2016 Air Quality Annual Status Report (ASR):

Warwick District Council

July 2016

Experts in air quality management & assessment

Document Control

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Executive Summary: Air Quality in Our Area

Air Quality in Warwick

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].

Warwick District is situated in the West Midlands, within the county of Warwickshire. To the south lies Stratford-on-Avon, to the east, Rugby, and to the north are Coventry and Solihull. The main towns in the district are Warwick, Leamington Spa and Kenilworth. The M40 runs through the district. The main air quality issues identified are in relation to road traffic, particularly at congested town centre locations within Warwick, Leamington Spa and Kenilworth. There are also a number of villages scattered throughout the rural parts of the district.

There are currently AQMAs declared in Warwick town centre and Coventry Road, Leamington Spa and 2 small AQMAs in Kenilworth. The Action Plan encompassing all these AQMAs was updated in 2015 and is reported on in this report. Warwick District Council is actively working to improve air quality in the district, through the implementation of the Action Plan, as well as implementation of the Local Transport Plan and in partnership with Planning and Public Health colleagues.

Actions to Improve Air Quality

Warwick District Council has taken forward a number of measures during the current reporting year of 2015 in pursuit of improving local air quality. As the Action Plan is still relatively new, many of the measures are still in the planning phase. One of the key groups of measures relate to those being implemented on the key corridors, which have been prioritised by Warwickshire County Council. Good progress is being made in relation to these proposals, with many of the detailed measures having some air quality impact. Detailed proposals are

[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

set out for 11 main corridors/ areas many of which align with AQMAs in the district. Each of the 11 areas include specific measures for junction / highway improvements, walking and cycling improvements, Park and Ride provision, bus priority measures as well as behavioural change measures. Most work has been undertaken on the A452 Europa Way 'Sustainable Spine' corridor which is the key route from the M40 in Leamington Spa and Warwick. Proposals are being worked on and funding being sought from large scale developments currently coming forward.

The measures being implemented through planning are also successfully moving forward. Planning applications are routinely being checked by the environmental health team and air quality assessments requested where relevant. Mitigation, based on the Low Emissions SPG is also routinely requested. In addition, an air quality assessment of the impacts of Local Plan development has been undertaken, which goes some way to assessing the potential cumulative impact of development outlined in the Local Plan.

Local Priorities and Challenges

Warwick District Council's priorities for the coming year are to continue with the work on the key transport corridors and continue in implementing the planning measures, as well as promoting low emission vehicles and infrastructure.

How to Get Involved

Members of the public can help improve air quality in the borough by travelling using sustainable transport options, such as walking, running, cycling and using public transport. Car sharing is also a relatively easy way to reduce private car use (https://carsharewarwickshire.liftshare.com/).

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1 Local Air Quality Management

1.1 This report provides an overview of air quality in Warwick during 2015. 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.

1.2 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 exceedence 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 Warwick District Council to improve air quality and any progress that has been made.

1.3 The statutory air quality objectives applicable to LAQM in England can be found in Table A5.1 in Appendix A5.

2 Actions to Improve Air Quality

Air Quality Management Areas

2.1 Air Quality Management Areas (AQMAs) are declared when there is an exceedence or likely exceedence 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 the objectives.

2.2 The AQMAs declared by Warwick District Council are shown in Figure 1 to Figure 5 and described in Table 1.

2.3 No changes have been made to the AQMAs declared by Warwick District Council during the past year.

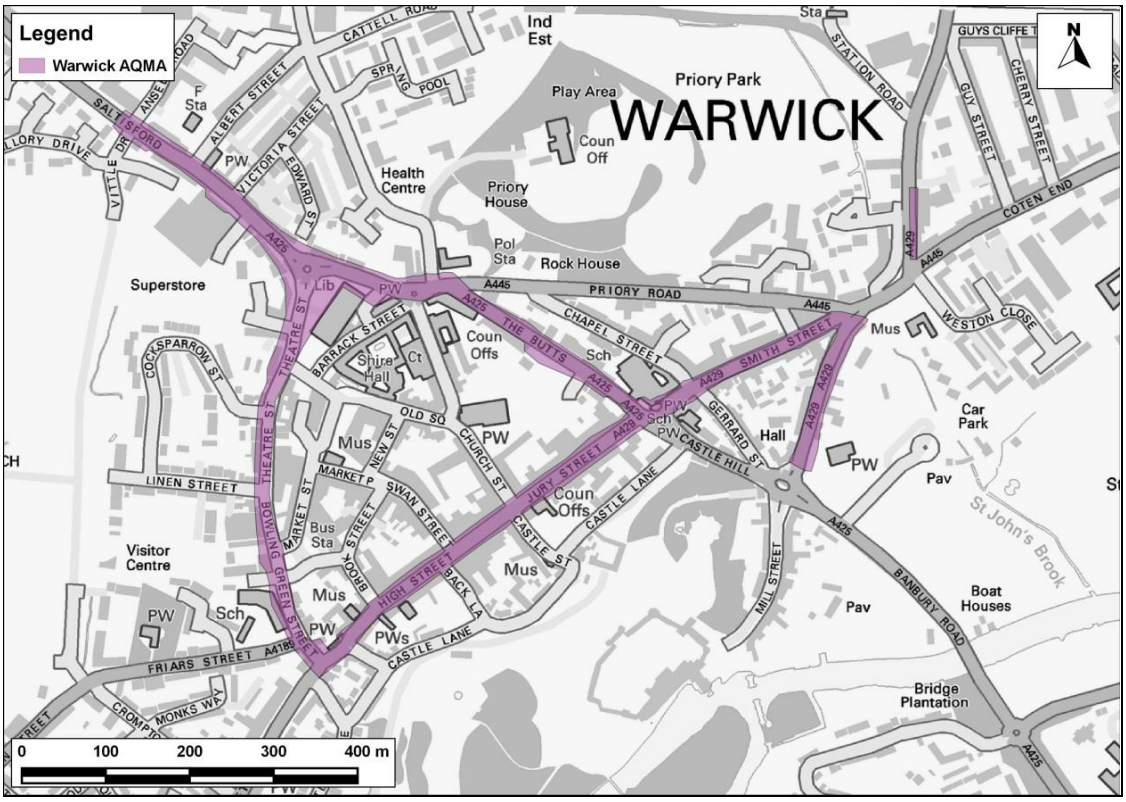

Figure 1: Warwick AQMA (amended 2008)

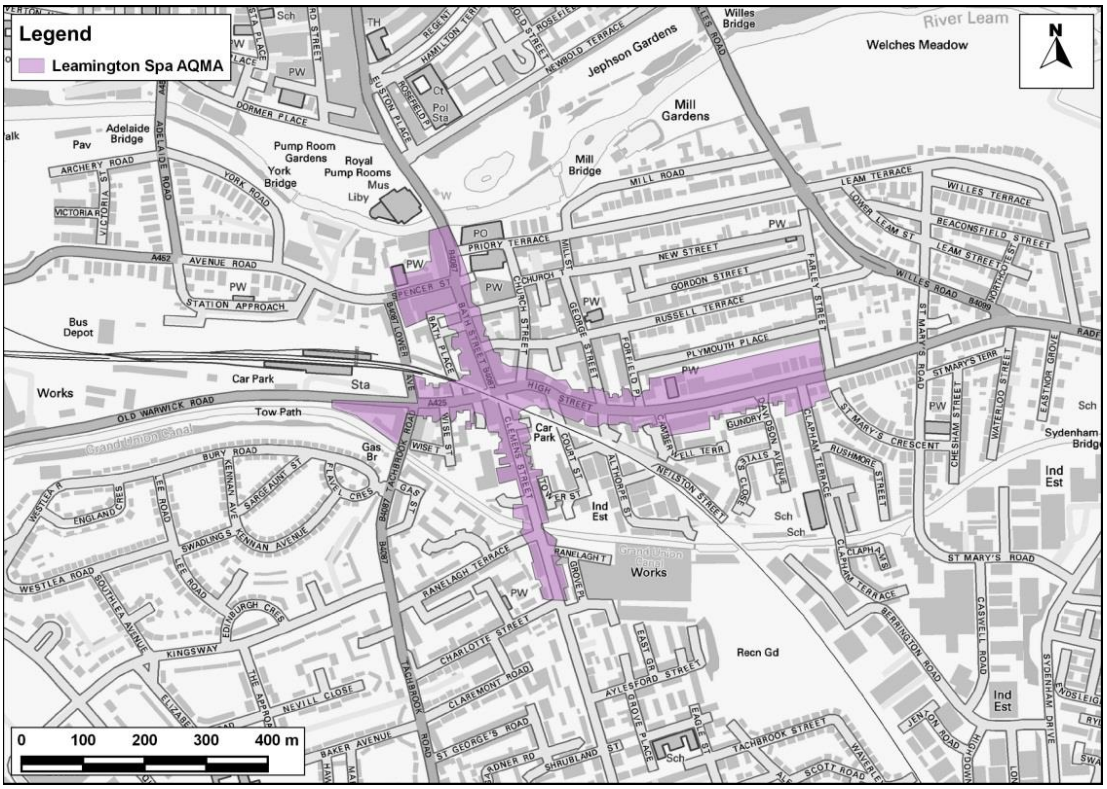

Figure 2: Leamington Spa AQMA

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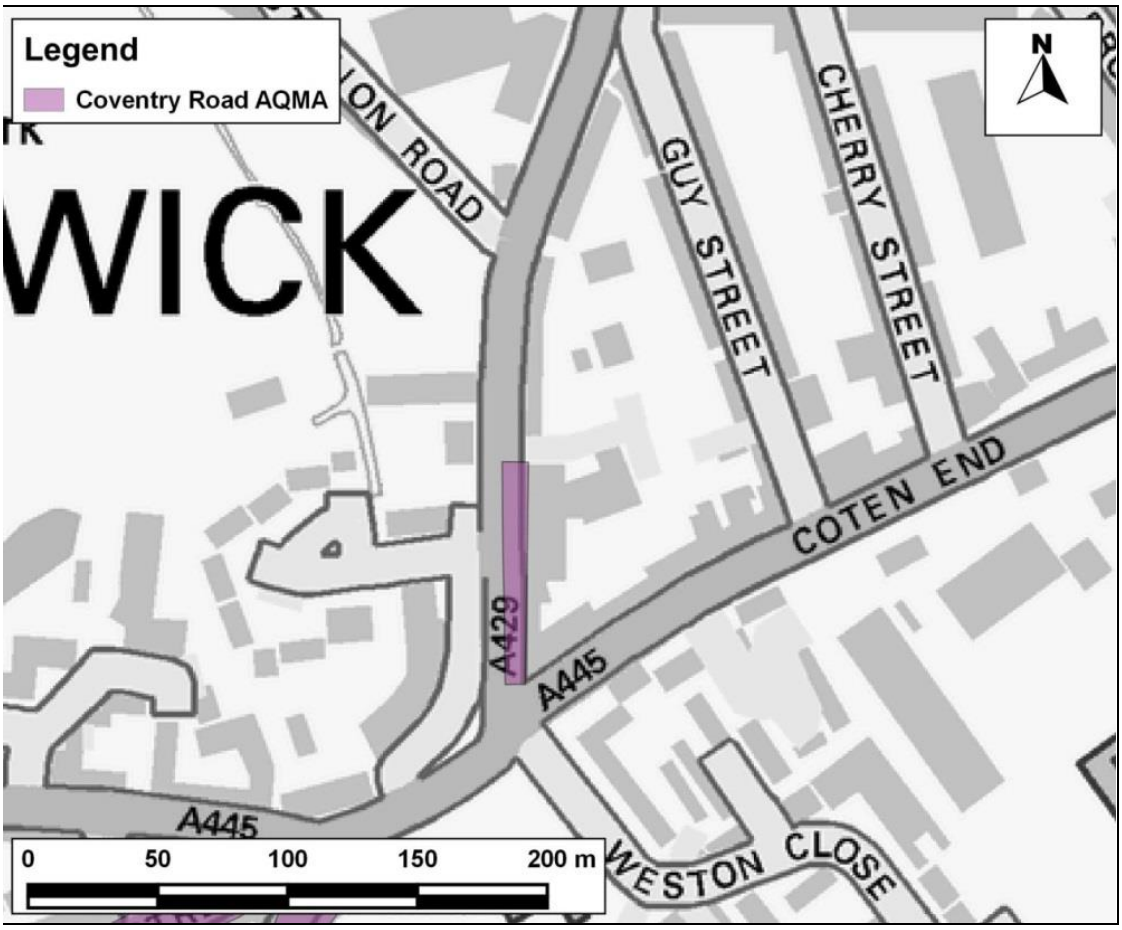

Figure 3: Coventry Road AQMA, Warwick

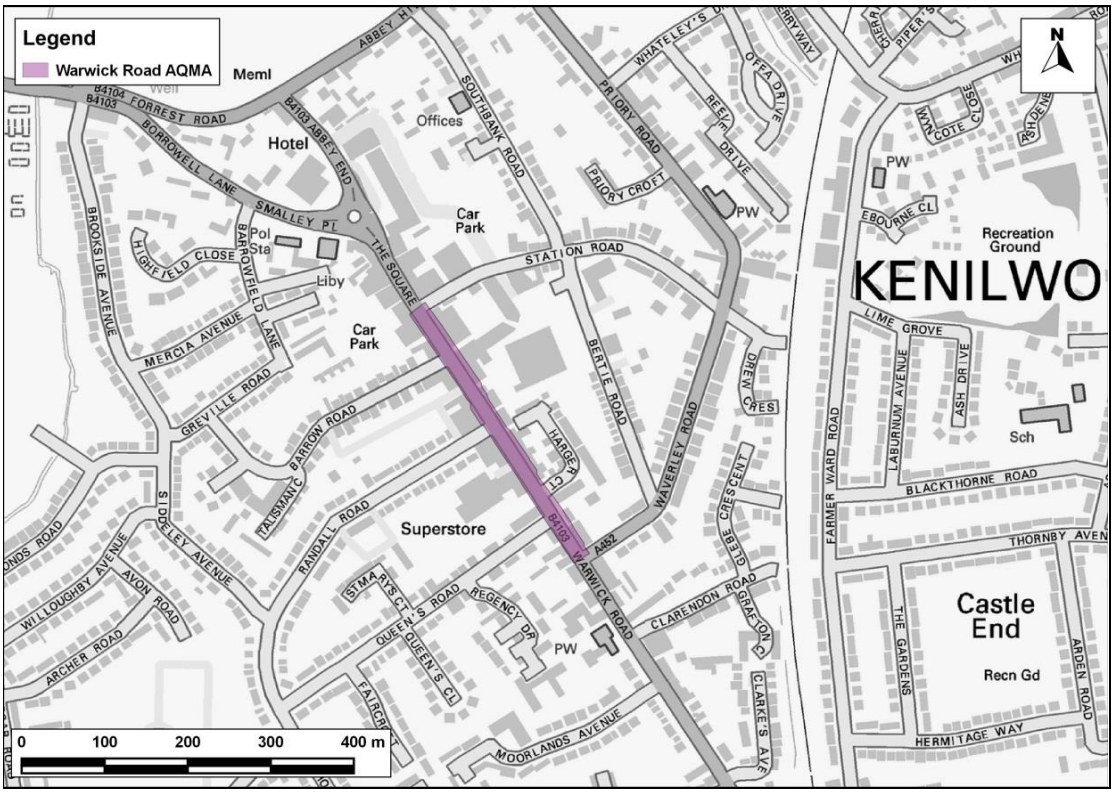

Figure 4: Warwick Road AQMA, Kenilworth

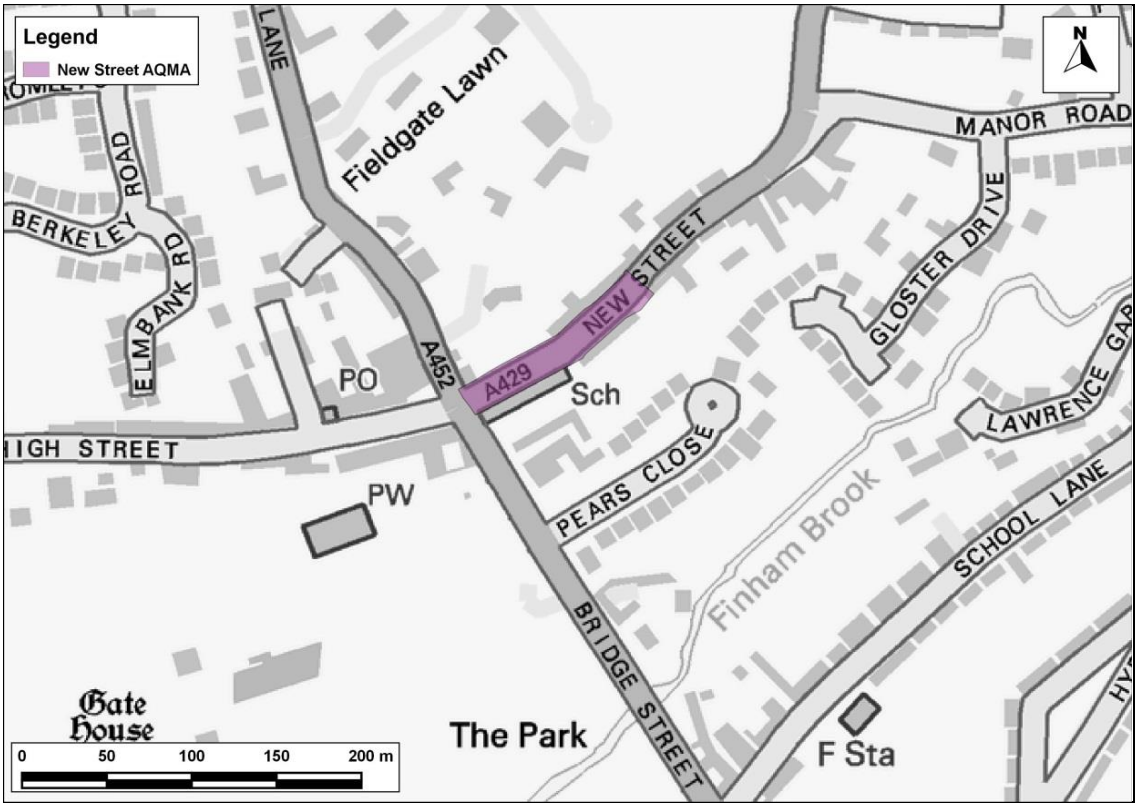

Figure 5: New Street AQMA, Kenilworth

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Table 1: Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Warwick Coventry Road	nitrogen dioxide: annual mean	Warwick	The area covers the east side of Coventry Road from the junction with St. Johns / Coten End, incorporating 2-4 Coventry Road and Montgomery Court, properties fronting on to Coventry Road only.	Air Quality Action Plan: Warwick District Council, 2015 (Air Quality Consultants, 2015) Available at: http://www.warwickdc.gov.uk/download/downloads/id/517/air_quality_action_plan
Warwick Road (Kenilworth) AQMA	nitrogen dioxide: annual mean	Kenilworth	An area encompassing all properties along Warwick Road, Kenilworth between the junctions with Station Road and Waverley Road.	Air Quality Action Plan: Warwick District Council, 2015 (Air Quality Consultants, 2015) Available at: http://www.warwickdc.gov.uk/download/downloads/id/517/air_quality_action_plan
New Street Kenilworth AQMA	nitrogen dioxide: annual mean	Kenilworth	An area encompassing all properties fronting New Street, Kenilworth from the junction with Bridge Street/Fieldgate Lane up to and including No. 17 New Street.	Air Quality Action Plan: Warwick District Council, 2015 (Air Quality Consultants, 2015) Available at: http://www.warwickdc.gov.uk/download/downloads/id/517/air_quality_action_plan
Warwick AQMA	nitrogen dioxide: annual mean and 1-hour mean	Warwick	An area in the centre of Warwick, encompassing properties along High Street, Jury Street, Bowling Green Street, Theatre Street, Northgate, The Butts, Smith Street, Church St and part of Saltisford, and also including a number of nearby properties. This AQMA is now declared for both annual and hourly mean nitrogen dioxide objectives.	Air Quality Action Plan: Warwick District Council, 2015 (Air Quality Consultants, 2015) Available at: http://www.warwickdc.gov.uk/download/downloads/id/517/air_quality_action_plan

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Leamington Spa AQMA	nitrogen dioxide: annual mean	Leamington Spa	An area of South Town, Leamington Spa, centred on High Street, Clemens Street and Bath Street.	Air Quality Action Plan: Warwick District Council, 2015 (Air Quality Consultants, 2015) Available at: http://www.warwickdc.gov.uk/download/downloads/id/517/air_quality_action_plan

Progress and Impact of Measures to Address Air Quality in Warwick

2.4 Warwick District Council has taken forward a number of measures during the current reporting year of 2015 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2. More detail on these measures can be found in the Action Plan: (Air Quality Action Plan: Warwick District Council, 2015 (Air Quality Consultants, 2015) . As the Action Plan is still relatively new, many of the measures are still in the planning phase. One of the key groups of measures relate to those being implemented on the key corridors, which have been prioritised by Warwickshire County Council. Good progress is being made relating to these proposals, and many of the detailed measures should have some air quality impact. Detailed proposals are set out for 11 main corridors, many of which align with AQMAs in the district. Each of the 11 areas include specific measures for junction/ highway improvements, walking and cycling improvements, Park and Ride provision, bus priority measures as well as behavioural change measures. Most work has been undertaken on the A452 Europa Way 'Sustainable Spine' corridor which is the key route from the M40 in Leamington Spa and Warwick. Proposals are being worked on and funding being sought from large scale developments currently coming forward.

2.5 The measures being implemented through planning are also successfully moving forward. Planning applications are routinely being checked by the environmental health team and air quality assessments requested where relevant. Mitigation, based on the Low Emissions SPG is also routinely requested. In addition, an air quality assessment of the impacts of Local Plan development has been undertaken, which goes some way to assessing the potential cumulative impact of development outlined in the Local Plan.

2.6 Warwick District Council's priorities for the coming year are to continue with the work on the key transport corridors and continue in implementing the planning measures, as well as promoting low emission vehicles and infrastructure.

Table 2: Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	KPI	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1 Smarter Travel	Area wide improvements to walking and cycling infrastructure	Promoting Travel Alternatives	Promotion of Cycling and Promotion of Walking	WCC	Mainly as part of key transport corridor proposals. Also a review of cycling infrastructure across the district underway (and how that fits in with new developments)	Ongoing	n/a	n/a	Feasibility work undertaken on some corridors	Ongoing implementation of schemes	Detailed information on specific schemes can be found at http://www.warwickdc.gov.uk/download/downloads/id/2234/in03_-_draft_infrastructure_delivery_plan_appendix_a_-_transport_corridor_strategies.pdf
	Smarter Choices and Travel Planning programme	Promoting Travel Alternatives	School Travel Plans and Workplace Travel Planning	WCC	Mainly as part of key transport corridor proposals	Ongoing	n/a	n/a	Feasibility work undertaken on some corridors	Ongoing implementation of schemes	https://www.warwickshire.gov.uk/ltp3

	Targeted bus stop infrastructure upgrades on key public transport corridors	Transport Planning and Infrastructure	Bus Route Improvements	WCC	Bus priority measure implemented as part of key transport corridor proposals	Ongoing	n/a	n/a	Feasibility work undertaken on some corridors	Ongoing implementation of schemes	
	Improving infrastructure to improve walking and cycling signage	Promoting Travel Alternatives	Promotion of Cycling and Promotion of Walking	WCC	Walking and cycling implemented part of key transport corridor proposals	Ongoing	n/a	n/a	Feasibility work undertaken on some corridors	Ongoing implementation of schemes	
	Hearts and Minds campaign to encourage modal shift away from private car use	Public Information	Other	WCC	Ongoing	Ongoing	n/a	n/a	Mini campaigns undertaken such as 'choose how you move'	Ongoing campaigns	
	Further consideration of Park and Ride	Alternatives to private vehicle use	Bus based Park and Ride	WCC	Currently in planning phase	Not yet – funding required from development	n/a	n/a	Park and Ride provision outlined in key transport corridor proposals	Unknown at this time	
	Consideration of a car club	Alternatives to private vehicle use	Car clubs	WDC/ WCC	2015	n/a	n/a	n/a	Decision not to take this forward	n/a	Not being taken forward – population areas not considered large enough to support

	Publicising CarShare Coventry and Warwickshire	Alternatives to private vehicle use	Car and lift sharing schemes	WCC	Ongoing	Ongoing	n/a	n/a	Companies in Tech Park are promoting car share. Workshop for other companies planned	Ongoing	
2. Promote Low Emission Vehicles and Infrastructure	Supporting future opportunities for funding for Low Emission Vehicles, in particular for vehicle charging infrastructure	Promoting Low Emission Transport	n/a	WDC	2016	Ongoing (depending on opportunities)	n/a	n/a	No success in this area yet.	Ongoing implementation	
	Use of the planning system to ensure a more widespread infrastructure for low emission vehicles	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	WDC	2013	2014 (for adoption of guidance)	n/a	n/a	Implementation of Low Emission Strategy Guidance to install EV infrastructure	Ongoing implementation	Useful policy mechanism for improving infrastructure in long term
	Moving the Warwick DC fleet to electric vehicles where practicable	Promoting Low Emission Transport	Public Vehicle procurement	WDC	2015	2016	n/a	n/a	5 vehicles ordered as pool vehicles	2016 to have vehicles in place. Ongoing commitment where feasible	Very funding dependent. Business case not great without additional funding

	Strive to set up an Ecostars scheme in Warwick District Council whereby fleet operators can join for free and strive to reduce their environmental impacts.	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	WDC	2016	2017 onwards	n/a	n/a	Not taken forward yet – will apply for grant funding 2016	2018 if funding bid successful	Dependent on funding being available
	Working with Warwickshire County Council and bus operators to encourage lower emission buses (either retrofitting existing buses, or use of alternative fuels).	Vehicle fleet efficiency	Promoting Low Emission Public Transport	WCC	2016	2016 onwards	n/a	n/a	Not yet taken forward, will potentially bring into discussion regarding work in Warwick	Ongoing implementation	
	Ensuring that the electric taxi within Warwick District Council is utilised to promote Low Emission Vehicles to commercial operators and the public.	Promoting Low Emission Transport	Taxi emission incentive	WDC	n/a	n/a	n/a	n/a	Not feasible as taxi is privately owned	n/a	Licensing service has to be provided as cost neutral therefore can't incentivise electric taxis
	Promotion of electric vehicles through the Warwickshire Drive Electric Website. http://www.warwickshire.gov.uk/driveelectric	Promoting Low Emission Transport	Other	WCC	2016	Ongoing	n/a	n/a	Promotion could be enhanced.	Ongoing implementation	Investigate including links on Warwick District Council website

	Use the taxi and private hire licensing system to try and reduce emissions from taxis and private hire vehicles.	Promoting Low Emission Transport	Taxi emission incentive	WDC	n/a	n/a	n/a	n/a	Not feasible as Licensing service has to be provided as cost neutral therefore can't incentivise electric taxis	n/a	
3. Procurement	Investigation with procurement colleagues to produce a sustainable procurement guide to ensure transport emissions are as low as possible	Policy Guidance and Development Control	Sustainable Procurement Guidance	WDC (Procurement)	2016	2016-17	n/a	n/a	No progress made to date	2017	Steering group meeting involved procurement manager. This action now to be taken forward
4. Planning	Ensuring that the Warwick Low Emission Strategy Guidance for Developers is kept up to date, and implemented	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	WDC E,S, H and CP and Planning	n/a	Ongoing	n/a	n/a	Good progress in implementing mitigation through development control	Ongoing	
	Working with planning policy colleagues to ensure that the Local Plan fully addresses air quality issues with appropriate policies included	Policy Guidance and Development Control	Other policy	WDC E,S, H and CP and Planning	n/a	Ongoing	n/a	n/a	Planning policy relevant to air quality included in new Local Plan	n/a	Joint working to continue. Air quality impacts of local plan have been assessed.

	Working with planning colleagues and developers to ensure that new developments are based around the 'five-minute walkable neighbourhood', thereby encouraging active travel as the preferred methods of transport to access local facilities	Policy Guidance and Development Control	Other policy	WCC Public Health	n/a	Ongoing	n/a	n/a	5 minute walkable neighbourhoods have been investigate within work undertaken by WYG on how developments should look	Ongoing encouragement of active travel	
	Ensure that green infrastructure is integrated into all residential and commercial developments, in line with the National Planning Policy Framework (NPPF)	Policy Guidance and Development Control	Other policy	WDC E,S, H and CP and Planning	n/a	Ongoing	n/a	n/a	NPPF followed for new development. Green infrastructure included where relevant	Ongoing	
	Ensuring that planning applications with potential air quality impacts are fully assessed for their impacts, at relevant locations using appropriate methodologies	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	WDC E,S, H and CP and Planning	n/a	Ongoing	n/a	n/a	Air quality assessments asked for on a regular basis	Ongoing	

	Ensuring that where possible, cumulative impacts are taken into account. Any committed developments should be included within a given air quality assessment	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	WDC E,S, H and CP and Planning	n/a	Ongoing	n/a	n/a	Ongoing work required where large areas of development are allocated in Local Plan	Ongoing	To some extent, work undertaken on air quality impacts of the Local Plan takes cumulative impacts into account at a strategic level
	Ensuring that appropriate mitigation is implemented where any relevant impacts are identified	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	WDC E,S, H and CP and Planning	n/a	Ongoing	n/a	n/a	Mitigation asked for on a regular basis	Ongoing	
5. Traffic Management	Junction improvements on key travel corridors in Warwick and Leamington Spa AQMAs are proposed which include junction/ highway modifications, improvements for walking and cycling and bus priority measures	Traffic Management	Strategic Highway Improvements	WCC (Transport)	2014-2016	Possible first corridor in place by 2020	n/a	n/a	Good progress on planning and starting to implement corridor proposals	Ongoing for different corridors, Europa Way target for completion 2020 but dependent on development funding	
	An investigation of 20 mph zones as part of the wider transport strategy, where this will smooth traffic flow	Traffic Management	Reduction of Speed Limits, 20 mph zones	WCC (Transport)	2015	n/a	n/a	n/a	Not being taken forward at this time	n/a	

	Targeted re-allocation of road space to prioritise and facilitate movement of pedestrians, cyclists, public transport and car share users	Traffic Management	Strategic Highway Improvements	WCC (Transport)	2014-2016	Possible first corridor in place by 2020	n/a	n/a	Good progress on planning and starting to implement corridor proposals	Ongoing for different corridors, Europa Way target for completion 2020 but dependent on development funding	
	Manage deliveries across Warwick District Council to ensure that no additional congestion is caused by stationary delivery vehicles in busy locations	Traffic Management	Congestion Management	WCC (Transport)	2016	Not being taken forward at present	n/a	n/a	Will review at future Steering Group meetings	n/a	
6. Public Health	Re-investigate funding for a website to engage with the public on air quality, the health impacts of poor air quality, sustainable transport and strategies to improve air quality	Public Information	Via the internet	WCC Public Health	n/a	n/a	n/a	n/a	Unsuccessful bid for funding. Unlikely to take this forward, but instead will use existing websites more effectively	n/a	

	Working with planners and developers to embed Public Health's Evidence for Planning guidance, thereby encouraging any new developments to support access to active travel	Policy Guidance and Development Control	Other policy	WCC Public Health	n/a	Ongoing	n/a	n/a	The guidance document is used when responding to planning applications, pre-planning applications and local plan consultations on an ad-hoc basis.	ongoing	The recommendations made always support the inclusion of active travel. The document is currently under review and an updated version with the latest national guidance will be released early 2017.
	Investigate implementing a campaign aimed at vulnerable members of the public (i.e. those with existing respiratory or cardio vascular conditions) in order that they could change behaviour to reduce exposure when pollution levels are high	Public Information	Via the internet	WCC Public Health	2015/16	Unlikely to implement a campaign aimed at vulnerable member of population	n/a	n/a	Instead will embed active travel in everything we do, aimed at whole population	Ongoing	
7. Local Air Quality Management	Continuation of monitoring within Warwick District Council, focussed on AQMAs, but also in other strategic locations	n/a	n/a	WDC E,S, H and CP.	n/a	Ongoing	n/a	n/a	Monitoring reported in this report	ongoing	

	Regular assessment of air quality against air quality objectives as specified by the LAQM process with reports to defra and the public	n/a	n/a	WDC E,S, H and CP.	n/a	Ongoing	n/a	n/a	Undertaken in this report	ongoing	
	Review of measures set out in this Air Quality Action Plan on a regular basis to ensure they are up to date and being implemented	n/a	n/a	WDC E,S, H and CP	n/a	Ongoing	n/a	n/a	Undertaken in this report	ongoing	

$PM_{2.5}$ - Local Authority Approach to Reducing Emissions and or Concentrations

2.7 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.

2.8 Warwick District Council is largely using its Action Plan to take forward measures to address $PM_{2.5}$. in particular, the measures which focus on behavioural change should also reduce $PM_{2.5}$ emissions from transport, as well as the proposals on the key transport corridors which will also help to some extent reduce fuel usage (by smoothing traffic flow), and hence $PM_{2.5}$ emissions.

2.9 Warwick District Council is working with Public Health colleagues to prioritise action on air quality in their local area to help reduce the health burden from air pollution. The Public Health Outcomes Framework is a Department of Health data tool for England, intended to focus public health action on increasing healthy life expectancy and reducing differences in life expectancy between communities. The PHOF includes an indicator, based on the effect of particulate matter ($PM_{2.5}$) on mortality. The approach used in partnership with Public Health colleagues includes the encouragement of active travel, which will also have wider public health benefits captured in other indicators such as increased physical activity (indicator 2.13) and reducing excess weight at various ages (indicators 2.6 & 2.12).

2.10 Planning is also particularly important for $PM_{2.5}$ and although planning work is focussed on AQMAs declared for NO_2, it is important that through planning policy particulate concentrations aren't inadvertently increased. One example of this may be through giving centralised energy plants consent without fully assessing the impacts on PM_{10} and $PM_{2.5}$.

2.11 In order to support the work on $PM_{2.5}$, Warwick District Council has two monitoring stations in the AURN measuring $PM_{2.5}$. It is difficult to decipher a trend over the last 5 years, and there is little difference in concentrations between the roadside site (Rugby Road, Leamington) and the background site (Hamilton Terrace) illustrating that sources of $PM_{2.5}$ are much wider than just transport. Monitoring at these two locations will continue to show any future improvements with the implementation of various measures across the district.

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

Summary of Monitoring Undertaken

Automatic Monitoring Sites

3.1 This section sets out what monitoring has taken place and how the results compare with relevant objectives.

3.2 Warwick District Council undertook automatic (continuous) monitoring at three sites during 2015. Table A1.1 in Appendix A1 shows the details of the sites. National monitoring results are available for the two AURN automatic monitoring sites (i.e. Rugby Road and Hamilton Terrace) at https://uk-air.defra.gov.uk/networks/network-info?view=aurn. Pageant House in Warwick is not an AURN site and therefore data are not available on line.

3.3 Maps showing the location of the monitoring sites are provided in Appendix A4. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix A3.

Non-Automatic Monitoring Sites

3.4 Warwick District Council undertook non-automatic (passive) monitoring of NO_2 at 59 sites during 2015. Table A1.2 in Appendix A1shows the details of the sites.

3.5 Maps showing the location of the monitoring sites are provided in Appendix A4. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix A3.

Individual Pollutants

3.6 The air quality monitoring results presented in this section are, where relevant, adjusted for "annualisation" and bias. Further details on adjustments are provided in Appendix A3.

Nitrogen Dioxide (NO_2)

3.7 Table A1.3 in Appendix A1 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.

3.8 For diffusion tubes, the full 2015 dataset of monthly mean values is provided in Appendix A2.

3.9 Table A1.4 in Appendix A1 compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

3.10 Exceedences of the nitrogen dioxide annual mean objective were measured at nine diffusion tubes monitoring sites. All measured exceedences were below 60 µg/m^3, which indicates that an exceedence of the 1-hour mean objective at these sites is not likely. No exceedences of the annual mean or the 1-hour mean objectives were measured by the automatic monitoring stations.

3.11 Six of the sites exceeding the objective were measured in central Warwick, by roadside diffusion tubes in proximity to A-roads. Three exceedences were measured in central Leamington Spa, clustered around a crossroads between A-roads and a junction joining a main road to an A-road.

3.12 One exceedence occurred at sites located outside AQMAs (W67). It is noted that W67 (Castle Hill, Warwick) also exceeded the annual mean objective in 2014. As W67 is closer to the road than the relevant exposure, Defra's "NO_2 with Distance from Roads Calculator" tool (Defra, 2009) has been used to estimate the annual nitrogen dioxide concentrations at the nearest site of relevant exposure (1.2 m from W67) (see Appendix A3). The estimated concentration at the nearest site of relevant exposure is 39.6 µg/m^3, slightly below the annual mean objective. It is concluded therefore that no changes will be made to the AQMA, although it is recommended that monitoring at this site continue and reviewed carefully in the 2017 ASR.

Particulate Matter (PM_{10})

3.13 Table A1.5 in Appendix A1 compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

3.14 Table A1.6 in Appendix A1 compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

3.15 No exceedences of the annual mean objective or the PM_{10} 24-hour mean objective were measured in 2015.

Particulate Matter ($PM_{2.5}$)

3.16 Table A1.7 in Appendix A1 presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

3.17 No exceedences of the UK $PM_{2.5}$ annual mean objective were measured in 2015.

Ozone

3.18 Annual reporting is no longer required for ozone, unless local circumstances indicate that there is a problem. An analysis of monitored ozone concentrations has been included to provide a more complete assessment of air quality status.

3.19 Table A1.8 in Appendix A1 presents the ratified monitored number of 8-hour means >100 µg/m^3 for the past 5 years. There is no exceedence of the objective in 2015. There have historically been exceedences prior to 2014.

A1 Monitoring Results

Table A1.1: Details of Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
Hamilton Terrace, Leamington Spa	Urban Background	431943	265730	nitrogen dioxide, ozone, benzene, PM_{10} and $PM_{2.5}$	N	Chemiluminescence, Ultra-violet fluorescence (UVF), FDMS	9 m	50	4
Pageant House, Warwick	Roadside	428263	264877	nitrogen dioxide	Y	Chemiluminescence	13 m	2.8	N/A
Rugby Road, Leamington Spa	Roadside	431271	266404	Nitrogen dioxide, PM_{10} and $PM_{2.5}$	N	Chemiluminescence, FDMS	23 m	8	3.5

(1) N/A if not available.

Table A1.2: Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure? (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
Warwick										
W5	Hampton Street (3)	Roadside	427615	264563	nitrogen dioxide	N	N	2.0	N	1.5
W17	Coventry Road, Woodville Court	Kerbside	428704	265236	nitrogen dioxide	N	N	1.0	N	1.5
W18	Coventry Road, Coachouse Mews	Roadside	428735	265362	nitrogen dioxide	N	N	1.5	N	1.5
W19	West Street (Torrys)	Roadside	427937	264586	nitrogen dioxide	N	N	3.2	N	1.5
W33(1), W34(2), W35(3)	Pageant House	Roadside	428263	264877	nitrogen dioxide	Y	Y	2.8	Y (Pageant House)	1.5
W36	Jury Street	Roadside	428391	264966	nitrogen dioxide	Y	N	2.1	N	1.5
W37	High Street	Roadside	428132	264799	nitrogen dioxide	Y	N	2.9	N	1.5
W38	West Street	Kerbside	427959	264624	nitrogen dioxide	N	N	0.6	N	1.5

W39	Crompton Street / West Street	Roadside	427910	264541	nitrogen dioxide	N	Y	4.1	N	1.5
W40	Bowling Green Street	Kerbside	427992	264695	nitrogen dioxide	Y	Y	0.9	N	1.5
W41	Friars Street	Roadside	427905	264682	nitrogen dioxide	N	N	1.0	N	1.5
W42	Theatre Street	Roadside	427938	264947	nitrogen dioxide	Y	Y	2.3	N	4.5
W43	Saltisford / Northgate	Roadside	428026	265158	nitrogen dioxide	Y	Y	1.5	N	2.5
W44	West Rock, Saltisford	Roadside	427930	265200	nitrogen dioxide	Y	N	2.3	N	2.6
W45	Albert Street / Saltisford Jcn.	Roadside	427867	265275	nitrogen dioxide	Y	Y	2.7	N	2.5
W46	The Butts	Roadside	428240	265088	nitrogen dioxide	Y	N	1.6	N	2.5
W48	Smith Street	Roadside	428522	265039	nitrogen dioxide	Y	Y	2.0	N	3.0
W49	Gerrard Street	Roadside	428501	264967	nitrogen dioxide	N	Y	1.8	N	2.6
W50	St Nicholas' Church St 1.	Roadside	428600	264983	nitrogen dioxide	N	Y	1.7	N	2.6

W51	St Mary's Churchyard	Urban background	428270	264982	nitrogen dioxide	N	N	n/a	N	n/a
W52	Coventry Road, Crown Hotel	Kerbside	428710	265165	nitrogen dioxide	Y	N	0.5	N	2.5
W53	Coventry Road No 1, Montgomery Court	Roadside	428715	265202	nitrogen dioxide	Y	Y	1.8	N	2.4
W54	Coventry Road No 2, 28 Coventry Road	Roadside	428715	265285	nitrogen dioxide	N	Y	1.9	N	2.4
W55	Coventry Road No 3, Great Western Arms	Roadside	428710	265341	nitrogen dioxide	N	N	1.2	N	2.5
W56	St Johns	Roadside	428619	265113	nitrogen dioxide	N	N	1.1	N	2.5
W57	Coten End	Roadside	428748	265166	nitrogen dioxide	N	Y	3.0	N	2.5
W58	Emscote Road	Roadside	429514	429514	nitrogen dioxide	N	N	3.8	N	n/a
W59	Charles Street	Roadside	429501	265494	nitrogen dioxide	N	N	2.0	N	n/a

W60	Bridge Street	Roadside	430015	265718	nitrogen dioxide	N	N	2.4	N	n/a
W61	Greville Road	Roadside	429974	265733	nitrogen dioxide	N	N	5.4	N	n/a
W62	St Nicholas' Church St. 2	Roadside	428608	265042	nitrogen dioxide	Y	Y	2.1	N	3.0
W64	Hampton Street (1)	Roadside	427702	264631	nitrogen dioxide	N	Y	1.6	N	2.0
W65	Hampton Street (2)	Roadside	427680	264607	nitrogen dioxide	N	Y	4.3	N	n/a
W67	Castle Hill	Roadside	428477	264939	nitrogen dioxide	N	N (1.2 m)	3.2	N	2.5
Leamington Spa										
W1	Bath Street	Kerbside	431978	265280	nitrogen dioxide	Y	N	0.8	N	1.5
W2	High Street	Roadside	432075	265234	nitrogen dioxide	Y	N	2.2	N	1.5
W6(1), W7(2), W8(3)	Hamilton Terrace	Urban Background	431943	285730	nitrogen dioxide	N	N	n/a	N	1.5
W10	Farley Street	Roadside	432560	265254	nitrogen dioxide	N	N	0.1	N	4.5
W11	Clemens Street	Roadside	432051	265060	nitrogen dioxide	Y	N	3.2	N	1.5
W12	Spencer Street	Roadside	431866	265371	nitrogen dioxide	Y	N	5.0	N	1.5

W13	Wise Street	Roadside	431900	265189	nitrogen dioxide	Y	Y	1.0	N	1.5
W14	Tachbrook Road	Roadside	431862	265169	nitrogen dioxide	N	N	5.2	N	1.5
W15	Old Warwick Road	Roadside	431849	265193	nitrogen dioxide	Y	N	2.0	N	1.5
W16	Parade	Roadside	431951	265397	nitrogen dioxide	N	N	7.5	N	1.5
Kenilworth										
W23	Moorlands Road Jcn	Roadside	429078	271207	nitrogen dioxide	N	N	4.2	N	1.5
W24	Waverley Road	Roadside	428974	271402	nitrogen dioxide	Y	N	2.8	N	4.5
W25	New Street No 1, Abbotsford School	Roadside	428707	272556	nitrogen dioxide	Y	Y	0.4	N	1.5
W26	New Street No 2, Coventry Cross	Roadside	428733	272578	nitrogen dioxide	Y	Y	1.7	N	1.5
W27	New Street No 3, 21 New Street	Kerbside	428750	272612	nitrogen dioxide	N	N	1.1	N	4.5
W28	Fieldgate Lane Jcn	Roadside	428652	272524	nitrogen dioxide	Y	Y	0.7	N	4.5

W30	The Square	Roadside	428714	271769	nitrogen dioxide	N	Y	3.4	N	4.5
W31	Barrow Road	Kerbside	428816	271618	nitrogen dioxide	Y	N	1.4	N	4.5
W32	Warwick Road	Roadside	428906	271497	nitrogen dioxide	Y	Y	1.3	N	1.5
Stoneleigh										
W68	Birmingham Road	Roadside	432931	272790	nitrogen dioxide	N	Y	3.2	N	n/a

(1) Details whether or not the site is positioned in proximity to a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.

Table A1.3: Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture for 2015 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2011	2012	2013	2014	2015
Warwick									
Pageant House, Warwick	Roadside	Automatic	99.9	99.9	**58.2**	**60.4**	39.7	**40.1**	37.2
W5	Roadside	Diffusion tube	100.0	100.0	33.5	36.0	32.7	33.8	34.5
W17	Kerbside	Diffusion tube	100.0	100.0	27.7	27.8	29.1	27.7	26.4

W18	Roadside	Diffusion tube	91.7	91.7	26.6	27.9	25.0	24.7	24.7
W19	Roadside	Diffusion tube	75.0	75.0	34.5	32.9	31.4	31.0	28.4
W33(1), W34(2), W35(3)	Roadside	Diffusion tube	100.0	100.0	**57.8**	**46.1**	**40.8**	**41.3**	**41.2**
W36	Roadside	Diffusion tube	100.0	100.0	**49.1**	**44.6**	**41.1**	**43.6**	**42.2**
W37	Roadside	Diffusion tube	91.7	91.7	37.5	36.6	38.3	34.6	37.5
W38	Kerbside	Diffusion tube	91.7	91.7	32.6	36.9	32.6	34.5	34.0
W39	Roadside	Diffusion tube	100.0	100.0	30.1	27.5	26.8	27.3	27.6
W40	Kerbside	Diffusion tube	100.0	100.0	37.1	**42.2**	39.8	40.0	**40.7**
W41	Roadside	Diffusion tube	91.7	91.7	25.7	26.1	24.8	25.4	22.6
W42	Roadside	Diffusion tube	91.7	91.7	31.7	34.7	32.0	29.4	26.4
W43	Roadside	Diffusion tube	100.0	100.0	**43.1**	32.5	**44.3**	**45.4**	**43.4**
W44	Roadside	Diffusion tube	100.0	100.0	30.9	31.6	29.9	31.9	28.6
W45	Roadside	Diffusion tube	100.0	100.0	29.3	28.6	26.4	27.8	27.2

W46	Roadside	Diffusion tube	83.3	83.3	36.9	36.4	35.4	34.3	34.2
W48	Roadside	Diffusion tube	100.0	100.0	37.5	36.0	33.5	33.8	32.7
W49	Roadside	Diffusion tube	100.0	100.0	24.6	24.7	22.9	23.3	22.1
W50	Roadside	Diffusion tube	100.0	100.0	31.7	30.0	29.4	28.7	27.9
W51	Urban background	Diffusion tube	91.7	91.7	15.6	19.6	19.3	18.2	17.4
W52	Kerbside	Diffusion tube	100.0	100.0	**43.3**	**42.0**	**41.4**	39.4	38.1
W53	Roadside	Diffusion tube	100.0	100.0	**43.0**	**41.0**	**42.7**	**41.0**	38.5
W54	Roadside	Diffusion tube	100.0	100.0	31.3	32.5	34.0	32.9	31.0
W55	Roadside	Diffusion tube	100.0	100.0	30.4	29.4	29.9	28.5	27.3
W56	Roadside	Diffusion tube	100.0	100.0	21.0	24.7	22.5	22.7	21.3
W57	Roadside	Diffusion tube	91.7	91.7	31.3	31.9	31.4	31.3	30.0
W58	Roadside	Diffusion tube	91.7	91.7	34.1	33.8	35.0	31.3	29.9
W59	Roadside	Diffusion tube	100.0	100.0	**40.9**	**40.1**	36.3	36.7	34.0

W60	Roadside	Diffusion tube	100.0	100.0	29.8	31.1	31.2	28.9	27.8
W61	Roadside	Diffusion tube	100.0	100.0	28.6	29.8	27.8	26.4	26.2
W62	Roadside	Diffusion tube	100.0	100.0	**47.5**	**45.6**	**43.8**	**44.0**	**42.5**
W64	Roadside	Diffusion tube	100.0	50.0	30.6	27.5	25.3	25.4	21.1 (3)
W65	Roadside	Diffusion tube	91.7	91.7	27.2	25.9	24.3	23.2	42.6
W67	Roadside	Diffusion tube	91.7	91.7	N/A	N/A	N/A	**41.0**	**41.8**
Leamington Spa									
Hamilton Terrace, Leamington Spa	Urban background	Automatic	98.3	98.3	21.1	20.7	20.7	19.6	19.30
Rugby Road, Leamington Spa	Roadside	Automatic	99.0	99.0	n/a	19.5	21.2	21.1	20.21
W1	Kerbside	Diffusion tube	83.3	83.3	**49.0**	**44.0**	36.3	**40.0** (4)	**43.4**
W2	Roadside	Diffusion tube	100.0	100.0	**42.8**	39.3	33.5	32.6	38.2
W6(1), W7(2), W8(3)	Urban background	Diffusion tube	100.0	100.0	20.8	20.7	19.8	19.2	19.7

W10	Roadside	Diffusion tube	100.0	100.0	29.0	25.4	24.1	24.0	24.3
W11	Roadside	Diffusion tube	91.7	91.7	22.9	25.5	32.9	23.7	23.2
W12	Roadside	Diffusion tube	91.7	91.7	**40.7**	35.1	38.0	33.7	33.3
W13	Roadside	Diffusion tube	91.7	91.7	**52.7**	**49.6**	**42.8**	**47.0**	**48.6**
W14	Roadside	Diffusion tube	100.0	100.0	**41.9**	**40.6**	39.6	34.5	38.1
W15	Roadside	Diffusion tube	100.0	100.0	**41.9**	**45.2**	35.9	**41.0**	**43.9**
W16	Roadside	Diffusion tube	91.7	91.7	31.0	31.6	30.6	28.5	30.7
Kenilworth									
W23	Roadside	Diffusion tube	100.0	100.0	36.5	33.0	30.7	31.1	30.6
W24	Roadside	Diffusion tube	91.7	91.7	27.8	30.9	30.2	29.7	28.2
W25	Roadside	Diffusion tube	91.7	91.7	26.2	27.0	34.6	34.5	31.3
W26	Roadside	Diffusion tube	100.0	100.0	22.9	23.3	27.1	25.7	24.4
W27	Kerbside	Diffusion tube	100.0	100.0	38.5	39.8	23.1	22.5	21.6

W28	Roadside	Diffusion tube	91.7	91.7	33.6	39.3	37.7	37.8	33.2
W30	Roadside	Diffusion tube	83.3	83.3	27.7	28.1	25.0	26.1	24.0
W31	Kerbside	Diffusion tube	100.0	100.0	37.1	37.0	37.4	37.6	35.2
W32	Roadside	Diffusion tube	100.0	100.0	36.0	37.2	36.0	35.8	34.0
Stoneleigh									
W68	Roadside	Diffusion tube	100.0	100.0	n/a	n/a	n/a	23.3	23.6

Notes: Exceedences 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 exceedence 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 Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix A3 for details.

Table A1.4: 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture for 2015 (%) (2)	NO_2 1-Hour Means >200 µg/m^3 (3)				
					2011	2012	2013	2014	2015
Hamilton Terrace, Leamington Spa	Urban background	Automatic	98.3	98.3	0	0	0 (77)	0 (74)	0
Pageant House, Warwick	Roadside	Automatic	99.9	99.9	17	**379** (4)	4	0	0
Rugby Road, Leamington Spa	Roadside	Automatic	99.0	99.0	n/a	0 (82)	1	0	0

Notes: Exceedences of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

(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) If the period of valid data is less than 90%, the 99.8th percentile of 1-hour means is provided in brackets.

(4) All 379 exceedences occurred during the period 1 January to 4 April 2012, during which time the data was considered anomalous. After this period there were no more exceedences.

Table A1.5: Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture for 2015 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2011	2012	2013	2014	2015
Hamilton Terrace, Leamington Spa	Urban background	97.5	97.5	20.0	26.3	17.9	15.9	15.3
Rugby Road, Leamington Spa	Roadside	94.5	94.5	n/a	11.6	15.75	14.7	15.3

Notes: Exceedences of the PM_{10} annual mean objective of 40µg/m^3 are shown in **bold.**

(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%).

Table A1.6: 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture for 2015 (%) (2)	PM_{10} 24-Hour Means >50 $\mu g/m^3$ (3)				
				2011	2012	2013	2014	2015
Hamilton Terrace, Leamington Spa	Urban background	97.5	97.5	13	4	6 (39)	3	4
Rugby Road, Leamington Spa	Roadside	94.5	94.5	n/a	0 (20)	6 (29)	1 (30)	2

Notes: Exceedences of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

(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) If the period of valid data is less than 90%, the 90.4th percentile of 24-hour means is provided in brackets.

Table A1.7: $PM_{2.5}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture for 2015 (%) (2)	$PM_{2.5}$ Annual Means Concentrations (µg/m^3)				
				2011	2012	2013	2014	2015
Hamilton Terrace, Leamington Spa	Urban background	88.0	88.0	16.0	11.4	13.0	12.9	12.3
Rugby Road, Leamington Spa	Roadside	94.0	94.0	n/a	11.7	12.1	11.2	12.9

(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%).

Table A1.8: Ozone Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture for 2015 (%) (2)	Ozone 8-Hour Means >100 µg/m^3				
				2011	2012	2013	2014	2015
Hamilton Terrace, Leamington Spa	Urban background	99.6	99.6	**24**	**12**	**30**	10	5

Notes: Exceedences of the ozone 8-hour mean objective (100 µg/m^3 not to be exceeded more than 10 times/year) are shown in **bold.**

(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%).

A2 Full Monthly Diffusion Tube Results for 2015

Table A2.1: NO_2 Monthly Diffusion Tube Results - 2015

Site ID	NO_2 Mean Concentration ($\mu g/m^3$)												Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjustment (1)
Warwick														
W5	51.1	50.9	39.3	41.1	34.3	33.0	35.9	36.5	41.1	54.6	42.3	33.4	41.1	34.5
W17	42.0	41.5	31.6	31.5	22.1	20.5	22.7	28.7	32.8	38.7	33.9	31.6	31.5	26.4
W18	33.3	36.4	27.5	31.3	23.1	23.8	25.2	27.8	Tube Missing	39.3	29.3	26.4	29.4	24.7
W19	39.8	48.4	4.0	29.6	29.6	28.8	33.8	Tube Missing	Tube Missing	48.7	41.9	Tube Missing	33.8	28.4
W33 (1)	57.2	59.4	48.8	45.8	35.5	41.2	44.7	44.3	48.9	54.8	57.9	50.7	49.1	41.2
W34 (2)	57.9	60.6	46.4	48.8	Tube Missing	42.1	46.3	43.2	49.7	56.4	53.2	53.4	50.7	42.6

W35 (3)	57.9	55.5	38.7	48.9	Tube Missing	41	47.4	45.2	48.4	54.8	55.8	52.7	49.7	41.7
Averaged W33(1), W34(2) & W35(3)	57.7	58.5	44.6	47.8	35.5	41.4	46.1	44.2	49.0	55.3	55.6	52.3	49.0	41.2
W36	63.5	64.6	51.0	44.5	39.4	35.5	47.4	40.4	47.1	59.5	60.1	50.1	50.3	42.2
W37	Tube Missing	52.9	51.7	46.5	45.4	39.8	40.7	36.0	45.5	57.4	45.3	29.6	44.6	37.5
W38	50.4	49.9	43.6	27.1	37.5	34.1	34.2	40.0	Tube Missing	53.3	45.2	29.6	40.5	34.0
W39	41.2	39.1	32.0	31.0	25.9	25.4	27.3	31.6	33.8	44.1	34.5	28.5	32.9	27.6
W40	61.7	60.7	41.4	43.9	45.6	44	48.8	45.5	43.1	51.3	48.8	47.1	48.5	40.7
W41	36.5	37.0	26.8	26.1	17.8	20.6	22.8	26.1	29.4	28.2	Tube Missing	25.0	26.9	22.6
W42	40.3	42.6	31.4	31.3	26.2	27.9	30.3	1.0	Tube Missing	49.1	35.5	30.6	31.5	26.4

W43	59.1	56.8	48.8	44.2	49.2	50.5	51.6	53.3	56.6	57.7	52.9	39.5	51.7	43.4
W44	39.0	42.7	35.5	29.0	24.9	27.0	32.4	31.0	35.4	41.7	38	32.6	34.1	28.6
W45	33.6	39.5	30.9	28.9	25.2	27.1	31.2	28.9	34.3	42.1	33.7	33.1	32.4	27.2
W46	55	48.3	Tube Missing	Tube Missing	29.8	35.3	32.9	36.5	40.3	56.2	40.3	33.1	40.8	34.2
W48	49.1	50.1	34.6	30.7	30.9	31.4	33.9	35.8	37.9	46.2	46.6	40.3	39.0	32.7
W49	35.5	36	23.5	26	19.5	18.9	22.1	22.1	25	33.6	28.7	25.4	26.4	22.1
W50	37.0	41.0	35.6	35.2	24.9	24.5	27.3	30.2	34.6	41.3	33.9	33.6	33.3	27.9
W51	26.7	26.2	20.4	18.9	14.2	13.2	Tube Missing	18.3	22.2	30.5	19.4	17.7	20.7	17.4
W52	49.5	51.5	42.3	48.6	42.7	41.7	43.0	45.0	46.7	59.5	35.2	38.4	45.3	38.1
W53	47.0	55.8	45.1	47.9	39.6	39.2	43.3	45.6	45.2	54.0	43.8	44.2	45.9	38.5
W54	40.7	42.1	36.7	37.9	28.6	33.7	30.8	36.3	37.6	44.8	38.5	35.5	36.9	31.0
W55	33.9	41.1	26.9	28.8	27.5	29.4	30.2	31.2	35.0	42.7	31.9	30.8	32.5	27.3
W56	32.5	30.8	22.3	24.7	20.1	20.5	19.7	22.7	27.8	36.1	25.5	22.2	25.4	21.3

W57	42.4	43.2	30.6	35.3	Tube Missing	23.9	33.3	33.6	38.1	43	36.5	32.4	35.7	30.0
W58	45.4	Tube Missing	33.3	33.8	27.5	30.1	34.1	34.2	35.7	42.9	37.8	37.1	35.6	29.9
W59	51.8	51	32.7	40.1	39.6	37.3	20.8	38.2	39.9	49.3	45.2	39.1	40.4	34.0
W60	39.5	42.8	27.4	38.1	28.0	28.4	25.5	32.7	36.8	48.5	26.1	23.5	33.1	27.8
W61	39.2	37.4	30.0	29.6	26.9	24.4	26.8	29	32.5	36.3	31.3	30.4	31.2	26.2
W62	59.9	58.9	48.4	45.6	47.1	45.0	49.2	49.1	48.7	67.0	46.6	41.5	50.6	42.5
W64	32.5	37.6	24.1	25.6	20.6	19.3	Monitoring Ceased						26.6	21.1
W65	53.5	63.0	51.2	46.6	47.8	46.7	52.7	56.5	Tube Missing	43.6	49	50.72	45.5	42.6
W67	53.5	63.0	51.2	46.6	47.8	46.7	47.3	52.7	56.5	Tube Missing	43.6	49.0	49.8	41.8
Leamington Spa														

W1	56.2	58.1	39.2	38.1	44.9	43.9	Tube Missing	52.0	Tube Missing	62.9	64.3	56.6	51.6	43.4
W2	53.7	51.5	40.7	44.3	41.9	40.6	43.4	39.7	47.1	58	49.5	36	45.5	38.2
W6 (1)	32.9	32.1	22.8	20.2	16.2	19.5	21.7	19.1	21.1	32.4	26.3	22.8	23.9	20.1
W7 (2)	32.4	33.3	23.3	17.3	15.3	13.4	23.1	19.5	22.3	30.7	25.9	22.9	23.3	19.6
W8 (3)	31.5	34.9	20.5	15.5	13.5	12.5	19.5	17.3	22.5	38.2	28.4	23.3	23.1	19.4
Averaged W6(1), W7(2) & W8(3)	32.3	33.4	22.2	17.7	15.0	15.1	21.4	18.6	22.0	33.8	26.9	23.0	23.5	19.7
W10	40.4	37.9	26.0	27.7	21.4	21.4	22.6	24.9	28.3	36.5	31.9	28.7	29.0	24.3
W11	34	38.8	25.9	23.2	16.9	Tube Missing	19.5	25.8	29.6	40	26.7	24	27.7	23.2
W12	41.1	52.9	Tube Missing	32.7	36.5	24.6	32.7	37.0	39.5	51.8	44.9	42.2	39.6	33.3
W13	57.9	66.8	47.7	50.0	48.1	Tube Missing	57.2	59.2	60.1	63.6	67.2	59	57.9	48.6

W14	52.8	54.2	45.7	43.9	46.0	41.4	45.8	38.5	44.0	52.9	43.1	35.7	45.3	38.1
W15	59.3	61.5	48.2	42.2	49.2	41.2	51.0	47.7	49.6	63.3	62.0	52.0	52.3	43.9
W16	47.7	46.7	37.3	30	27.2	28.3	Tube Missing	32.8	34.5	46.8	40.8	30.1	36.6	30.7
Kenilworth														
W23	47.9	49.5	37.9	31.5	26.1	26.7	30.2	31.3	33.0	43.0	40.7	39.8	36.5	30.6
W24	40.9	42.9	30.6	28.5	26.3	26.1	Tube Missing	28.2	34	46.9	33.8	30.5	33.5	28.2
W25	42.8	48	34.7	36.6	Tube Missing	29.8	29.1	25.3	30.6	52	45.1	36.2	37.3	31.3
W26	37.1	39.8	28.2	27.6	24.2	23.5	24.1	21.2	26.5	32	33.4	30.7	29.0	24.4
W27	33.7	34.8	26.6	22.1	21.9	21.3	19.4	20.1	25.2	32.9	28.4	22.1	25.7	21.6
W28	Tube Missing	49.1	37.6	38.9	34.5	38.1	36.6	29.6	36.5	51.1	42.5	40.5	39.6	33.2

W30	35.3	37.3	25.9	26.5	22.9	23.9	25.7	27.8	27.8	Tube Missing	32.5	Tube Missing	28.6	24.0
W31	50.1	54.6	40.6	36.1	35	33.9	39.5	40.9	41.8	52.8	45.2	31.9	41.9	35.2
W32	42.1	48.8	38.7	43.1	33.7	33.4	33.2	35.2	42.9	64.8	38.2	32	40.5	34.0
Stoneleigh														
W68	35.6	35.8	25.7	22.1	20.3	21.0	22.6	24.5	28.6	45.9	31.3	23.7	28.1	23.6

(1) See Appendix A3 for details on bias adjustment

A3 Supporting Technical Information/Air Quality Monitoring Data QA/QC

Supporting Technical Information

A3.1 Changed and new sources of pollution have been investigated and any changes to existing sources, or new sources are listed below:

Table A3.1: New or Existing Pollution Sources

New or Existing Source	Screening Assessment Required?
Narrow Congested Streets with residential properties close to the kerb	No
Busy Streets where people may spend 1-hour or more close to traffic	No
Roads with a high flow of buses and/or HGV	No
Junctions	No
New roads constructed since the last round of Review and Assessment	No
New roads constructed since the last round of Review and Assessment	No
Bus and coach stations	No
Railway (diesel and steam trains)	No
Industrial installations (new installations and those with significantly increased emissions)	No
Major petrol storage depots	No
Petrol Stations	No
Poultry farms	No
Biomass combustion (including domestic solid-fuel burning for PM_{10})	No
CHP installations	No
Domestic solid-fuel burning (SO_2)	No
Quarries, landfill sites, opencast coal mining, waste transfer sites, materials handling (i.e. ports, major construction sites)	No
New Developments	Further details of new developments are provided below

Table A3.2: New Developments

ID	Location	Description	Status	Within AQMA
W/16/0279	Land off Severn Acre Close, Bishops Tachbrook	Outline application for up to 50 dwellings	Granted on appeal 24/05/2016	No
W/16/0196	Land to the south of Offchurch Lane, Radford Semele CV31 1TN	Outline application for 150 dwellings	Granted 03/05/2015	No
W/15/2129	Land at Spring Lane, Radford Semele, L'Spa	Reserved matters in relation to application W/14/0433 for 65 dwellings	Granted 18/03/2016	No
W/15/1361	Sydenham Industrial Estate, Sydenham Dive & St Mary's Road, L'Spa CV31 1PH	Outline permission for the demolition of existing buildings and erection of up to 88 affordable and 55 low cost dwellings	Granted 28/09/2015	No
W/15/1293	Land east of Radford Semele, north of Southan Road, Radford Semele CV31 1TP	Reserved matters in relation to application W/14/0322 for 60 dwellings	Granted 17/11/2015	No
W/15/0905	Station Approach, Leamington Spa CV31 3NN	Demolition of existing bus depot, car sales lot and disused buildings and construction of 212 homes (118 flats and 94 houses)	Granted 04/02/2016	No
W/15/0851	Grove Farm, Harbury Lane, Bishops Tachbrook, L'Spa CV33 9QF	Outline permission for 520 dwellings	Granted 20/08/2015	No
W/15/0646	Opus 40, Birmingham Road, Warwick	Erection of 85 dwellings	Granted 21/07/2015	No
W/15/0305	Woodside Farm, Harbury Lane, Bishops Tachbrook	Reserved matters in relation to application W/13/1207 for up to 280 dwellings	Granted 03/06/2015	No
W/14/1340	Land north of Common Lane, Kenilworth	Erection of up to 93 dwellings	Granted 23/12/2014	No
W/14/1076	Land between Myton Road and Europa Way, Warwick	Construction of up to 735 dwellings	Granted 05/12/2014	No
W/14/0967	Land north of Gallows Hill, Warwick CV34 6SJ	Development of up to 425 dwellings	Granted 03/04/2015	No

ID	Location	Description	Status	Within AQMA
W/14/0689	Land north of Oakley Wood Road, Bishops Tachbrook	Development of up to 150 dwellings	Granted 22/08/2014	No
W/14/0681	Land south of Gallows Hill / west of Europa Way, Warwick CV34 6SP	Development of up to 450 dwellings	Granted 31/07/2014	No
W/14/0661	Land at Lower Heathcote Farm, Harbury Lane, Warwick CV34 6SL	Development of up to 785 dwellings	Granted 19/09/2014	No
W/14/0300	Land at Asps Farm, bound by Europa Way and Banbury Road, Bishops Tachbrook, L'Spa	Outline planning for up to 900 dwellings, a primary school, a local centre and a Park and Ride facility for up to 500 spaces.	Granted on Appeal 14/01/2016	No
W/13/1490	2-22 Northgate Street, Warwick CV34 4SP	Conversion and alteration of former offices to 18 residential dwellings	Development Near Completion	Yes
W/16/0496	Former Warwick Printing Co Ltd, Land adjacent to Theatre Street and Bowling Green Street, Warwick CV34 4DR	Demolition of Warwick Printing Co building and erection of 39 apartments with associated parking	Granted 25/05/2016	Yes

In relation to the new developments listed, all are being examined through the planning system and air quality assessments requested where relevant. These assessments investigate both the impacts of traffic generated by the development, and the impacts of existing sources of pollution on new residents. Where necessary, mitigation is requested. Monitoring within and around the current AQMAs should alert Warwick District Council to a situation whereby cumulatively, additional traffic affects monitored concentrations. This will be reported annually through the LAQM process.

Quality Assurance and Quality Control of Monitoring Data

Factor from Local Co-location Studies

Bias adjustment factors have been calculated for two co-location studies at the automatic monitoring sites Hamilton Terrace in Leamington Spa and Pageant House in Warwick, as shown in Table A3.3, for the 2015 monitoring data.

Table A3.3: Local Bias Adjusment Factors

	Hamilton Terrace, Leamington Spa	Pageant House, Warwick
Triplicate Diffusion Tubes Annual Mean	22.6	50.2
Automatic Monitor Annual Mean	18.4	37.1
Bias Adjustment Factor	0.81	0.74

Notes: the above annual means for automatic monitors are not a calendar year, as they relate to diffusion tube monitoring periods, and hence may be different to calendar annual mean quoted. Diffusion tube annual means have been weighted based on exposure period.

Diffusion Tube National Bias Adjustment Factors

Warwick District Council uses Staffordshire Scientific Services for its diffusion tube analysis. These tubes are prepared using the 20% TEA in water method. The bias adjustment factor for Staffordshire Scientific Services in 2015, obtained from the national bias adjustment spreadsheet Version 03/16) is 0.84 (based on 15 studies).

Discussion of Choice of Factor to Use

The bias adjustment factor derived from the national bias adjustment spreadsheet has been used and applied to all 2015 data: 0.84. This is based on a larger number of studies, and is slightly more worst-case than the two local factors (particularly Pageant House in Warwick). Warwick's bias adjustment factors will be added to the next version of the national bias adjustment spreadsheet.

PM Monitoring Adjustment

PM_{10} and $PM_{2.5}$ have been measured using an FDMS monitor and there is therefore no adjustment is required.

Short-term to Long-term Data adjustment

During 2015 diffusion tube monitoring sites W64 had less than 75% data capture (50%). Data for W64 have therefore been annualised following the guidance set out in Box 7.10 of Local Air Quality Management; Technical Guidance (TG16) (Defra, 2016).

The data have been adjusted to an annual mean, based on the ratio of concentrations during the monitoring period to those over the 2015 calendar year at the nearest background automatic monitoring site operated as part of the AURN where long-term data are available, i.e. Hamilton Terrace, Leamington Spa. This AURN site has high data capture for 2015 (98.3%).

The annual mean for the Hamilton Terrace automatic background site was compared to the "period mean" which represents the time for which the W64 monitoring site recorded data. The ratio of Hamilton Terrace annual mean and period mean has been calculated, and applied to the W64 period mean.

Table A3.4: W64 Nitrogen Dioxide – Short-term to Long-term Data Adjustment

Monitoring Period	Hamilton Terrance	Hamilton Terrance when W64 is Available
January 2015	27.61	27.61
February 2015	36.50	36.50
March 2015	21.63	21.63
April 2015	16.41	16.41
May 2015	11.67	11.67
June 2015	10.39	10.39
July 2015	12.19	-
August 2015	15.08	-
September 2015	17.49	-
October 2015	25.77	-
November 2015	22.42	-
December 2015	17.68	-
Annual / Period Mean:	*19.57*	*20.70*
Adjustment Factor:	*0.945*	

No short-term to long-term data adjustment was necessary for PM_{10}, $PM_{2.5}$, benzene or ozone.

Nitrogen dioxide concentration drop-off with distance calculation

3.20 During 2015 the diffusion tube monitoring site W67 on Castle Hill marginally exceeded the nitrogen dioxide annual mean objective. W67 is not a site of relevant exposure, therefore Defra's "NO_2 with Distance from Roads Calculator" tool (Defra, 2009) has been used to estimate the annual nitrogen dioxide concentrations at the nearest site of relevant exposure (1.2 m from W67). The inputs to the tool are:

- distance from kerb (Castle Hill) to the diffusion tube monitoring site (W67): *3.0 m*;
- distance from kerb (Castle Hill) to nearest site of relevant exposure: *4.2 m;*

- local annual mean background NO_2 concentration: *17.02 µg/m³* [4]; and
- measured W67 annual mean NO_2 concentration: *39.6 µg/m³* (see Table A1.3).

On the basis of these inputs, the tool estimates that the annual mean nitrogen dioxide concentration experienced at the site of relevant exposure nearest to W67 would be 39.6 µg/m³.

QA/QC of automatic monitoring

All automatic monitoring sites in Warwick, other than Rugby Road, are calibrated by the Council's Local Site Operator (LSO). The QA/QC of the Leamington Spa sites is undertaken through its status as part of the AURN and therefore conforms to AURN standards (undertaken buy Ricardo-AEA). WeCare4Air is responsible for the servicing and call out contract for Hamilton Terrace and Jury Street and provides data management for Jury Street. The service contract for Rugby Road is arranged by Bureau Veritas and Defra and is provided by Enviro Technology Services.

QA/QC of diffusion tube monitoring

Warwick District Council uses Staffordshire Scientific Services for its diffusion tube analysis. These tubes are prepared using the 20% TEA in water method.

Staffordshire Scientific Services was assessed as part of the AIR scheme. AIR is an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme. AIR offers a number of test samples designed to test the proficiency of laboratories undertaking analysis of chemical pollutants in ambient indoor, stack and workplace air. One such sample is the AIR NO_2 test sample type that is distributed to participants in a quarterly basis. AIR NO_2 PT forms an integral part of the UK NO_2 Network's QA/QC. In the quarters of 2015, Staffordshire Scientific Services had 100% satisfactory samples in the first 2 rounds of testing and 75% satisfactory samples in the last 2 rounds.

[4] Annual mean background concentration has been obtained by using the national pollution maps published by Defra (2016b). These cover the whole country on a 1x1 km grid.

A4 Maps of Monitoring Locations

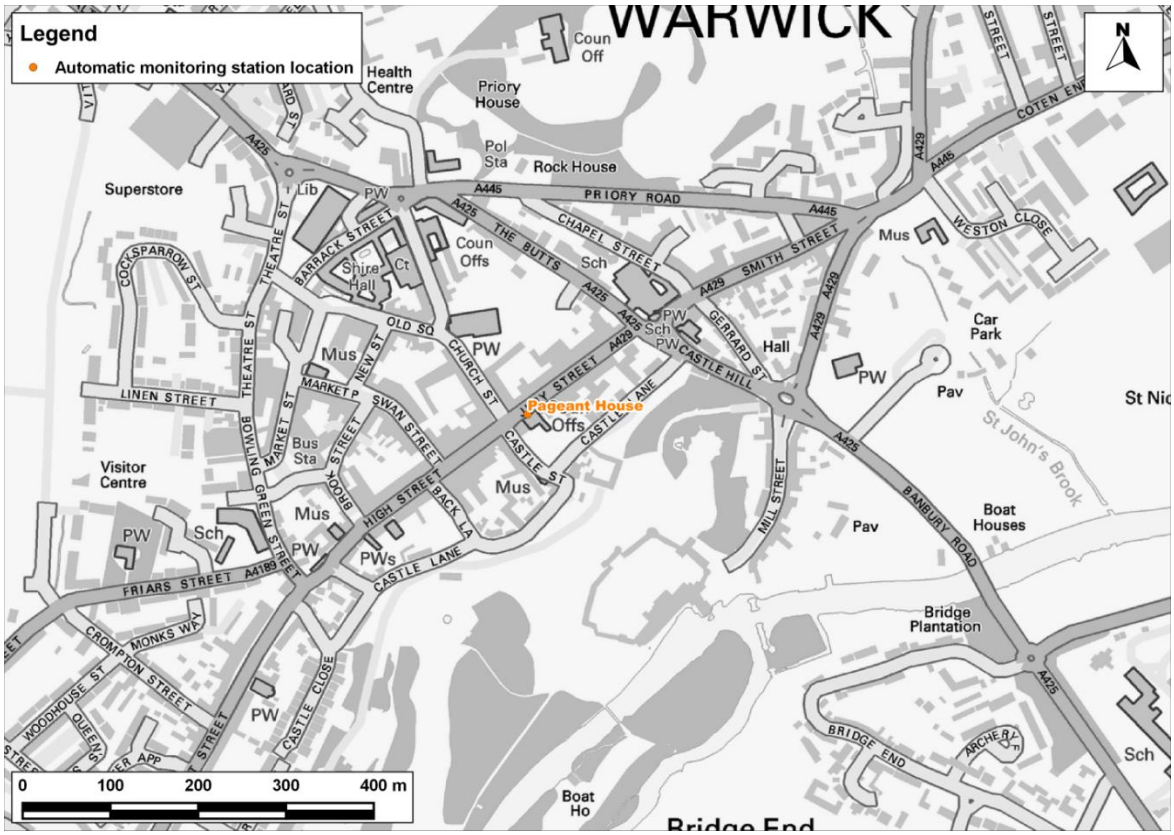

Figure A4.1: Warwick Automatic Monitoring Station Location

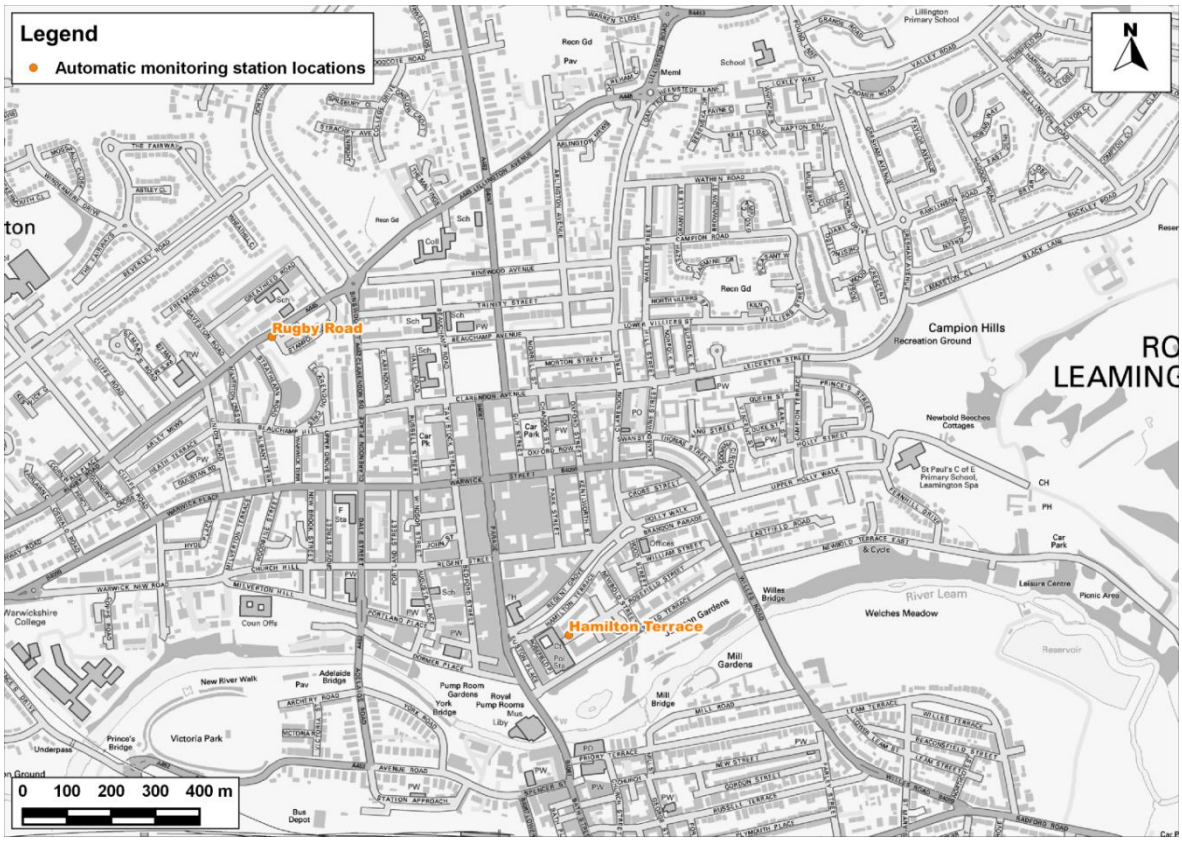

Figure A4.2: Leamington Spa Automatic Monitoring Station Locations

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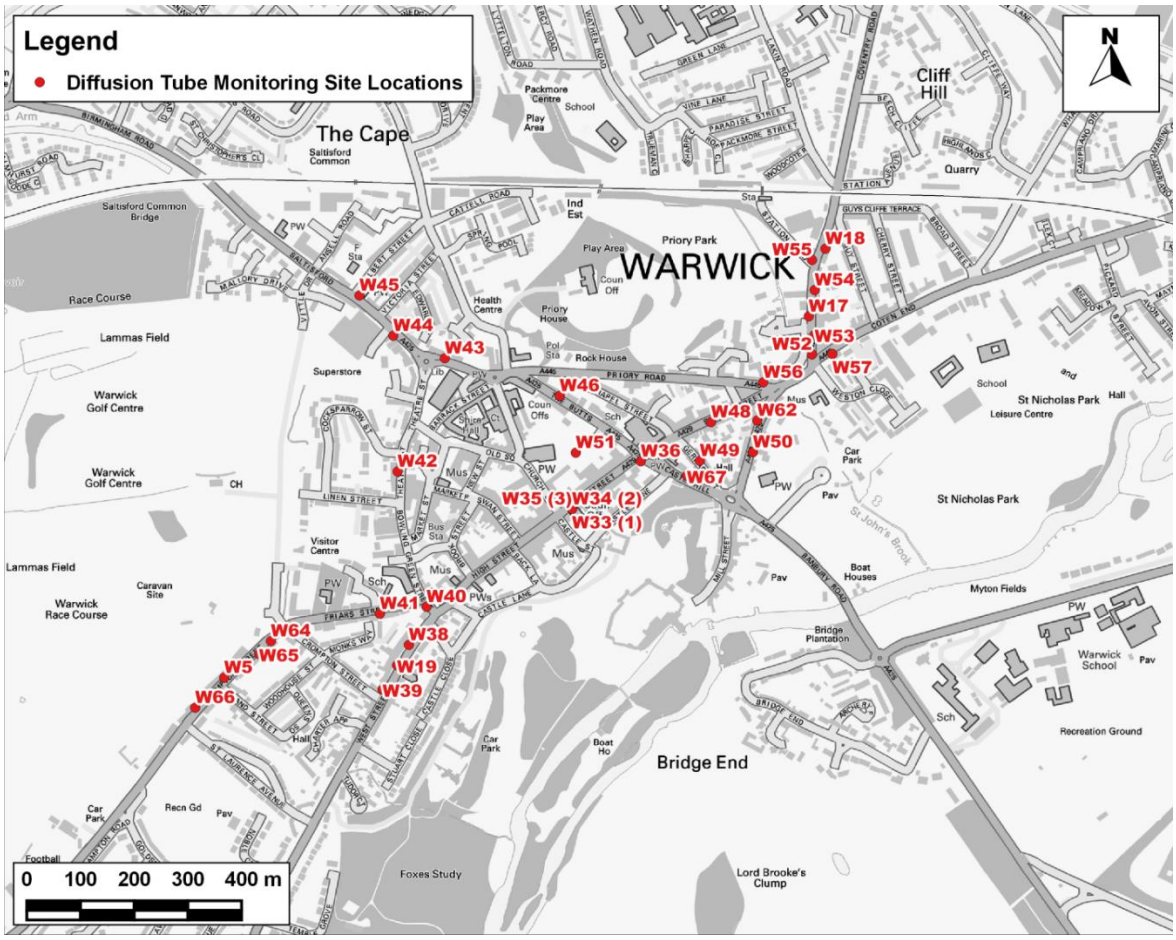

Figure A4.3: Warwick (Centre) Diffusion Tube Monitoring Site Locations

Contains Ordnance Survey data © Crown copyright and database right 2016.

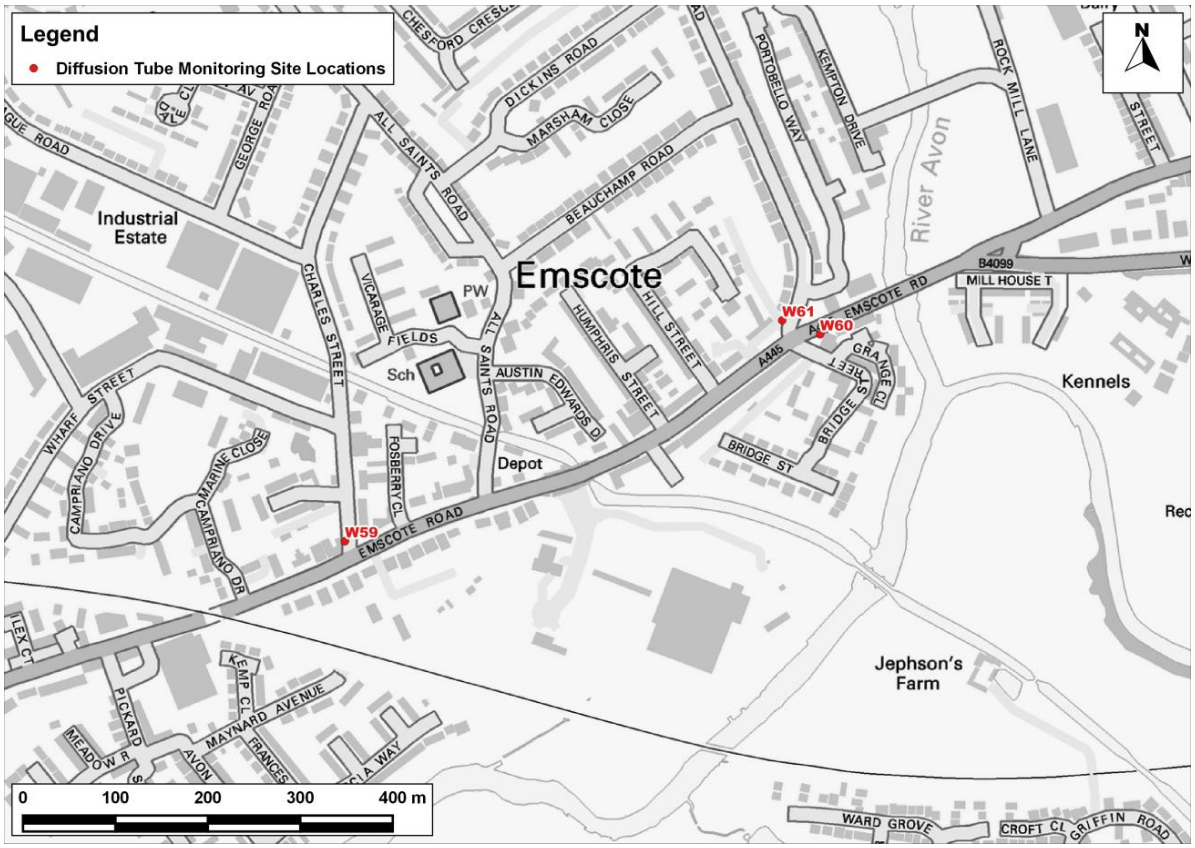

Figure A4.4: Warwick (North) Diffusion Tube Monitoring Site Locations

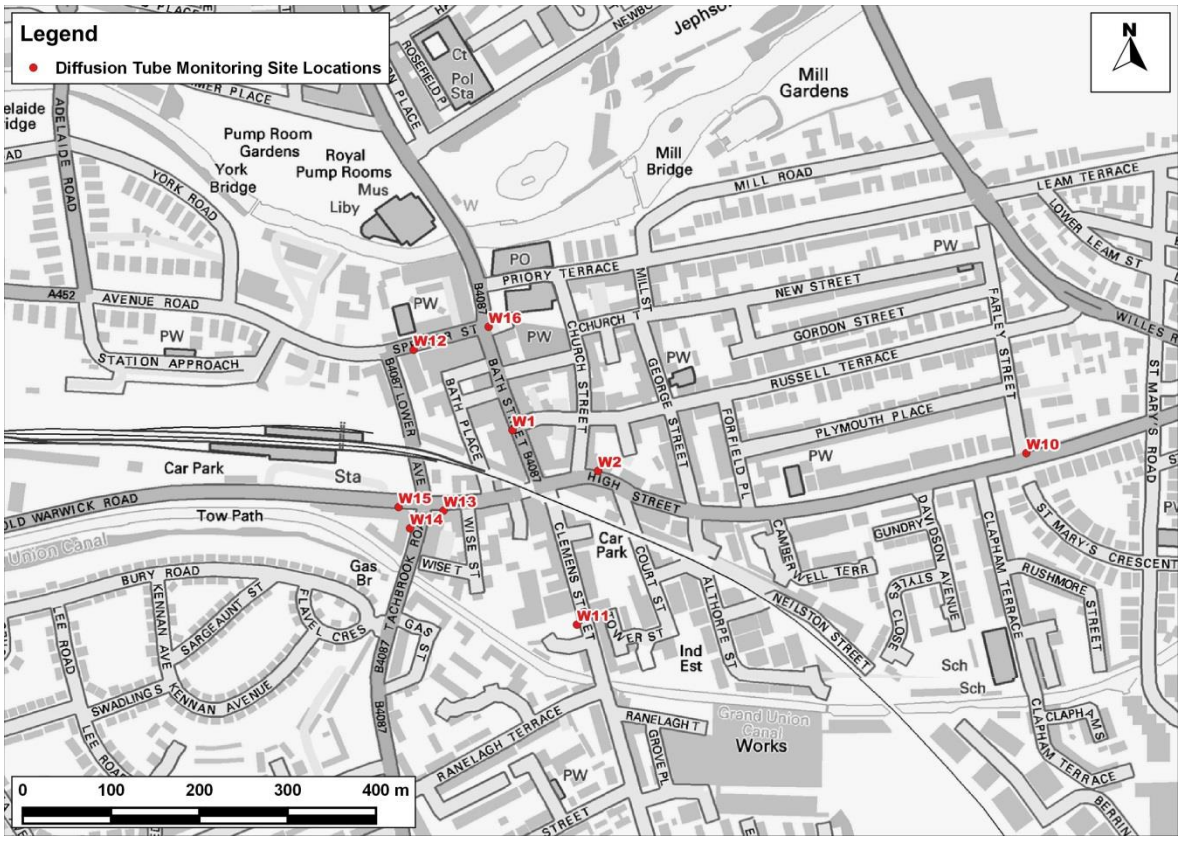

Figure A4.5: Leamington Spa Diffusion Tube Monitoring Site Locations

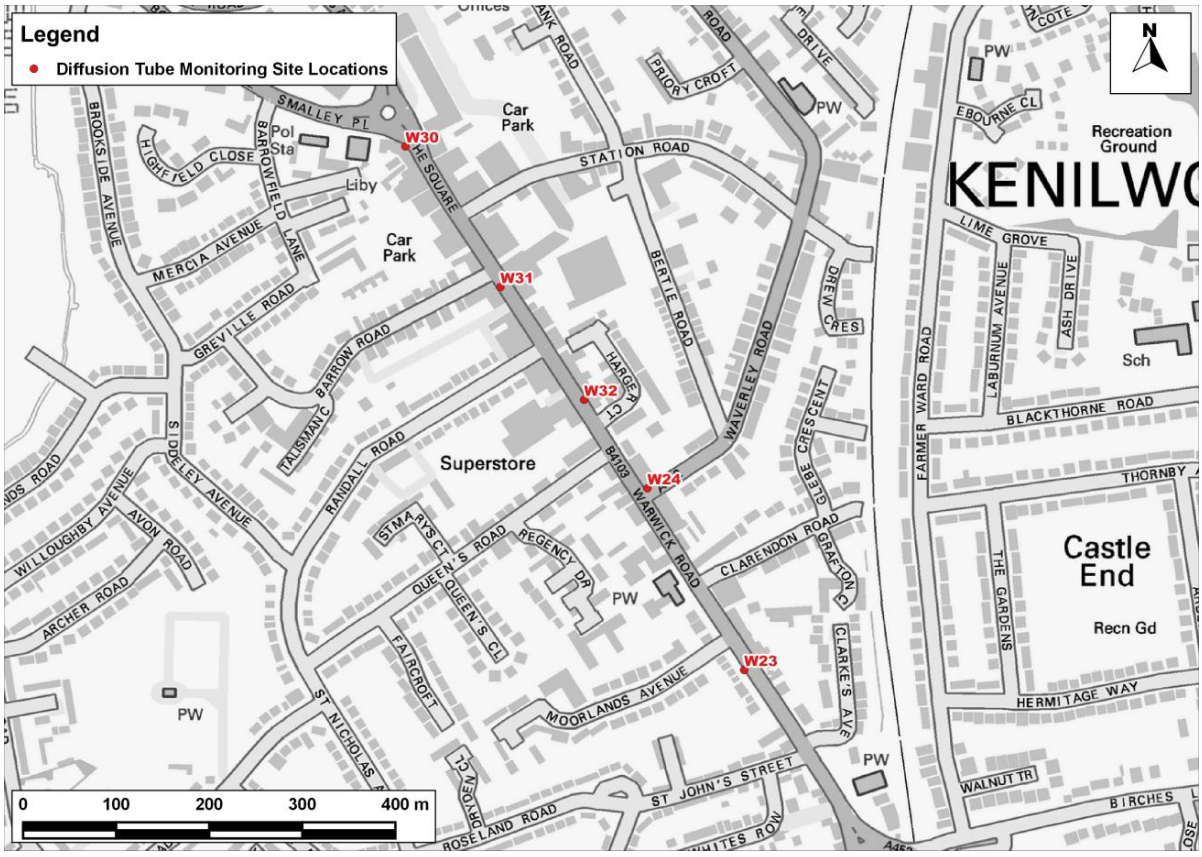

Figure A4.6: Kenilworth (Centre) Diffusion Tube Monitoring Site Locations

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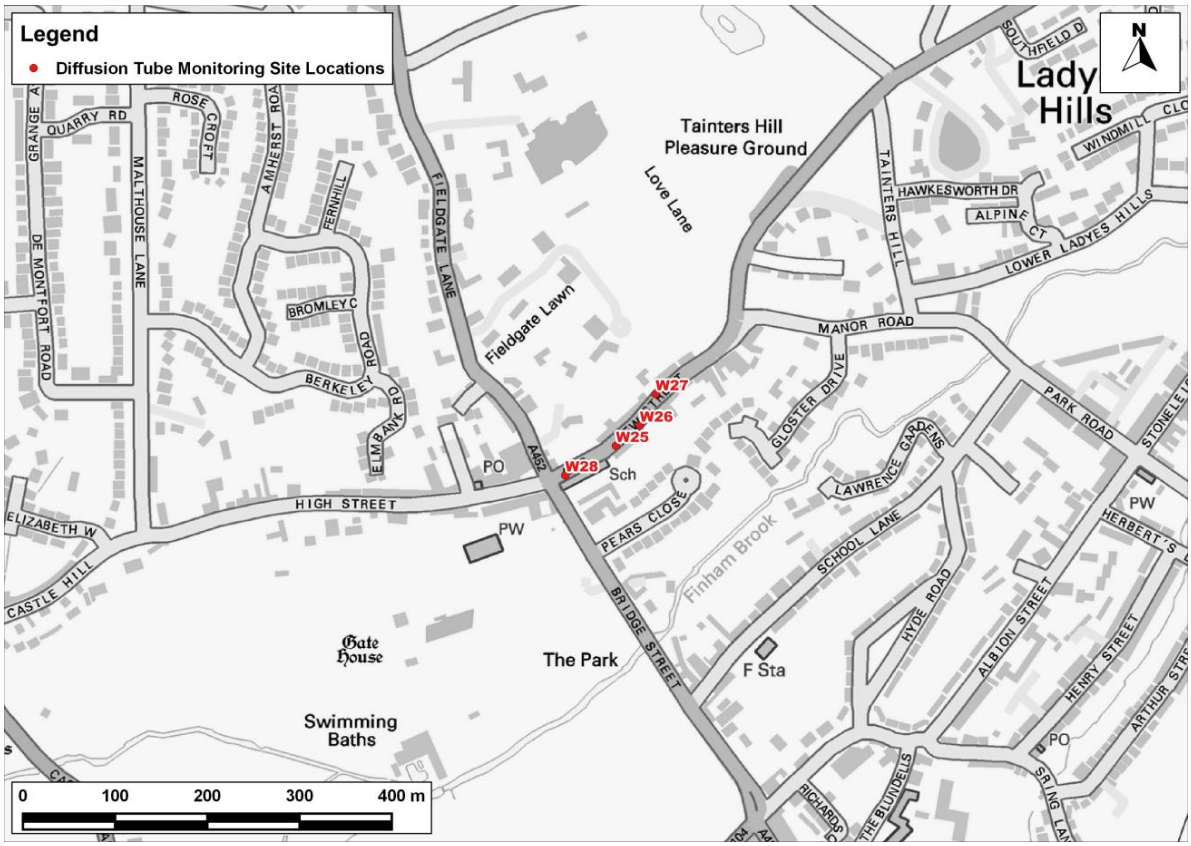

Figure A4.7: Kenilworth (North) Diffusion Tube Monitoring Site Locations

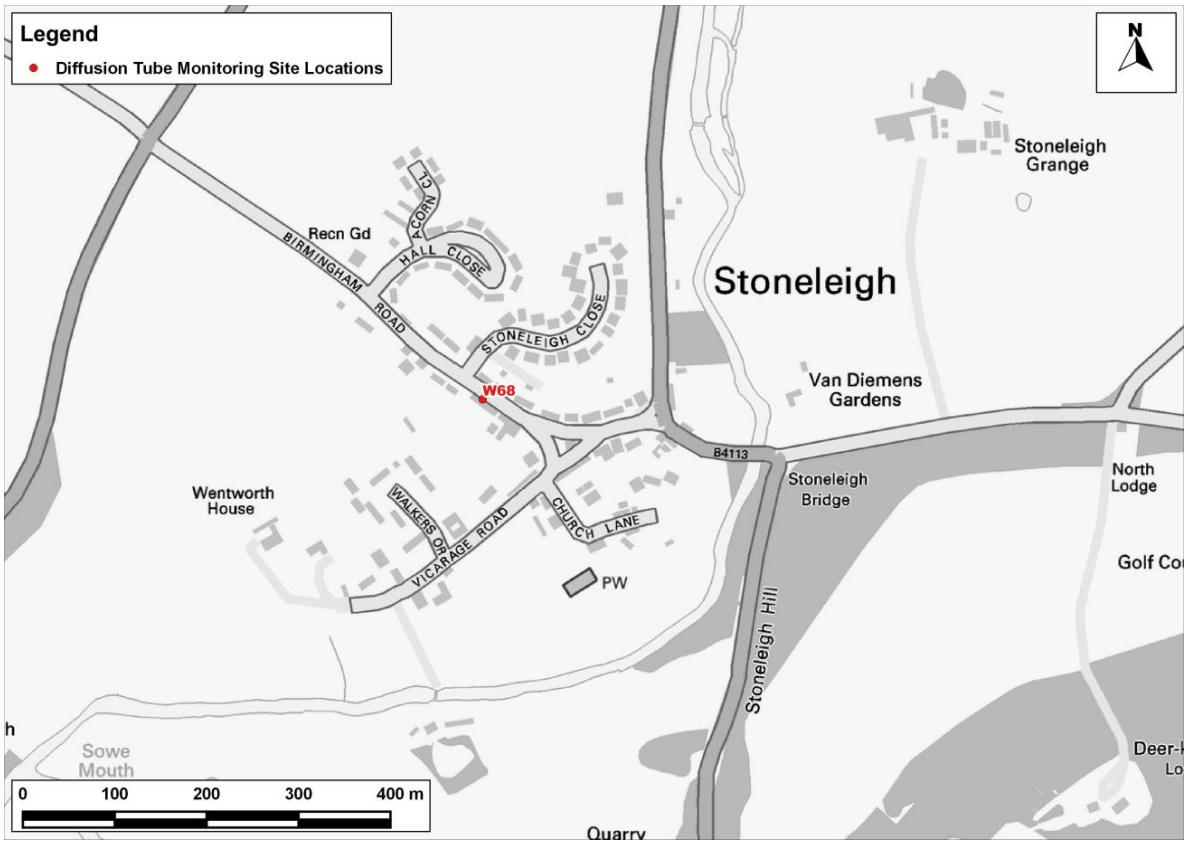

Figure A4.8: Stoneleigh Diffusion Tube Monitoring Site Locations

A5 Summary of Air Quality Objectives in England

Table A5.1: Air Quality Objectives in England

Pollutant	Air Quality Objective[5]	
	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
Benzene	5 µg/m^3	Running annual mean
Ozone	100 µg/m^3, not to be exceeded more than 10 times a year	8-hour mean

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

A6 Glossary

AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
O_3	Ozone
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control

A7 References

Air Quality Consultants. (2015). *2015 Air Quality Updatnig and Screening Assessment: Warwick District Council.*

Air Quality Consultants. (2015). *Air Quality Action Plan: Warwick District Council.*

Defra. (2016). *Local Air Quality Management; Technical Guidance (TG16).*

Warwick District Council. (2008). *Warwick District Air Quality Action Plan 2008.*