	49.85	47.53	**42.30**	**40.7**
LR5	51.03	53.01	59.70	47.94	61.86	52.95	44.44	32.61	37.68	47.46	54.85	50.52	49.50	**44.06**	
LR4	47.29	47.08	53.07	43.28	45.90	43.27	40.74	33.30	35.15	44.19	41.67	42.53	43.12	38.38	33.0
SIDFG	52.51	46.27	57.29	48.61	51.95	43.10	49.36	38.19	41.81	45.68	44.12	46.48	47.11	**41.93**	35.3
BG	41.23	36.25	40.36	33.39	23.84	17.65	21.50	21.39	22.73	29.25	33.01	31.69	29.36	26.13	

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.89) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
BG2	32.29	-	36.91	31.26	23.79	28.96	27.08	24.08	-	-	40.48	32.13	30.78	27.39	23.6
RH	44.91	40.24	47.05	37.08	37.09	29.96	33.65	31.38	-	34.67	44.39	43.00	38.49	34.26	26.6
BkC	57.34	54.55	60.53	54.65	54.37	46.91	58.80	44.22	45.70	51.93	50.04	53.85	52.74	**46.94**	

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

☒ **Annualisation has been conducted where data capture is <75%**

☒ **Where applicable, data has been distance corrected for relevant exposure**

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.**

(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 of Diffusion Tube Monitoring

The following UKAS accredited company provides Worcester City 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. Under the AIR NO_2 PT (formerly WASP) Scheme Somerset Scientific Services performed 100% satisfactory for the period January to October 2018. Tube precision was 'Good' throughout 2018.

Bias adjustment

The bias adjustment factor applied to the results in 2018 was 0.89 (Spreadsheet Version No. 03/19) which were derived from the national studies.

Annualisation

Table C. 1 - Annualisation calculations for monitoring location Ast2 Astwood Road

Site	Site Type	Annual Mean	Period Mean	Ratio
Leamington Spa	Background Urban	17.50256812	17.51189838	0.999467204
Birmingham Acocks Green	Background Urban	17.70286413	17.33307455	1.021334332
Coventry Allesley	Background Urban	20.40629078	21.83980496	0.934362318
			Annualisation factor (Ra)	0.985054618
			Ast2 result	34.01
			Ast2 annualised	**33.50**
			Ast2 bias adjusted	**29.82**

Estimates of concentrations at the nearest receptor

If an exceedance is measured at a monitoring site (or close to the air quality objective) which is not representative of public exposure, Defra advise the procedure specified in Technical Guidance LAQM.TG(16) should be used to estimate the concentration at the nearest receptor where applicable. For consistency and purposes of demonstrating long term trends this procedure has been adopted for *all* monitoring locations which are not representative of public exposure. The results are presented in Figures C.1 to C.14 below and summarised in Table B.1.

Figure C.1 - Loc. DDASH - Distance from road to relevant exposure calculation

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	2.33	metres
Step 2	How far from the KERB is your receptor (in metres)?	4.33	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	13.76861	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	37.75	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	34.1	µg/m^3

Figure C.2 - Loc. BrS - Distance from road to relevant exposure calculation

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	0.66	metres
Step 2	How far from the KERB is your receptor (in metres)?	2.66	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	13.76861	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	32.68	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	27.8	µg/m^3

Figure C.3 - Loc. Tyn2 - Distance from road to relevant exposure calculation

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	2.28	metres
Step 2	How far from the KERB is your receptor (in metres)?	2.61	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	14.15297	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	40.61	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	*39.7*	µg/m^3

Figure C.4 - Loc. Fos - Distance from road to relevant exposure calculation

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	1.9	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	14.15297	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	40.19	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	*36.8*	µg/m^3

Figure C.5 - Loc. Ast1b - Distance from road to relevant exposure calculation

Enter data into the pink cells

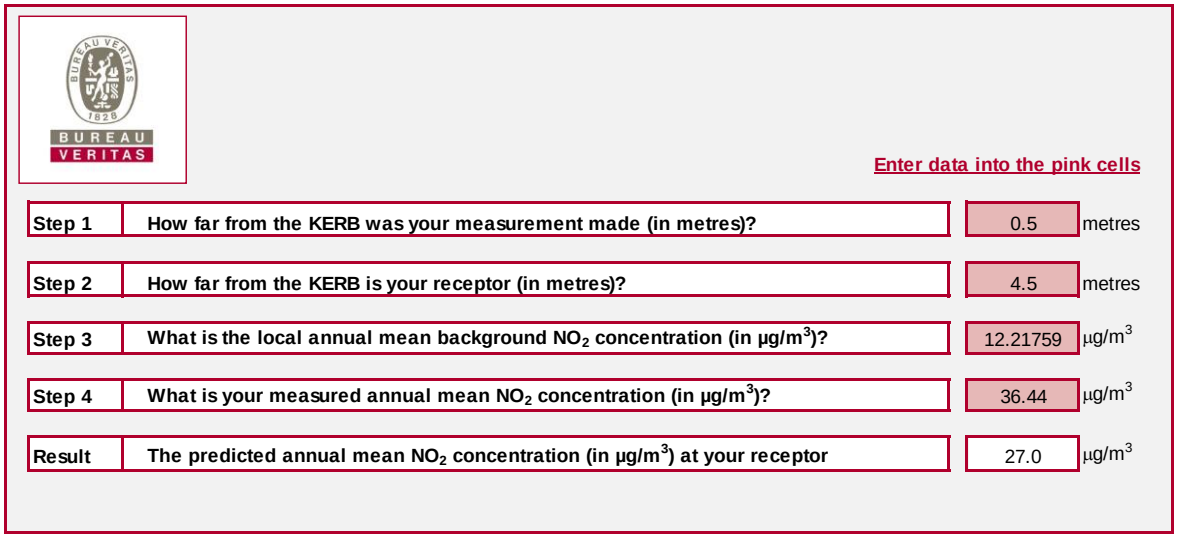
Step 1	How far from the KERB was your measurement made (in metres)?	3.5	metres
Step 2	How far from the KERB is your receptor (in metres)?	9	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	13.7022	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	27.3	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	23.8	µg/m^3

Figure C.6- Loc. Ast3 - Distance from road to relevant exposure calculation

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1.68	metres
Step 2	How far from the KERB is your receptor (in metres)?	8.3	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	16.10747	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	39.14	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	30.9	µg/m^3

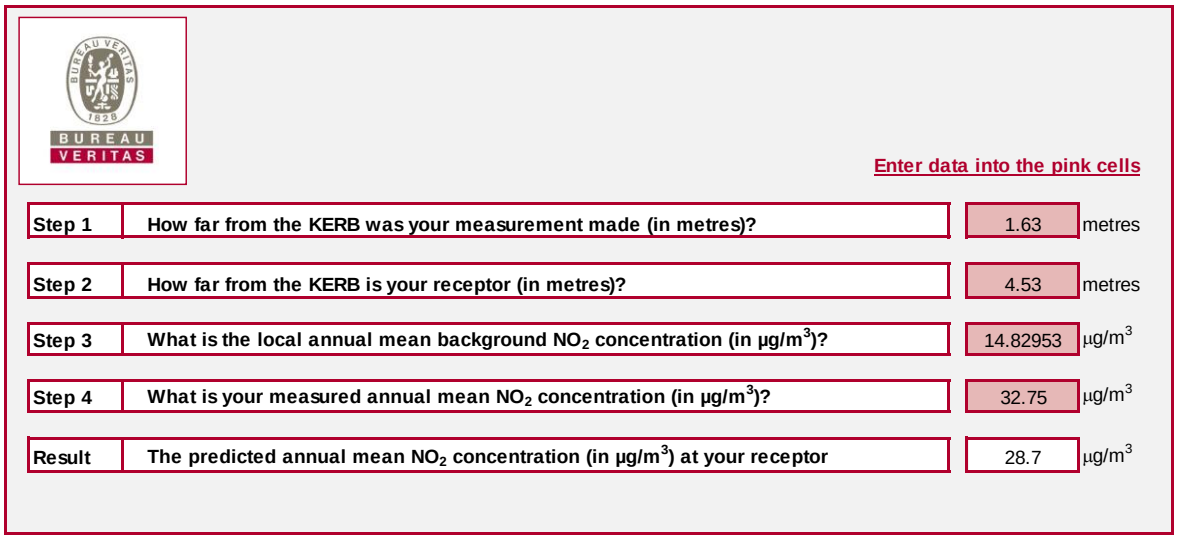
Figure C.7 - Loc. LRW - Distance from road to relevant exposure calculation



Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	0.5	metres
Step 2	How far from the KERB is your receptor (in metres)?	4.5	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	12.21759	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	36.44	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	27.0	µg/m^3

Figure C.8- Loc. LR1 - Distance from road to relevant exposure calculation



Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1.63	metres
Step 2	How far from the KERB is your receptor (in metres)?	4.53	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	14.82953	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	32.75	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	28.7	µg/m^3

Figure C.9 - Loc. LR2 - Distance from road to relevant exposure calculation

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1.45	metres
Step 2	How far from the KERB is your receptor (in metres)?	4.45	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	14.82953	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	34.96	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	30.0	µg/m^3

Figure C.10 - Loc. LR3 - Distance from road to relevant exposure calculation

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1.77	metres
Step 2	How far from the KERB is your receptor (in metres)?	2.27	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	14.82953	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	36.09	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	34.9	µg/m^3

Figure C.11 - Loc. LR4 - Distance from road to relevant exposure calculation

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1.86	metres
Step 2	How far from the KERB is your receptor (in metres)?	4.96	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	14.82953	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	31.98	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	28.1	µg/m^3

Figure C.12 - Loc. SidFG - Distance from road to relevant exposure calculation

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	2.3	metres
Step 2	How far from the KERB is your receptor (in metres)?	6.24	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	14.82953	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	35.73	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	30.7	µg/m^3

Figure C.13 - Loc. BG2 - Distance from road to relevant exposure calculation

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	5.1	metres
Step 2	How far from the KERB is your receptor (in metres)?	10.4	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	11.231	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	21.27	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	19.1	µg/m^3

Figure C.14 - Loc. RH - Distance from road to relevant exposure calculation

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1.45	metres
Step 2	How far from the KERB is your receptor (in metres)?	9.25	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	16.10747	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	29.45	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	24.1	µg/m^3

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

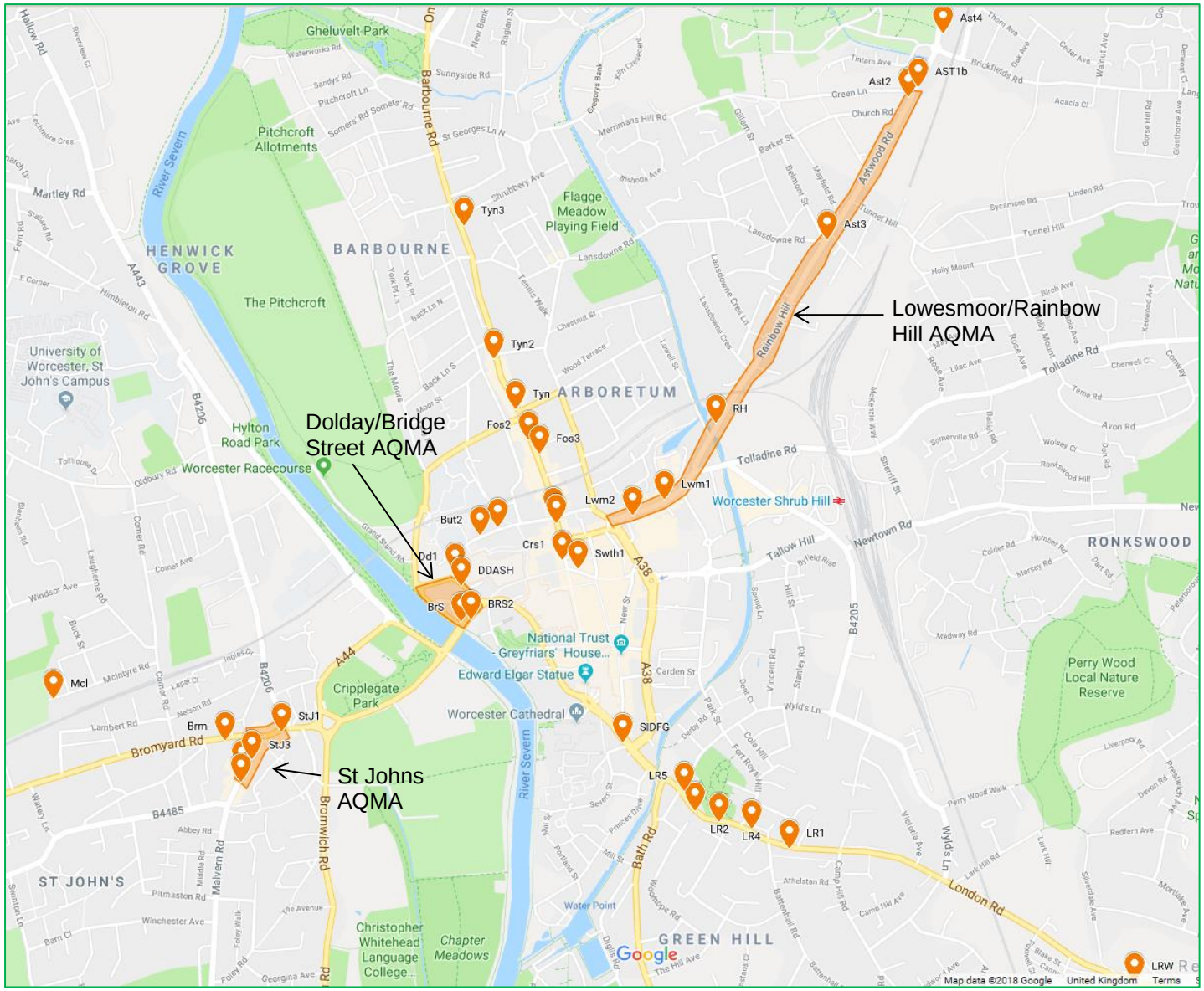


Figure D.1 - Overview of AQMAs and inner city monitoring locations

Figure D.2 - The Tything and The Foregate monitoring locations

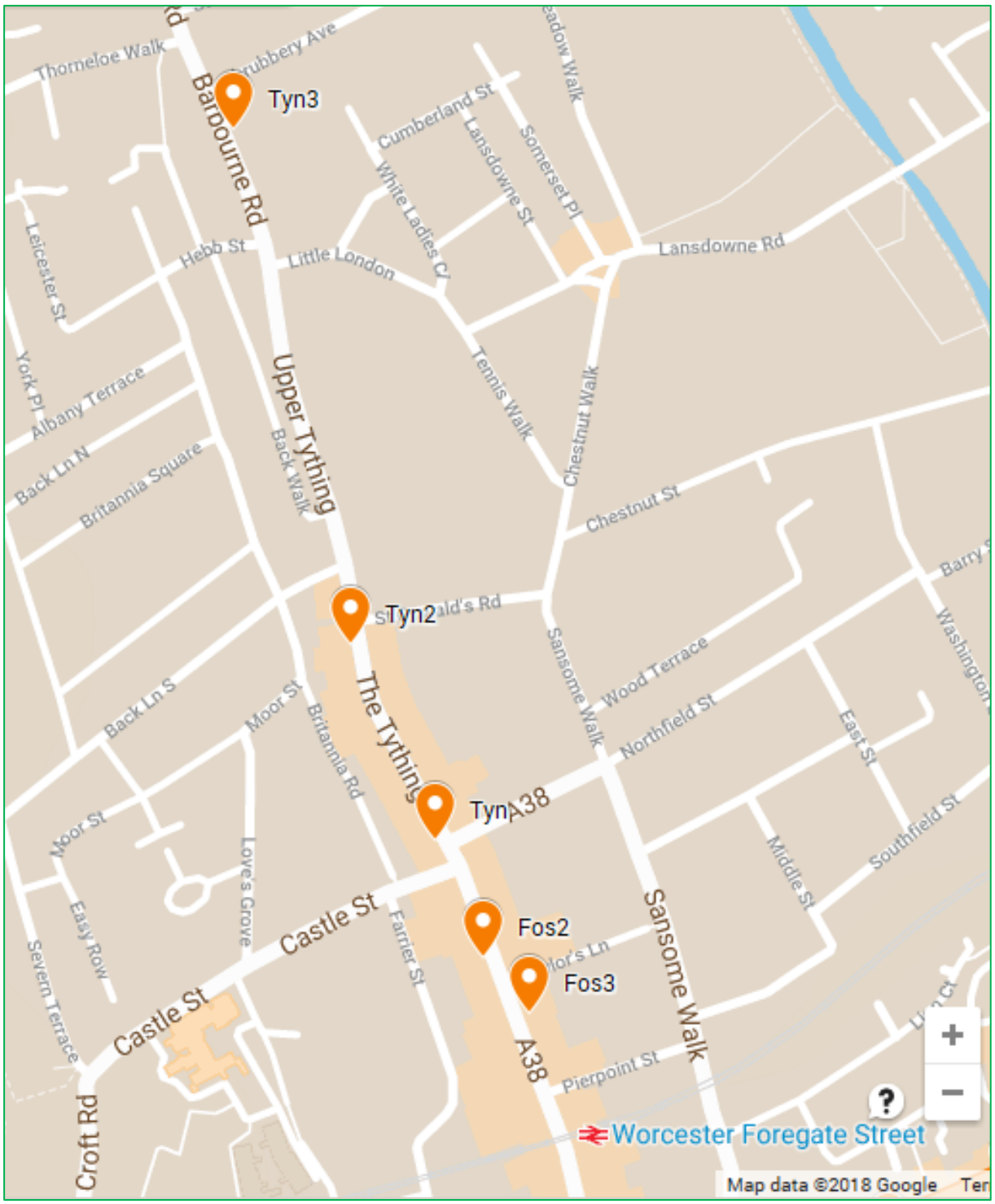


Figure D.3 - Dolday/Bridge Street AQMA and The Foregate monitoring locations

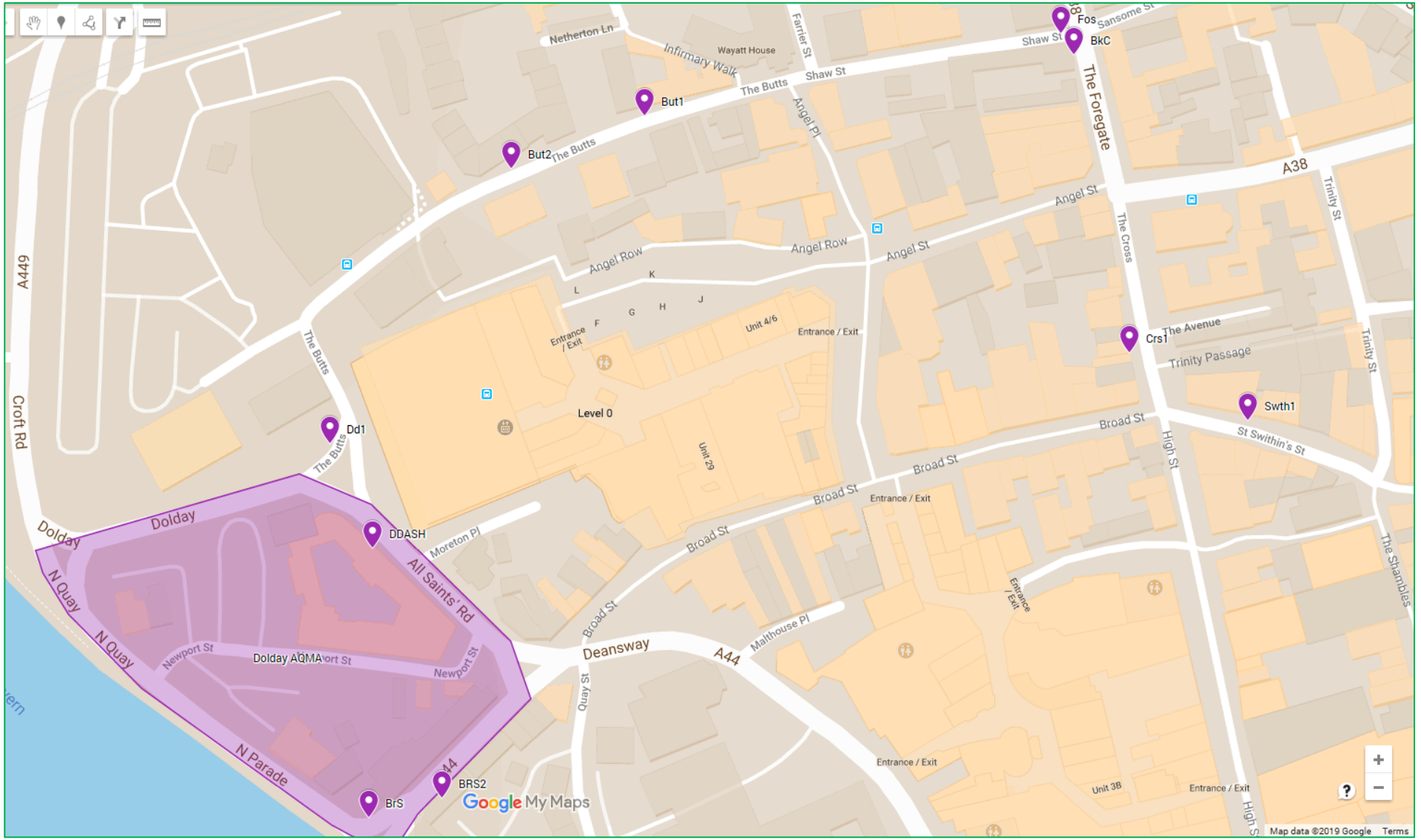


Figure D.4 - St Johns AQMA and McIntyre Road monitoring location

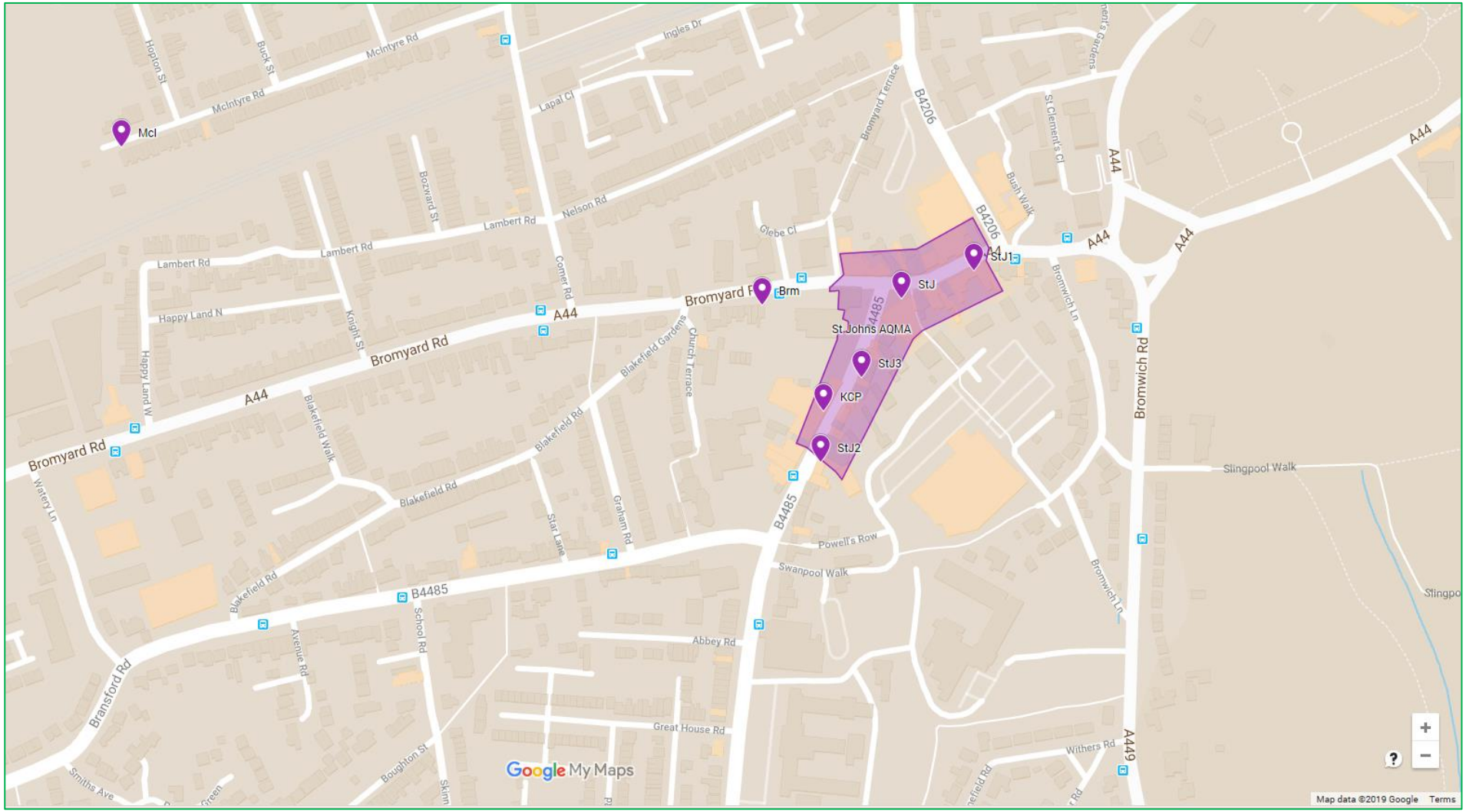


Figure D.5 - Astwood Road (north part of Rainbow Hill/Lowesmoor AQMA)

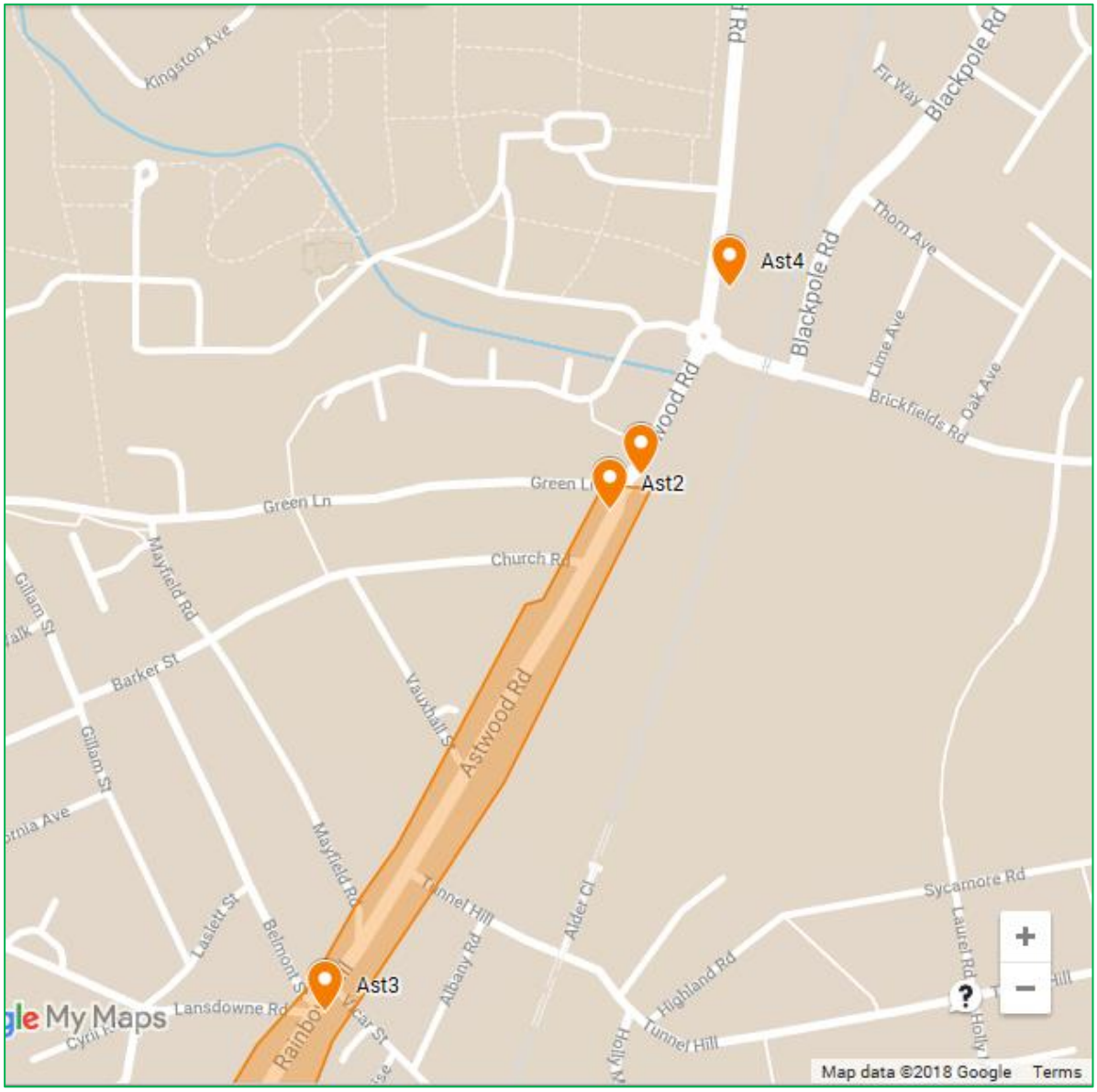


Figure D.6 - Southern part of Rainbow Hill/Lowesmoor AQMA monitoring locations

Figure D.7 - London Road/Sidbury monitoring locations

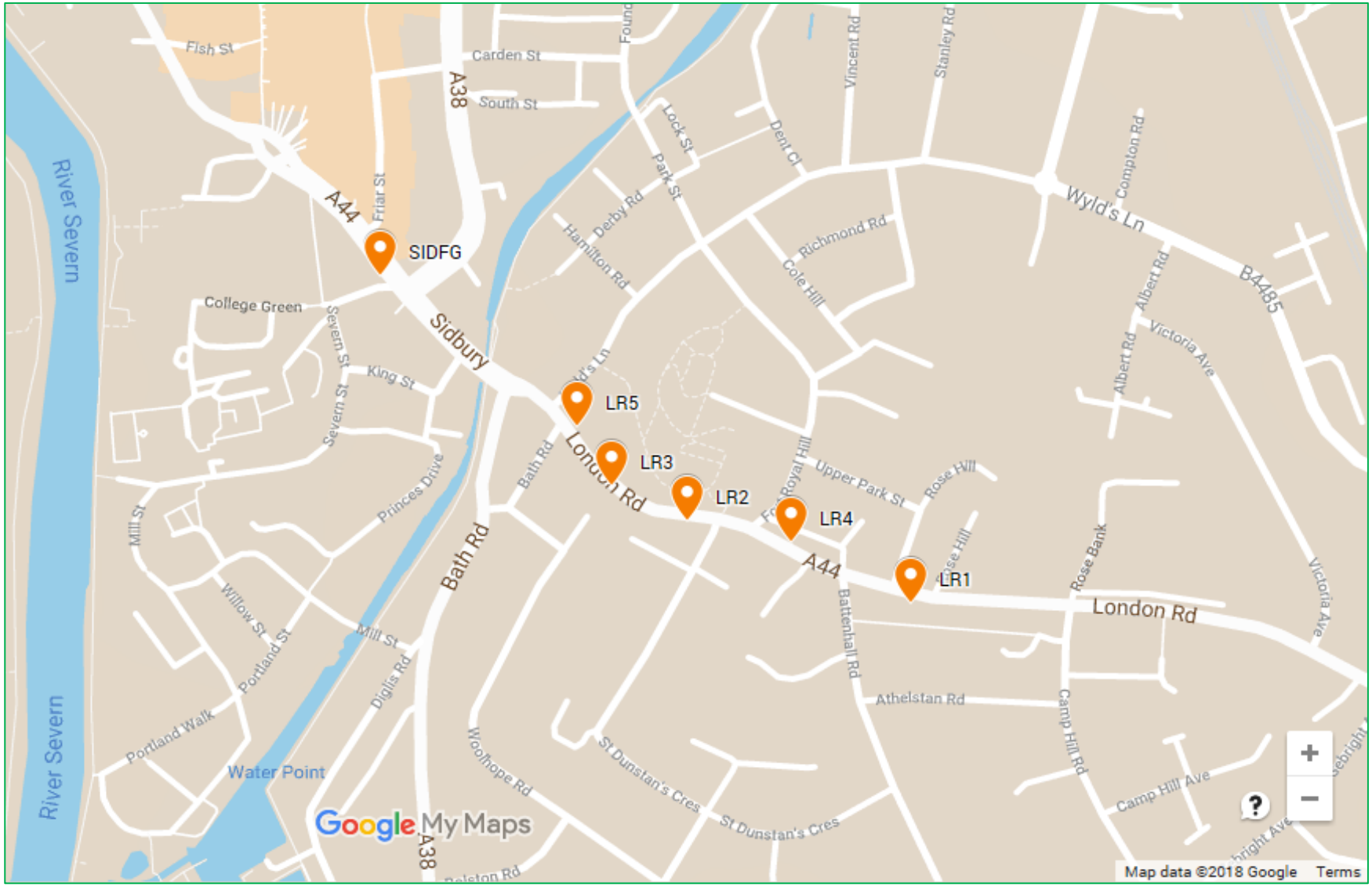


Figure D.8 - London Road (Waitrose) and Oaklands monitoring locations

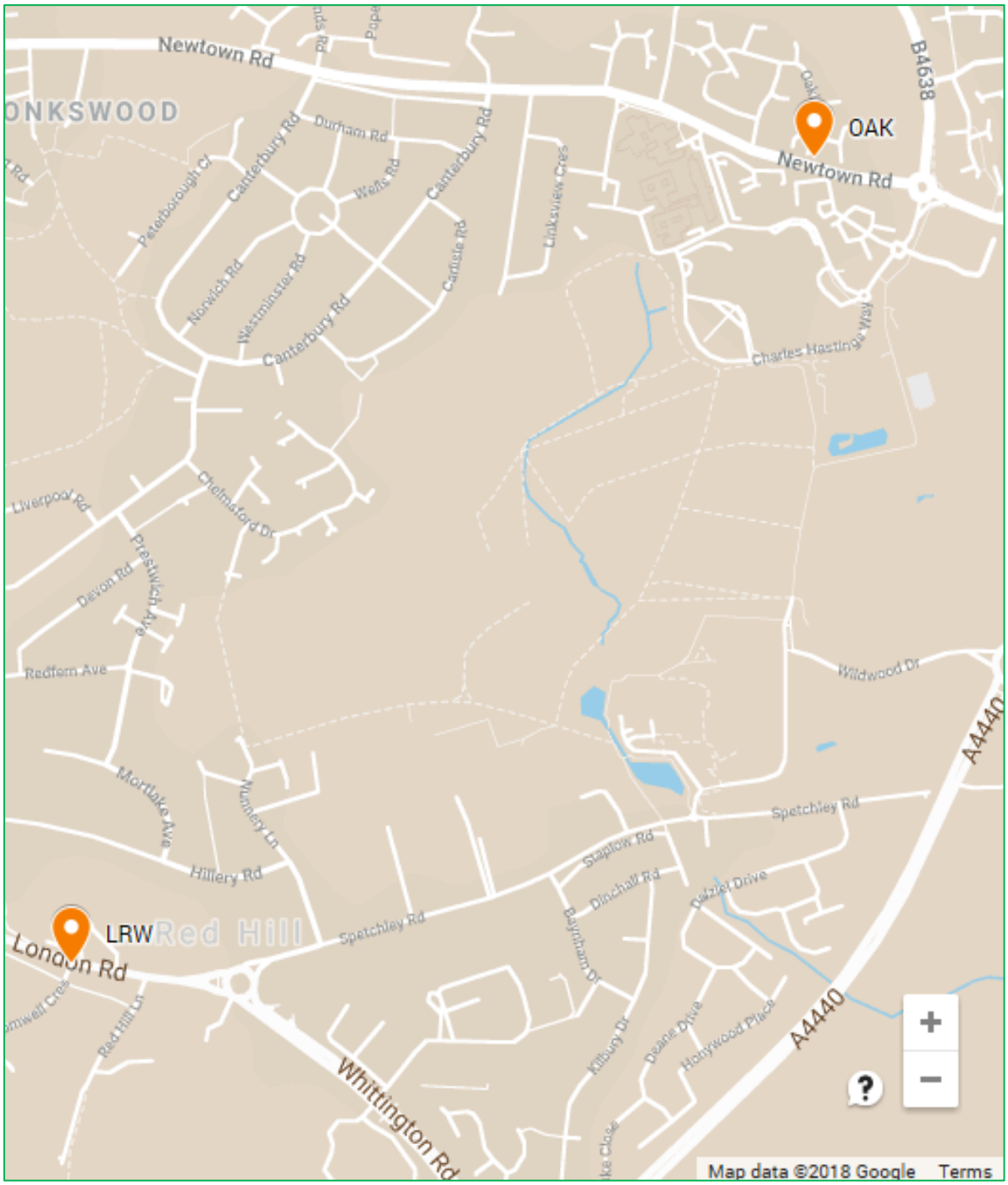
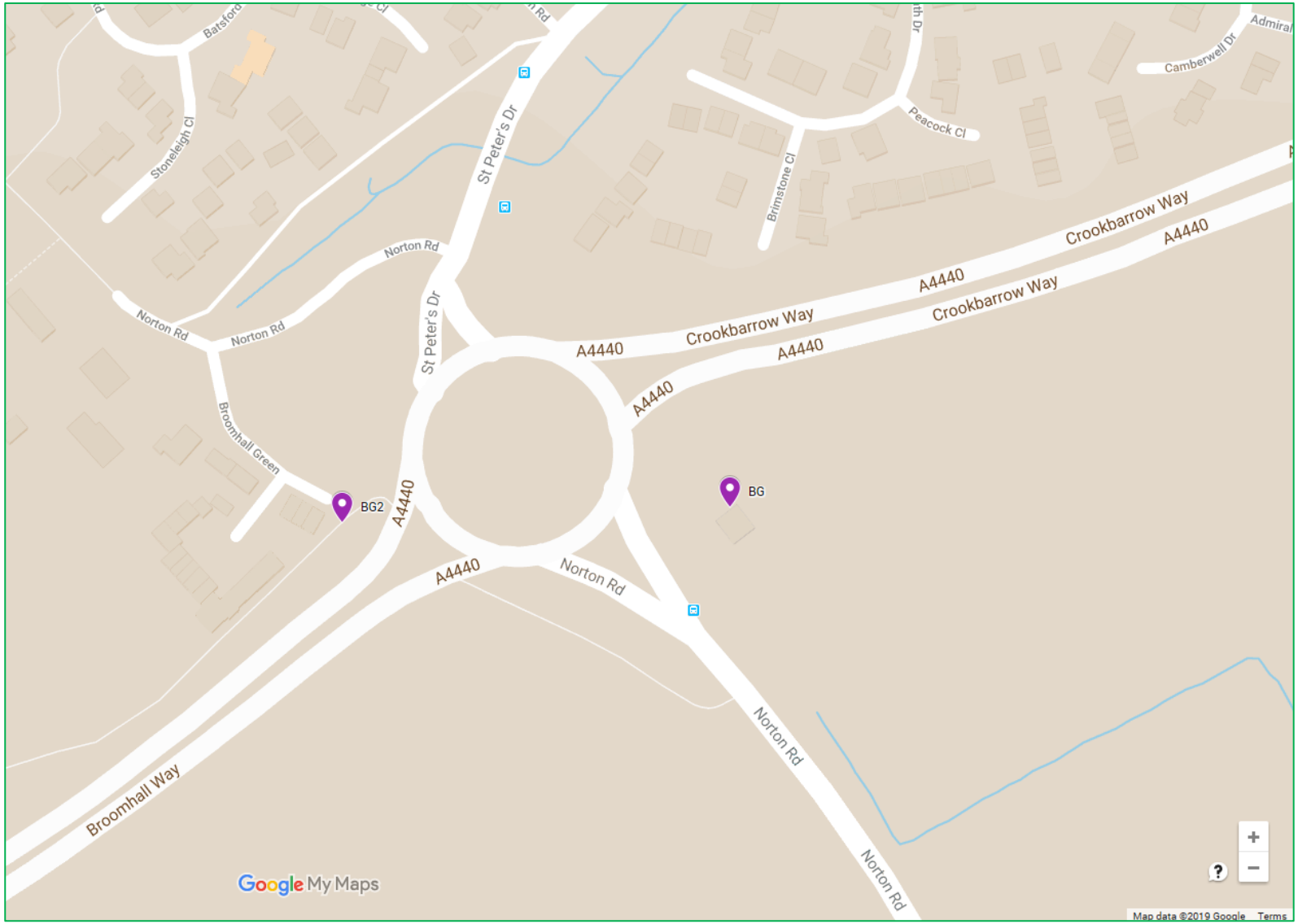


Figure D.9 - Broomhall monitoring locations



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[6]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

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

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
AQC	Air Quality Consultants (private consultancy)
AQO	Air Quality Objective
ASR	Air quality Annual Status Report
CAZ	Clean Air Zone
CBTF	Clean Bus Technology Fund
CEEPG	Central England Environmental Protection Managers Group
CNG	Compressed Natural Gas
COPD	Chronic Obstructive Lung Disease
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DoPH	Director of Public Health, Worcestershire County Council
EU	European Union
EV	Electric Vehicle
HGV	Heavy Goods Vehicle
IPPC	Integrated Pollution Prevention and Control
JAQU	Defra and DfT Joint Air Quality Unit
LAPPC	Local Authority Pollution prevention and Control
LAQAG	Local Authority Air Quality Advisory Group to Defra

LAQM	Local Air Quality Management
LAQM.PG(16)	Defra 2016 Local Air Quality Management Policy Guidance
LAQM.TG(16)	Defra 2016 Local Air Quality Management Technical Guidance
LES	Lowering Emissions Strategy
LTP4	Worcestershire County Council's fourth edition of the Local Transport Plan for the county
$\mu g/m^3$	Micrograms per metre cubed
MJAC	Midland Joint Advisory Council
MTE	Moving Traffic Enforcement
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPIF	National Productivity Investment Fund
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
PTP	Personalised Travel Planning
QA/QC	Quality Assurance and Quality Control
SPD	Supplementary Planning Document
TRO	Traffic Regulation Order
ULEV	Ultra Low Emission Vehicle
UTC	Urban Traffic Control
VMS	Variable Messaging System
WFH	Working from home
WRS	Worcestershire Regulatory Services

References

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3. Defra (2016) 'Local Air Quality Management Technical Guidance LAQM TG.(16)'
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10. WRS (2016) 'Air Quality Action Plan Progress Report for Worcestershire April 2015 – March 2016'
11. WRS (2017) 'Source Apportionment of Local Emissions of Nitrogen Dioxide in St. Johns Air Quality Management Area' (ref: StJSA FINAL)
12. WRS (2019) 'Technical Guidance Note for Planning v5.1'