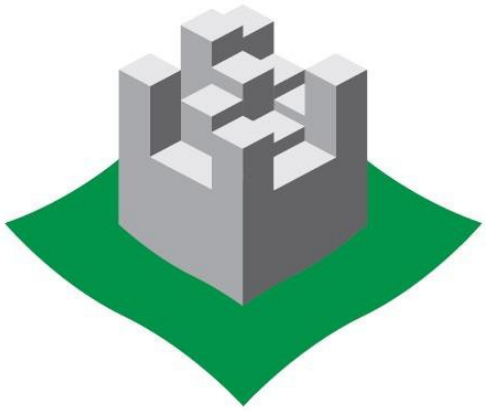


Exeter City Council

2018 Air Quality Annual Status Report (ASR)

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

June 2019

Local Authority Officer	Alex Bulleid
Department	Environmental Health and Licensing
Address	Exeter City Council, Civic Centre, Paris Street, Exeter EX1 1RQ
Telephone	01392 265718
E-mail	Alex.Bulleid@exeter.gov.uk
Report Reference number	ASR2018
Date	June 2019

Executive Summary: Air Quality in Our Area

Air Quality in Exeter

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].

There are two national objectives for levels of nitrogen dioxide. These are for the average level over a whole year, which should be below 40 $\mu g/m^3$, and the average level for one hour, which should be below 200 $\mu g/m^3$. It is not easy to measure the average level for one hour, so a proxy has been developed by the Department for Environment, Food and Rural Affairs (DEFRA) which is that the average over a whole year should be below 60 $\mu g/m^3$. The annual average objective applies to residential, hospital and educational sites. The hourly average objective applies to these sites and to busy streets and workplaces as well.

Exeter City Council has a monitoring network that is designed to identify the areas with the highest levels of nitrogen dioxide, at the locations where the objectives apply. Most of the monitoring sites are therefore on residential properties in close proximity to the busiest roads and junctions in the city. The results of the monitoring conducted by the City Council is not representative of typical or average conditions across the city. Instead it is indicative of the worst case locations.

In recent years the annual average objective has not been met at a number of places in the city. These are Alphington Street, the junction of Blackboy Road and Pinhoe Road, and along the Heavitree corridor into the city. The highest levels are measured on the Heavitree corridor, at East Wonford Hill. Here levels have historically been close to or above the levels which indicates an exceedance of the hourly objective.

[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

The measured results for 2018 can be found in table A.3 of this report. Trends in annual nitrogen dioxide concentrations can also be seen in Figure A.1. These show that in 2018 levels of nitrogen dioxide at the junction of Blackboy Road and Pinhoe Road fell to below the objective. However levels at East Wonford Hill rose slightly compared to 2017. Levels at one monitoring site on Cowick Street also increased to above the objective level having been below the objective for some time. The validity of this result is discussed further in the main body of the report.

Some sites have levels between 35 and 40 $\mu g/m^3$ (i.e. are close to but not above the objective level of 40). These are Cowick Street / Cowick Lane junction, Red Cow Village, York Road, the junction of Blackboy Road and Pinhoe Road, Barrack Road at Livery Dole, Sidmouth Road and Topsham Road near Tollards Road. Away from these locations, but still along the busy routes into and around the city, concentrations of nitrogen dioxide are in the range between 25 and 35 $\mu g/m^3$.

As you move away from busy roads, levels fall below 25 $\mu g/m^3$. Typical suburban streets with only local traffic flows experience levels of between 13 and 25 $\mu g/m^3$. The majority of the population of Exeter therefore live in locations with concentrations of nitrogen dioxide well below the objective, but a small number are exposed at home to levels above the objective. No schools in Exeter experience levels above the objective.

NO_2 levels in Exeter have at most sites been broadly stable since around 2012, following a decrease from 2009 levels. However some locations have shown increases between 2017 and 2018 which need to be considered further. 2018 was a year with unusual weather conditions, and this could have affected pollution levels, for example by increased emissions from cold engines in the cold winter, or use of vehicle air conditioning in the hot summer. Whether this change is the start of a trend or part of the variation between years which occurs naturally will not become clear until data can be evaluated over a longer timescale. If it appears that this is the start of an upward trend, it will necessitate updates to the AQAP, which will be reported in future Annual Status Reports.

The Annual Status Report also summarises the results of particulate pollution measurements (PM_{10} and $PM_{2.5}$). No areas in the city are thought to exceed the objectives for this type of air pollution.

The new Air Quality Action Plan for 2019-2024 was published in the last year, following a significant consultation and engagement process which reached nearly 3000 people. This is available online at www.exeter.gov.uk/airpollution. Exeter City Council will work with Devon County Council Highways team, neighbouring authorities, Exeter City Futures and Sport England to deliver the measures in this plan.

Actions to Improve Air Quality

The following actions have been completed in the last year.

1. Sport England Local Delivery Pilot funding and programme agreed for the next two years, including measurable deliverables related to active travel and public realm improvements.

2. Development of updated source apportionment modelling for the areas where there are exceedances of the objective, which were used to assist in the selection of appropriate measures to include in the AQAP, and will continue to be used in the further refinement of those actions.
3. Development by Devon County Council of a new draft Transport Strategy which was consulted on in early 2019. Proposed measures and targets within this included:
    a. 50% of trips by foot or cycle within the city,
    b. Removal of all air quality exceedances in the city,
    c. Single ticketing platform combing bus, bike and car club (with scope for all these to be electric in the future).
4. Installation of new continuous analysers at Exeter RAMM and Alphington Street, providing greater data reliability and the ability to measure $PM_{2.5}$ at both sites.
5. Extension of the Council's monitoring network to include four additional locations close to off-road cycle routes, to demonstrate the possibility for exposure reduction.
6. Education projects in two Heavitree primary schools close to the AQMA, working with Sustrans.

7. A stand and presentation at Junior Life Skills, which provided active travel education to about 1000 year six pupils from primary schools throughout the city.
8. A community-led monitoring project in Heavitree to increase awareness and inform local projects to improve air quality.
9. Installation of six further EV charging points for the Council's electric van and pool car fleet.
10. Development of a scheme for battery storage linked to the Council's PV arrays which will be able to power a fleet of electric refuse collection vehicles.
11. Scrutiny of planning applications for air quality impacts, including making objections to developments on air quality grounds where this is justified and the negotiation of mitigation in accordance with Council and national planning policy.
12. Inclusion of two new electric car club vehicles at city rail stations and a further eight in communities have either been delivered are imminent to be delivered.
13. Further development of the cycle network in and around the city, particularly route E4 and new segregated cycle-only lanes beside Cumberland Way to access the new housing at Monkerton, Hill Barton and Pinn Lane.
14. Stagecoach continued to upgrade their bus fleet, introducing 14 Euro 6 single decker buses to serve the city.
15. Significant additions to the city's bus network, particularly East of Exeter including:
    a. half hourly service to East of Exeter for employment and airport (56),
    b. Science Park service (K),
    c. New outer orbital service connecting City Centre, Newcourt, Ikea, Whipton, City Centre (I / J).
16. By 1st Jan 2020 the Hackney carriage fleet will be 50% Euro 6 wheelchair accessible vehicles and 50% ULEV saloon cars with a stated emission level of 75g km CO_2 or below.

17. A reduction in NOx emissions from buildings as a result of a variety of measures intended primarily to address fuel poverty and carbon emissions. These include retrofitting 6 ECC Council houses under a ZEBCat (zero energy buildings catalyst) pilot, completion of 26 new PassivHaus standard homes by Exeter City Council, commencement of construction of a PassivHaus standard leisure centre and swimming pool in the city centre, replacement of an ageing boiler at the Corn Exchange venue and continued implementation of district heating schemes to provide heating and hot water to 2800 homes at Monkerton, Tithebarn, Mosshayne, Pinn Court and Park Farms, and Exeter Science Park.

Conclusions and Priorities

No exceedences were identified in 2018 outside the existing AQMA. Levels at some sites have increased since 2017, and this situation will be closely monitored to see if it develops into an upward trend, or whether it was instead linked to the unusual weather conditions in 2018.

Exeter City Council's priorities for 2019 are to continue to progress the actions in the AQAP, particularly those that are part of the Sport England Local Delivery Pilot programme, and to assist Devon County Council in the development of plans for the Heavitree corridor. The Greater Exeter Strategic Plan (GESP) will contribute to a number of measures in the Air Quality Action Plan (AQAP), so any delays in the development and implementation of the GESP will be monitored closely because they could affect implementation of the AQAP as well. Currently the published GESP timetable is subject to change, and once this is finalised alterations to the AQAP can be made if necessary by means of future Annual Status Reports.

Local Engagement and How to get Involved

Local air pollution currently has a high profile within the city. For example it is one of Exeter City Futures 12 goals, nearly 3000 people were involved in the recent consultation on the AQAP and Devon County Council have committed in the draft Transportation Strategy to resolve exceedences of the objective.

Exeter City Council welcomes proposals from community and interest groups who wish to improve air quality in their local area. The Wellbeing Exeter Community

Builders are actively engaging with local communities to increase active travel, social inclusion, improve the public realm for walking and cycling and benefit air quality.

Further enquiries about pollution levels and actions to improve air quality should be made to environmental.protection@exeter.gov.uk.

Table of Contents

Executive Summary: Air Quality in Our Area i

Air Quality in Exeter i

Actions to Improve Air Quality iii

Conclusions and Priorities v

Local Engagement and How to get Involved v

1 Local Air Quality Management 1

2 Actions to Improve Air Quality 2

2.1 Air Quality Management Areas 2

2.2 Progress and Impact of Measures to address Air Quality in Exeter 4

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations 15

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance 16

3.1 Summary of Monitoring Undertaken 16

3.1.1 Automatic Monitoring Sites 16

3.1.2 Non-Automatic Monitoring Sites 16

3.2 Individual Pollutants 16

3.2.1 Nitrogen Dioxide (NO_2) 16

3.2.2 Particulate Matter (PM_{10}) 18

3.2.3 Particulate Matter ($PM_{2.5}$) 19

3.2.4 Ozone (O_3) 19

Appendix A: Monitoring Results 20

Appendix B: Full Monthly Diffusion Tube Results for 2018 38

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC 42

Appendix D: Map(s) of Monitoring Locations and AQMAs 47

Appendix E: Summary of Air Quality Objectives in England 48

Glossary of Terms 49

References 50

List of Tables

Table 2.1 – Declared Air Quality Management Areas 3

Table 2.2 – Progress on Measures to Improve Air Quality 8

List of Figures

Figure A.1 – Trends in Annual Mean NO_2 Concentration at 6 Long-Term Sites in Exeter…..31

Figure A.2 – Trends in Annual Mean PM_{10} Concentrations…..... 34

Figure C.4.1 – Diffusion Tube Precision and Accuracy..... 42

Figure C.4.2 – Hourly NO_2 data from Exeter Roadside (RAMM) ($\mu g/m^3$)…. 44

Figure C.4.3 - Hourly PM_{10} data from Exeter Roadside (RAMM) and Alphington Street ($\mu g/m^3$)…..... 45

1 Local Air Quality Management

This report provides an overview of air quality in Exeter during 2018. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

The statutory air quality objectives applicable to LAQM in England can be found in 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 Exeter City Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://exeter.gov.uk/airpollution/. 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
Exeter AQMA	Declared 2007, amended 2011	NO2 Annual Mean	Exeter	An area encompassing the radial routes into the city and other major routes	NO	70	µg/m3	61.9	µg/m3	Exeter AQAP 2019-2024	2018	www.exeter.gov.uk/airpollution
Exeter AQMA	Declared 2007, amended 2011	NO2 1 Hour Mean	Exeter	An area encompassing the radial routes into the city and other major routes	NO	65	µg/m3	61.9	µg/m3	Exeter AQAP 2019-2024	2018	www.exeter.gov.uk/airpollution

☒ **Exeter 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 Exeter

Defra's appraisal of last year's ASR concluded that 'the report is well structured, detailed, and provides the information specified in the Guidance, following the latest reporting template'. The appraisal goes on to say 'There have been two new diffusion tube sites added to the network networking in 2017. It is encouraging to see that the Council is taking an active approach to reviewing and amending their monitoring program as necessary,' and 'The Council has committed to continue automatic monitoring in Exeter, to replace current aging continuous analysers, and to include the capacity to measure $PM_{2.5}$, this is supported, and encouraging to see'.

Exeter City Council has taken forward a number of direct measures during the current reporting year of 2018 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in the Action Plan. Key completed measures are:

1. Publication of the new Air Quality Action Plan for 2019-2024, including a significant consultation and engagement process which reached nearly 3000 people.

2. Sport England Local Delivery Pilot funding and programme agreed for the next two years, including measurable deliverables related to active travel and public realm improvements.

3. Development of updated source apportionment modelling for the areas where there are exceedances of the objective, which were used to assist in the selection of appropriate measures to include in the AQAP, and will continue to be used in the further refinement of those actions.

4. Development by Devon County Council of a new draft Transport Strategy which was consulted on in early 2019. Proposed measures and targets within this included:

    a. 50% of trips by foot or cycle within the city,

    b. Removal of all air quality exceedances in the city,

   c. Single ticketing platform combing bus, bike and car club (with scope for all these to be electric in the future).

5. Installation of new continuous analysers at Exeter RAMM and Alphington Street, providing greater data reliability and the ability to measure $PM_{2.5}$ at both sites.
6. Extension of the Council's monitoring network to include four additional locations close to off-road cycle routes, to demonstrate the possibility for exposure reduction.
7. Education projects in two Heavitree primary schools close to the AQMA, working with Sustrans.
8. A stand and presentation at Junior Life Skills, which provided active travel education to about 1000 year six pupils from primary schools throughout the city.
9. A community-led monitoring project in Heavitree to increase awareness and inform local projects to improve air quality.
10. Installation of six further EV charging points for the Council's electric van and pool car fleet.
11. Development of a scheme for battery storage linked to the Council's PV arrays which will be able to power a fleet of electric refuse collection vehicles.
12. Scrutiny of planning applications for air quality impacts, including making objections to developments on air quality grounds where this is justified and the negotiation of mitigation in accordance with Council and national planning policy.
13. Inclusion of two new electric car club vehicles at city rail stations and a further eight in communities have either been delivered are imminent to be delivered.
14. Further development of the cycle network in and around the city, particularly route E4 and new segregated cycle-only lanes beside Cumberland Way to access the new housing at Monkerton, Hill Barton and Pinn Lane.
15. Stagecoach continued to upgrade their bus fleet, introducing 14 Euro 6 single decker buses to serve the city.

16. Significant additions to the city's bus network, particularly East of Exeter including:
    a. half hourly service to East of Exeter for employment and airport (56),
    b. Science Park service (K),
    c. New outer orbital service connecting City Centre, Newcourt, Ikea, Whipton, City Centre (I / J).

17. By 1st Jan 2020 the Hackney carriage fleet will be 50% Euro 6 wheelchair accessible vehicles and 50% ULEV saloon cars with a stated emission level of 75g km CO_2 or below.

18. A reduction in NOx emissions from buildings as a result of a variety of measures intended primarily to address fuel poverty and carbon emissions. These include retrofitting 6 ECC Council houses under a ZEBCat (zero energy buildings catalyst) pilot, completion of 26 new PassivHaus standard homes by Exeter City Council, commencement of construction of a PassivHaus standard leisure centre and swimming pool in the city centre, replacement of an ageing boiler at the Corn Exchange venue and continued implementation of district heating schemes to provide heating and hot water to 2800 homes at Monkerton, Tithebarn, Mosshayne, Pinn Court and Park Farms, and Exeter Science Park.

The Corporate Strategy for 2018 to 2021 and the emerging Exeter Vision for 2040 commit the Council to tackling congestion, improving accessibility and increasing activity levels (including active travel). The Air Quality Action Plan is highly complementary to these existing corporate priorities, and the measures identified in section 5 of the AQAP and Table 2.2 of this report are listed under headings from this strategy:

- Tackling congestion and accessibility;
- Promoting Active & Healthy Lifestyles;
- Building Great Neighbourhoods.

The Corporate Plan and emerging Vision contain a key aspiration for the city which is relevant to this plan. This is that by 2021 cycling to work will have doubled (from 6% to 12%), and 50% of people will be walking or cycling to work within the city.

The Action Plan focuses on the Heavitree corridor, where the greatest reductions in emissions are required. An integrated plan for this whole area will be developed that will increase active travel and change the way that existing roads are used (including filtered permeability). As part of this process care will be taken that any traffic displaced from the Heavitree corridor does not compromise the effectiveness of other city-wide measures to achieve compliance at the other locations.

In the AQAP we outline how we plan to effectively tackle air quality issues within our control. However, we recognise that there are a large number of air quality policy areas that are outside of our influence (such as vehicle emissions standards agreed in Europe), but for which we may have useful evidence, and so we will continue to work with regional and central government on policies and issues beyond Exeter City Council's direct influence.

Exeter City Council expects to continue to implement the actions in the AQAP over the course of the next reporting year, particularly:

- Implementation of the agreed programme of Sport England work, particularly work in communities led by the Wellbeing Exeter Community Builders, and the creation of Active and Play streets.
- Improvements to the E4 cycle route.
- New Park and Change sites on the outskirts of the city.

The principal challenges and barriers to implementation that Exeter City Council anticipates facing are continued funding constraints within Local Government. Concerns have been raised by local interest groups over the impact that delays in the GESP timetable may have on implementation of the AQAP. Currently the published GESP timetable is under review, but it has not yet been finalised. Until this happens, the impact on the AQAP cannot be assessed. Changes can be made to the AQAP if required by means of subsequent Annual Status Reports.

Exeter City Council anticipates that the measures stated above and in Table 2.2 will achieve compliance in the Exeter AQMA.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	Filtered permeability projects to be considered for the city with an initial focus on the Heavitree corridor area and including a feasibility study for corridor improvements	Policy Guidance and Development Control	Other policy	DCC via Transport Strategy and Exeter City Futures, Sport England Local Delivery Pilot	In consultation with communities, develop plans for individual areas	2019 start challenge definition and feasibility assessment	12% cycle to work and 50% walk or cycle to work and Heavitree corridor improvements designed to achieve compliance with the objective	The target for design of changes to the Heavitree corridor area will be to eliminate exceedences. Details will be finalised as the design emerges, but it is currently expected that a reduction in emissions of between 39 and 78% will be required	DCC have undertaken an initial sift of proposals for Heavitree area to identify those to progress this year. SELDP expect to deliver 15 Play Streets, 3 Community Streets and are working with 2 schools towards the development of School Streets	Rolling Programme	Sport England funding and programme agreed for the next two years.
2	Consider access restrictions which will reduce the dominance of private cars, including in the city centre	Policy Guidance and Development Control	Other policy	DCC via Transport Strategy and Exeter City Futures	Development of plans as part of Transport Strategy for the city, consultation and obtaining relevant permissions, consents and traffic orders	2021 start implementation	Less than 50% private car commute	4% reduction in emissions at East Wonford Hill (shared across all measures which will in combination achieve the targeted reduction in private car commutes)	Traffic reduction scheme for Bartholomew Street West to be implemented in 2019. Roadside interviews in the city centre have been undertaken to inform a city centre traffic strategy. Liveable Exeter vision for the city published, which includes development on car parks, and a reduction in road space for cars. Initial work on South Street project is progressing, to	Ongoing Programme	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
									include improved cycle routes, and connections between the city centre and the Quay area.		
3	New transport links and Park & Change facilities to make it easier for those living outside the city to choose active and sustainable travel modes	Transport Planning and Infrastructure	Other	DCC via GESP and Transport Strategy	2021 start formalisation of plans through Transport Strategy and GESP	2023 start implementation of plans, once relevant permissions, consents and traffic orders obtained, and funding is in place	Publication of Transport Strategy. Less than 50% private car commute.	4% reduction in emissions at East Wonford Hill (shared across all measures which will in combination achieve the targeted reduction in private car commutes)	Pinhoe Park and Change under construction. Park and Change at Science Park being developed and construction expected to commence in 2020.	Ongoing Programme	Currently the GESP timetable is subject to change. Once this is finalised, the impact on the AQAP will be evaluated. At this stage programmed works are being implemented.
4	Changes to parking charges to discourage car travel in peak times, encourage longer stays in the city centre and support other measures in this plan, such as active travel	Traffic Management	Other	ECC via Local Plan	2019 commission relevant changes to software and/or hardware (if cost effective to achieve)	2020 implement new charging scheme (if approved)	New charging scheme in place	<1% reduction in emissions. This measure is expected to have an indirect effect on emissions, such that it is not possible to reliably quantify the impact of this measure alone.	This is being actively pursued with ECCs equipment providers ahead of next tariff review.	2021	There was also reference in DCC's recent draft Transport Strategy to this, providing additional support for the measure.
5	Maximise efficiency of existing highway network	Transport Planning and Infrastructure	Other	DCC via GESP, Transport Strategy and Exeter City Futures	2020 identify areas for specific improvement and	TBC, depending on outcome of planning phase and funding availability	TBC in subsequent annual air quality status reports	TBC, based on predicted changes to traffic parameters provided by	In planning phase	Ongoing programme	Currently the GESP timetable is subject to change. Once this is finalised, the impact on the AQAP will be evaluated.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
					develop detailed models to assess solutions			DCC as plans for specific locations emerge and are consulted upon			
6	Access Fund and cycle/walking network, Local Walking and Cycling Infrastructure Plan (LCWIP)	Transport Planning and Infrastructure	Other	DCC via GESP and Transport Strategy	2019 continue to develop and expand plans for cycle network and development of LCWIP	Ongoing, as DCC have current plans for upgrades to cycling and walking infrastructure which will evolve as the LCWIP develops	12% cycle to work and 50% walk or cycle to work	4% reduction in emissions at East Wonford Hill (shared across all measures which will in combination achieve the targeted reduction in private car commutes)	Planned E4 Cycle Route improvements ongoing, with 2km of works to be completed by 2020.	Ongoing programme	Access Fund money obtained until April 2020.
7	Expand school and community projects, car free events and events promoting active travel, building on the success of the Heavitree pilot	Promoting Travel Alternatives	Other	ECC via Sport England Local Delivery Pilot & Exeter City Futures	2019, develop initial programme with communities	Ongoing programme, which evolves as previous events and projects are evaluated	12% cycle to work and 50% walk or cycle to work	4% reduction in emissions at East Wonford Hill (shared across all measures which will in combination achieve the targeted reduction in private car commutes)	Network of Community Builders working with local neighbourhoods to implement programme of trial road closure events, leading to the implementation of Play Streets and Community Streets. SELDP working with two schools.	Ongoing programme	The impact of Magdalen Street summer event closures will be monitored as part of the development of plans for the area
8	Use social prescribing and community building to help individuals get and stay active	Public Information	Other	2019, expand on existing Wellbeing Exeter programme	Ongoing programme, which evolves as previous events and projects are evaluated	12% cycle to work and 50% walk or cycle to work	4% reduction in emissions at East Wonford Hill (shared across all measures which will in combination achieve the targeted reduction in		14 Community Builders working in local districts, linked to Community Connectors at each GP practice	Exeter will be healthy and happy and local services will support people to live their lives well, in the ways that matter to them.	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
							private car commutes)				
9	High quality parks, play areas, sport and leisure facilities	Promoting Travel Alternatives	Other	ECC via Physical Activity Strategy, Sport England Local Delivery Pilot & Local Plan	2019 formal consultation on draft Physical Activity Strategy	2020 start to implement plans, after obtaining necessary permissions and consents, and funding	Exeter the most active city in England	4% reduction in emissions at East Wonford Hill (shared across all measures which will in combination achieve the targeted reduction in private car commutes)	Draft Physical Activity Strategy published for consultation, including plans for POS	Ongoing programme	
10	Communications plan, to support measures that will achieve modal shift	Public Information	Other	ECC via Sport England Local Delivery Pilot & Exeter City Futures	2019 develop communications plan to promote behavioural change as part of existing programmes	2019 onwards implement and evolve plan	12% cycle to work and 50% walk or cycle to work	<1% reduction in emissions. The purpose of this measure is to enable the Council to explain why it is taking action. The measure itself is unlikely to have significant impact on its own.	Work on baseline evidence report commenced. Lessons from Commute Exeter project will contribute to development of plan.	Ongoing (iterative process of developing and implementing communications / messages)	
11	Promote and expand Co-Bikes network, and support the roll out of electric car club vehicles to more locations	Promoting Travel Alternatives	Other	DCC, ECC via Transport Strategy, Sport England Local Delivery Pilot & Exeter City Futures	2019	Ongoing programme, dependent on funding availability	ULEV Co-Car fleet and expanded network of Co-Bikes	<1% reduction in emissions. This measure will have indirect benefits for air quality by facilitating active travel and supporting a change in car ownership patterns. It is not possible to reliably model the impact of this measure	DCC have planned upgrades to the Co-Bikes network. Bikes and docking stations to be upgraded in 2019. Ongoing expansion of car network.	Ongoing programme	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
								alone on emissions			
12	An improved multi-modal public transport network, incorporating cleaner bus technologies	Transport Planning and Infrastructure	Other	DCC via GESP, Transport Strategy and Exeter City Futures	2020	TBC	Less than 50% private car commute	4% reduction in emissions at East Wonford Hill (shared across all measures which will in combination achieve the targeted reduction in private car commutes). As an example, 33% bus electrification would achieve 5% fall in emissions at East Wonford Hill and 66% electrification would achieve 10% reduction.	14 Euro 6 busses have entered the fleet and significant new additions to the city's bus network.	Ongoing programme	
13	Developers to mitigate the effects of their development on air quality	Policy Guidance and Development Control	Other policy	GESP team, ECC via GESP & Local Plan	2019/20 start formalisation of new policies, plans, emerging GESP and updates to Local Plan	2019 continue to implement policies in existing planning policy in a robust manner. 2022 start implementation of new policies.	Incorporation of new policies into GESP and Local Plan review	The purpose of this measure is to limit the impact of new development. It is not intended to reduce emissions on the current baseline (although some reduction may be achieved as a result in practice)	Implementing current policy eg when considering retail park applications and new housing.	Ongoing	Currently the GESP timetable is subject to change. Once this is finalised, the impact on the AQAP will be evaluated.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
14	Policies deliver development where private car use is not the only realistic travel choice	Policy Guidance and Development Control	Other policy	GESP team, ECC via GESP & Local Plan	2019/20 start formalisation of new policies, plans, emerging GESP and updates to Local Plan	2019 continue to implement policies in existing planning policy in a robust manner. 2022 start implementation of new policies.	12% cycle to work and 50% walk or cycle to work	The purpose of this measure is to limit the impact of new development. It is not intended to reduce emissions on the current baseline (although some reduction may be achieved as a result in practice)	Liveable Exeter vision for development in the city which is not reliant on car travel.	Ongoing	Currently the GESP timetable is subject to change. Once this is finalised, the impact on the AQAP will be evaluated.
15	More things to see/do in the City Centre, encouraging longer stays and supporting events which promote sustainable travel, active and healthy lifestyles.	Policy Guidance and Development Control	Other policy	ECC via Local Plan	2019 start to update current City Centre Strategy.	TBC once strategy adopted	Adoption of new City Centre Strategy	<1% reduction in emissions. This measure will not have a significant direct impact on emissions, but will support the step change in behaviour which will be required to meet the City Council's aspirations for active and healthy travel.	St Sidwells Point leisure centre development commenced. Consultants appointed to produce City Centre Strategy	Ongoing programme	
16	Better information to raise awareness and improve the level of understanding of air pollution and transport issues within	Public Information	Other	ECC	2019 develop plan, to raise understanding of air quality (identified in consultation as a key barrier)	2020 onwards implement and evolve plan	12% cycle to work and 50% walk or cycle to work	Enable the Council to explain why it is taking action. Measure itself is unlikely to have significant impact on its own.	Work on baseline evidence report commenced	Ongoing (iterative process of developing and implementing communications / messages).	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
	communities										
17	An air pollution monitoring network that supports the measures in this action plan	Public Information	Other	ECC via Local Plan	2019 Identify gaps in the ability of the current network to achieve the aims of this action plan, and specify new or changed elements that are required	2021 new network on line (once necessary funding in place, and the tender process, installation and commissioning are complete)	The monitoring network provides the data required to inform the development and implementation of the actions in this plan	This measure would not in itself deliver reductions in emissions, but would support the other measures in this plan	10 new diffusion tube monitoring sites added to the network in 2019. The potential benefits of new sensor technologies is being evaluated but no projects have currently been identified where these types of equipment would provide added value.	Ongoing evolution of network may be required, as needs change	

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

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

There is now a capacity for direct monitoring of $PM_{2.5}$ in Exeter, since August 2018. Faults with the new analyser installed at Exeter RAMM mean that data from that site is not available for 2018, but it is for the Alphington Street site. This showed $PM_{2.5}$ concentrations of 7.8 $\mu g/m^3$ (average for period August to December) and 9.02 $\mu g/m^3$ (annualised using the method from LAQM.TG16). The annual average EU limit value for $PM_{2.5}$ is 25 $\mu g/m^3$ so there is no suggestion that this level is being exceeded in Exeter. However the council still has a duty to reduce emissions of and exposure to this pollutant.

During 2019, Exeter City Council will be taking the measures described in Table 2.2 that will address $PM_{2.5}$ as well as NO_2. During the year data from the second monitoring site at Exeter RAMM will also become available as faults with this analyser have been rectified.

Approximately 60% of Exeter is designated as Smoke Control Areas. Controls on solid fuel combustion appliances and fuels are likely to have restricted $PM_{2.5}$ emissions in these areas.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

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

Exeter City Council undertook automatic (continuous) monitoring at two sites during 2018. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available 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.

3.1.2 Non-Automatic Monitoring Sites

Exeter City Council undertook non- automatic (passive) monitoring of NO_2 at 71 sites during 2018. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided at https://exeter.gov.uk/airpollution/. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), are included in Appendix C.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, “annualisation” and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.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 40µg/m^3.

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

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 200µg/m^3, not to be exceeded more than 18 times per year.

The data shows that eight locations measured an exceedence of the annual objective in 2018. Six of these are at relevant locations (DT19 Alphington Street, DT29 Cowick Street (outbound), DT52 Livery Dole, DT 53 Rowancroft, DT56 Fore Street Heavitree inbound and DT57 East Wonford Hill). The other two (DT54 Salutary Mount and DT58 Honiton Road) are not at relevant receptors. When corrected for the distance to the nearest receptor the objective is still exceeded at the façade of the nearest houses at DT54 Salutary Mount, but not at DT58 Honiton Road (Appendix B). For DT58 there is also a tube located at the nearest property (DT59 Honiton Road façade); this tube does not show an exceedence.

All eight locations that exceeded the objective are within the AQMA. The extent of the exceedence of the objective ranges from 3.35 µg/m^3 at Fore Street Heavitree to 21.86 µg/m^3 at East Wonford Hill. The annual average at East Wonford Hill was over a level of 60µg/m^3, suggesting that an exceedance of the 1-hour mean objective may also occur at this site. This is included in the AQMA order.

Hotspots of pollution clearly therefore remain in locations where congestion and poor dispersion combine to create specific local conditions that cause higher pollution levels. The extent of these areas is smaller than the extent of the AQMA, however Exeter City Council has no current plans to amend the AQMA and reduce the area included. The AQMA boundary was originally drawn to include a larger area than just the strict areas of exceedence (Exeter City Council 2011). The rationale for this boundary remains sound.

Although the number of sites where measured levels were above the objective is the same as in 2017, the location of these has changed. In the 2018 data there is no longer an exceedence at the DT42 Pinhoe Road (Polsloe Road) location. However the previous exceedence at DT29 Cowick St (outbound) has recurred as a result of a 10 mg/m^3 increase from 2017 levels (table A.3). This seems likely to have been caused by very localised factors because this scale of increase is not reflected in the other monitoring locations on Cowick Street (DT27, 28 or 30). Devon County Council are unaware of any specific road works in this area which may have affected the results, so the cause of an increase of this magnitude is unclear. It is possible that it

is caused by measurement or analytical error but the data has not been excluded during the QA/QC process because neither the officer collecting the tubes nor the lab raised any specific concerns. Results during 2019 will be reviewed to see whether this exceedence remains, or whether levels return to below the objective (which may tend to suggest that the 2018 result was affected by poor data quality).

Figure A.1 and the data in Table A.3 shows that NO_2 levels in Exeter have at most sites been broadly stable since around 2012, following a decrease from 2009 levels. However some locations have shown increases between 2017 and 2018 which need to be considered further. 2018 was a year with unusual weather conditions, and this could have affected pollution levels, for example by increased emissions from cold engines in the cold winter, or use of vehicle air conditioning in the hot summer. Whether this change is the start of a trend or part of the variation between years which occurs naturally will not become clear until data can be evaluated over a longer timescale. If it appears that this is the start of an upward trend, it will necessitate updates to the AQAP, which will be reported here.

Four new Exeter City Council diffusion tubes were added to the network in 2018. These were DT68 (Riverside Valley Park), DT69 (Cowick Barton Playing Fields), DT70 (Exwick playing Fields) and DT71 (Heavitree Pleasure Grounds). None of these measured levels above the objective in 2018, which was expected. The purpose of these is to establish levels close to off-road cycle paths.

Exeter City Council has always chosen to monitor at expected hot spots and relevant worst-case locations and so no further revision to the monitoring network is proposed in order to identify suspected exceedences. However in 2019 the Council has added ten new diffusion tube locations to its network. These are areas of significant new housing development (to monitor trends in pollution levels) and in suburban areas to quantify pollution levels to which residents are exposed in typical housing locations.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A 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.

Table A.6 in Appendix A 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.

Data collection was affected by the change in monitoring equipment at both sites but there were no exceedances of the air quality objectives for this pollutant.

3.2.3 Particulate Matter ($PM_{2.5}$)

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

There is now a capacity for direct monitoring of $PM_{2.5}$ in Exeter, since August 2018. Faults with the new analyser installed at Exeter RAMM mean that data from that site is not available for 2018, but it is for the Alphington Street site. This showed $PM_{2.5}$ concentrations of 7.8 $\mu g/m^3$ (average for period August to December) and 9.02 $\mu g/m^3$ (annualised using the method from LAQM.TG16). The annual average EU limit value for $PM_{2.5}$ is 25 $\mu g/m^3$ so there is no suggestion that this level is being exceeded in Exeter.

3.2.4 Ozone (O_3)

Although not a local air pollutant, Exeter City Council has the facility to measure ozone (O_3) levels. Table A.8 in Appendix A compares the ratified continuous monitored O_3 concentrations for 2018 with the nationally applied air quality objective for this pollutant. (In 2014 and 2016, the data capture was low (below 90%) and so the 97^{th} percentile of 8-hour running means is also shown for comparison with the objective). The objective was exceeded in Exeter in 2018, which may be a result of the fine summer. Reports by the Air Quality Expert Group (2009) have suggested that urban O_3 concentrations will increase over coming years as a result of reduced scavenging of ozone by NO. As stated above, this ozone is not a local air pollutant so Exeter City Council is not responsible for reporting on, or mitigating exceedences of this objective. The data has been included here because the appraisal of the last Annual Status Report by DEFRA's consultants recommended that it be included in future.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	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)
CM1	Exeter Roadside	Kerbside	291939	92830	NO_2; O_3; PM_{10}; $PM_{2.5}$	YES	Chemiluminescent; UVA; Optical Light Scattering	0	1	1.7
CM2	Alphington Street	Roadside	291670	91773	PM_{10}; $PM_{2.5}$	NO	Optical Light Scattering	12	3	1.7

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	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
DT1	High Street /Castle Street	Kerbside	292199	92814	NO2	YES	50	0.5	NO	2
DT2	Longbrook Street	Kerbside	292315	93016	NO2	NO	0	1	NO	1.7
DT3	New North Road	Kerbside	292185	93049	NO2	YES	0	1	NO	2
DT4	Queen Street	Kerbside	291779	93011	NO2	YES	0	1.5	NO	2
DT5	RAMM 1	Kerbside	291944	92826	NO2	YES	0	1	YES	1.7
DT6	RAMM 2	Kerbside	291944	92826	NO2	YES	0	1	YES	1.7
DT7	High Street Guildhall	Roadside	291984	92626	NO2	YES	0	2	NO	2
DT8	North Street	Kerbside	291895	92569	NO2	YES	0	1	NO	1.7
DT9	South Street	Roadside	291943	92511	NO2	YES	4	2.5	NO	2
DT10	Market Street	Kerbside	291833	92433	NO2	YES	0	1	NO	1.7
DT11	Magdalen Street	Kerbside	292291	92292	NO2	YES	6	2	NO	1.7
DT12	Magdalen Street façade	Kerbside	292422	92320	NO2	YES	0	1	NO	1.7
DT13	Archibald Road	Roadside	292590	92743	NO2	NO	0	1.5	NO	1.7
DT14	Heavitree Road inbound	Roadside	292832	92731	NO2	YES	0	10	NO	2
DT15	Heavitree Road outbound	Kerbside	292703	92807	NO2	YES	0	1	NO	1.7
DT16	Holloway Street	Kerbside	292378	92039	NO2	YES	0	1	NO	1.7
DT17	Carder's Court, Shilhay	Roadside	291699	92091	NO2	NO	0	15	NO	1.7

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
DT18	Rear of Gervase Avenue	Roadside	291657	91973	NO2	YES	5	18	NO	2
DT19	Alphington Street	Kerbside	291669	91812	NO2	YES	0	1	NO	2
DT20	Alphington Road inbound	Roadside	291532	91349	NO2	YES	0	2	NO	1.7
DT21	Queen's Road	Urban Background	291460	91390	NO2	NO	8	2	NO	1.7
DT22	Alphington Road outbound	Roadside	291509	91151	NO2	YES	0	8	NO	1.7
DT23	Alphington Road outer	Roadside	291518	90813	NO2	YES	15	2	NO	1.7
DT24	Church Road Alphington	Roadside	291691	90425	NO2	YES	0	1.5	NO	1.7
DT25	Church Road II	Kerbside	291767	90160	NO2	YES	0	1	NO	1.7
DT26	Alphington Cross	Roadside	291520	90531	NO2	YES	0	1.8	NO	1.7
DT27	Cowick Street (Cowick Lane)	Kerbside	290864	91725	NO2	YES	0	1	NO	1.7
DT28	Cowick Street (inbound)	Roadside	291249	91874	NO2	YES	0	4	NO	1.7
DT29	Cowick Street (outbound)	Roadside	291376	91944	NO2	YES	0	1.5	NO	1.7
DT30	Cowick Street (Exe Bridges)	Roadside	291500	92055	NO2	YES	0	2	NO	1.7
DT31	Okehampton Street	Roadside	291351	92169	NO2	YES	0	4	NO	1.7
DT32	Station Road	Roadside	290830	96598	NO2	NO	0	2.1	NO	1.7
DT33	Bonhay Road (St Clements Lane)	Roadside	291253	93299	NO2	YES	0	2	NO	2
DT34	Red Cow Village	Kerbside	291242	93483	NO2	YES	0	1	NO	1.7

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
DT35	Red Cow II	Kerbside	291272	93468	NO2	YES	0	1	NO	1.7
DT36	Cowley Bridge Road	Roadside	291054	94399	NO2	YES	0	4	NO	1.7
DT37	Pennsylvania Road	Roadside	292391	93291	NO2	NO	0	1	NO	1.7
DT38	York Road School	Roadside	292469	93245	NO2	NO	3.5	2.5	NO	1.7
DT39	York Road	Kerbside	292579	93146	NO2	NO	1.5	0.1	NO	1.7
DT40	Union Road	Roadside	293047	93877	NO2	NO	0	1	NO	1.7
DT41	Pinhoe Road inbound	Roadside	293405	93395	NO2	YES	0	3	NO	1.7
DT42	Pinhoe Road (Polsloe Road)	Kerbside	293251	93375	NO2	YES	0	1	NO	1.7
DT43	Blackboy Road (Polsloe Road)	Roadside	293227	93356	NO2	YES	0	2	NO	1.7
DT44	Beacon Heath	Kerbside	295068	94487	NO2	NO	10	1	NO	1.7
DT45	Venny Bridge	Kerbside	295888	94101	NO2	NO	8	1	NO	1.7
DT46	Pinhoe	Kerbside	296418	94470	NO2	NO	20	0.1	NO	1.7
DT47	Langaton Lane	Urban Background	296984	94327	NO2	NO	12	0.5	NO	1.7
DT48	Pinn Lane	Roadside	296494	93782	NO2	NO	9.5	1	NO	2
DT49	Pinhoe Road (Fairfield Avenue)	Roadside	295413	93689	NO2	YES	0	5	NO	1.7
DT50	East John Walk	Urban Background	293091	92825	NO2	NO	1.5	N/A	NO	1.7
DT51	Magdalen Road (Barrack Road)	Kerbside	293448	92419	NO2	YES	0	1	NO	1.7
DT52	Livery Dole	Roadside	293418	92497	NO2	YES	0	1.5	NO	1.7

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
DT53	Rowancroft	Kerbside	293533	92473	NO2	YES	0	0.2	NO	2
DT54	Salutary Mount	Roadside	293738	92396	NO2	YES	4.5	1.5	NO	1.7
DT55	Fore Street Heavitree outbound	Roadside	293781	92409	NO2	YES	6	4	NO	1.7
DT56	Fore Street Heavitree inbound	Roadside	294043	92359	NO2	YES	0	2	NO	1.7
DT57	East Wonford Hill	Roadside	294410	92310	NO2	YES	0	2	NO	1.7
DT58	Honiton Road	Roadside	295203	92378	NO2	YES	20	1.5	NO	2
DT59	Honiton Road façade	Roadside	295191	92395	NO2	NO	0	15	NO	1.7
DT60	Sidmouth Road lamp post	Roadside	295466	92365	NO2	YES	7	2	NO	2
DT61	Sidmouth Road Middlemoor	Roadside	295636	92232	NO2	YES	0	10	NO	1.7
DT62	Newcourt Way	Roadside	295710	90571	NO2	NO	17	2	NO	2
DT63	Topsham Road (Countess Wear)	Roadside	294694	90001	NO2	YES	0	5	NO	2
DT64	Bridge Road (Countess Wear)	Roadside	294652	89974	NO2	NO	0	15	NO	1.7
DT65	High Street Topsham	Kerbside	296415	88477	NO2	NO	0	1	NO	1.7
DT66	Topsham Road (Tollards Road)	Roadside	294227	90435	NO2	YES	0	1.5	NO	1.7

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
DT67	Topsham Road (Barrack Road)	Roadside	293213	91245	NO2	YES	0	10	NO	1.7
DT68	Riverside Valley Park	Urban Background	292291	91678	NO2	NO	N/A	N/A	NO	2
DT69	Cowick Barton Playing Fields	Urban Background	291016	91304	NO2	NO	N/A	N/A	NO	1.7
DT70	Exwick Playing Fields	Urban Centre	291298	92593	NO2	NO	N/A	N/A	NO	2
DT71	Heavitree Pleasure Ground	Urban Background	294387	92611	NO2	NO	N/A	N/A	NO	2

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2014	2015	2016	2017	2018
CM1	Kerbside	Automatic		96.6	31	28	30.50	27.70	29.10
DT1	Kerbside	Diffusion Tube		100	29.9	25	26.78	28.04	29.19
DT2	Kerbside	Diffusion Tube		83.3		24.8	25.48	25.91	25.21
DT3	Kerbside	Diffusion Tube		100	28.1	26.5	26.25	26.54	25.88
DT4	Kerbside	Diffusion Tube		91.7	26	21.6	23.22	24.29	23.13
DT5	Kerbside	Diffusion Tube		66.7	30.6	29.6	29.60	27.71	29.63
DT6	Kerbside	Diffusion Tube		58.3	31.1	28.9	29.53	27.88	29.34
DT7	Roadside	Diffusion Tube		91.7	29.2	25	25.19	24.36	25.96
DT8	Kerbside	Diffusion Tube		91.7	39.8	34.8	33.45	35.72	33.92
DT9	Roadside	Diffusion Tube		91.7	33.6	30.6	31.07	31.55	29.15
DT10	Kerbside	Diffusion Tube		91.7	34.1	28.3	29.63	31.04	30.79
DT11	Kerbside	Diffusion Tube		83.3	31.5	27.6	28.08	29.19	29.36
DT12	Kerbside	Diffusion Tube		100	31.9	28	30.14	31.75	31.12
DT13	Roadside	Diffusion Tube		91.7	22.1	20.5	22.46	20.79	21.56
DT14	Roadside	Diffusion Tube		100	21.7	19.6	20.98	19.62	20.32
DT15	Kerbside	Diffusion Tube		100	38.8	33.5	36.45	34.05	34.52

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2014	2015	2016	2017	2018
DT16	Kerbside	Diffusion Tube		100	35.9	28.8	33.40	31.33	34.18
DT17	Roadside	Diffusion Tube		100	23.5	20.5	22.41	21.96	22.40
DT18	Roadside	Diffusion Tube		91.7	26.6	23.7	23.36	23.41	22.28
DT19	Kerbside	Diffusion Tube		100	**44.4**	35.2	**40.35**	**40.82**	**46.99**
DT20	Roadside	Diffusion Tube		100	36.3	32.5	32.88	33.85	33.61
DT21	Urban Background	Diffusion Tube		91.7	15.2	12.8	14.25	13.66	15.30
DT22	Roadside	Diffusion Tube		100	30.7	25.3	27.46	26.81	28.99
DT23	Roadside	Diffusion Tube		83.3	28.6	22.3	24.82	23.40	27.33
DT24	Roadside	Diffusion Tube		100	26.4	24.1	25.83	29.12	27.97
DT25	Kerbside	Diffusion Tube		100	29.1	26.9	26.85	25.57	26.13
DT26	Roadside	Diffusion Tube		100				32.68	31.33
DT27	Kerbside	Diffusion Tube		100	**45.4**	36.4	37.01	37.03	39.85
DT28	Roadside	Diffusion Tube		91.7	24.6	20.5	22.99	20.71	23.91
DT29	Roadside	Diffusion Tube		100	**40.8**	34	33.59	33.56	**43.36**
DT30	Roadside	Diffusion Tube		100	35.7	32.4	31.73	32.02	33.23
DT31	Roadside	Diffusion Tube		100	26.5	23.7	24.35	24.63	25.16
DT32	Roadside	Diffusion Tube		100				27.08	25.36
DT33	Roadside	Diffusion Tube		100	31.5	27.2	29.36	28.69	30.86

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2014	2015	2016	2017	2018
DT34	Kerbside	Diffusion Tube		100	**42.7**	36.1	37.66	38.04	38.27
DT35	Kerbside	Diffusion Tube		100	36.8	32	31.72	31.88	31.44
DT36	Roadside	Diffusion Tube		100	38.3	33.2	31.53	32.34	33.82
DT37	Roadside	Diffusion Tube		91.7	31.3	25.6	28.00	26.74	28.64
DT38	Roadside	Diffusion Tube		100		27.9	29.08	28.40	29.68
DT39	Kerbside	Diffusion Tube		91.7	38.8	32	36.24	37.61	38.88
DT40	Roadside	Diffusion Tube		100	32.1	22.3	26.42	23.96	27.95
DT41	Roadside	Diffusion Tube		100	37.7	30.6	31.18	30.22	31.23
DT42	Kerbside	Diffusion Tube		100	**48.3**	**42.1**	**42.15**	**41.20**	37.22
DT43	Roadside	Diffusion Tube		100	33.4	29.2	30.86	29.19	28.15
DT44	Kerbside	Diffusion Tube		100	19	17.5	19.70	19.75	20.28
DT45	Kerbside	Diffusion Tube		100			18.79	18.54	19.08
DT46	Kerbside	Diffusion Tube		100	38.4	24.9	27.37	23.33	24.76
DT47	Urban Background	Diffusion Tube		100	18.7	16.7	18.07	15.74	18.71
DT48	Roadside	Diffusion Tube		83.3			17.37	17.17	19.28
DT49	Roadside	Diffusion Tube		100	20.2	18.5	19.74	18.86	19.70
DT50	Urban Background	Diffusion Tube		100	15.7	13.9	15.32	14.54	14.53
DT51	Kerbside	Diffusion Tube		100	**40.4**	37.2	36.86	37.16	39.75

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2014	2015	2016	2017	2018
DT52	Roadside	Diffusion Tube		100	**52**	**48.8**	**46.78**	**49.91**	**48.65**
DT53	Kerbside	Diffusion Tube		100	**42.5**	38.2	39.76	**43.53**	**46.43**
DT54	Roadside	Diffusion Tube		100	39.5	35.5	**49.70**	**52.68**	**53.62**
DT55	Roadside	Diffusion Tube		100	30.3	29.5	31.42	30.05	31.24
DT56	Roadside	Diffusion Tube		100	**48.5**	38.6	38.49	**40.85**	**43.35**
DT57	Roadside	Diffusion Tube		91.7	**64.2**	**59.2**	**57.87**	**59.05**	**61.86**
DT58	Roadside	Diffusion Tube		100	**58.4**	**42.7**	**49.89**	**49.33**	**50.61**
DT59	Roadside	Diffusion Tube		100	21.9	18.4	20.07	19.67	24.51
DT60	Roadside	Diffusion Tube		100	35.3	31.4	34.96	35.83	37.04
DT61	Roadside	Diffusion Tube		100	24	21.2	22.01	23.27	24.19
DT62	Roadside	Diffusion Tube		75.0			17.76	20.19	19.17
DT63	Roadside	Diffusion Tube		100	29	26.3	24.56	25.04	26.98
DT64	Roadside	Diffusion Tube		100	21.6	19.3	20.51	19.86	22.57
DT65	Kerbside	Diffusion Tube		100	26.1	21.6	24.34	26.94	27.87
DT66	Roadside	Diffusion Tube		91.7	**40.2**	36.6	34.88	35.38	39.69
DT67	Roadside	Diffusion Tube		100	27.6	24.1	25.01	23.36	25.55
DT68	Urban Background	Diffusion Tube		75.0					13.70
DT69	Urban Background	Diffusion Tube		75.0					11.46

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2014	2015	2016	2017	2018
DT70	Urban Background	Diffusion Tube		91.7					17.50
DT71	Urban Background	Diffusion Tube		91.7					11.24

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

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

Notes:

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

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

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

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

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

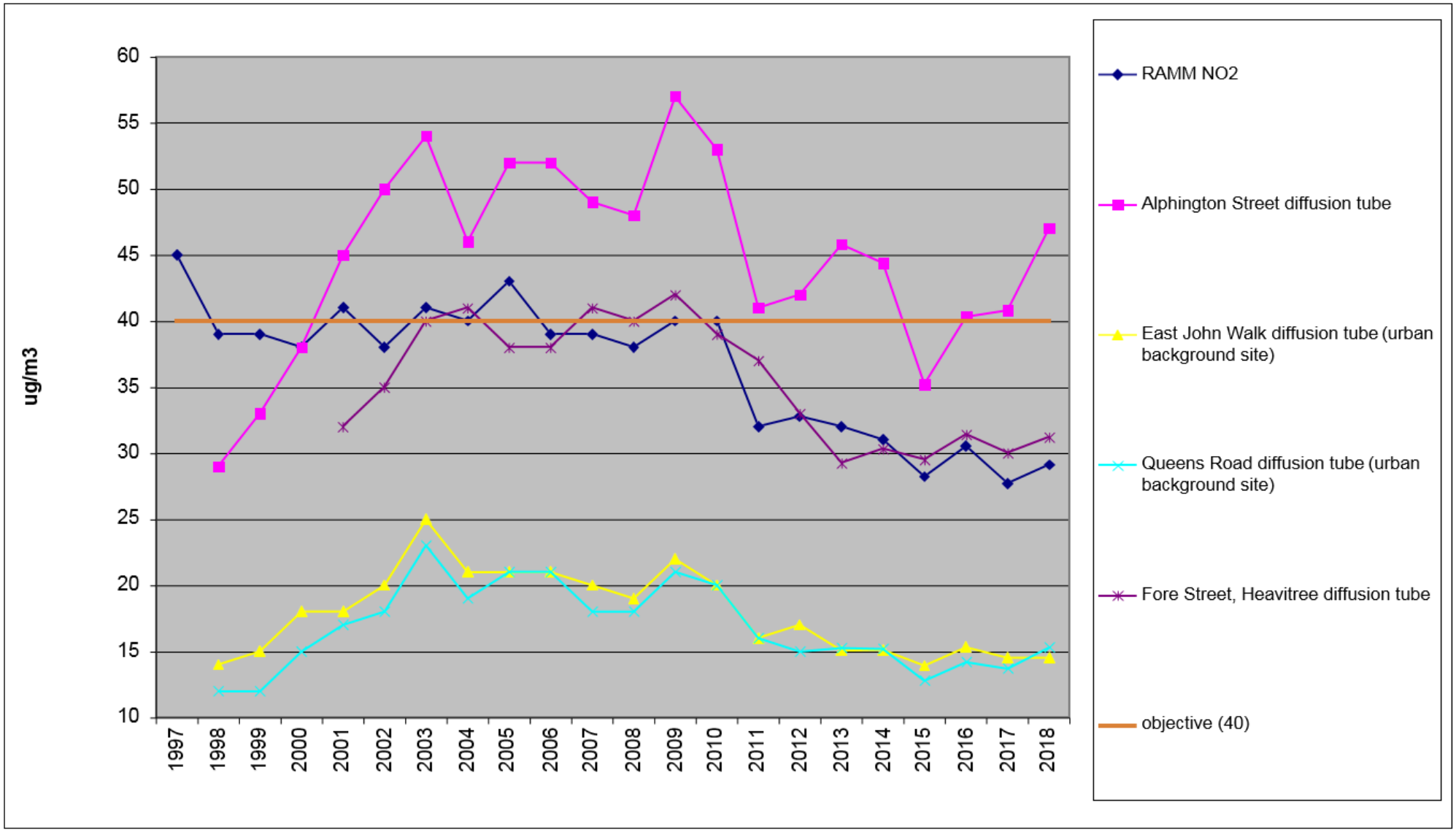


Figure A.1 – Trends in Annual Mean NO_2 Concentrations

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2014	2015	2016	2017	2018
CM1	Kerbside	Automatic		96.6	0(109)	0	0	0	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	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2014	2015	2016	2017	2018
CM1	Kerbside		46.7	20	19	15	18	17.7
CM2	Roadside		87.0	20	19	15	19	16.7

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

Notes:

Exceedances of the PM_{10} annual mean objective of 40$\mu g/m^3$ 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.

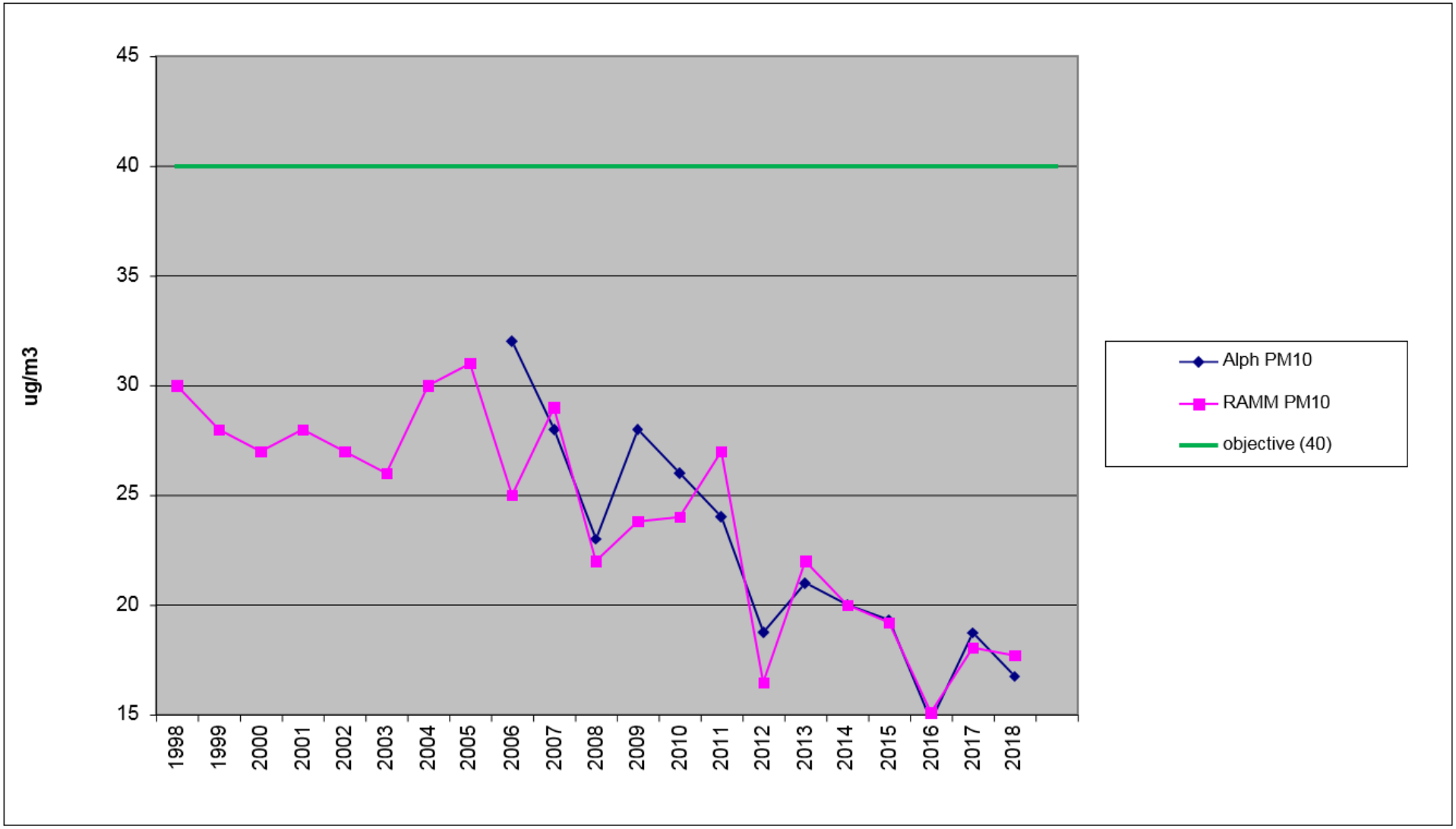


Figure A.2 – Trends in Annual Mean PM_{10} Concentrations

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2014	2015	2016	2017	2018
CM1	Kerbside		46.7	2	6	0	1	0 (28.79)
CM2	Roadside		87.0	2	6 (29.5)	0 (23.7)	2	1

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	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
				2014	2015	2016	2017	2018
CM1	Kerbside		0.0					
CM2	Roadside		43.5					9.02

☒ **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.

Table A.8 – O_3 Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	O_3 8-hour mean > 100 (µg/m^3) (3)				
				2014	2015	2016	2017	2018
CM1	Kerbside		97.1	0 (57.9)	0	0 (58.0)	0	12

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) If the period of valid data is less than 85%, the 97th percentile of 8-hour running means is provided in brackets.

Appendix B: Full Monthly Diffusion Tube Results for 2018

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

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
DT1	31.79	34.96	34.19	35.32	32.76	27.69	28.62	24.68	27.67	28.64	37.71	32.60	31.39	29.2	17.2
DT2	29.44	30.79	31.74		24.30	23.04	22.73	22.58	26.52	27.99		31.95	27.11	25.2	
DT3	30.72	34.36	33.90	27.78	23.46	23.44	24.55	22.72	19.79	26.29	34.14	32.74	27.82	25.9	
DT4	25.55	29.11	26.49		25.05	22.21	23.18	18.58	25.50	24.02	27.08	26.79	24.87	23.1	
DT5	28.70	35.58	35.62	28.84	35.29		30.22		33.38			31.41	32.38	29.6	
DT6	28.21	32.66	34.55	29.69			30.06		34.46			32.27	31.70	29.3	
DT7	29.16	29.65	31.57		29.22	24.50	25.31	20.11	28.90	28.09	34.04	26.56	27.92	26.0	
DT8	34.21	35.22	36.35	34.90	35.69	31.59		33.97	42.83	39.25	36.84	40.33	36.47	33.9	
DT9	33.77	31.69	33.40		26.83	23.40	30.45	28.73	33.55	32.90	34.86	35.16	31.34	29.1	25.7
DT10	31.24	32.93	34.05		32.52	29.58	30.40	29.65	32.10	37.43	40.15	34.15	33.11	30.8	
DT11	35.48	37.17	34.38	28.98	30.21	23.74	26.11		29.32	32.43		37.84	31.57	29.4	24.6
DT12	35.16	45.18	35.52	29.31	30.99	29.11	28.15	27.71	32.17	33.76	31.11	43.37	33.46	31.1	
DT13	25.89	27.72	26.54	19.14	19.94	19.28	16.83		21.13	25.04	24.68	28.85	23.19	21.6	
DT14	22.60	25.41	26.07	22.50	20.56	17.86	16.91	15.18	20.72	22.75	27.16	24.56	21.85	20.3	
DT15	37.51	44.37	43.68	34.59	38.97	37.84	29.54	28.65	35.14	38.27	37.00	39.85	37.12	34.5	
DT16	37.36	39.80	35.51	32.35	37.77	27.69	33.56	32.57	34.63	41.09	50.07	38.69	36.76	34.2	
DT17	28.17	25.68	23.28	20.08	20.51	20.26	22.58	22.20	24.14	26.41	26.21	29.55	24.09	22.4	

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
DT18	25.83	27.66	28.13	22.39	22.02	11.66	21.64	22.23	24.06	28.07		29.83	23.96	22.3	21.5
DT19	45.57	52.08	51.71	47.72	54.24	70.37	46.81	35.08	43.99	58.31	51.50	48.88	50.52	**47.0**	
DT20	36.63	40.31	40.55	31.67	35.77	31.23	31.84	33.22	40.26	39.25	34.56	38.44	36.14	33.6	
DT21	17.91	19.96	20.07	14.89	13.60	13.57		10.46	11.85	16.73	21.11	20.84	16.45	15.3	
DT22	26.96	35.27	35.41	30.26	35.54	30.00	32.45	24.29	27.18	30.55	35.33	30.86	31.18	29.0	
DT23	27.61	31.20	34.68			27.69	30.04	18.76	25.86	28.36	35.94	33.76	29.39	27.3	21.3
DT24	32.90	38.13	34.91	27.80	23.74	25.73	27.23	24.30	29.11	31.37	34.09	31.62	30.08	28.0	
DT25	29.92	32.85	33.23	22.72	25.05	24.33	24.84	21.59	26.03	29.85	32.91	33.79	28.09	26.1	
DT26	40.00	30.76	38.89	28.54	31.13	29.81	34.85	33.25	32.47	35.05	30.61	38.94	33.69	31.3	
DT27	42.49	43.26	49.46	44.02	39.24	39.39	44.86	33.71	40.58	36.98	54.27	45.96	42.85	39.9	
DT28	23.97	27.78	29.14		26.82	20.74	22.67	20.03	26.27	28.93	27.80	28.62	25.71	23.9	
DT29	40.35	41.67	72.14	46.25	44.51	37.26	40.50	35.81	41.40	52.39	62.28	44.89	46.62	**43.4**	
DT30	42.77	38.46	38.07	34.35	37.39	28.92	31.49	29.89	37.92	35.07	34.50	39.99	35.74	33.2	
DT31	28.16	30.95	31.44	24.60	26.99	25.73	25.20	20.13	25.44	25.33	29.66	31.00	27.05	25.2	
DT32	28.50	33.86	34.47	20.43	17.28	20.45	27.40	24.36	26.52	28.95	33.33	31.69	27.27	25.4	
DT33	32.08	37.58	39.33	27.01	34.51	30.45	29.95	26.58	31.06	35.65	35.97	38.09	33.19	30.9	
DT34	40.96	45.24	42.46	37.47	38.43	37.88	44.84	33.76	44.23	44.74	39.80	43.97	41.15	38.3	
DT35	35.91	34.23	43.30	31.69	27.31	30.51	32.37	27.44	36.90	35.09	34.77	36.21	33.81	31.4	
DT36	36.23	38.67	43.97	27.78	35.23	31.96	35.28	32.20	39.24	44.33	32.07	39.46	36.37	33.8	
DT37	30.43	31.01	34.19		30.91	27.03	27.13	22.66	28.43	30.47	40.79	35.78	30.80	28.6	
DT38	34.71	37.26	35.83	22.51	33.23	28.49	27.56	23.55	28.77	30.71	37.07	43.26	31.91	29.7	26.4
DT39	44.44	54.66	47.37		42.04	37.96	36.55	31.48	38.77	45.56	46.40	34.68	41.81	38.9	29.6
DT40	31.23	32.76	34.59	26.82	28.31	25.18	29.85	23.78	27.18	26.90	38.84	35.22	30.06	28.0	

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
DT41	37.74	34.27	38.30	31.58	30.18	28.15	30.04	27.07	35.29	29.91	38.59	41.90	33.58	31.2	
DT42	39.61	47.22	48.86	34.28	19.09	37.50	45.19	34.91	41.17	40.13	43.42	48.90	40.02	37.2	
DT43	37.37	37.47	34.63	26.15	25.42	24.31	24.47	23.86	31.81	28.95	29.88	38.97	30.27	28.2	
DT44	27.20	25.24	24.02	21.00	18.41	17.35	18.24	19.13	20.07	19.23	25.65	26.19	21.81	20.3	17.5
DT45	24.72	21.33	23.75	20.01	18.42	18.79	17.96	15.64	17.33	19.70	24.86	23.74	20.52	19.1	17.1
DT46	34.15	31.57	28.09	23.49	22.10	23.59	23.07	21.31	27.86	27.29	26.91	30.00	26.62	24.8	17.3
DT47	21.89	21.59	24.08	18.76	18.79	18.09	18.59	14.78	16.31	17.77	27.37	23.40	20.12	18.7	16.3
DT48	22.96	22.72	22.87	19.21	18.46	17.22		15.65	19.17		23.05	25.98	20.73	19.3	17.0
DT49	25.96	27.04	26.98	18.88	17.49	16.92	15.66	15.34	18.85	19.88	23.69	27.55	21.19	19.7	
DT50	20.56	17.03	18.04	14.84	11.53	11.72	11.20	11.50	13.65	14.64	19.89	22.89	15.62	14.5	
DT51	47.24	43.46	47.85	44.46	45.51	39.64	38.84	31.48	39.01	41.09	46.01	48.28	42.74	39.7	
DT52	61.95	60.29	40.46	53.91	46.40	49.88	46.15	41.87	56.88	50.88	58.36	60.75	52.31	**48.7**	
DT53	58.17	60.80	57.85	48.02	45.42	43.99	42.57	38.60	52.42	41.60	51.20	58.48	49.93	**46.4**	
DT54	69.12	61.39	72.04	56.51	52.73	52.57	55.40	50.72	47.46	51.92	62.73	59.30	57.66	**53.6**	**41.7**
DT55	37.95	39.52	37.17	35.25	31.96	30.62	28.40	25.97	28.75	33.35	34.41	39.81	33.60	31.2	26.9
DT56	55.57	39.52	53.35	44.27	42.55	42.66	44.59	37.66	48.24	41.40	54.17	55.38	46.61	**43.4**	
DT57	82.33	88.61		61.31	63.99	60.26	69.16	57.98	61.17	55.30	60.75	70.78	66.51	**61.9**	
DT58	64.56	58.26	63.67	55.11	22.95	53.17	50.51	43.55	56.54	57.60	65.65	61.42	54.42	**50.6**	29.5
DT59	27.95	26.41	25.78	21.07	45.56	24.78	20.84	19.38	22.68	23.53	27.78	30.48	26.35	24.5	
DT60	42.30	44.58	43.26	38.08	37.85	37.24	34.36	31.55	39.92	38.74	43.32	46.72	39.83	37.0	29.1
DT61	24.43	25.84	28.80	24.62	24.24	24.67	24.98	21.88	25.33	28.44	26.27	32.60	26.01	24.2	
DT62		25.75	25.21	20.26		18.77	15.93	15.85	18.90	19.80		25.07	20.61	19.2	16.7
DT63	30.04	28.65	29.12	27.81	26.71	27.18	26.58	28.68	32.02	26.41	30.84	34.12	29.01	27.0	

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
T64	23.10	28.08	25.38	23.00	23.65	24.61	19.88	20.03	24.21	26.68	24.78	27.89	24.27	22.6	
DT65	27.24	34.34	30.63	33.18	34.02	32.89	30.16	23.66	28.13	28.11	25.63	31.65	29.97	27.9	
DT66	39.68	35.70	39.82	31.95		47.18	44.18	39.83	44.42	43.02	49.45	54.18	42.67	39.7	
DT67	24.77	29.69	31.44	16.92	30.34	31.36	28.73	21.16	24.21	28.54	32.69	29.87	27.48	25.6	
DT68	18.71	18.05	18.48	14.21		11.08	10.87	10.41	15.27	15.46			14.73	13.7	
DT69		16.07	18.12	13.08	11.64	10.26	9.73	8.89	10.77	12.37			12.32	11.5	
DT70	19.81	19.39	23.05	16.94	17.57	17.90	19.12	14.17	17.28	19.78	22.00		18.82	17.5	
DT71	16.48	15.17	14.83	11.24	9.33	8.81	8.44	8.41	10.94	12.45		16.83	12.08	11.2	

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

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

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

Notes:

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

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

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

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

Diffusion Tube Bias Adjustment Factors - National Factor

The national bias adjustment factor of 0.93 has been obtained from the spreadsheet version 03/19, for Gradko diffusion tubes (20% TEA in water). This means that the diffusion tubes over-estimate actual concentrations when compared to the reference method.

Factor from Local Co-Location Studies

The precision and local bias factor (0.95) for the co-located diffusion tubes at Exeter Roadside (RAMM Queen Street) has been calculated using the spreadsheet shown as Figure C.4.1 below.

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	Automatic Method: Period Mean	Automatic Method: Data Capture (% DC)	Data Quality Check: Tubes Precision Check	Data Quality Check: Automatic Monitor Data
1	03/01/2018	01/02/2018	28.70	28.21		28	0.3	1	3.1	27.04	99.40	Good	Good
2	01/02/2018	01/03/2017	35.58	32.66		34	2.1	6	18.6	35.66	99.00	Good	Good
3	01/03/2017	29/03/2018	35.62	34.55		35	0.8	2	6.8	32.04	98.30	Good	Good
4	29/03/2018	01/05/2018	28.84	29.69		29	0.6	2	5.4	28.27	99.70	Good	Good
5	01/05/2018	06/06/2018	35.29							32.41	99.70		Good
6	06/06/2018	05/07/2018								29.37	99.40		Good
7	05/07/2018	31/07/2018	30.22	30.06		30	0.1	0	1.0	25.26	72.60	Good	or Data Capture
8	31/07/2018	05/09/2018								21.74	99.10		Good
9	05/09/2018	02/10/2018	33.38	34.46		34	0.8	2	6.9	27.35	95.50	Good	Good
10	02/10/2018	30/10/2018								32.05	98.10		Good
11	30/10/2018	04/12/2018								31.17	94.80		Good
12	04/12/2018	10/01/2019	31.41	32.27		32	0.6	2	5.5	32.12	99.20	Good	Good
13													

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

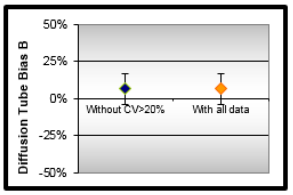
Overall survey --> Good precision | Good Overall DC

Site Name/ ID: RAMM (Exeter Roadside)

Precision: 7 out of 7 periods have a CV smaller than 20%

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20%		Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 6 periods of data		Bias calculated using 6 periods of data	
Bias factor A	0.95 (0.86 - 1.05)	Bias factor A	0.95 (0.86 - 1.05)
Bias B	6% (-5% - 16%)	Bias B	6% (-5% - 16%)
Diffusion Tubes Mean:	32 μgm^{-3}	Diffusion Tubes Mean:	32 μgm^{-3}
Mean CV (Precision):	3	Mean CV (Precision):	3
Automatic Mean:	30 μgm^{-3}	Automatic Mean:	30 μgm^{-3}
Data Capture for periods used:	99%	Data Capture for periods used:	99%
Adjusted Tubes Mean:	31 (28 - 34) μgm^{-3}	Adjusted Tubes Mean:	31 (28 - 34) μgm^{-3}



Jaume Targa
jaume.targa@aeat.co.uk

Version 03 - November 2006

Figure C.4.1 Diffusion Tube Precision and Accuracy

Discussion of Choice of Factor to Use

Data from the tubes are ratified and suspect data is rejected by Exeter City Council, following the procedure in the DEFRA practical guidance. Analysis of the data from the two tubes that are co-located with the continuous analyser shows that these have overall good precision and a bias factor of 0.95 (Figure C.4.1). The nationally collated bias adjustment factor is similar, at 0.93. However results calculated using the national factor are used in this report because the diffusion tube data capture at Exeter RAMM is below 90%.

QA/QC of Automatic Monitoring

Neither of the two PM analysers are part of the national network, however recommended QA/QC procedures from the AURN Local Site Operator's manual are followed, including the filter change frequency and methodology. Horiba also service each analyser every six months. Data capture at the both sites was affected by the change-over to the new equipment in 2018, particularly at the RAMM site. This can clearly be seen in C.4.3. The data for RAMM has been annualised using the methodology in LAQM.TG(16). This was not done for the Alphington Road site because the data capture was above 75%.

The PM_{10} data is collected, validated and ratified by Exeter City Council. Validation involves checking the data daily for instrumentation errors etc. and then visually screening the data on a weekly basis to mark any obviously spurious or unusual measurements. The Council also undertakes data ratification on an approximately three monthly basis as well as following site services. This involves:

- Comparison of data with other pollutants and other appropriate AURN network sites (roadside sites and other sites in the south west),
- Final checking and deletion of data marked as possibly erroneous,
- Removal of data from unrepresentative periods of operation (e.g. road works in immediate vicinity of site etc. where data is shown or believed to have been affected),
- Adjustment for issues identified during services etc.

Both the old PM_{10} analysers were TEOMs. The TEOM method of measuring particulates has failed the EC equivalence test, so this data has been adjusted for volatiles using the online Volatile Correction Model tool from Kings College, London. The data from the new analysers does not need to be corrected in this way.

The NO_2 data from Exeter Roadside is collected and ratified by the AURN. Network data from the site can be found at http://uk-air.defra.gov.uk/data/. It is ratified every 3 months by NETCEN, and is reported in the QA / QC Data Ratification Report for the Automatic Urban Network. Data capture from the NO_2 analyser was 96% in 2018.

Plots of hourly average values for nitrogen dioxide and particulate matter are shown below in figures C.4.2 and C.4.3.

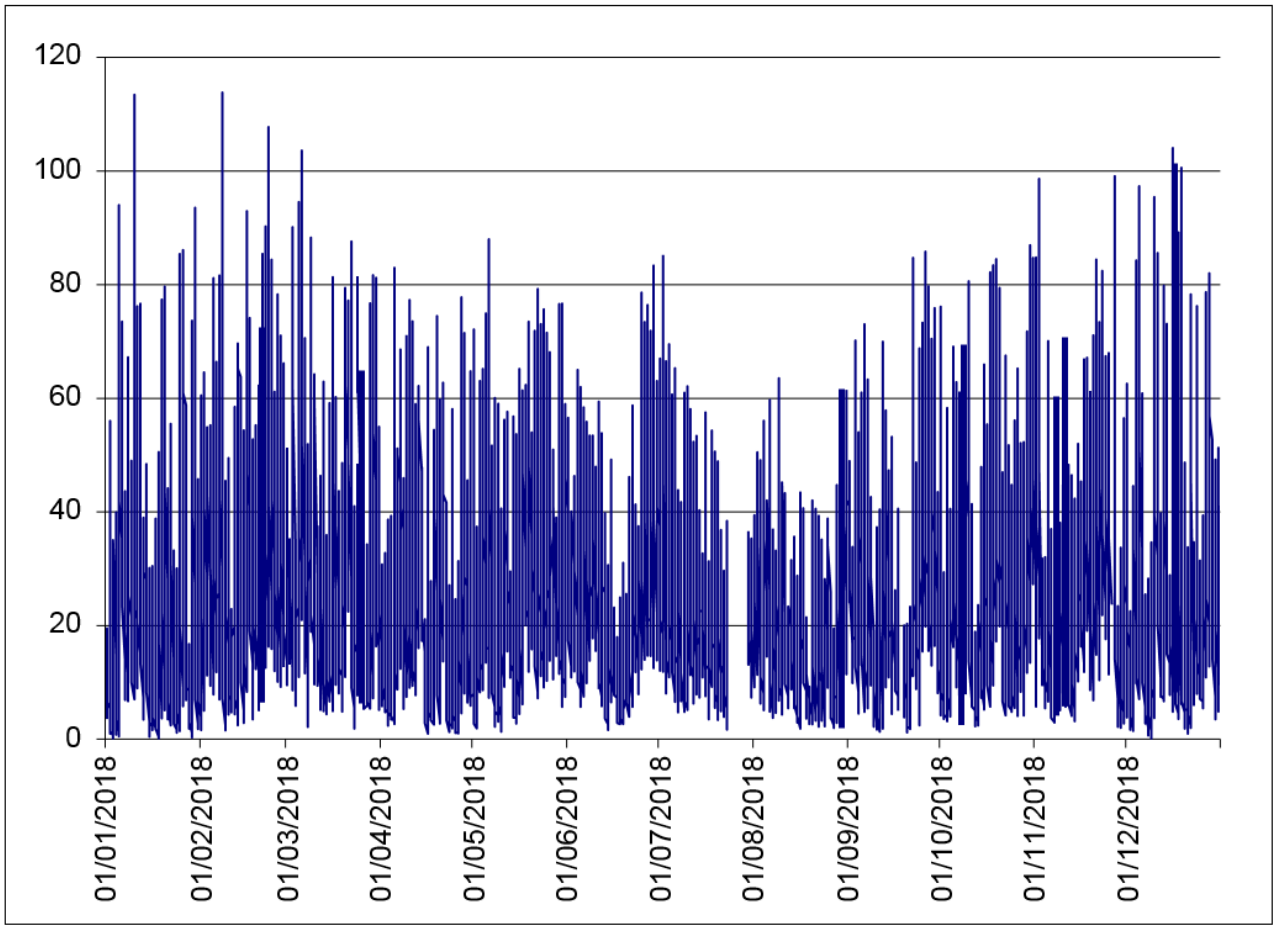


Figure C.4.2 Hourly NO_2 data from Exeter Roadside (RAMM) ($\mu g/m^3$)

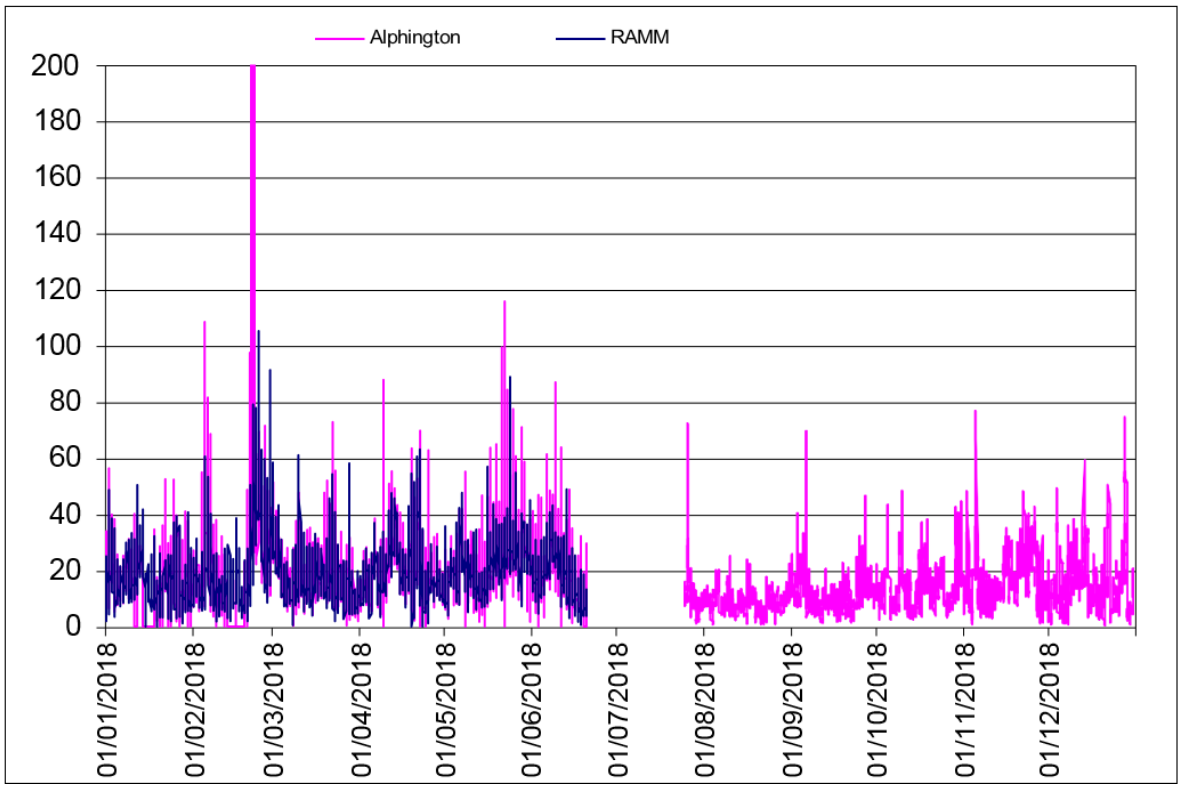


Figure C.4.3 Hourly PM_{10} data from Exeter Roadside (RAMM) and Alphington Street ($\mu g/m^3$)

QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied by GRADKO[4] and are prepared using 20% TEA in water. The GRADKO lab follows the procedures set out in the Harmonisation Practical Guidance. The performance of the laboratory is rated as satisfactory in the centralised AIR NO_2 PT scheme for quality assurance and quality control.

The tube exposure period used follows the timetable provided by the Air Quality Support Helpdesk, i.e. an exposure time of 4 or 5 weeks, with an allowed variation in exposure time of $\pm$ 2 days. The tubes are stored in a fridge before they are exposed. Location sites and fixings follow the recommendations in the DEFRA practical guidance on the use of diffusion tubes for NO_2 monitoring, published in 2008. Two tubes are collocated with the continuous analyser at the Royal Albert Memorial Museum (RAMM), Queen Street (Exeter Roadside).

Data from the tubes are ratified and suspect data rejected by Exeter City Council, following the procedure in the DEFRA practical guidance. Analysis of the data from

[4] GRADKO International Ltd., St. Martins House, 77 Wales Street, Winchester, Hants. SO23 0RH

the two tubes that are co-located with the continuous analyser shows that these have overall good precision.

The full monthly dataset is shown in Table B.1 above.

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

The monitoring locations and 2018 data can be viewed using an online map here:

https://exeter.gov.uk/airpollution/

Appendix E: Summary of Air Quality Objectives in England

Table E.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
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
Ozone (O_3)	100 µg/m3 not to be exceeded more than 10 times a year	8-hour mean

[5] 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
EU	European Union
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
O_3	Ozone
DCC	Devon County Council
ECC	Exeter City Council
GESP	Greater Exeter Strategic Plan
ECF	Exeter City Futures
SELDP	Sport England Local Delivery Pilot

References

Exeter City Council 2019. Exeter Air Quality Action Plan 2019-2023. https://exeter.gov.uk/airpollution/

Exeter City Council 2018. Exeter Air Quality Annual Status Report. https://exeter.gov.uk/airpollution/

Local Air Quality Management Technical Guidance 2016 - LAQM.TG(16)

Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users 2008

National bias adjustment factor spreadsheet: http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Tube precision spreadsheet: www.airquality.co.uk/archive/laqm/tools/AEA_DifTPAB_v03.xls

Volatile Correction Model website: http://www.volatile-correction-model.info/

Devon Local Transport Plans: http://www.devon.gov.uk/index/transportroads/devon_local_transport_plan.htm

DEFRA 2015. DEFRA National Statistics Release; Emissions of air pollutants in the UK, 1970 to 2014