2020 Air Quality Annual Status Report (ASR)

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

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Executive Summary: Air Quality in Our Area

Air Quality in Winchester

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 equality 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].

Winchester City Council (WCC)'s administrative area comprises the city of Winchester and wider district area. The main source of air pollution in the borough is road traffic emissions from major roads, including the M3, A34, A31 and A303. Other pollution sources, including commercial, industrial and domestic sources, also make a contribution to background pollution concentrations.

The main pollutant of concern in Winchester is nitrogen dioxide (NO_2), which currently exceeds the annual mean air quality objective near to the city centre. In 2003 an Air Quality Management Area (AQMA) was designated for exceedances of the annual mean NO_2 objective and 24-hr PM_{10} objective. The 24-hr PM_{10} AQMA was later revoked in 2013 after a number of years of measured concentrations remaining below objective levels. Details of the current AQMA are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=314.

WCC currently monitors NO_2 concentrations at various locations throughout Winchester. Results from the monitoring network of diffusion tubes show that there is still an area adjacent to Romsey Road within the AQMA that fails to meet the UK annual mean objective. In the wider district, pollutant concentrations are all below the national air quality objectives.

[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

Between the years 2014-2019, a decreasing trend in NO_2 concentrations has generally been observed at all monitoring locations. There are some year-to-year variations in concentrations, which are likely due to meteorological influences.

Prior to 2019, no monitoring of particulates (PM_{10} and $PM_{2.5}$) was carried out within Winchester, but the Council has now re-instated monitoring within the AQMA on Romsey Road using low cost monitoring devices. In December 2018 the Council installed a continuous monitor (AQMesh) at Romsey Road to monitor for NO_2 and particulates, the annual results of which are reported within this ASR. The Council has also installed a FIDAS 200 Particulate monitor in the St George's Street air quality station that went live in February 2020. The results of this monitor will be presented within the next reporting year.

In late 2018, 3 additional diffusion tubes were also added in Martyr Worthy, as part of the 'Enhanced Kingsworthy Study', to investigate the failures in NO_2 concentrations seen at Site 3 - Martyr Worthy, though this exceedance has not persisted into 2019. Results are presented within this ASR.

In May 2017 Winchester City Council issued a new Air Quality Action Plan (AQAP)[4], with the aim of tackling the remaining hotspots in the city centre. This action plan replaced the previous action plan which ran from 2006 to 2016. This action plan has remained relevant through an update before Cabinet in January 2020.

Actions to Improve Air Quality

The 2020 AQAP update outlines nine high impact core and nice complimentary actions aimed at improving air quality and working towards meeting the relevant air quality objectives within Winchester district. The core measures were identified as directly influencing NO_2 concentrations through a combination of reducing traffic volumes, encouraging a lower NO_x emitting vehicle profile in the city and addressing future emissions through environmentally aware procurement practices and ensuring minimum development standards. Due to the main source of pollution within the AQMA being road traffic, some of the key actions in the AQAP aim to reduce congestion and vehicle emissions in the city centre, with the focus on improving NO_2 concentrations.

[4] Winchester City Council Air Quality Action Plan (2017) Available at: https://www.winchester.gov.uk/environment/air-quality/historical-air-quality-reports-for-government

The core actions for this action plan are:

1. Build on car parking pricing differential (Modelled 2% reduction in NO_x);
2. Review of enforcement of goods deliveries by time of day (Modelled 2% reduction in NO_x);
3. Introduce a Park and Ride Site to the north of Winchester (Modelled 3% reduction in NO_x);
4. Introduce new parking charges/incentives to reduce diesel car parking and high polluting petrol cars (older than Euro 4) from parking in central car parks in favour or low emission vehicles. (Modelled 10% reduction in NO_x);
5. Investigate the feasibility of introducing a CAZ for heavy duty vehicles (Modelled 10% reduction in NO_x);
6. Ensure that all Council owned leased, contracted or influenced vehicles that enter the AQMA meet the OLEV standards for ULEV's and are not diesel fuelled by 2020. (Modelled 2% reduction in NO_x);
7. Development of an Air Quality Supplementary Planning Document (AQ SPD);
8. Continue to work with and lobby Hampshire County Council to identify projects to improve air quality; and
9. Monitor the performance of the Action Plan and reassess whether additional measures are required to meet the Objective.

Progress has been made with these core actions since the 2017 AQAP and the progress to the new updates will be reported in the next ASR.

There is also a range of complementary measures that mainly relate to the continued support for ongoing softer measures such as supporting walking, cycling and travel plan initiatives. These can be seen below in Table 2.2. A new electric vehicle charging strategy[5] has been implemented within the city as part of Measure 11 and proposes to install 46 Electric Vehicle Chargers.

The adoption and implementation of a new of Parking and Access Strategy was completed in March of 2020 which includes actions to promote means of transport other than the private car, greener vehicles and use of car parks outside the city

[5] Electric Vehicle Charging Infrastructure Study for Winchester City Centre and District (2018), Available at: https://www.winchester.gov.uk/environment/air-quality/air-quality-in-winchester

centre including an expanded park and ride offer. Progress on this will be reported in the next ASR.

Hampshire County Council is the lead local authority for transport in Winchester District. Policies to improve transport, and encourage sustainable transport have been set out within the Local Transport Plan for Hampshire[6]. WCC is working with the County to deliver measures in their AQAP and conduct a Movement Study to gather the required data to monitor progress. Consultation on the study was completed in January 2019 and progress is ongoing.

Conclusions and Priorities

Across all monitored sites there was one location which exceeded the annual mean objective of 40 µg/m^3, located on Romsey Road, where a concentration of 46.5 µg/m^3 was reported. This location has seen the highest monitored concentration for the last four years, though concentrations continue to fall steadily. These falling results together with the real time indicative data from the AQMesh show it is extremely unlikely that there is an exceedance of the hourly mean objective. The annual mean exceedance at this location is within the existing AQMA, so there is no need to declare a new AQMA, nor amend or revoke the existing AQMA. Three additional diffusion tube locations have been installed on Romsey Road for 2020 and will be included in next years ASR. Two further sites (both on St George's Street) were within 10% of the objective limit (>36 µg/m^3) which indicates a risk of exceedance and these sites will therefore continue to be closely monitored in the coming years. There remains little risk of exceedances of the objectives for NO_2 at the locations monitored across the Disctrict (i.e. outside of Winchester city centre).

Generally, concentrations of NO_2 are steadily declining year on year. This tends to indicate that the actions and measures within the City's AQAP are having a positive effect, though there is still more work to do, particularly on Romsey Road.

WCC's priorities for the coming year in relation to the existing measures include finalising the SPD, installing EV charging points and implementing the City of Winchester Movement Strategy. These actions will be progressed in 2020 and beyond, with the aim of achieving further improvement in air quality to the point where it is hoped that in early 2021, a review of the current AQMA can be undertaken

[6] Hampshire County Council LTP Implementation Plan 2014-2017 https://www.hants.gov.uk/transport/strategies/transportstrategies

with a view to revoking the current AQMA or considering it's revision to a smaller AQMA if the data supports this. This will also then provide opportunity to consider a new AQAP to address the new smaller AQMA, if required.

WCC will also continue to monitor air quality within our jurisdiction, specifically within Winchester City centre and at select locations across the wider district. The Council has undertaken a review of the current monitoring network and is planning to move the real time Chesil St site to Romsey Road to better capture elevated concentrations, which will free up the AQMesh instrument on Romsey Road to be relocated to other perceived areas of concern.. WCC will also use the newly installed FIDAS 200 monitor to inform policy and actions over the next reporting period.

It will also be necessary to manage the impact of the COVID-19 pandemic, as in the short term this has been positive for air quality, but in the long term could continue to divert Council resources. In addition, some of the air quality messaging, such as use of pubic transport and car sharing, is currently problematic.

Local Engagement and how to get involved

Members of the public can take simple measures to help improve air quality, the main ones being, where possible, making short trips and journeys on foot or by bike instead of by car. Traffic congestion can further be reduced by the general public through car sharing or by using public transport including the park and ride buses to access the city centre. A car share club was launched in 2017 and is currently being actively promoted. In 2017, Winchester hosted its first National Clean Air Day event where members of the public were encouraged to get involved. This was carried on into 2018 and again into the National Clean Air Day which took place on 20th June 2019.

During 2020, WCC intends to improve public access to live parking information and signage. There will be an increased focus on public engagement relating to domestic solid fuel combustion (and bonfires). Both of these initiatives will help to improve air quality and public engagement.

Winchester City Council provides information on air quality on their website http://www.winchester.gov.uk/environment/air-quality/ and air quality monitoring data from Winchester can be viewed on UK Air Quality net: http://www.ukairquality.net/.

Further information on air quality can be found on Defra's Local Air Quality Management (LAQM) website[7].

[7] Defra LAQM website: http://laqm.defra.gov.uk/

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1 Local Air Quality Management

This report provides an overview of air quality in Winchester during 2019. 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 WCC to improve air quality and any progress that has been made.

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by WCC can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=314 – see full list at https://uk-air.defra.gov.uk/aqma/list>. 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).

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
Winchester Town Centre AQMA	Declared 14/11/2003	NO_2 Annual Mean	Winchester	Area surrounded by the town centre one-way system and the town centre end of the major roads feeding into it.	No	>40 µg/m^3 at multiple locations	46.5 µg/m^3 at one location	Winchester City Council Air Quality Action Plan	2017	https://winchester.citizenspace.com/licensing/air-quality/supporting_documents/Winchester%20AQAP_Final%20Draft_160120 17.pdf

☒ **Winchester 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 Winchester

Defra's appraisal of last year's ASR agreed that on the basis of the evidence provided the conclusions reached were acceptable for all sources and pollutants. It suggested the monitoring results for both PM_{10} and $PM_{2.5}$ from the indicative monitor should be included within the 2020 ASR. Data from the new AQMesh on Romsey Road has been presented within this ASR to address this comment. Defra feedback on the 2019 ASR also picked up the following inaccuracy **"**coordinates of the triplicate diffusion tube monitoring site (Site 5, 6, 7) should be checked". These coordinates have been updated and presented within this ASR.

In May 2017 Winchester City Council issued an AQAP, with the aim of tackling the remaining hotspots in the city centre. This action plan replaced the previous action plan which ran from 2006 to 2016. This action plan was also kept relevant through an update in January 2020 and presentation to Cabinet.

WCC has taken forward a number of direct measures during the current reporting year of 2019 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

Progress has already been made and improvements already seen on a number of these core measures including;

- The new car parking charges implemented in city centre, inner and outer car parks have promoted the use of park and ride sites, resulting in fewer cars parking in the city centre;
- A new 'Electric Vehicle Charging Strategy'[5] has been adopted and there are plans to install 46 electric vehicle chargers within the city, serving a total of 57 bays. Of this 23 EV Chargers will be in the City Centre serving 25 bays. Contractors to install the first batch are currently being appointed; and
- A 'Car Club Scheme' has now been introduced in Winchester and is provided by Enterprise Car Club.

WCC expects the following measures to be completed over the course of the next reporting year:

- Ensure that all Council-owned, leased, contracted or influence vehicles that enter the AQMA meet the OLEV standards for ULEVs and are not diesel fuelled by 2020. This measure is expected to result in a 2% reduction in NO_x emissions; and
- Development of air quality supplementary planning document (SPD).

WCC's priorities in relation to the existing measures for the coming year are to:

- Finalise the SPD, which is currently out for consultation;
- Progress with the installation of EV charging points;
- Continue to liaise with the wider regional authorities regarding an LES;
- Continue with the Implementation of the City of Winchester Movement Strategy;
- Improve public access to live parking information and signage; and
- Progress the outcomes of the WCC Staff Travel survey completed in early 2020.

These actions will be progressed in 2020 and beyond, with the aim of achieving further improvement in air quality in conjunction with the following additional actions:

- It is hoped that in early 2021, a review of the current AQMA can be undertaken with a view to revoking the current AQMA or considering the need for revision to a smaller AQMA if the data supports this. This will also provide the opportunity to consider a new AQAP to address the new smaller AQMA, if required;
- Increased monitoring in the Romsey Road area (further outlined in Section 3.1) to help quantify the extent of the issue in this area;
- There will be an increased focus on public engagement relating to domestic solid fuel combustion (and bonfires); and
- Adoption and implementation of a new of Parking and Access Strategy in March of 2020 which will include actions to promote means of transport other

than the private car, greener vehicles and use of car parks outside the city centre including an expanded park and ride offer[8].

The principal challenges and barriers to implementation that WCC anticipates facing are likely to be related to the long term effects of the COVID-19 pandemic, which are anticipated to divert council resources for a significant period within 2020 and potentially beyond, which may detract from focus on the AQAP measures. This has already impacted on progress with some measures during the first half of 2020.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Winchester City Council anticipates that further additional measures not yet prescribed may be required in subsequent years to achieve compliance and enable the full revocation of Winchester AQMA.

[8] WCC (2020) Parking and Access Strategy, Available at: https://democracy.winchester.gov.uk/ieListDocuments.aspx?CId=136&MId=1885

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	Build on existing car park pricing differentiation strategy	Traffic Management	Other	2017	WCC -Engineering & Transport & Parking Services	Local Authority	Annual Mean NO_2; Car park patronage; preferential responses	2% reduction in NO_x emissions	This measure has already been implemented since April 2018 and have since demonstrated strong trend toward an uptake in use of the P&R sites and a consequential freeing up of city centre parking capacity. All P&R sites are now at operating at near capacity during the week.	Charges introduced and will be reviewed after one year	Impact on pollution reduction will require further assessment
2	Review enforcement of goods deliveries by time of day and enforce	Freight and Delivery Management	Quiet & out of hours delivery	2017	WCC - Parking services	Local Authority	Annual mean NO2; PCNs issued; Change in delivery hours	2% reduction in NO_x emissions	Adopted to encourage a smooth traffic flow through the one way system during peak periods. After an initial targeted data gathering and enforcement programme by the CEOs several parking tickets have been served. Further data collection is expected to better inform on whether targeted enforcement possess a demonstrable improvement on traffic flow	Ongoing	Adopted to encourage a smooth traffic flow through the one way system during peak periods. These waiting restrictions are actively enforced by the Council's Civil Parking Enforcement Officers and, in 2019 (November), we have issued 55 Penalty Charge Notices for loading ban contraventions in various locations in the city centre. Of these: 47 paid; 1 cancelled; 7 cases still live
3	Introduce a Park and Ride site in the north of Winchester	Alternatives to private vehicle use	Bus based Park & Ride	2017	WCC but informed by City of Winchester Movement Strategy	Local Authority	Bus patronage; Traffic flow; Use and satisfaction of P&R	3% reduction in NO_x emissions	The Winchester Movement Strategy was adopted by WCC on 25 March 2019 see https://www.hants.gov.uk/aboutthecouncil/haveyoursay/consultations/winchestermovementstrategy The strategy is now embarking on developing a detailed set of identified study options	tbc	Should the study identify the need for additional P&R facilities at the northern approaches or in other locations on the edge of the city, this will inevitably be subject to a capital investment programme and will not be realistically delivered in accordance with the relatively short time scales set out in the AQAP. The City Council has recently completed the clearance of the Vaultex site at Bar End and is progressing work to provide an estimated 130 additional Park & Ride spaces, which should be operational by the end of 2020
4	Introduce new parking charges/incentives to reduce diesel car parking and high pollution petrol cars (older than Euro 4) from parking in central car parks in favour of low emission vehicles	Traffic Management	Emission based parking or permit charges	2017/18	WCC – Parking Services Engineering & Transport	Local Authority	Traffic flow and speed; Increase in petrol/ULEVs using car parks; Preferential responses	10% reduction in NO_x emissions	The AQAP modelled the impact of diesel cars at contributing 58% of the Nox emissions from all vehicles entering the AQMA, many of which will elect to use the City Centre car parks. Parking Services continues to closely monitor developments and will, present a further new report setting out proposals to introduce an emissions based charging regime as part of the wider parking strategy for the city. The Council have now introduced the 'Electric Vehicle Charging Strategy' as part of Measure 11 below but it also supports Measure 4	Unlikely to be completed, but reviewed annually	This measure seeks to adopt 'smart' ticket machine technology to implement differential charging tariffs for higher polluting vehicles, primarily diesels. Having reviewed the options currently available and costs it has been decided in the current parking review to not pursue this option at this stage. This decision will be reassessed as part of the annual car parking review. The implementation of this measure is now being addressed through the new Parking Strategy, which seeks to procure 'equipment and/ or technology to allow differential charging for cleaner vehicles (Emission Based Pricing) and smart payment options.
5	'Investigate the feasibility of introducing a CAZ for heavy duty vehicles that enter the AQMA,	Promoting Low Emission Transport	Low Emission Zone (LEZ)	Ongoing	WCC	Local Authority	Annual mean NO2; Number of Euro VI entering AQMA; PCNs issued	10% reduction in NO_x emissions	It has now been determined that the WCC cannot 'ban' non Euro VI heavy duty vehicles from entering the city. Thus the measure has been reworded from	Ongoing, unlikely to be a CAZ option pursued	The Winchester Movement Strategy is not currently pursuing the CAZ option. Alternative measures are currently being assessed within identified study

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
	which do not meet Euro VI Standards (amended)								'ensure' to investigate the feasibility of introducing a CAZ'. The feasibility of alternative measures, such as bus retrofitting, freight consolidation centres, restrictions on last mile HGV deliveries and the use of bus gates, are to be investigated.		options .See https://www.hants.gov.uk/aboutthecouncil/haveyoursay/consultations/winchestermovementstrategy
6	Ensure that all Council-owned, leased, contracted or influence vehicles that enter the AQMA meet the OLEV standards for ULEVs and are not diesel fuelled by 2020	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	2017-	WCC	Local Authority	Low emission vehicles in fleet; Number of trips entering AQMAs	2% reduction in NO_x emissions	WCC is currently reviewing the Council's current procurement policy and a new policy is expected by the end of the year. This includes ensuring that the refuse fleet deployed to serve the district utilizes lower emission Euro VI engines and that the City Council's 'grey fleet' uses electric or hybrid vehicles where possible. The taxi licensing regime is currently under review and phase 2 of this project now underway, to be completed by June 2020	End of 2020	Winchester City Council no longer provides lease cars.
7	Development of air quality supplementary planning document (SPD)	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2017-	WCC	Local Authority	Annual Mean NO_2; Planning applications showing regard for SPG	N/A	Initial 2019 draft version was too complex and had to be redrafted. Final version is currently out for consultation	End of 2020	
8	Continue to work with and lobby Hampshire County Council to identify projects to improve air quality	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2017-	WCC/HCC	Local and County Authority	Annual Mean NO_2	N/A	WCC is currently working with HCC on the detailed delivery of the Movement Strategy for Winchester (adopted April 2019) which will consider air quality and a regional SPD (if appropriate).	Detailed studies that have air quality impacts currently underway	Funding for any measures identified needs to be secured
9	Monitor the performance of the action plan and reassess whether additional measures are required to meet the objective	Public Information	Other	2017	WCC	Local Authority	Annual mean NO_2; Modelling of actual emissions reductions	See Core Actions	To be undertaken as part of annual reporting requirements and data from monitoring at static monitoring sites	Ongoing	
Additional Measures											
10	Work with authorities towards adoption of a regional LES	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2017	WCC with SCC, EBC	Local Authority	Adoption of strategy	N/A	Winchester City Council currently chairs the Hampshire Air Quality Group a collective of air quality regulators across the County., including PHE, Local authorities and Hampshire County Council (health, transport and travel planning). A programme of measures is proposed for 2020, including a Hampshire wide no idling campaign, the development of Hampshire wide air quality planning guidance and work regarding domestic solid fuel combustion	Ongoing, but unlikely to be implemented	Following initial meetings to explore this option it is unlikely that a regional LES will be adopted
11	Seek to commit to introduce more electric vehicle charging points within car parks	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel	2017	WCC	Local Authority	Number of points installed	N/A	In March 2020, Winchester City Council allocated a budget of £120k to implement in the part JoJu's feasibility study to part fund 30 fast 22kWh chargers and for JoJu to fully fund 2 rapid 50kWh chargers.	2020/21	Delivery has been delayed due to the Coronavirus pandemic however detailed site studies are expected in July 2020 with work to commence over the summer of 2020.

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
			recharging								
12	Ensure that air quality is a standard consideration as part of procurement practice and is reflected in the Council's Procurement Policy	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	2017	WCC	Local Authority	Adoption of procurement policy; Uptake of LEVs (as per core action)	See Core Action 6	WCC is updating its Procurement Strategy and will ensure air quality is a material consideration in contracts.	Ongoing	In response to the Climate Emergency declaration in June 2019, one of the aims of the strategy will be to require social and environmental factors to be considered in all procurements.
13	Continue to improve public access to live parking information and signage and better signage to encourage drivers to use the car park best suited to their journey.	Public Information	Via other mechanisms	2017	WCC/HCC	Local Authority	Utilisation of central car parks	N/A	Studies now underway as part of potential programmes of work identified within the Hampshire Movement Study	Ongoing	Currently in Winchester city centre, Hampshire County Council manages the ROMANSE system: https://www.romanse.org.uk/winchester.htm which also includes digital signs which denote specific car parks and the number of available spaces therein. Due to technological improvements, further measures could include the introduction of individual bay sensors which are available from multiple suppliers such as: https://www.clearview-intelligence.com/products/m300-bay-occupancy-system.
14	To continue to work on the delivery and promotion of car club schemes operating in the city	Alternatives to private vehicle use	Car Clubs	2017	WCC	Local Authority	Number of car club members	N/A	WCC now has a Car Club Scheme in city centre provided by Enterprise Car Club.	Completed in 2018	
15	Consider the introduction and promotion of additional cycle stands, in consultation with local cycling groups, as part of planned developments in the AQMA	Promoting Travel Alternatives	Promotion of cycling	2017	WCC	Local Authority	Number of cycle parking; Number of cyclists as a modal share (through surveys)	N/A	No progress from previous year. Measure has been impacted by potential road infrastructure changes coming out of detailed studies driven by the Winchester Movement Strategy	Ongoing	
16	Work with stakeholder organisations and maintain a programme of regular communication to encourage behavioural change	Promoting Travel Alternatives	Other	2017	WCC	Local Authority	tbc	N/A	Ongoing	Ongoing	The City Council's Lead for Public protection currently organises and chairs the Hampshire Air Quality Action Group, which consists of various air quality officers from across the County and two Unitaries, as well as representatives from Public Health England, HCC Public Health Team, HCC Highways, HCC School Travel Planners.
17	Review and refresh the Council Travel Plan to promote more sustainable travel for staff	Promoting Travel Alternatives	Workplace Travel Planning	2017	WCC	Local Authority	Number of staff travelling to work by car (surveys)	N/A	WCC has set up a new Winchester Travel Planners Forum initially targeted at the major employers within Winchester, which includes WCC, HCC, Winchester University, Winchester Hospital and the Prison all of whom have members on the forum. In addition we have members from Southampton University and links with the Southampton Travel Planners	2021	WCC Staff Travel survey completed early 2020

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
									Network for a cross regional approach. The group has a Terms of Reference and is working towards a consistent collation of staff travel data to inform policies to assist major employers in the development of sustainable travel policies.		
18	Provide web based information and sign posting to resources that will assist and encourage workplaces and schools in the City to adopt Travel Plans	Promoting Travel Alternatives	Workplace Travel Planning	2017	WCC	Local Authority	Number of travel plans adopted	N/A	Little progress on this measure beyond sign posting to existing resources. It is expected that once the Travel Planners Forum gains traction that a shared-on line resource can be hosted on Winchester's Web Pages.	tbc	My Journey Hampshire has already been established and provides a body of useful information. The Winchester Travel Planners Forum will work with this site to ensure that it provides the right advice for travel planning for individuals and businesses in Winchester and wider district.

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG(16) (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.

Between 2011-16, Winchester had below the national average for the Public Health Framework Indicator, 'Fraction of mortality attributable to particulate air pollution'. However in 2017, the fraction value increased marginally from 5% to 5.1% which was the same as the national average[9]. In 2018 (the latest available year), Winchester's indicator remained at 5.1%, but the national average increased to 5.2%, indicating Winchester is again now marginally below the national average. Winchester also compares favourably with nearby authorities (Southampton at 6.1%, Basingstoke & Deane at 5.4%, and Eastleigh at 5.7%) and the South Eastern region as a whole (5.6%).

Winchester City Council is taking a number of measures to address $PM_{2.5}$. Measures include working with Public Heath colleagues, adopting transport initiatives included in The Local Transport Plan for Hampshire and local planning policies supporting the implementation of the Winchester Air Quality Action Plan.

A new AQMesh monitoring device was installed on Romsey Road in December 2018 to monitor concentrations of $PM_{2.5}$ so that the pollutant may be better understood in Winchester.

WCC has so far measured indicative $PM_{2.5}$ concentrations below the air quality objective threshold and does not consider this pollutant to be a major compliance issue. However, once more data is available from the newly installed FIDAS 200 monitor and the AQMesh, a conclusion can be drawn as to whether further measures are required to address $PM_{2.5}$ in the area. It is the Council's intention that this will also tie in with the time frames for further central government guidance on $PM_{2.5}$ (as per

[9] Public Health Outcome Framework (2019), 'Health Protection'. Available at: https://fingertips.phe.org.uk/profile/public-health-outcomes-framework/data#page/0/gid/1000043/pat/6/par/E12000008/ati/101/are/E07000094

the Environment Bill 2020) and potentially a more stringent objective in line with World Health Organisation guidelines.

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 national air quality objectives.

Winchester City Council undertook automatic (continuous) monitoring at 3 sites during 2019, which is hosted live and externally on UK Air Quality Net. Table A.1 in Appendix A shows the details of the sites. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem, which isn't the case in Winchester. National monitoring results are available for comparison at https://uk-air.defra.gov.uk/.

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

The Council has recently undertaken a review of the current monitoring network and is planning within the next reporting year to move the automatic Chesil Street site to Romsey Road to better capture elevated concentrations, which will free up the AQMesh instrument currently located on Romsey Road. This will likely be relocated initially to the Whiteley area, that has significant development taking place and reported congestion issues. The Council can therefore obtain some indicative real time data from 2020/21 to ensure compliance in this area.

The Council has also recently (27 February 2020) installed a FIDAS 200 Particulate monitor in the St George's Street air quality station, which will enhance understanding of particulates within the city centre in the next reporting round.

3.1.2 Non-Automatic Monitoring Sites

WCC undertook non-automatic (passive) monitoring of NO_2 at 35 locations (39 diffusion tubes, with two triplicate sites) during 2019, though Shepherds Lane (District Site 9) was discontinued after only one month[10].

Table A.2 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[11], "annualisation" (where the data capture falls below 75%), and distance correction[12]. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 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 40 µg/m^3. Note that the concentration data presented in Table A.3 represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment). Some co-ordinates for the monitoring sites have been updated from the 2019 ASR in line with appraisal commentary from Defra, and following an internal audit of the locations. These are still comparable with previous year's data, as the sites' real locations have not been altered.

For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 should include distance corrected values if relevant, though no distance correction was required as any sites >36 µg/m^3 were already at locations of relevant exposure.

[10] This site was only in-situ for a year to show that the large biomass plant at Four Dells Farm Poles Lane Otterbourne Winchester Hampshire SO21 2DY (Grid Ref 445,419 124,419) was not a significant source of NO_2. This data was reported in the 2018 ASR
[11] https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html
[12] Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

Across both continuous and passive monitoring sites, there was one location which exceeded the annual mean objective of 40 µg/m^3, Site 23 in the City Study, located on Romsey Road, where a concentration of 46.5 µg/m^3 was reported. This location has been the highest monitored concentration for the last four years, though concentrations continue to fall steadily. The exceedance at this location is within the existing AQMA as shown in Appendix D: Map(s) of Monitoring Locations and AQMAs, so no amendment or extension is required, nor can the AQMA be revoked at this time. The exceedance in this location is thought to be related to the geometry of Romsey Road, which is enclosed by structures (including some domestic premises) and trees, forming a 'canyon' which limits the dispersion of pollutants emitted by road traffic. The road is also on a gradient, which affects the emissions from traffic, particularly when congested. Two further sites (City Study 8 & 9, both on St George's Street) were within 10% of the objective limit (>36 µg/m^3) which indicates a risk of exceedance due to the uncertainties associated with the diffusion tube monitoring technique, and these sites will therefore continue to be closely monitored in the coming years. There remains little risk of exceedances of the objectives for NO_2 at the locations monitored across the Disctrict (i.e. outside of Winchester city centre).

Generally, across both the City and District-wide studies, concentrations are steadily declining year on year, as demonstrated in Figure A.1. Large reductions in monitored concentrations compared to 2018 were seen at the majority of sites, including the St George's Street continuous monitor, City Sites 10, 16 and District Sites 3 and 6. The exceptions were at City Sites 17 and 22, and District Site 4, though all these concentrations still represent reductions from years preceding 2018. This tends to indicate that the actions and measures within the City's AQAP are having a positive effect, though there is still more work to do, particularly on Romsey Road.

There were no recorded instances of annual means greater than 60 µg/m^3, which according to the empirical relationship stated in LAQM.TG(16) indicates that an exceedance of the 1-hour mean objective is also unlikely at these sites.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200 µg/m^3, not to be exceeded more than 18 times per year. There were no instances where the

1-hour mean was greater than 200 µg/m^3, and so this objective was therefore not exceeded.

3.2.2 Particulate Matter (PM_{10})

Ratified and adjusted annual mean monitored PM_{10} concentrations from the AQMesh are presented within Table A.5 in Appendix A for the past 5 years although the monitor has only recorded full data for the current recording year as it was installed in late 2018. The annual mean concentration monitored in 2019 of 29.5 µg/m^3 was below the objective of 40 µg/m^3.

The 24-hour exceedance data is presented within Table A.6 and shows that the 24-hour mean exceeded 50 µg/m^3 34 times in 2019, one within the limit permitted by the objective in Romsey Road. This will therefore be closely monitored into 2020, as the AQMesh monitor indicates a risk of exceeding the 24-hour mean objective.

3.2.3 Particulate Matter ($PM_{2.5}$)

A new continuous monitor (AQMesh) was installed on Romsey Road in December 2018 that measures $PM_{2.5}$. Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

Whilst no objective is presented for $PM_{2.5}$ in Appendix E: Summary of Air Quality Objectives in England, the Air Quality Strategy does contain an air quality objective of 25 µg/m^3 for achievement by 2020, which Table A.7 indicates is being achieved presently within Winchester.

Appendix A: Monitoring Results

Table A.1 - Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
St George's Street	St George's Street	Roadside	448062	129537	NO_2 (from March 2017)	YES	Chemiluminescent	0	2.25	2.2
Chesil Street	Station Approach (Chesil Street)	Roadside	448664	129257	NO_2 (from March 2017)	YES	Chemiluminescent	0	4.6	2.2
Romsey Road	Romsey Road	Roadside	447544	129543	PM_{10},$PM_{2.5}$, Ozone, NO_2	YES	Electrochemical and Optical (AQMesh)	0	2.5	2.1-

Notes:
(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).
(2) N/A if not applicable

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

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
Site 1 (City Study)	10 Eastgate St	Roadside	448563	129391	NO_2	YES	0	5.55	NO	1.7
Site 2 (City Study)	Greyfriars	Roadside	448566	129560	NO_2	YES	0	9.7	NO	1.75
Site 3 (City	Friarsgate	Roadside	448426	129523	NO_2	YES	4.6	4.25	NO	2.4

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m)	Tube collocated with a Continuous	Height (m)
Study)										
Site 4 (City Study)	Upper Brook St (Echo)	Roadside	448227	129504	NO_2	YES	9.2	8	NO	2.45
Site 5 (City Study)	Co-located Roadside Monitor	Roadside	448666	129258	NO_2	YES	0	3.1	YES	1.7
Site 6 (City Study)	Co-located Roadside Monitor	Roadside	448666	129258	NO_2	YES	0	3.1	YES	1.7
Site 7 (City Study)	Co-located Roadside Monitor	Roadside	448666	129258	NO_2	YES	0	3.1	YES	1.7
Site 8 (City Study)	St Georges St Bed	Roadside	448106	129541	NO_2	YES	0	4.05	NO	2.45
Site 9 (City Study)	St Georges St Lad	Roadside	448163	129512	NO_2	YES	0	3.6	NO	2.4
Site 10 (City Study)	Jewry St	Roadside	448046	129692	NO_2	YES	0	4.05	NO	2.4
Site 11 (City Study)	Southgate St DV	Roadside	447918	129413	NO_2	YES	0	3.65	NO	2.6
Site 12 (City Study)	Sussex St	Roadside	447804	129741	NO_2	YES	2.4	3.6	NO	2.6
Site 13 (City Study)	City Road	Roadside	447963	129875	NO_2	YES	0	6.55	NO	3
Site 14 (City Study)	74 Northwalls	Roadside	448297	129789	NO_2	YES	10.2	3.7	NO	2.3
Site 15 (City Study)	Wales St	Roadside	448842	129820	NO_2	YES	0	1.7	NO	2.45
Site 16 (City Study)	Alresford Rd (M3)	Other	449563	129439	NO_2	NO	24	N/A (M3)	NO	1.5
Site 17 (City Study)	Chesil St	Roadside	448679	129068	NO_2	YES	0	1.3	NO	2.6

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m)	Tube collocated with a Continuous	Height (m)
Site 18 (City Study)	Stockbridge Rd	Roadside	447534	130006	NO_2	YES	10	5.4	NO	2
Site 19 (City Study)	Worthy Rd 1	Roadside	448092	130411	NO2	YES	3.7	2,2	NO	2.5
Site 20 (City Study)	Worthy Rd 2	Roadside	448092	130411	NO_2	YES	3.7	2.2	NO	2.5
Site 21 (City Study)	Worthy Rd 3	Roadside	448092	130411	NO_2	YES	3.7	2.2	NO	2.5
Site 22 (City Study)	St Cross Rd	Roadside	447842	129050	NO_2	YES	6	2.4	NO	2.2
Site 23 (City Study)	Romsey Road	Roadside	447495	129511	NO_2	YES	0	1.1	NO	2.5
Site 24 (City Study)	Andover Rd	Roadside	447898	130065	NO_2	YES	0	4.2	NO	2.15
Site 25 (City Study)	Bus Station	Other	448427	129401	NO_2	YES	N/A*	N/A	NO	2.4
Site 1 (District Study)	High St, Twyford	Roadside	448063	124371	NO_2	NO	0	1.4	NO	N/A
Site 2 (District Study)	Southdown Road, Otterbourne	Other	446680	124644	NO_2	NO	N/A**	N/A	NO	N/A
Site 3 (District Study)	Martyr Worthy Rd, Kings Worthy	Other	449647	132669	NO_2	NO	0	0.5	NO	N/A
Site 4 (District Study)	West St/Broad St, New Alresford	Roadside	458826	132719	NO_2	NO	N/A**	N/A	NO	N/A
Site 5 (District Study)	Hambledon Rd, Denmead	Roadside	465917	112046	NO_2	NO	N/A**	N/A	NO	N/A
Site 6 (District	Winchester Rd, Wickham	Roadside	457203	111380	NO_2	NO	N/A**	N/A	NO	N/A

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m)	Tube collocated with a Continuous	Height (m)
Study)										
Site 7 (District Study)	Winchester Rd, Bishops Waltham	Roadside	455176	117476	NO_2	NO	N/A**	1	NO	N/A
Site 8 (District Study)	Whiteley Lane, Whiteley	Other	453645	108261	NO_2	NO	N/A**	1.3	NO	N/A
Site 9 (District Study)	Stepherds Lane, Compton	Other	445700	124877	NO_2	NO	N/A**	N/A	NO	1.4
Mill Lane (Enhanced Kingsworthy Study 1)	(B3047) Abbots Worthy	Roadside	449752	132674	NO_2	NO	0	6	NO	1.7
Kings Worthy Cottage (Enhanced Kingsworthy Study 2)	(B3047) Abbots Worthy	Roadside	449650	132673	NO_2	NO	0	4.5	NO	1.7
Old School House (Enhanced Kingsworthy Study 3)	(B3047) Abbots Worthy	Roadside	449623	132675	NO_2	NO	0	8	NO	1.7
Lidl (Enhanced Whiteley Study 1)	-	Kerbside	452831	109130	NO_2	NO	N/A***	N/A	NO	N/A
Marjoram Way (Enhanced Whiteley	-	Kerbside	453285	109429	NO_2	NO	N/A***	N/A	NO	N/A

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m)	Tube collocated with a Continuous	Height (m)
Study 2)										

Notes:
(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).
(2) N/A if not applicable.
* - used for an indication of hourly mean exposure at the bus station
** - Worst case sites immediately adjacent to road sources or on traffic islands
*** - These sites are on pavements used by commuters so are only relevant exposure locations for 1 hour mean - these tubes are being used to see if over 60ug/m^3 to see if more detailed equipment required for hourly mean assessment

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3) (4)				
							2015	2016	2017	2018	2019
St George's Street	448062	129537	Roadside	Automatic	99.1	99.1	-	-	38.5	**41**	37
Chesil Street	448664	129257	Roadside	Automatic	99.5	99.5	-	-	29.7	30	28
Romsey Road	447544	129543	Roadside	Automatic	100	100	-	-	-	-	32
Site 1 (City Study)	448563	129391	Roadside	Diffusion Tube	75.0	75.0	37.6	36.8	30.9	28.9	27.9
Site 2 (City Study)	448566	129560	Roadside	Diffusion Tube	100.0	100.0	31.5	30	27.5	26.2	24.6
Site 3 (City Study)	448426	129523	Roadside	Diffusion Tube	91.7	91.7	25.9	26.9	23.9	23.8	22.2
Site 4 (City Study)	448227	129504	Roadside	Diffusion Tube	100.0	100.0	37.6	37.1	33	30.6	27.9
Site 5 (City	448666	129258	Roadside	Diffusion Tube	91.7	91.7	38.2	37.2	32.1	29.8	28.4

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2019 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3] [4]				
							2015	2016	2017	2018	2019
Study)											
Site 6 (City Study)	448666	129258	Roadside	Diffusion Tube	91.7	91.7	38.2	38.6	31.7	30.8	28.4
Site 7 (City Study)	448666	129258	Roadside	Diffusion Tube	91.7	91.7	38.2	37.7	31.9	30.6	29.0
Site 8 (City Study)	448106	129541	Roadside	Diffusion Tube	100.0	100.0	**50.2**	**49.8**	**46.8**	39.5	39.3
Site 9 (City Study)	448163	129512	Roadside	Diffusion Tube	100.0	100.0	**52.6**	**48.9**	**46.5**	**41.4**	38.5
Site 10 (City Study)	448046	129692	Roadside	Diffusion Tube	91.7	91.7	**40.6**	**41.7**	38.7	35.9	31.0
Site 11 (City Study)	447918	129413	Roadside	Diffusion Tube	91.7	91.7	37.7	37	31.6	28.8	28.3
Site 12 (City Study)	447804	129741	Roadside	Diffusion Tube	91.7	91.7	33.9	37.3	28	29	29.0
Site 13 (City Study)	447963	129875	Roadside	Diffusion Tube	100.0	100.0	36.7	33.8	31.6	28.8	28.2
Site 14 (City Study)	448297	129789	Roadside	Diffusion Tube	100.0	100.0	30	29.7	28.2	25.7	24.1
Site 15 (City Study)	448842	129820	Roadside	Diffusion Tube	50.0	50.0	30.5	31.5	29.8	26.1	23.4
Site 16 (City Study)	449563	129439	Other	Diffusion Tube	100.0	100.0	37	38.4	33	34.6	30.0
Site 17 (City Study)	448679	129068	Roadside	Diffusion Tube	75.0	75.0	36.4	39.9	37.6	34.7	35.3
Site 18 (City Study)	447534	130006	Roadside	Diffusion Tube	91.7	91.7	21.2	24.8	23.7	20	18.7
Site 19 (City Study)	448092	130411	Roadside	Diffusion Tube	100.0	100.0	24.2	22.8	20	23.3	20.8
Site 20 (City Study)	448092	130411	Roadside	Diffusion Tube	100.0	100.0	24.2	23.8	22.2	23.8	21.0

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2019 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3] [4]				
							2015	2016	2017	2018	2019
Site 21 (City Study)	448092	130411	Roadside	Diffusion Tube	100.0	100.0	24.2	22.9	20.4	23.7	21.6
Site 22 (City Study)	447842	129050	Roadside	Diffusion Tube	100.0	100.0	35.3	33.4	32.5	19.3	20.2
Site 23 (City Study)	447495	129511	Roadside	Diffusion Tube	100.0	100.0	**48.8**	**56.6**	**50.8**	**47.6**	**46.5**
Site 24 (City Study)	447898	130065	Roadside	Diffusion Tube	100.0	100.0	33.5	32.9	32.4	30.6	26.5
Site 25 (City Study)	448427	129401	Roadside	Diffusion Tube	58.3	58.3	33.7	30.4	28	22.7	21.7
Site 1 (District Study)	448063	124371	Roadside	Diffusion Tube	91.7	91.7	27.7	28.4	24	24.1	21.4
Site 2 (District Study)	446680	124644	Other	Diffusion Tube	100.0	100.0	28.5	29.4	27.1	25.2	22.2
Site 3 (District Study)	449647	132669	Roadside	Diffusion Tube	100.0	100.0	-	-	56	40.5	34.6
Site 4 (District Study)	458826	132719	Roadside	Diffusion Tube	66.7	66.7	30.1	33.8	28.9	26.6	27.5
Site 5 (District Study)	465917	112046	Roadside	Diffusion Tube	91.7	91.7	18.4	19.9	17.9	18.1	17.7
Site 6 (District Study)	457203	111380	Roadside	Diffusion Tube	100.0	100.0	28.8	30.6	27.5	29.8	26.8
Site 7 (District Study)	455176	117476	Roadside	Diffusion Tube	100.0	100.0	29.6	32.5	29.8	29.6	27.0
Site 8 (District Study)	453645	108261	Other	Diffusion Tube	66.7	66.7	21.8	22.6	22.8	20.3	18.1
Site 9 (District Study)	445700	124877	Other	Diffusion Tube	8.3	8.3	-	-	-	12.3	N/A
							-	-	-		

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2019 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3] [4]				
							2015	2016	2017	2018	2019
Mill Lane (Enhanced Kingsworthy Study 1)	449752	132674	Roadside	Diffusion Tube	100.0	100.0				20	15.4
Kingsworthy Cottage (Enhanced Kingsworthy Study 2)	449650	132673	Roadside	Diffusion Tube	100.0	100.0	-	-	-	22.9	19.1
Old School House (Enhanced Kingsworthy Study 3)	449623	132675	Roadside	Diffusion Tube	100.0	100.0	-	-	-	20.7	18.2
Lidl (Enhanced Whiteley Study 1)	452831	109130	Kerbside	Diffusion Tube	66.7	66.7	-	-	-	-	24.9
Marjoram Way (Enhanced Whiteley Study 2)	453285	109429	Kerbside	Diffusion Tube	66.7	66.7	-	-	-	-	26.2

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

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

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

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.**

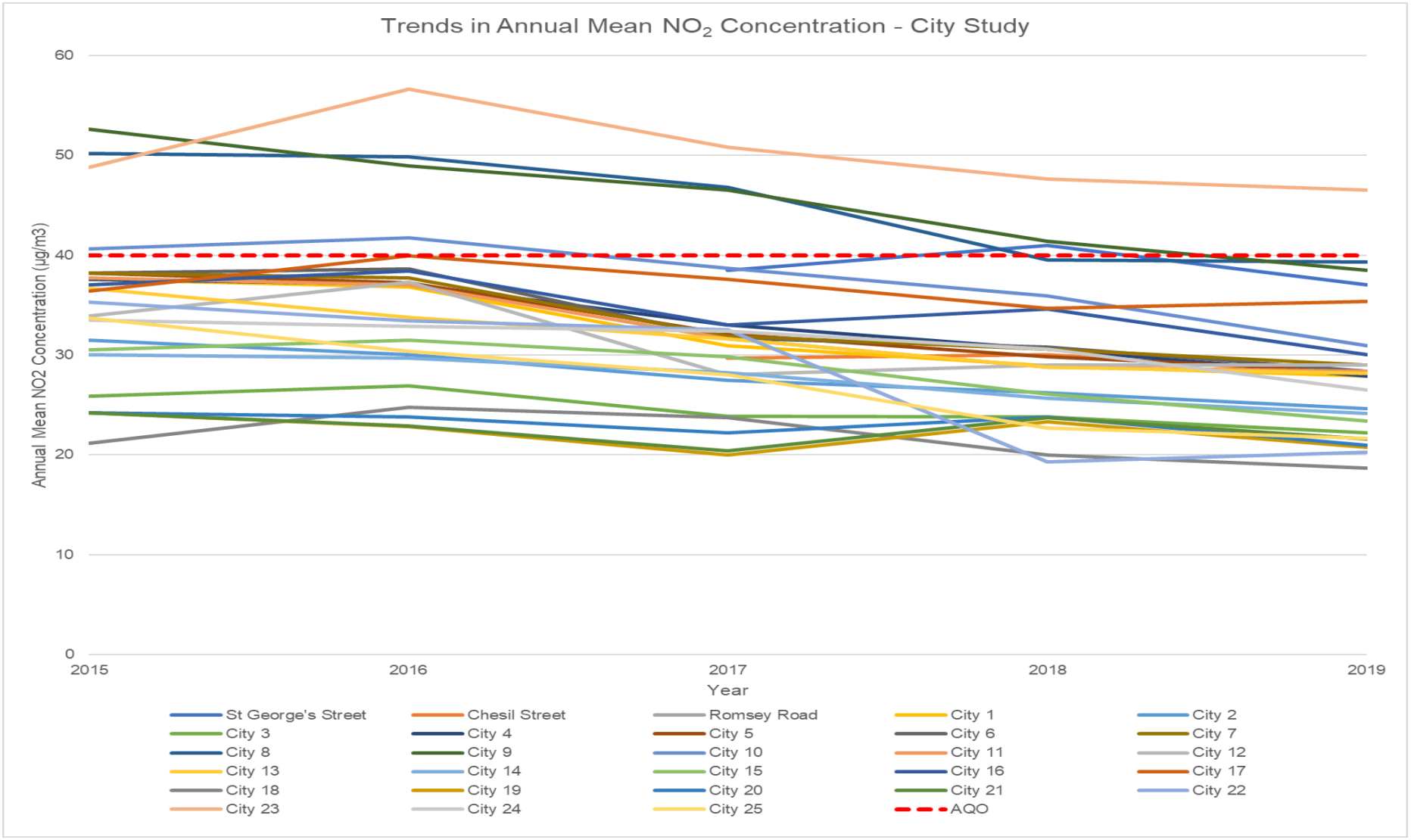
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(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.

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

Figure A.1 – Trends in Annual Mean NO_2 Concentrations



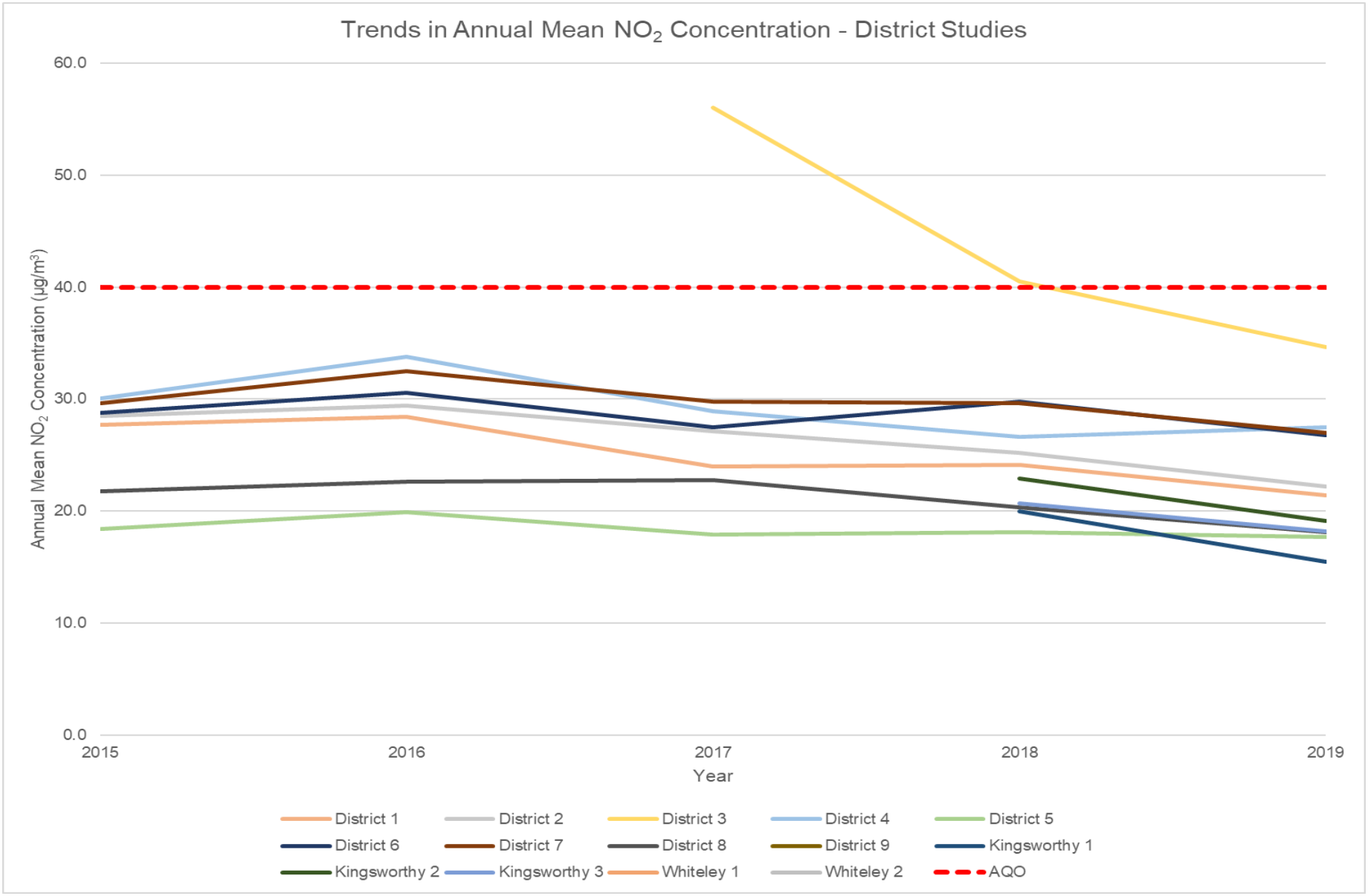

Trends in Annual Mean NO2 Concentration - District Studies
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Annual Mean NO2 Concentration (µg/m3)
2015
2016
2017
2018
2019
Year
District 1
District 2
District 3
District 4
District 5
District 6
District 7
District 8
District 9
Kingsworthy 1
Kingsworthy 2
Kingsworthy 3
Whiteley 1
Whiteley 2
AQO

Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
							2015	2016	2017	2018	2019
St Georges Street	448062	129537	Roadside	Automatic	99.1	99.1	-	-	-	0	0
Chesil Street	448664	129257	Roadside	Automatic	99.5	99.5	-	-	-	0	0
Romsey Road	447544	129543	Roadside	Automatic	100	100	-	-	-	-	0

Notes:

Exceedances 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 85%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} Annual Mean Concentration (µg/m^3) (3)				
						2015	2016	2017	2018	2019
Romsey Road	447544	129543	Roadside	Automatic	99.9	-	-	-	-	29.5

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

Notes:

Exceedances 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%).

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

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
						2015	2016	2017	2018	2019
Romsey Road	447544	129543	Roadside	Automatic	99.9	-	-	-	-	34

Notes:

Exceedances 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 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Table A.7 – $PM_{2.5}$ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
						2015	2016	2017	2018	2019
Romsey Road	447544	129543	Roadside	99.9	99.9	-	-	-	-	15

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

Notes:

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

Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 - NO_2 Monthly Diffusion Tube Results - 2019

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO_2 Mean Concentrations ($\mu g/m^3$)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
Site 1 (City Study)	448563	129391	38.6	37.7	29.0	-	24.1	17.3	29.2	-	-	29.3	35.2	29.7	30.0	27.9	N/A
Site 2 (City Study)	448566	129560	27.9	31.8	28.3	25.6	28.7	23.5	21.8	23.1	24.1	23.3	30.0	29.7	26.5	24.6	N/A
Site 3 (City Study)	448426	129523	-	26.2	23.2	27.1	25.7	20.5	21.9	18.3	20.5	24.3	27.7	27.1	23.9	22.2	N/A
Site 4 (City Study)	448227	129504	30.7	37.1	31.6	29.6	31.6	25.0	27.6	25.5	29.9	28.0	31.6	31.8	30.0	27.9	N/A
Site 5 (City Study)	448666	129258	30.6	35.4	32.1	33.1	29.7	26.8	25.0	27.5	27.4	-	32.6	35.4	30.5	28.4	N/A
Site 6 (City Study)	448666	129258	29.2	35.2	29.8	35.1	30.2	22.3	31.2	29.0	27.4	-	32.6	33.8	30.5	28.4	N/A
Site 7 (City Study)	448666	129258	30.0	34.3	31.6	34.5	32.6	26.3	32.6	27.8	26.2	-	32.7	34.6	31.2	29.0	N/A
Site 8 (City Study)	448106	129541	51.2	44.0	41.5	46.0	46.6	34.8	41.9	35.2	41.7	36.4	45.9	42.4	42.3	39.3	N/A
Site 9 (City Study)	448163	129512	38.3	45.6	47.5	38.5	43.0	40.2	38.1	32.4	42.4	41.1	43.8	45.5	41.4	38.5	N/A
Site 10 (City Study)	448046	129692	33.2	39.2	33.7	36.9	34.3	30.4	31.6	31.3	32.3	27.2	36.1	-	33.3	31.0	N/A
Site 11 (City Study)	447918	129413	29.5	36.8	31.8	30.3	28.4	27.8	27.1	22.8	27.4	-	36.5	36.8	30.5	28.3	N/A
Site 12 (City Study)	447804	129741	28.5	37.6		32.9	30.9	23.1	31.6	24.6	26.8	31.4	42.0	33.8	31.2	29.0	N/A
Site 13 (City Study)	447963	129875	31.2	35.6	34.7	28.5	21.1	28.2	28.1	28.2	29.1	30.8	34.8	33.2	30.3	28.2	N/A
Site 14 (City Study)	448297	129789	28.7	31.1	31.2	23.0	24.3	21.5	23.9	22.7	22.5	23.9	29.1	29.3	25.9	24.1	N/A
Site 15 (City Study)	448842	129820	28.9	30.3	29.4	32.4	-	-	-	-	-	25.2	35.8		30.3	23.4	N/A

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO_2 Mean Concentrations ($\mu g/m^3$)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
Site 16 (City Study)	449563	129439	29.8	36.6	33.1	35.2	35.4	18.6	48.8	26.1	30.0	27.0	36.6	29.8	32.3	30.0	N/A
Site 17 (City Study)	448679	129068	35.9	41.8	40.5	37.7	-	32.5	36.2	34.5		39.4	43.6		38.0	35.3	N/A
Site 18 (City Study)	447534	130006	20.2	24.8	21.1	24.0	18.3	16.5	18.2		12.5	17.2	25.2	23.0	20.1	18.7	N/A
Site 19 (City Study)	448092	130411	23.5	27.5	24.3	22.9	19.3	20.0	19.1	17.9	19.5	22.5	21.6	30.0	22.3	20.8	N/A
Site 20 (City Study)	448092	130411	27.3	27.0	27.0	22.6	19.2	15.8	19.2	17.2	21.1	22.6	25.2	26.7	22.6	21.0	N/A
Site 21 (City Study)	448092	130411	27.8	29.6	26.8	21.8	18.8	20.9	18.9	16.4	19.1	23.1	26.7	28.7	23.2	21.6	N/A
Site 22 (City Study)	447842	129050	24.8	27.5	23.7	25.6	17.3	17.7	18.5	15.1	17.6	18.6	29.7	25.1	21.8	20.2	N/A
Site 23 (City Study)	447495	129511	51.2	48.3	52.9	46.8	56.2	48.2	52.8	45.7	48.0	47.3	56.4	46.8	50.0	**46.5**	N/A
Site 24 (City Study)	447898	130065	22.4	35.8	24.8	32.6	27.5	25.6	28.4	24.0	23.3	31.3	31.6	34.3	28.5	26.5	N/A
Site 25 (City Study)	448427	129401		26.3	22.2	-	-	21.2	20.4	14.0	-	21.0	29.9	-	22.1	21.7	N/A
Site 1 (District Study)	448063	124371	26.8	25.3	-	17.3	21.0	21.1	22.6	19.8	21.3	24.4	27.0	26.6	23.0	21.4	N/A
Site 2 (District Study)	446680	124644	31.2	28.6	29.7	29.2	20.7	16.1	16.1	18.9	24.1	21.3	27.8	23.0	23.9	22.2	N/A
Site 3 (District Study)	449647	132669	38.3	43.4	36.1	34.8	33.5	34.1	43.6	34.5	35.7	33.3	38.9	40.6	37.2	34.6	N/A
Site 4 (District Study)	458826	132719	31.0	31.7	-	-	33.4	22.5	26.9	22.7	-	-	34.1	33.0	29.4	27.5	N/A
Site 5 (District Study)	465917	112046	22.6	24.7	22.5	17.7	13.8	14.9	14.9	13.8	17.1	-	22.1	25.2	19.0	17.7	N/A
Site 6 (District Study)	457203	111380	33.8	37.5	33.1	27.1	27.0	18.8	28.4	22.4	24.9	25.7	34.8	31.9	28.8	26.8	N/A
Site 7 (District Study)	455176	117476	34.4	34.4	36.0	24.7	26.7	23.9	28.9	23.3	24.8	27.9	33.1	30.4	29.0	27.0	N/A
Site 8 (District Study)	453645	108261	-	-	26.1	18.5	18.3	17.4	13.9	-	15.2	17.1	21.3	-	18.5	18.1	N/A
Site 9 (District Study)	445700	124877	8.3	-	-	-	-	-	-	-	-	-	-	-	8.3	N/A	N/A

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO_2 Mean Concentrations ($\mu g/m^3$)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
Mill Lane (Enhanced Kingsworthy Study 1)	449752	132674	18.9	21.1	19.8	18.3	13.2	14.3	13.1	11.3	14.0	15.0	18.7	21.7	16.6	15.4	N/A
Kings Worthy Cottage (Enhanced Kingsworthy Study 2)	449650	132673	18.8	20.3	23.1	20.5	21.0	20.4	21.3	17.9	18.3	18.9	23.4	23.2	20.6	19.1	N/A
Old School House (Enhanced Kingsworthy Study 3)	449623	132675	19.9	23.3	21.7	19.3	18.3	18.6	17.2	16.5	18.0	19.2	22.3	19.9	19.5	18.2	N/A
Lidl (Enhanced Whiteley Study 1)	452831	109130	-	-	-	-	20.9	20.9	21.8	20.8	21.0	21.8	28.4	26.9	22.8	24.9	N/A
Marjoram Way (Enhanced Whiteley Study 2)	453285	109429	-	-	-	-	20.7	24.8	24.4	23.1	23.4	21.6	27.4	27.0	24.0	26.2	N/A

☒ **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 in the final column**

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

Automatic Monitoring Data

The data capture percentage for the roadside NO_2 automatic monitoring stations in 2019 was greater than the required 75% (99.1% for St. George's Street, 99.5% for Chesil Street and 100% for Romsey Road). Therefore, no annualisation of data was required.

The AQMesh monitor was installed on Romsey Road in 2019 which measured NO_2, PM_{10} and $PM_{2.5}$ and Ozone concentrations. The data capture percentage for $PM_{2.5}$ and PM_{10} at Romsey road were 99.9%.

All results have been zero and span corrected with readings taken approximately every 2 weeks in accordance with Defra guidance for roadside locations. All gases used for calibration have been independently certified. All instruments were fully serviced every six months by external contractors (Matts Monitors). All real data was polled and ratified by an external air quality consultant (AQDM.

The Council has also installed a FIDAS 200 particulate monitor at the St George's Street air quality station which began monitoring in late February 2020. The results of this monitor will be presented within the next reporting year.

Diffusion Tube Data

All diffusion tubes were from Gradko and used a mixture of 20% TEA in water preparation method. Gradko International Ltd is a UKAS accredited laboratory. Gradko participates in the AIR Proficiency Testing (PT) scheme for diffusion tubes, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL), which provides a Quality Assurance / Quality Control (QA/QC) framework for local authorities carrying out diffusion tube monitoring as a part of their local air quality management process. The percentage of results submitted by Gradko International Ltd that were subsequently determined to be satisfactory was 100% for all tests in AIR-PT Rounds 24, 25, 27, 28, 31, 33 and 34 (January 2018 – November 2019)[13] with AIR-PT Round 30 (January – February 2019) being 75%, and the lab is therefore deemed to have a satisfactory performance.

[13]https://laqm.defra.gov.uk/assets/laqmno2performancedatauptonovember2019v1.pdf

The results have been adjusted by using a local bias adjustment factor using the procedure detailed in DEFRA guidance document Technical Guidance LAQM TG(16)[14]. This was calculated by locating three diffusion tubes adjacent to the roadside automatic analyser and comparing results. The local bias adjustment factor calculated and used was 0.93.

Results of the local adjustment, using the diffusion tubes co-located with the continuous monitor on Chesil Street are presented in Figure C.1.

Figure C.1 - Local Bias Adjustment Calculation

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	20/12/2018	18/01/2019	30.6	29.2	30.0	30	0.7	2	1.7
2	18/01/2019	15/02/2019	35.4	35.2	34.3	35	0.6	2	1.5
3	15/02/2019	21/03/2019	32.1	29.8	31.6	31	1.2	4	3.0
4	21/03/2019	23/04/2019	33.1	35.1	34.5	34	1.0	3	2.5
5	23/04/2019	20/05/2019	29.7	30.2	32.6	31	1.6	5	3.9
6	20/05/2019	21/06/2019	26.8	22.3	26.3	25	2.5	10	6.1
7	21/06/2019	12/07/2019	25.0	31.2	32.6	30	4.0	14	10.0
8	12/07/2019	13/08/2019	27.5	29.0	27.8	28	0.8	3	2.0
9	13/08/2019	16/09/2019	27.4	27.4	26.2	27	0.7	3	1.7
10	16/09/2019	28/10/2019							
11	28/10/2019	22/11/2019	32.6	32.6	32.7	33	0.1	0	0.1
12	22/11/2019	03/01/2020	35.4	33.8	34.6	35	0.8	2	2.0
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
28.6	100	Good	Good
34.58	100	Good	Good
28.88	99.8	Good	Good
34.59	96.9	Good	Good
28.12	99.4	Good	Good
26	98.6	Good	Good
28	97.8	Good	Good
21	98.75	Good	Good
23	98.67	Good	Good
26	98.82		Good
30	98.31	Good	Good
31.43	98.72	Good	Good
Overall survey -->		Good precision	Good Overall DC

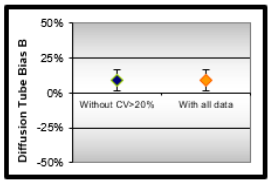
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Winchester

Precision: 11 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A 0.93 (0.87 - 0.99)
Bias B 8% (1% - 15%)
Diffusion Tubes Mean: 31 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 29 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 29 (27 - 30) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 11 periods of data
Bias factor A 0.93 (0.87 - 0.99)
Bias B 8% (1% - 15%)
Diffusion Tubes Mean: 31 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 29 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 29 (27 - 30) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

If you have any enquiries about this spreadsheet please contact the LAQM Helpdesk at: LAQMHelpdesk@uk.bureauveritas.com

The national bias adjustment factor was also calculated in accordance with LAQM TG(16)[14]. The factor for 2019 was found to be 0.93, as per the local adjustment factor, giving confidence in the local calculation derived. As the co-location site was found to have 'good' precision for the diffusion tubes, the local bias adjustment factor was deemed suitable for all tubes in Winchester as for previous years.

[14] Defra LAQMTG(16). Available at https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf

Figure C. 2 - National Bias Adjustment Calculation

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/20

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

This spreadsheet will be updated at the end of June 2020
LAQM Helpdesk Website

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

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

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

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

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

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in **blue** at the foot of the final column.
If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method	Year[2]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in water	2019	R	Blackburn with darwen Borough Council	10	29	21	36.9%	G	**0.73**
Gradko	20% TEA in water	2019	R	Cheshire West and Chester	12	39	38	2.0%	G	**0.98**
Gradko	20% TEA in water	2019	R	Cheshire West and Chester	11	34	34	-2.1%	G	**1.02**
Gradko	20% TEA in water	2019	R	Gedling Borough Council	12	32	30	7.3%	G	**0.93**
Gradko	20% TEA in water	2019	R	NOTTINGHAM CITY COUNCIL	10	37	40	-7.0%	G	**1.07**
Gradko	20% TEA in water	2019	R	Bedford Borough Council	11	29	29	-1.0%	G	**1.01**
Gradko	20% TEA in water	2019	R	Bedford Borough Council	12	37	32	13.0%	G	**0.89**
Gradko	20% TEA in water	2019	R	Gateshead Council	12	30	25	18.1%	G	**0.85**
Gradko	20% TEA in water	2019	R	Gateshead Council	10	32	34	-7.2%	G	**1.08**
Gradko	20% TEA in water	2019	R	Gateshead Council	12	34	27	23.7%	P	**0.81**
Gradko	20% TEA in water	2019	R	Gateshead Council	11	40	44	-10.5%	G	**1.12**
Gradko	20% TEA in water	2019	KS	Marylebone Road Intercomparison	12	85	65	30.1%	G	**0.77**
Gradko	20% TEA in water	2019	R	Borough Council of King's Lynn and West Nor	9	27	21	28.4%	G	**0.78**
Gradko	20% TEA in water	2019	R	Lancaster City Council	13	40	34	16.4%	G	**0.86**
Gradko	20% TEA in water	2019	R	Lancaster City Council	12	31	31	1.6%	G	**0.98**
Gradko	20% TEA in Water	2019	R	Monmouthshire County Council	12	39	39	1.3%	G	**0.99**
Gradko	20% TEA in water	2019	UC	Belfast City Council	10	29	24	21.8%	G	**0.82**
Gradko	20% TEA in water	2019	R	Dudley MBC	12	33	32	4.5%	G	**0.96**
Gradko	20% TEA in water	2019	R	Dudley MBC	12	44	42	3.9%	G	**0.96**
Gradko	20% TEA in water	2019	UB	Dudley MBC	12	23	19	19.8%	G	**0.83**
Gradko	20% TEA in water	2019	UB	Eastleigh Borough Council	12	24	26	-7.1%	G	**1.08**
Gradko	20% TEA in water	2019	R	Gateshead Council	12	34	27	23.7%	P	**0.81**
Gradko	20% TEA in water	2019	R	Gateshead Council	11	40	44	-10.5%	G	**1.12**
Gradko	20% TEA in water	2019	R	Gateshead Council	10	32	34	-7.2%	G	**1.08**
Gradko	20% TEA in water	2019	R	Gateshead Council	12	30	25	18.1%	G	**0.85**
Gradko	20% TEA in water	2019	R	Thurrock Borough Council	12	29	24	21.6%	G	**0.82**
Gradko	20% TEA in water	2019	R	Brighton & Hove City Council	11	45	50	-9.3%	G	**1.10**
Gradko	20% TEA in water	2019		**Overall Factor[3] (27 studies)**				**Use**		**0.93**

Data capture for a majority of relevant diffusion tube sites was greater than 75%, with the exception of City Sites 15 and 25, and District Sites 4, 8, 13 and 14. The data for these sites were therefore subsequently annualised in accordance with the methodology stipulated in LAQM.TG(16), presented in Table C. 1. A further site, Shepherds Lane (District Site 9) returned data for only one month as it was discontinued and was therefore below the 33% data capture threshold necessary for annualisation to be deemed appropriate.

Table C. 1 - Annualisation of Diffusion Tube Data

Site ID	Annualisation	AURN Background Sites		
		Bournemouth	Portsmouth	Southampton Centre
Site 15 (City Study) Missing Periods: 5,6,7,8,9,12	Annual Mean (µg/m^3)	11.6	17.5	27.8
	Period Mean (µg/m^3)	14.9	20.9	31.8
	Ratio (Am/Pm)	0.78	0.84	0.87
	Annualisation Factor:	0.83		
Site ID	**Annualisation**	**AURN Background Sites**		
		Bournemouth	**Portsmouth**	**Southampton Centre**
Site 25 (City Study)	Annual Mean (µg/m^3)	11.6	17.5	27.8

Missing Periods: 1,4,5,9,12	Period Mean (µg/m^3)	10.8	16.8	26.7
	Ratio (Am/Pm)	1.08	1.04	1.04
	Annualisation Factor:	1.05		
Site ID	**Annualisation**	**AURN Background Sites**		
		Bournemouth	**Portsmouth**	**Southampton Centre**
Site 4 (District Study) Missing Periods: 3,4,9,10	Annual Mean (µg/m^3)	11.6	17.5	27.8
	Period Mean (µg/m^3)	11.6	17.7	27.1
	Ratio (Am/Pm)	1.00	0.99	1.02
	Annualisation Factor:	1.01		
Site ID	**Annualisation**	**AURN Background Sites**		
		Bournemouth	**Portsmouth**	**Southampton Centre**
Site 8 (District Study) Missing Periods: 1,2,8,12	Annual Mean (µg/m^3)	11.6	17.5	27.8
	Period Mean (µg/m^3)	10.8	16.4	26.9
	Ratio (Am/Pm)	1.07	1.07	1.03
	Annualisation Factor:	1.06		
Site ID	**Annualisation**	**AURN Background Sites**		
		Bournemouth	**Portsmouth**	**Southampton Centre**
Sites 13 & 14 (District Study) Missing Periods: 1,2,3,4	Annual Mean (µg/m^3)	11.6	17.5	27.8
	Period Mean (µg/m^3)	9.2	15.2	25.1
	Ratio (Am/Pm)	1.26	1.16	1.10
	Annualisation Factor:	1.17		

*Table produced prior to the release of the LAQM Annualisation Tool v1

Distance correction was not required at any sites, since those exceeding were all at locations of relevant exposure.

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

Figure D. 1 - Winchester City Centre AQMA & Continuous Monitors

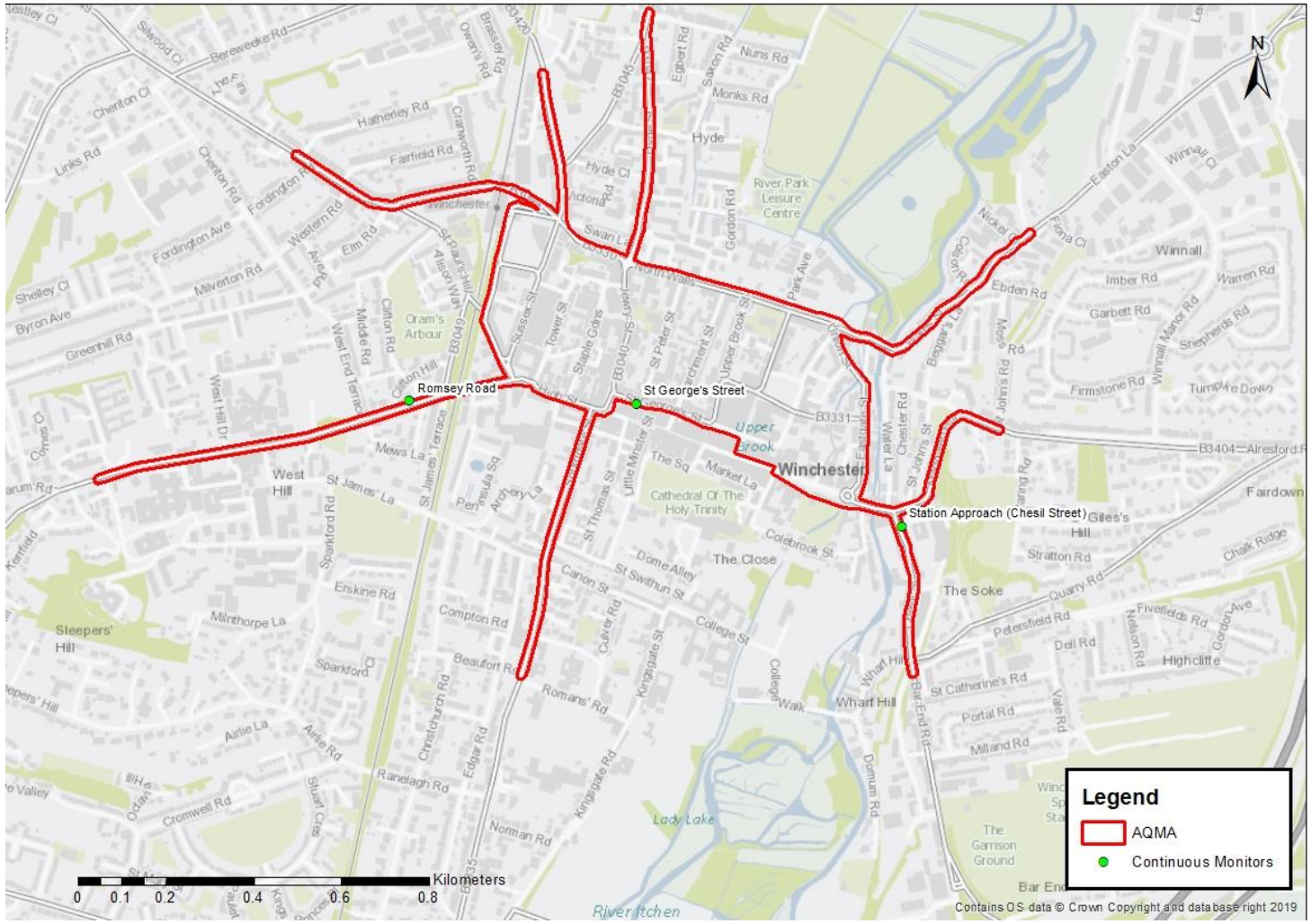


Figure D. 2 - Winchester City Centre AQMA & Diffusion Tube City Study

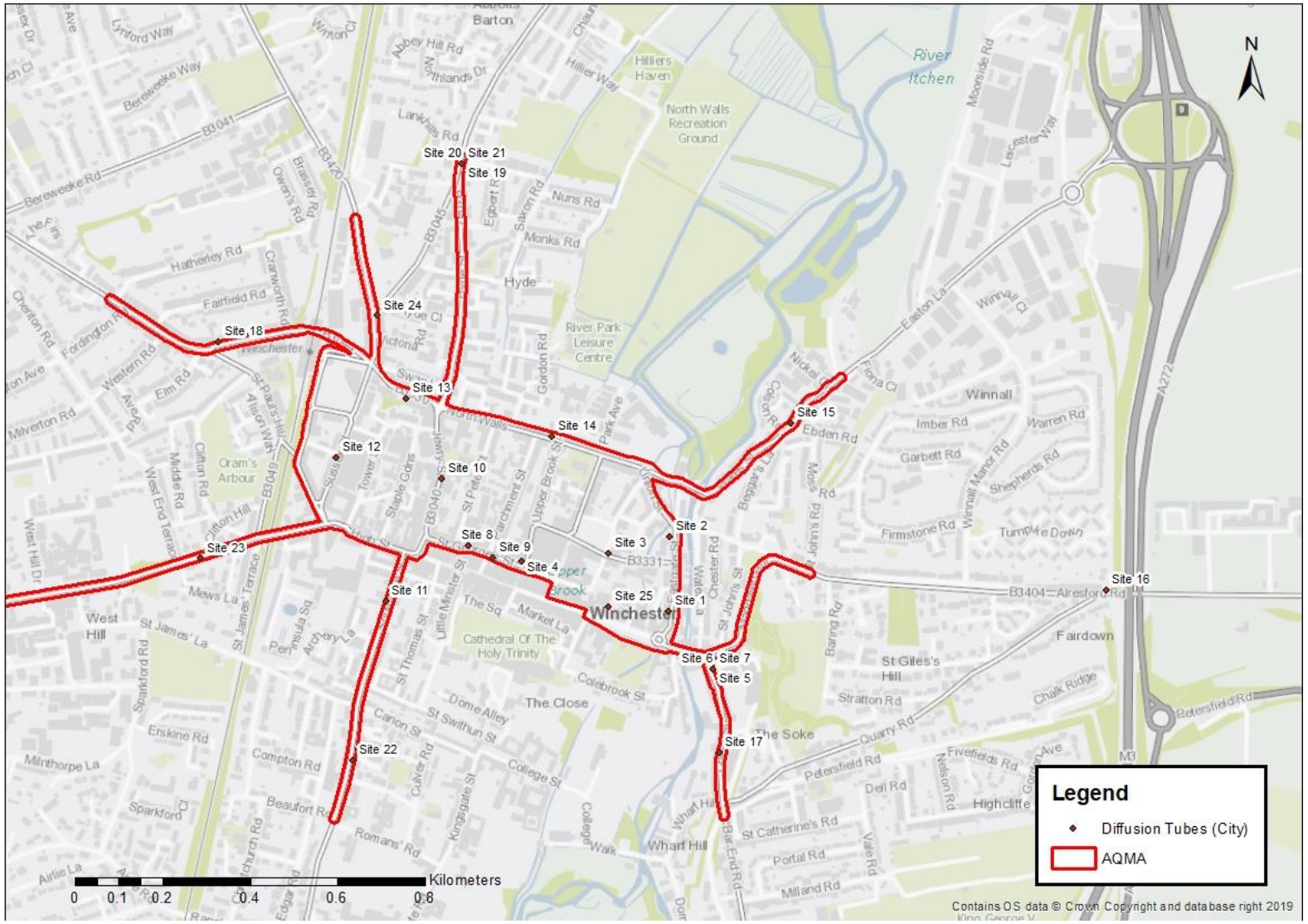
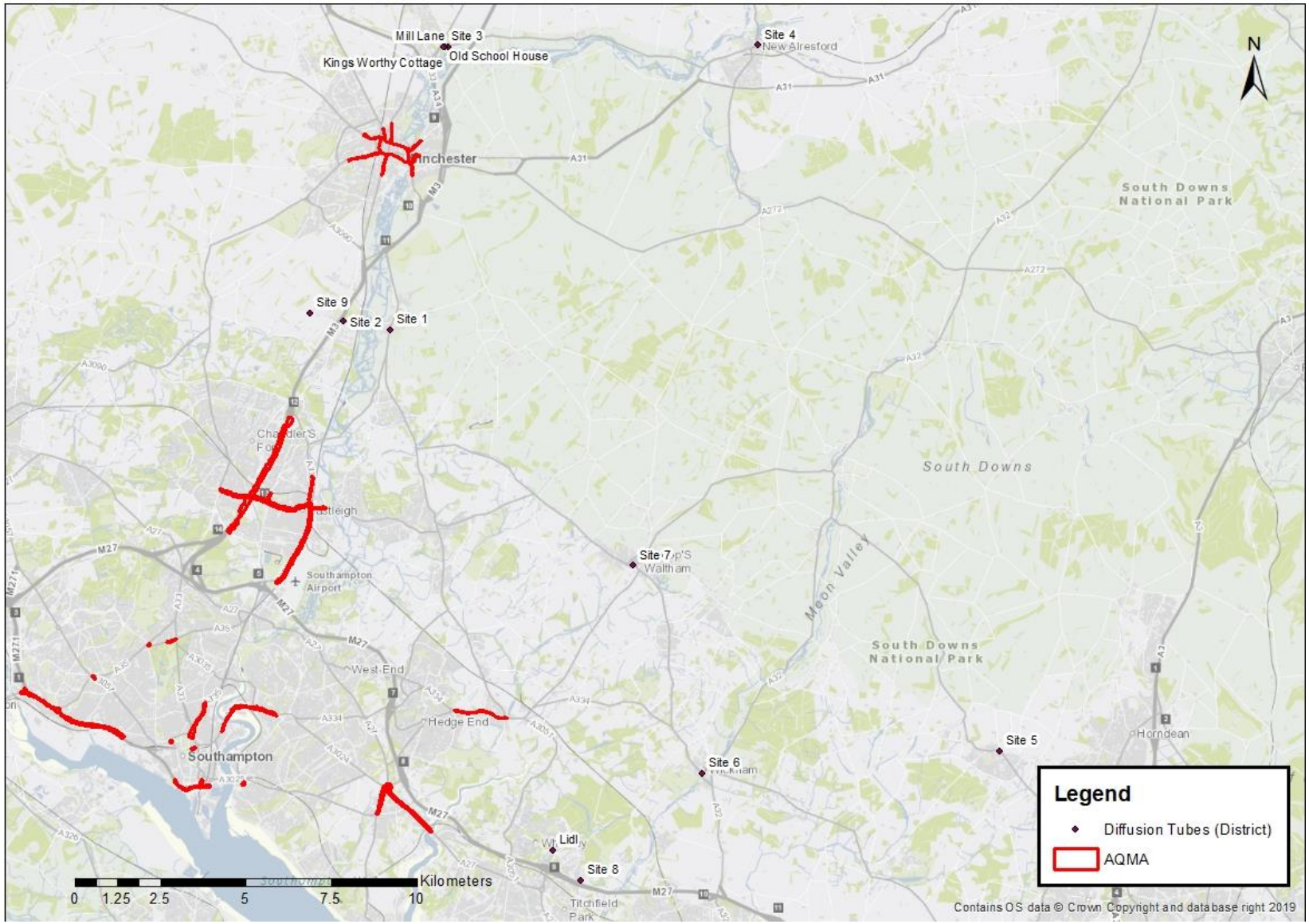


Figure D. 3 - Diffusion Tube District Wide Study



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[15]	
	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

[15] 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
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EBC	Eastleigh Borough Council
EU	European Union
HSL	Health and Safety Laboratory
LAQM	Local Air Quality Management
LAQM.PG(16)	Local Air Quality Management Policy Guidance 2016
LAQM.TG(16)	Local Air Quality Management Technical Guidance 2016
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
PT	Proficiency Testing
QA/QC	Quality Assurance and Quality Control
SCC	Southampton City Council
SO_2	Sulphur Dioxide

SPD	Supplementary Planning Document
WCC	Winchester City Council

References

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

4 Winchester City Council Air Quality Action Plan (2017) Available at: https://www.winchester.gov.uk/environment/air-quality/historical-air-quality-reports-for-government

5 Electric Vehicle Charging Infrastructure Study for Winchester City Centre and District (2018), Available at: https://www.winchester.gov.uk/environment/air-quality/air-quality-in-winchester

6 Hampshire County Council LTP Implementation Plan 2014-2017, https://www.hants.gov.uk/transport/strategies/transportstrategies

7 Defra LAQM website: Available at: http://laqm.defra.gov.uk/

8 WCC (2020) Parking and Access Strategy, Available at: https://democracy.winchester.gov.uk/ieListDocuments.aspx?CId=136&MId=1885

9 Bias Adjustment Factors, Available at: https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html

10 Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

11 Summary of Laboratory Performance in AIR NO_2 Proficiency Testing Scheme. Available at: https://laqm.defra.gov.uk/assets/laqmno2performancedatauptonovember2019v1.pdf

12 Defra LAQMTG(16). Available at: https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf