Annual Progress Report (APR)

2021 Air Quality Annual Progress Report (APR) for Aberdeen City Council

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

June 2021

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Report Reference Number	001
Date	June 2021

Executive Summary: Air Quality in Our Area

Air Quality in Aberdeen City

The Annual Progress Report has been undertaken to fulfil Aberdeen City Council's duty to annually review and assess air quality. The report provides the latest monitoring results and discusses the implications for air quality management in Aberdeen.

The main pollutants of concern in Aberdeen City are nitrogen dioxide (NO_2) and particulate matter (PM_{10}), related to road traffic emissions.

In 2020, annual mean NO_2 levels monitored across the city, both within and outside of AQMAs, were generally significantly lower than in 2019. The main cause of this is likely to have been due to reduced road traffic, as "lockdown" travel restrictions were imposed at a national and regional level throughout the year to protect public health and minimise the spread of infection during the COVID 19 coronovirus pandemic. Temporary traffic restrictions, such as those on Union Street, may also have contributed to pollutant level reduction. Except for one monitoring location on Market Street, all monitoring locations suggest NO_2 levels were below the annual mean objective in 2020.

There were no exceedances of the NO_2 one hour objective at any of the monitoring locations.

There were no exceedances of the annual or 24 hour mean PM_{10} objectives. The impact of traffic reduction due to COVID lockdown periods appears less significant for PM_{10} compaired to changes in NO_2 levels. This may be due to other transboundry particulate pollutant sources.

There were no exceedances of the $PM_{2.5}$ annual mean objective.

Appraisal options for a Low Emission Zone (LEZ) continued in 2020, with the completion of the base City Centre Traffic Model and receipt of the Interim Stage 2 National Low Emission Framework (NLEF) report. The report concluded by recommending 8 options proceed to public and stakeholder consultation and detailed traffic and air quality modelling. Consultation took place in autumn 2020 and modelling is now underway, with a view to identifying a preferred option in summer 2021.

The Air Quality Action Plan 2011 will be updated once the preferred LEZ option is defined.

Actions to Improve Air Quality

This section provides a brief summary of core actions to target sources of pollution in Aberdeen City over the past year.

Low Emission Zone:

- Public and stakeholder consultation on 8 possible LEZ options took place in September and October 2020;
- Option appraisal and modelling is ongoing, with a view to determining a preferred option in summer 2021.

Active Travel:

- In response to the COVID-19 pandemic, the Council implemented a range of temporary measures in the City Centre and other areas of the city to support safe physical distancing amongst members of the public, and to give more space to people walking and cycling. This includes the pedestrianisation of Union Street from Market Street to Bridge Street. Although temporary changes at the moment, officers have been monitoring the impacts of these changes and the response to these changes, to see how they might fit with our longer-term permanent aspirations for the City Centre as identified in the City Centre Masterplan and Sustainable Urban Mobility Plan, and how they may complement LEZ delivery;
- Development of a revised Active Travel Action Plan continued (with the Plan formally adopted in early 2021) and this was given renewed emphasis and urgency by the significant increases in walking and cycling experienced during the initial period of lockdown. The Plan looks to capitalise on this and ensure that such

behaviours can continue in the longer term via the provision of more and better infrastructure;

- Our programme of transport corridor studies continued with the completion of the Initial appraisal of options for improving walking, cycling and public transport conditions on the A944/A9119 Westhill to Aberdeen corridor in October 2020;
- Improvements to pedestrian wayfinding continued to take place in the city centre and other key trip attractors.

Public Transport:

- A new railway station at Kintore, northwest of Aberdeen on the line to Inverness, opened for passenger services on October 15, reinstating a rail service between Aberdeen and Kintore 56 years after the closure of the original station;
- The GoABZ multimodal journey planning app launched in 2020 which includes local bus and rail information.

Clean Vehicles

- The Aberdeen Car Club has continued to expand, with more electric and hydrogen vehicles added to the fleet. It now has 25 alternatively (electric or hydrogen) fuelled vehicles and 17 petrol hybrid vehicles as part of the fleet of 52 vehicles.
- The electric vehicle (EV) charging network has continued to expand, with more charging points located at various locations throughout the City.
- An EV Framework was developed to guide future EV strategy and locations of charge points and was approved in early 2021.

Locking in the Benefits of the Aberdeen Western Peripheral Route (AWPR)

- A series of road reclassifications were approved in summer 2020 as part of the revised North East of Scotland Roads Hierarchy, including the declassification of most roads in the city centre to reflect the area's status as a destination rather than a through-route for traffic. The purpose of the Road Hierarchy review is to encourage traffic onto appropriate routes in preference to less appropriate alternatives, thus reducing the impacts of traffic on vulnerable areas and communities; and
- New strategic road signage continued to be installed throughout the city to reflect the opening of the AWPR and the revised Roads Hierarchy

Local Priorities and Challenges

This section provides a brief summary of the priorities and challenges for Aberdeen City Council in addressing air quality for the coming year.

Priorities:

- Identification of, and consultation on, a preferred LEZ option, with a view to submitting a final scheme for Ministerial approval in late 2021;
- Ensure that any positive transport impacts of the COVID-19 pandemic (particularly the observed increases in walking and cycling and improved attitudes around working from home) are sustained in the long-term and, where possible, facilitated via infrastructure improvements; Support the recovery of the public transport network as Government advice against non-essential public transport use relaxes; Submission of an application to the Scottish Government's Bus Priority Fund to help support the appraisal, design and delivery of ambitious bus priority infrastructure;

- Continue with the programme of transport corridor studies and move to the speedy implementation of public transport and active travel priority measures as funding allows;
- Continue to implement the revised Roads Hierarchy in the form of signage improvements, junction changes and traffic management interventions.

- Commence delivery of the actions identified in the revised Active Travel Action Plan and EV Framework;
- Commence a revision of our Local Transport Strategy upon adoption of the revised Regional Transport Strategy;
- Oversee the successful implementation of a bicycle rental scheme, with a supplier appointed in early 2021;
- Participate in Sustrans' Bike Life Programme to better understand demand for cycle infrastructure provision, and how best to meet this demand;

Challenges:

While more walking and cycling and working from home have been observed during the COVID-19 pandemic, there are challenges ahead in terms of ensuring these positive behaviours can be sustained in the long term. While improving walking and cycling infrastructure is key to this, delivery programmes have been impacted by the need for resources to be diverted to the COVID-19 response, therefore 2021 will involve a degree of 'getting back on track' with these programmes of work.

There are also challenges in supporting the recovery of public transport networks who have experienced an unprecedented drop in patronage during 2020 and restoring confidence in the network to ensure previous bus users do not permanently change mode to less sustainable forms of transport.

How to Get Involved

Further information on the Local Transport Strategy, Action Plan and Active Travel Action Plan is available at the following web sites:

www.aberdeencity.gov.uk/services/roads-transport-and-parking/local-transport-strategy

City Centre Masterplan:

www.aberdeencity.gov.uk/services/strategy-performance-and-statistics/city-centre-masterplan

Further information on the schemes Aberdeen City Council has been delivering on Air Quality Action Plan and Local Transport Strategy actions over previous years can be found on best practice pages on the Energy Saving Trust and Paths for All websites:

Car Club

www.energysavingtrust.org.uk/sites/default/files/Aberdeen%20City%20Council.pdf

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Local Air Quality Management

This report provides an overview of air quality in Aberdeen City during 2020. 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 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 Progress Report (APR) is summarises the work being undertaken by Aberdeen City to improve air quality and any progress that has been made.

Table 1 – Summary of Air Quality Objectives in Scotland

Pollutant	Air Quality Objective Concentration	Air Quality Objective Measured as	Date to be Achieved by
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
Nitrogen dioxide (NO_2)	40 µg/m^3	Annual mean	31.12.2005
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
Particulate Matter (PM_{10})	18 µg/m^3	Annual mean	31.12.2010
Particulate Matter ($PM_{2.5}$)	10 µg/m^3	Annual mean	31.12.2020
Sulphur dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
Sulphur dioxide (SO_2)	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
Sulphur dioxide (SO_2)	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005
Benzene	3.25 µg/m^3	Running annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon Monoxide	10.0 mg/m^3	Running 8-Hour mean	31.12.2003

Actions to Improve Air Quality

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 months, setting out measures it intends to put in place in pursuit of the objectives.

A summary of AQMAs declared by Aberdeen City Council can be found in Table 2. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at uk-air.defra.gov.uk/aqma/list and uk-air.defra.gov.uk/aqma/maps

Table 2 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	Description	Action Plan
City Centre	NO_2 annual mean PM_{10} annual mean & 24 hour mean	Aberdeen	Declared 2001, extended in 2003. PM_{10} included in 2005 & 2011. Amended 2018. An area encompassing several properties Union St, King St, Market St, Holburn St and Victoria Road.	Air Quality Action Plan 2011
Anderson Drive	NO_2 annual mean PM_{10} annual mean	Aberdeen	Declared in 2008, amended 2011 and 2018. Pockets of exceedances at residential properties along Anderson Drive and Auchmill Road.	Air Quality Action Plan 2011
Wellington Road	NO_2 annual mean PM_{10} annual mean & 24 hour mean	Aberdeen	Declared 2008. Residential properties along Wellington Road (Queen Elizabeth II Bridge to Balnagask Rd)	Air Quality Action Plan 2011

Cleaner Air for Scotland

Cleaner Air for Scotland – The Road to a Healthier Future (CAFS) is a national cross-government strategy that sets out how the Scottish Government and its partner organisations propose to reduce air pollution further to protect human health and fulfil Scotland's legal responsibilities as soon as possible. A series of actions across a range of policy areas are outlined, a summary of which is available on the Scottish Government's website. Progress by Aberdeen City Council against relevant actions within this strategy is demonstrated below.

Transport – Avoiding Travel – T1

All local authorities should ensure that they have a corporate travel plan (perhaps within a carbon management plan) which is consistent with any local air quality action plan.

Aberdeen City Council has had a Council Travel Plan since 2001. It is currently under review, with an updated plan expected to be developed during 2021. Staff have access to pages on the council intranet which provide information about travel choices to work. As part of its travel plan, the council undertakes a biannual staff travel survey to identify how staff usually travel to work. The most recent survey was in November 2018 when 824 responses were received. The 2020 survey was not undertaken as a result of travel habits being disrupted. The next survey will take place in 2022.

Climate Change – Effective co-ordination of climate change and air quality policies to deliver co-benefits – CC2

Scottish Government expects any Scottish local authority which has or is currently developing a Sustainable Energy Action Plan to ensure that air quality considerations are covered.

Aberdeen City Council has led the development of a number of place based plans to address climate change. A Net Zero Vision for Aberdeen and supporting Strategic Infrastructure Plan (Energy Transition) were approved in 2020 and the impact of climate change on air quality has been considered as part of Aberdeen Adapts: Climate Adaptation Framework for the city, approved in 2019.
In addition, setting a net zero target and climate adaptation actions for Council assets and operations, the Council Climate Change Plan was approved in 2021.

Further information is available at: aberdeencity.gov.uk/services/environment/strategic-environmental-assessment

National Low Emission Framework (NLEF) Stage 2 Appraisal

The NLEF[1], which is now part of the review and assessment process for LAQM reporting in Scotland, contributes to the Cleaner Air for Scotland strategy by aiming to improve local air quality in areas where air quality objectives are exceeded, or likely to be exceeded, primarily due to emissions from transport.

The NLEF is directly linked to Air Quality Action Planning (AQAP) for local authorities with Air Quality Management Areas (AQMAs) and will help to identify actions to improve local air quality within AQMAs.

Aberdeen City Council is currently undertaking a Stage 2 Low Emission feasibility study and aims to declare a LEZ during 2022.

With support from Scottish Government funding, Aberdeen City Council commissioned the consultant SYSTRA to undertake a low Emission feasibility study in the City and recommend potential LEZ options for stakeholder consultation.

The Council received the interim NLEF Stage 2 report in April 2020 and, since then, has been undertaking detailed traffic modelling of the options to determine their impacts. Public and stakeholder engagement on the options also took place in 2020.

Progress is being made to identify a preferred option for Council and Ministerial approval during 2021.

The Air Quality Action Plan 2011 will be reviewed and updated once the LEZ is defined.

[1] https://www.gov.scot/publications/national-low-emission-framework/pages/2/

Progress and Impacts of Measures to address Air Quality in Aberdeen City

Aberdeen City Council has taken forward several measures during the current reporting year of 2020 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 3. More detail on these measures can be found in the air quality Action Plan relating to each AQMA Key completed measures are:

Action 1: Modal Shift and Influencing Travel Choice

- Increase bus use:
    - Completion of Initial Appraisal of options for improving the A944 and A9119 corridors for active travel and bus users.
    - Launch of GoABZ journey planning smartphone app.
- Improve Cycling and Walking Provision:
    - Delivery of temporary Spaces for People infrastructure in the City Centre and other busy areas of the City to support and encourage safe walking and cycling during the pandemic and to enable members of the public to adhere to physical distancing requirements;
    - Continued delivery of cycle parking and bicycle maintenance facilities throughout the City
    - Continued implementation of improved pedestrian wayfinding throughout the City.
- Improve public awareness of air quality issues:
    - An I Bike officer continues to work to deliver targeted and intensive cycling training and promotion to schools in several Associated Schools group (ASG) clusters;
    - Consultation undertaken on options for a LEZ;
    - A marketing campaign to promote the Aberdeen City and Aberdeenshire sustainable transport brand, Getabout, has continued;
    - Anti-Idling campaigns were carried out as part of the Living Streets Travel Tracker project in 2020-21.

- Car Clubs/Pool Car Schemes:
    - The Aberdeen Car Club has continued to expand, with more electric and hydrogen vehicles added to the fleet.
- Rail Improvements:
    - A new railway station at Kintore, northwest of Aberdeen on the line to Inverness, opened for passenger services on October 15, reinstating a rail service between Aberdeen and Kintore 56 years after the closure of the original station.

Action 2: Lower Emissions and Cleaner Vehicles

- Green Vehicle procurement & Fuel/Charging Infrastructure
    - The electric vehicle charging network has continued to expand, with more charging points located at various locations throughout the City.
- Low Emission Zone
    - Interim Stage 2 appraisal and initial public and stakeholder consultation complete.

Action 3: Road Infrastructure

- Road Infrastructure
    - Consultation undertaken on the South College Street Improvement Scheme submitted, a key enabler of the City Centre Masterplan.

Action 4: Traffic Management

- Freight and Commercial Vehicle Access
    - Maps of preferred freight routes updates for communication to drivers and fleet operators.

Action 5: Planning and Policies

- Integration of policies of AQAP with Local Transport Strategy (LTS) and Regional Transport Strategy (RTS)
    - Second National Transport Strategy (NTS2) published in 2020, with a renewed emphasis on climate change and air quality;
    - Further engagement to inform a draft revision of the RTS took place.

- **Road Hierarchy**
    - Following the development of a revised Roads Hierarchy in 2019, a programme of road reclassifications were approved in 2020 to reflect the new hierarchy, which included declassifying many roads in the city centre to reflect the city centre's status as a destination rather than a through-route for traffic. The aim is to encourage traffic onto appropriate routes in preference to less appropriate alternatives, thus reducing the impacts of traffic on vulnerable areas and communities;
    - New strategic road signage continues to be installed throughout the city to reflect preferred traffic routeing following the opening of the AWPR and the

Progress on the following measures has been slower than expected due to the COVID-19 pandemic, the resulting impacts on the city centre and the need for key staff to be redeployed towards the COVID response.

- Active travel infrastructure delivery – progress of a number of permanent projects, including Phase 1 of the Sustainable Urban Mobility Plan, stalled during 2020 as a result of the COVID-19 response and the prioritisation of the delivery of the temporary Spaces for People infrastructure;
- LEZ – Proposals to introduce a Traffic Regulation Condition in 2020 as Phase 1 of the LEZ were abandoned given the impacts of the pandemic on the bus industry;
- Car Parking Framework – consultation on a Car Parking Framework has been paused until the city centre economy starts to recover from the pandemic;
- The usual programme of transport and air quality awareness-raising events were cancelled in accordance with physical distancing guidelines.

Aberdeen City Council expects the following measures to be completed over the course of the next reporting year:

- Identification of a preferred option for a LEZ in Aberdeen. Further consultation on the preferred option, with a view to seeking formal approval by the Council by the end of 2021, and thereafter submission to Scottish Ministers;
- Completion of a number of corridor improvement studies which will identify measures to improve conditions for active travel and public transport on routes identified as priority routes in the revised roads hierarchy - A956 Wellington Road, the A944/B9119 Westhill to Aberdeen corridor and the A90/A92 Ellon to Aberdeen corridor.
- Adoption of a revised Aberdeen Active Travel Action Plan to set future infrastructure priorities;
- Walking and cycling infrastructure – further measures to improve walking and cycling networks;
- Completion of cycle signage audit and action plan to identify improvements to cycle signage to increase awareness and usage of the network;
- Appointment of a supplier of a bicycle rental scheme for Aberdeen;
- Development of a revised Council Travel Plan to support employees to travel to and from work as sustainably as possible;
- Further expansion of the Aberdeen Car Club as a low-emission alternative to private vehicle ownership;
- Further expansion of the electric vehicle charging network to encourage and enable low-emission vehicle ownership and use;
- Adoption of an Electric Vehicle Framework for Aberdeen to guide future infrastructure planning and prioritisation;
- Adoption of a revised RTS with work underway to deliver a revised LTS;
- Completion of the Haudagain Roundabout improvement scheme.

Table 3 – Progress on Measures to Improve Air Quality

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1 Alternatives to private vehicle use											
1.1a	Increase bus use	Alternatives to private vehicle use	Delivery of standards and targets agreed by Bus Quality Partnership	North East of Scotland Bus Alliance	2010	Ongoing	Proportion of people not working from home travelling to work by bus (Scottish Household Survey, Aberdeen City Voice)	Not quantifiable	In 2018, the North East Bus Alliance (replacing the former Local Authority Bus Operator Forum (LABOF)) was established with a revised Terms of Reference and Quality Partnership Agreement. The Alliance comprises Nestrans, Aberdeen City Council, Aberdeenshire Council, First in Aberdeen, Stagecoach Bluebird, Bains Coaches and a representative of Bus Users Scotland. A State of the Network review has been undertaken and a subsequent Bus Action Plan developed, with a key focus on identifying areas where buses experience delays and inconsistent journey times because of congestion or other traffic management issues.	Ongoing	The first group of corridor studies are due for completion in 2021. An ambitious proposal has been submitted to the Scottish Government's Bus Partnership Fund in 2021 to take forward the recommendations of these studies and deliver ambitious bus priority in the City.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
									Options for addressing these are now being looked at in detail via several transport corridor studies which have public transport efficiency as a key outcome		
1.1b	Increase bus use	Alternatives to private vehicle use	Increase corridors covered by BPIP (currently voluntary)	North East of Scotland Bus Alliance	2010	On-going	Proportion of people not working from home travelling to work by bus (Scottish Household Survey, Aberdeen City Voice)	Not quantifiable	In the context of the revised Roads Hierarchy, several transport corridors are being reviewed to identify and appraise options for improving conditions for active and sustainable transport. These corridors have been prioritised with agreement from the Bus Alliance. The first of these, the A944/B9119 Westhill to Aberdeen study, commenced in late 2019, with Initial Appraisal complete in autumn 2020. Similar studies on the Ellon to Garthdee and the A96 Inverurie to Aberdeen corridors launched in 2020, with further corridor	Ongoing	It is anticipated that the outcomes of these studies will inform Business Cases and funding applications to enable the delivery of the improvements identified, including to the Scottish Government's Bus Partnership Fund.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
									studies due to commence in 2021. The A956 Wellington Road Multimodal Corridor STAG (Scottish Transport Appraisal Guidance) appraisal is due to be complete in 2021. Part of Wellington Road is an AQMA. it is hoped any measures recommended for implementation on this corridor will have air quality benefits.		
1.1c	Increase bus use	Alternatives to private vehicle use	Integrated Ticketing	North East of Scotland Bus Alliance / Transport Scotland	No defined start date	Ongoing		Not quantifiable	Both First and Stagecoach offer contactless payment on buses. First Aberdeen has introduced 'tap and cap', with fares capped at the most favourable daily rate to offer better value to the customer. The multi-operator Grasshopper ticket for North East Scotland continues to be promoted, and there is ambition to improve the Grasshopper offering by exploring opportunities for smart and mobile ticketing as	Ongoing	User engagement / co-design work has highlighted that it may be useful / attractive to deploy Rail & Bus ticket fulfilment features and a secure payment gateway / e -wallet on the GoABZ app, so these features are being investigated.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
									well as contactless ticket options and new ticket types. Work is currently ongoing to develop an online retail solution for purchasing Grasshopper tickets.		
1.2a	Improve Cycling & Walking Provision	Alternatives to private vehicle use	Core Paths Plan	ACC	Ongoing	Ongoing	Proportion of individuals walking and cycling (Scottish Household Survey, Aberdeen City Voice)	Not quantifiable	Various routes continue to be upgraded and installed. Tender will shortly go out to commission a survey of all Core Paths and Aspirational Core Paths, this project is in partnership with Nestrans.	Ongoing	Once this network survey has been completed it will provide information to direct further improvements to the Core Path network and baseline information to help inform a full Core Paths Plan Review
1.2b	Improve Cycling & Walking Provision	Alternatives to private vehicle use	Cycling Strategy/ Active Travel Action Plan	ACC	2014-2016	Ongoing	Proportion of individuals walking and cycling (Scottish Household Survey, Aberdeen City Voice)	Not quantifiable	The first Active Travel Action Plan was adopted in 2017, with most projects identified now being taken forward to delivery phase. A refresh of the Active Travel Action Plan is now underway, with two rounds of public engagement taking place in 2020 and the revised Plan	Ongoing.	Once adopted, work will commence on delivering the key priorities identified in the Active Travel Plan. Future iterations of the Plan will be informed by the findings of Bike Life.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
									was adopted by the Council in early 2021. The Council is taking part in Bike Life, a project whereby via data gathering and public and stakeholder input, a robust assessment is made of the local public's propensity for cycling and what more the local authority can do to enable this.		
1.3a	Travel Plans	Promoting travel alternatives	Existing Organisa-tions	ACC & Nestrans	2015-16	2016 onwards	No. organ-isation adopting TPs; No. employees covered by TPs, progress of travel plans in study area (North Dee, South Dee and Dyce)	Not quantifiable	Travel planning work being undertaken in the North Dee, South Dee and Dyce areas of Aberdeen as part of Civitas Portis EU funded project. Engagement activities, travel surveys and site audits undertaken, resulting in the development of action plans for each area.	2020	Funding now to be sought to deliver the interventions identified in the Action Plans.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1.3b	Travel Plans	Promoting travel alternatives	New Develop-ments	ACC	2014-16	2016 onwards	N/A	Not quantifiable	Guidance for new developments contained in Transport and Accessibility Supplementary Guidance to the 2017 Aberdeen Local Development Plan.	Ongoing	Work is now underway on the 2022 Local Development Plan
1.3c	Travel Plans	Promoting travel alternatives	Council	ACC	Ongoing	2003 onwards	% of Council staff using sustainable modes to travel to work (CTP Surveys)	Not quantifiable	Biannual staff surveys undertaken. A refresh of the Plan will take place in 2021.	Ongoing	Next survey to be undertaken in 2022
1.4a	Improve public awareness of air quality issues	Public information	Use of Variable Messaging System (VMS)	ACC & Transport Scotland	Ongoing	Ongoing	N/A	Not quantifiable	There have been 9 new Variable Messaging Signs (VMS) installed on routes on approach to the AWPR which are under Council control.	Ongoing	Discussions still ongoing about Council linking to VMS on AWPR
1.4b	Improve public awareness of air quality issues	Public information	ACC Website Improve-ments	ACC	2011	Ongoing	N/A	Not quantifiable	A new Low Emission Zone page was created in 2020 to provide information on air quality issues in Aberdeen and why a LEZ is being considered in response to this.	Ongoing	This page is being kept up to date as LEZ planning continues.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1.4c	Improve public awareness of air quality issues	Public information	'Airtext' Alert Service	ACC			No. of service users	Not quantifiable			
1.4d	Improve public awareness of air quality issues	Public information	Undertake air quality and sustainable travel events with Getabout Partner-ship	Get About	Ongoing	Ongoing	Events taking place	Not quantifiable	As a result of the pandemic, the annual programme of events could not take place in 2020 but will hopefully resume soon.	Ongoing	Linked to Smarter Choices, Smarter Places (SCSP) Programme.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1.4e	Improve public awareness of air quality issues	Public information	Information and Marketing Initiatives	ACC/Getabout	Ongoing	Ongoing	N/A	Not quantifiable	An I Bike officer currently promotes the uptake of active travel in schools, working closely with the Aberdeen Grammar ASG during the 2020/21 school year. A marketing campaign to promote the Aberdeen City and Aberdeenshire sustainable transport brand, Getabout, has continued. The Living Streets Travel Tracker project is currently running in several Aberdeen City schools. The project allows children to record their journey to school and to collect points depending on how sustainably they travelled. Anti-Idling campaigns were also run as part of this project. An updated version of the Aberdeen City Cycle map was published in January 2020 and over 20 walking	Ongoing	Linked to Smarter Choices, Smarter Places (SCSP) Programme.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
									trail maps have been developed.		
1.5a	Car Clubs / Carpool Schemes	Promoting low emission transport	General Public	ACC	2011	Ongoing	Car Club member-ship figures. Number of Car Club vehicles available.	Estimate 0 – 1 µg/m3	The Aberdeen Car Club has continued to expand, with more electric and hydrogen vehicles added to the fleet. It now has 25 alternatively (electric or hydrogen) fuelled vehicles and 17 petrol hybrid vehicles as part of its fleet of 52 vehicles, 41 of which are available for public use. There were 2,254 members as of end March 2020	Ongoing	Recent additions include Pittodrie Street, Osprey Housing Association at Bucksburn and Tanfield Road funded through Developer Contributions.
1.5b	Car Clubs / Carpool Schemes	Promoting low emission transport	Corporate	ACC	2011	Ongoing	Number of Car Club vehicles available.	Estimate 0 – 1 µg/m3	10 vehicles available for the exclusive use by the Council.	Ongoing	
1.6a	Rail Improve-ments	Alternatives to private vehicle use	Local rail improvem ents	Transport Scotland/ Nestrans	Ongoing	Ongoing	Number of stations in the North East. Travel to work by rail mode	Estimate 0 – 1 µg/m3	Aberdeen to Inverurie track dualling was completed in 2019, allowing a higher frequency and higher capacity local rail service to be delivered between	Ongoing	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
							share (Census).		Inverurie and Montrose via Aberdeen. Kintore Station re-opened to passenger services in late 2020. A study is underway looking at the feasibility of further rail stations in the region.		
1.6b	Rail Improve-ments		Infra-structure improve-ments	Transport Scotland/ Nestrans	Ongoing	Ongoing	Studies and infra-structure delivered	Not quantifiable	Wider Aberdeen to Inverness rail improvement project ongoing. Kintore Station re-opened to passenger services in late 2020. A study is underway looking at the feasibility of further rail stations in the region. As part of the Aberdeen City Region Deal, options for reducing rail journey times between Aberdeen and the Central Belt are being investigated.	Ongoing	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1.7	Rail Freight	Freight and delivery manage-ment	Modal Shift from road to rail	Nestrans	Ongoing	Ongoing	N/A	Not quantifiable	New rail freight strategy for Scotland launched in 2016	Ongoing	
2.1	Green Vehicle procurement & Fuel/ Charging Infrastructur e	Promote low emission transport	Increase electric vehicle charging points	ACC	Ongoing	Ongoing	Number of charge points available.	Not quantifiable	The electric vehicle charging network has continued to expand, with more charging points located at various locations throughout the City. The Proposed Aberdeen Local Development Plan 2020 was approved in March 2020. Within the Proposed Plan, policy T3 makes provision for alternative fuel vehicle infrastructure. The ratios and requirements for electrical vehicle charging will be set out in Aberdeen Planning Guidance: Transport and Accessibility. The Aberdeen Planning Guidance will take account of the finding of the Electric Vehicle Strategy which is currently being developed. The Planning	Ongoing	Under-taken through the SGs/ Transport Scotland and Energy Saving Trust Grants

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
									Guidance will be subject to a separate consultation process and will be adopted under the Aberdeen Local Development Plan 2022.		
2.2a	Emissions Testing & Idling Enforcement	Public information	Roadside Emission Testing	ACC	Ongoing	Ongoing	No. of tests / fails	Not quantifiable			
2.2b	Emissions Testing & Idling Enforce-ment	Public information	Idling Vehicles	ACC			No. cautions	Not quantifiable			
2.3a	Taxis	Vehicle fleet efficiency	Non-idling signs	ACC	Ongoing	On hold	Spatial coverage of signs	Not quantifiable		Ongoing	
2.3b	Taxis	Vehicle fleet efficiency	Licensing vehicle inspect-ions, emiss-ions restrict-ions	ACC			Fleet emissions profile improvement	Not quantifiable			

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
2.4	Low Emission Zone	Environ-mental Permits	Low Emission Zone	ACC	2011	Ongoing	Air quality improve-ment within LEZ area	TBC through NMF and NLEF	Detailed option modelling and consultation took place during 2020.	Ongoing	Further modelling and appraisal to take place in 2021 with a preferred option due to be reported In the summer.
3 Transport planning and infrastructure											
3.1	Pedestrian-isation	Transport planning and infrastruc-ture	Union Street and Broad Street	ACC	2008-2015	From 2016	N/A	TBC	City Centre Masterplan and Sustainable Urban Mobility Plan approved. Part pedestrianisation of Broad Street complete. Schoolhill Public Realm Enhancement Stage 1 complete.	2022	Options for Union Street being considered as part of LEZ proposals.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
3.2a	Road Building / Junction Alterations	Transport planning and infrastruc-ture	Aberdeen Western Peripheral Route	AWPR Managing Agent	2008	2015-2019	Monitoring data from permanent traffic counters on Anderson Drive, Market Street and Wellington Road	0 – 1 µg/m3 for PM10 and NO2 (Market St and Anderson Dr)	Final section opened in Feb 2019	Open 2019	Trunk Road
3.2b	Road Building / Junction Alterations	Transport planning and infrastruc-ture	Haudagain Improve-ments	Transport Scotland	2012-2019	2019-2021	Delivery of scheme	TBC	Construction underway	2021	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
4 TRAFFIC MANAGEMENT											
4.1	Intelligent Transport System (ITS)	Traffic manage-ment	To reduce city centre congestion	ACC	Ongoing	Ongoing	Predicted traffic flow impacts; air quality modelling; Monitoring data when operational; LTS monitoring data	Not quantifiable	Bluetooth monitoring installed on A96 corridor linking the Park & Choose to the city centre. There have been 9 new Variable Messaging Signs (VMS) installed on routes on approach to the AWPR which are under Council control.	On going	
4.2	High Occupancy Vehicle (HOV) Lane	Traffic manage-ment	Stone-haven Road	ACC	2011	Ongoing	N/A	Not quantifiable	Feasibility study complete. Option will be revisited as part of future south of the city corridor study, due to commence in 2021.	Subject to imple-men-tation of A90 south P and R	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
4.3a	Freight and Commer-cial Vehicle Access	Freight and delivery manage-ment	HGV Priority Measures	ACC	Ongoing	Ongoing	N/A	Not quantifiable	Options for combined bus and freight lanes contained within the Wellington Road Multimodal Corridor Study.	Ongoing	The need for HGV priority measures will be considered within subsequent road corridor studies.
4.3b	Freight and Commer-cial Vehicle Access	Freight and delivery managemen t	Commer-cial Delivery Strategy (routing, timing, idling control)	Netstrans	2015	Ongoing	N/A	Not quantifiable	Regional Freight Distribution Strategy adopted. Revised freight route maps and app-based solution in development for communicating to operators and drivers	Ongoing	
4.3c	Freight and Commer-cial Vehicle Access	Freight and delivery manage-ment	Freight Consolida-tion Centre	Nestrans	Ongoing	Ongoing	Delivery of study	Not quantifiable	Research to date has suggested such a venture would have to be private sector led but has garnered little interest so far.	TBC	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
5 Policy guidance and development control											
5.1a	Produce Supple-mentary Planning Guidance	Policy guidance and develop-ment control	Improve Develop-ment Control	ACC	Ongoing	Ongoing	Database of permitted developm ent	Not quantifiable	SGs for Transport and Accessibility, Air Quality and Noise. adopted as part of Aberdeen Local Development Plan (2017). New developments now 'master-planned' and consider layout of the develop-ment for ped/ cycle/ public transport movements first.	Ongoing	Work now taking place on Aberdeen Local Development Plan 2022,
5.1b	Produce Supple-mentary Planning Guidance	Policy guidance and develop-ment control	Section 75 monetary contribu-tions	ACC	Ongoing	Ongoing	Database of contribut-ions and what they have funded.	Not quantifiable	Contributions sought for sustainable transport improvements: core paths, car club, public transport infrastructure and pedestrian safety improvements such as pedestrian crossings, etc.	Ongoing	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
5.1c	Produce Supple-mentary Planning Guidance	Policy guidance and develop-ment control	Construc-tion Code of Practice	ACC			Database of develop-ments signing CCoP	Not quantifiable			
5.2	Integration of AQAP with LTS and RTS	Policy guidance and develop-ment control		ACC and Nestrans	2013-15	2016-21	N/A	Not quantifiable	LTS adopted in January 2016. Air quality and noise embedded within the LTS with specific objectives and actions to improve	2021	Revised RTS due to be adopted in 2021, with revised LTS to follow.
5.3	Integration of AQAP with Health and Transport Action Plan (HTAP)	Policy guidance and develop-ment control	Highlight Health Impacts	ACC / NHS	Ongoing	Ongoing	N/A	Not quantifiable	HTAP agreed and Steering Group/Board established.	Ongoing	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
5.4	Road Hierarchy	Transport planning and infrastruc-ture	Reclassify Union St / Denburn (requires TRO)	ACC	2015-19	2019-2021	N/A	Not quantifiable	A revised Roads Hierarchy was approved by Elected Members in June 2019, with formal programme of road reclassifications approved in 2020.	2030	This will be enhanced by signage changes and junction improvements to reinforce the revised hierarchy, and improvements to the revised network of priority and secondary corridors to achieve a more efficient movement of people and goods, with emphasis on walking, cycling and public transport.
5.5a	Car Parking Policies	Policy guidance and develop-ment control	Low Emission Vehicle Parking Incentives	ACC	Ongoing	Ongoing	No. of low emissions permits as proportion of total	Not quantifiable	Being considered as one of the measures within a revised Car Parking Framework.	Ongoing	Several city centre car parks will be within the LEZ boundary, meaning they can only be used by compliant vehicles.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
5.5b	Car Parking Policies	Policy guidance and develop-ment control	Limit car parking for new develop-ments	ACC	2013	Ongoing	N/A	Not quantifiable	Revised parking standards included in Local Development Plan 2017 and associated Transport and Accessibility Supplementary Guidance. City Centre Masterplan proposes zero parking for new office developments.	Ongoing	Will be reviewed as part of the developing Car Parking Framework and Local Development Plan 2022.
5.5c	Car Parking Policies	Policy guidance and develop-ment control	Developm ent of Local and Regional Car Parking Policies	ACC & Nestrans	Ongoing	Ongoing	N/A	Not quantifiable	Regional Car parking Strategy adopted 2012. Revised parking standards included in Aberdeen Local Development Plan 2017 and Transport and Accessibility Supplementary Guidance. Strategic car Parking Review is complete with the outcomes being developed into a revised Car Parking Framework..	Ongoing	Will be reviewed as part of the developing Car Parking Framework and Local Development Plan 2022.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
5.6a	National Lobbying	Transport planning and infrastruc-ture	Incentives/ funding/ tax breaks for Low Emission Initiatives	ACC	2011	Ongoing	N/A	Not quantifiable	In the lead-in to LEZ implementation, the Scottish Government has several grant schemes available to help residents and businesses change vehicle or mode to become LEZ compliant. Grants for home and workplace charging facilities are available through Home Energy Scotland. The Council implemented a charge point tariff of £0.19 per kWh from May 2020 with a connection fee of £0.38 and no minimum charge or overstay penalty. Users are still expected to pay parking charges where they apply (except for the rapid chargers at two pay and display car parks – Gallowgate and Broomhill Road – where users get their parking for free whilst charging if they stay with the vehicle.	Ongoing	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
5.6b	National Lobbying	Transport planning and infrastruc-ture	Shipping Emissions Reduc-tions	ACC	2011	Ongoing	N/A	Not quantifiable	No work being undertaken currently	Ongoing	
5.6c			HGV/Bus Scrappage schemes	ACC	2011	Ongoing	N/A	Not quantifiable	Several bus replacement and/or retrofit schemes are being funded by Transport Scotland to support LEZ development.	Ongoing	
6 Non-transport measures											
6.1	Control Biomass Installations	Policy guidance and developmen t control	Enforce new develop-ments to only install 'cleanest' biomass boilers	ACC	2012	Ongoing	Database of appliances installed	Not quantifiable			
6.2	Industry Permitting	Environment al permits		ACC and SEPA			N/A	Not quantifiable			

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
6.3	Tree Planting	Promoting low emission plants	Pro-active planting of tree species with a positive air quality impact and avoid planting varieties that may have detrimen-tal air quality impact	ACC			N/A	Not quantifiable	Policies contained within ALDP Supplementary Guidance (2016) robust policy to achieve this as part of development		
6.4	Shipping	Freight and delivery manage-ment	Consider actions available at Aberdeen Harbour	ACC & Aberdeen Harbour			Pollutant monitoring	Not quantifiable			

Air Quality Monitoring Data and Comparison with Air Quality Objectives

Summary of Monitoring Undertaken

Automatic Monitoring Sites

This section sets out what monitoring has taken place and how local concentrations of the main air pollutants compare with the objectives.

Aberdeen City Council undertook automatic (continuous) monitoring at 6 sites during 2020. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at www.scottishairquality.scot.

Maps showing the location of the monitoring sites are provided in Appendix E.Figure 9, and also available at www.scottishairquality.scot. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

The Union Street and Market Street continuous monitoring sites are on busy city centre roads and are representative of population exposure for NO_2, PM_{10} and $PM_{2.5}$. Union Street is the city's main shopping street with shops on the ground level and commercial premises and flats on the 1st, 2nd and 3rd floors. Almost all the city's bus routes pass along at least part of Union Street and the inside lane of both sides of the road are designated bus lanes.

Market Street is adjacent to Aberdeen Harbour and has a high proportion of HGV's travelling between the north-east of Scotland, the Harbour and locations to the south of Aberdeen. The street is used by pedestrians travelling to the city centre from residential properties to the south of the river Dee, visiting the Union Square retail park and people working around the Harbour area. There are a small number of 1st, 2nd and 3rd floor flats. Emissions from Aberdeen Harbour also contribute to the pollution on Market Street.

The Anderson Drive site is 4m from the kerb and is not representative of population exposure as residential properties are set back 10-20m from the kerb. Similarly, the site at Wellington Road is around 3-4m closer to the kerb than residential properties in the area.

The nearest properties are 10m from the King Street site, however the location is typical of flatted properties close to the kerb at other locations on King Street. Errol Place is representative of typical residential properties close to the city centre but not adjacent to a major road and provides urban background data.

The automatic monitoring sites at Union Street, Market Street, Wellington Road and Anderson Drive are located within AQMAs.

The King Street site is not located within an AQMA but is relatively close to the City Centre in an area of high traffic flow.

Non-Automatic Monitoring Sites

Aberdeen City Council undertook non- automatic (passive) monitoring of NO_2 at 72 sites during 2020. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix E.Figure 10 to Figure.17, and Air Quality - Diffusion Tubes - Datasets - Open Data Aberdeen (aberdeencity.gov.uk). Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

Diffusion tubes on Market Street, Union Street and the majority of those on Holburn Street and King Street within the city centre are at building façade and are representative of population exposure. Some of the tubes out with the city centre are at roadside locations with the façade of the nearest relevant property 5-20m back from the roadside.

Maps showing the location of the monitoring sites are provided in Appendix E. Locations can also be view at Air Quality - Diffusion Tubes - Datasets - Open Data Aberdeen (aberdeencity.gov.uk)

Individual Pollutants

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

Nitrogen Dioxide (NO_2)

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

For diffusion tubes, the full 2020 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 five years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

Monitored NO_2 levels at all automatic monitoring sites continue to be below the annual mean air quality objective of 40 µg/m^3. The trend in NO_2 levels over the last 5 years is shown in Appendix D.Figure 1. NO_2 levels have been decreasing since 2015. NO_2 levels at all automatic monitoring sites have been below the objective level since 2018. The graph in Appendix D.Figure 2, shows the annual average at each automatic monitoring location since 2016.

In relation to diffusion tubes, duplicate and triplicate tube monitoring locations were assessed for precision using the precision accuracy bias spread sheet available on the SAQD website. Adjustments made, due to poor precision, are detailed in Table C.4, Appendix C.

Two diffusion tube monitoring locations were removed in 2020 (DT27, DT87). Access to these locations was no longer possible. NO_2 levels monitored at these locations were below the objective level. There were 2 new monitoring locations (DT90,DT91) at a busy junction in the Skene Street area as existing tubes in that area suggest elevated NO_2

concentrations. The tubes were installed in October and therefore only 3 months of data have been collected at these new sites. The data for these tubes has not been annualised due to low data capture (less than 33%) and therefore the data is to be treated with caution.

Diffusion tubes DT2, DT12, DT24, DT28, DT48, DT71 and DT79 have been annualised due to poor data capture. Details of the annualisation study are in Appendix C.

Diffusion tube monitoring locations are at areas of relevant exposure except where indicated in Table A.2. Diffusion tube monitoring sites, not at point of exposure, recorded annual mean concentrations below 36µg/m^3 and therefore do not require distance correction during 2020.

The NO_2 automatic monitoring data collected at all sites in 2020 was significantly lower than in 2019. The majority of diffusion tube monitoring locations also showed significantly lower NO_2 concentrations compared to previous years. The main cause of this is likely to have been due to reduced road traffic as “lockdown” travel restrictions were imposed at a national and regional level throughout the year, to protect public health and minimise the spread of infection during the COVID 19 coronovirus pandemic. The graphs in Appendix D, Figure 4, plot the daily concentration of NO_2 measure at each automatic site from January 2020. The dark green shading represents periods when lockdown was in place across most of Scotland. The light blue shading indicates the periods during which various restrictions on a more regional level were implemented. Periods of restriction generally show a reduction in daily NO_2 concentrations (Ricardo Energy & Environment). Monitoring at King Street and Union Street illustrate the most significant change in levels.

The average reduction in NO_2 concentrations monitored at automatic sites in 2020 compared to 2019 is in the region of 30%. Diffusion tube data suggested a similar magnitude of reduction in NO_2 levels across the city both within and outside of AQMAs. Reduction in diffusion tube NO_2 levels, compaired to 2019 data, ranged from 5% to 41% with an average reduction of 27%. All tubes suggest NO_2 levels below the objective level

except for DT9 located at 39 Market Street, with a annual average of 42 µg/m^3. Tube DT2 at 885 Great Northern Road showed no reduction in annual average. Long term traffic control measures related to Haudagain bypass works, in the area of this tube, may have caused this impact.

The Union Street automatic monitoring site measured the greatest reduction in NO_2 compared with 2019, with a decrease of 37%. Diffusion tubes along Union Street also suggest the greatest reduction in concentrations between 33% to 40%. Monitoring locations are shown in Appendix E.Figure 18.

A combination of reduced road traffic and temporary traffic restrictions on Union Street may have been the greatest impact on this reduction. Automatic traffic counters in Aberdeen City recorded reduced daily traffic flows in 2020 compaired to 2019. A comparison of traffic flow trends is illustrated in Appendix D, Figure 3. In May 2020, Aberdeen City was awarded a Scottish Government Spaces for People grant to provide temporary interventions to allow people to walk, cycle and queue for buses and shopping while adhering to physical distance guidance. This included pedestrianisation, pavement widening and temporary bike lanes along Union Street. The central part of Union Street between Bridge Street and Market Street were closed to all vehicles.

A bus gate was introduced at Market Street/Union Street junction and buses, taxis and authorised vehicles were only permitted between Broad Street and Market Street. This may account for levels monitored by tube DT9 not decreasing to any extent and remaining above the objective level. See map Appendix E.Figure 18.

Simulated normal concentrations can be used to predict what normal concentrations can be expected if no lockdown interventions had taken place (Ricardo Energy & Environment). Ricardo Energy and Environment (REAE) undertook a validated modelling study to simulate a best estimate for normal concentrations in 2020 had there been no lockdown. The modelled, business as usual, NO_2 concentrations are predominatly higher than the measured concentrations from 23 March to July, suggesting that reduced

emmissions from traffic are being seen in the measurements (Ricardo Energy & Environment). The chart in Appendix D.Figure 5, illustrates the modelled verses measured levels for the Union Street site and chart Figure 6 compares annual NO_2 concentrations at each automatic site since 2018 against 2020 measured and modelled data. Measured 2020 levels are lower at all monitoring locations compaired to the BAU model and previous monitoring years.

Tube monitoring locations (DT11, DT20, DT21, DT22, DT33 and DT46) in the area of the King Street/North Street juction in the city centre AQMA suggest an average reduction of NO_2 levels by 25% compared to 2019. The annual average of all these tubes were below the objective level.

Diffusion tubes located along the Anderson Drive AQMA recorded NO_2 levels on average 22% lower than 2019 levels. The exception to this was tube DT2 at 885 Great Northern Road, that showed no reduction in annual average. Long term traffic control measures related to Haudagain bypass works, in the area of this tube, may have caused this impact. The measured level remained below the objective level.

There is an automatic monitoring site (CM5) and two diffusion tube locations within the Wellington Road AQMA (DT7, DT36). All these locations recorded NO_2 levels below the objective level in 2020. CM1 and DT36 have recorded levels above or very close to the objective level since 2016. It appears the reduction in road traffic in 2020 had a significant impact of reducing measured NO_2 levels, at these locations, in the region of 30%.

Diffusion tubes (DT73, DT74 and DT77) located in the Skene Square area are outside of any AQMA and monitoring at these sites since 2018 suggest levels close to the annual objective level. Monitoring in 2020 suggest between 24-32% reduction in NO_2 levels. Diffusion tubes (DT90 and DT91) were installed in October 2020 in the location at Caroline Place/Hutcheon Street junction to monitor levels. Major infrastructure works proposed for the Skene Street/Berryden area are discussed in Road Traffic Sources section.

There were no exceedances of the hourly mean objective at any automatic or diffusion tube sites in 2020. The hourly mean has not been exceeded at any automatic sites in the last 6 years.

Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 18µg/m^3.

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

Appendix D. Figure 7, provides the trend in annual means measured at each site since 2016. The Union Street Monitoring site data for PM_{10} and $PM_{2.5}$ was annualised due to poor data capture over the year caused by equipment failure. Details of the annualisation process are provided in Appendix C. Equipment replacement is planned in 2021.

The PM_{10} annual mean measured at each automatic site in 2020 were below the objective level and marginally lower than levels measured in 2019. A reduction in traffic during COVID 19 lockdown periods may have had some impact on PM_{10} level but the impact appears less significant compaired to changes in NO_2 levels. This may be due to transboundry pollutant sources. Roadside measurements are similar to urban background levels measured at Erroll Place.

Since 2016 the general trend is a reduction in PM_{10} levels. Appendix D.Figure 8, provides PM_{10} annual mean levels measured at each automatic site since 2016.

The 24-Hour Mean PM_{10} monitoring results are detailed in Table A.6. There have been no exceedances of the objective at any monitoring site since 2016.

Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A compares the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past five years with the air quality objective of 10µg/m^3.

There are 5 continuous monitoring sites measuring $PM_{2.5}$ levels in Aberdeen City. The Anderson Drive TEOM particulate monitor can only monitor PM_{10} and replacement is planned in 2021 with a monitor that can measure PM_{10} and $PM_{2.5}$.

No exceedances of the annual mean were recorded at any of the continuous monitoring sites. No exceedances of the objective have been recorded at any site since 2016.

Sulphur Dioxide (SO_2)

No monitoring of sulphur dioxide was carried out in 2020 as previous assessments did not predict a likelihood of exceedance of the objectives and there has been no significant change in local emissions.

Carbon Monoxide, Lead and 1,3-Butadiene

No monitoring of Carbon Monoxide, Lead and 1,3-Butadiene was carried out in 2020 as previous assessments did not predict a likelihood of exceedances of the objectives and there has been no significant change in local emissions.

New Local Developments

Road Traffic Sources

Berryden Corridor Improvement

The improvements include the widening of existing roads and creation of a new road, providing a more direct link between the City Centre and the north of the city. Necessary planning consents were obtained in 2020. The scheme is subject to a Compulsory Purchase Order (CPO) to acquire the land necessary to deliver the project which is now with Scottish Ministers for consideration. The timescale for this process is a matter for Scottish Ministers and it is anticipated that the CPO will be concluded by the end of 2021. Construction is expected to take 2 years and will not begin until the CPO has been completed.

The improvements include the duelling of Berryden Road and provide a more direct link between the City Centre and the Third Don Crossing.

It is anticipated that the proposed junction improvements will reduce congestion in this area and improve air quality, however these benefits may be offset by an increase in traffic flow. Air quality assessments predicted that the scheme would not lead to exceedances of the air quality objectives outside the existing AQMAs.

South College Street Junction Improvements (Phase 1) Project

Phase 1 of the South College Street project is due to commence in summer 2021 and be operational summer 2022. Notice for the making of the Compulsory Purchase Order (CPO) was served in May 2020. Following negotiations, all objections received were withdrawn and the order was confirmed by Scottish Ministers in December 2020.

A90/A96 Haudagain Improvements

Construction works commenced on the site in 2019 and are expected to be completed by the end of 2021. The improvements will create a new dual carriageway link road to the southwest of the Haudagain roundabout and improve traffic flow and air quality. The DMRB Environmental Statement details that there are no predicted exceedances of the

annual mean NO_2 or PM_{10} levels with the scheme in place and concludes that there will be no significant impact on local air quality as a result of the proposed scheme. It is hoped that the improvements will enable compliance with the air quality objectives along the entire Anderson Drive AQMA and the future revocation of the AQMA.

Wellington Road Improvements

A broad range of options to improve traffic management and flow on Wellington Road, including the section within the AQMA, were reviewed during 2017. Council approval was subsequently granted to proceed to a Stage 1 STAG assessment (Strategic Transport Analysis Guide) the outcome of which was reported to the Council in 2018. The Stage 1 STAG report generated 8 options for progression to a Stage 2 assessment. Should the Council subsequently approve improvement measures, it is likely to be several years before major infrastructure works are implemented. Options include road widening within the Wellington Road AQMA adjacent to the former HM Craiginches prison site which has recently been developed for residential accommodation. While road widening is likely to improve traffic flow, the works may bring the road closer to residential properties. Depending on the outcomes of the appraisal process, further air quality assessment may be required.

Roads Hierarchy Review

A programme of road reclassifications was approved by Transport Scotland in 2020. The reclassification of key routes supports the effective and efficient distribution and management of traffic around the City and facilitates the delivery of the transport elements of the City Centre Masterplan. Key principles include the direction of all through and peripheral traffic from the City Centre to the AWPR and hence support air quality improvement in the City Centre.

Other Transport Sources

Other transport sources include:

- Airports.
- Locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.
- Locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.
- Ports for shipping.

There were no new other transport sources in Aberdeen City in 2020.

Industrial Sources

Industrial Sources include:

- **Industrial installations**: new or proposed installations for which an air quality assessment has been carried out.
- **Industrial installations**: existing installations where emissions have increased substantially or new relevant exposure has been introduced.
- **Industrial installations**: new or significantly changed installations with no previous air quality assessment.
- Major fuel storage depots storing petrol.
- Petrol stations.
- Poultry farms.

The Scottish Environmental Protection Agency are the licensing and enforcement authority for different types of industrial installation. At the time of publication there were no updates. Further updates will be provided in subsequent annual reports.

Commercial and Domestic Sources

Commercial and domestic sources include:

- Biomass combustion plant – individual installations.
- Areas where the combined impact of several biomass combustion sources may be relevant.
- Areas where domestic solid fuel burning may be relevant.
- Combined Heat and Power (CHP) plant.

There were no new commercial and domestic sources in Aberdeen City in 2020.

New Developments with Fugitive or Uncontrolled Sources

This section relates potential fugitive or uncontrolled particulate matter from the following new sources:

New Source in 2020	Detail
Landfill sites	No new sources in 2020
Quarries	No new sources in 2020
Unmade haulage roads on industrial sites	No new sources in 2020
Other potential sources of fugitive particulate matter emissions.	No new sources in 2020

Planning Applications

This section identifies any major planning applications under consideration in 2020 that might affect air quality. A summary of applications in 2020 that may impact air quality are detailed in Table 4. Details of planning application can be view at publicaccess.aberdeencity.gov.uk/online-applications.

Table 4: Planning Applications in 2020 that may affect Air Quality

Planning Application	Application Number	Air Quality Impacts
Erection of 3 storey integrated mortuary (Class 8) including mortuary and post-mortem facilities, teaching/research and ancillary functions with access, parking, landscaping and associated works	201200/DPP	Conditionally approved 24 December 2020. Facility to install gas boilers with 3MW combined thermal input and back up oil fire generator. Thermal input suggests plant may require a MCP permit issued by SEPA. Environmental Health Service have advised given the proximity of the proposed plant to sensitive receptors, and the proposed output of the installation, a detailed dispersion modelling exercise be carried out to define the appropriate stack height, based on the likely worst-case air quality impacts. As the back-up generators are not running all the time, exceedances of the short-term air quality objectives would be the main concern. The testing scenario plus a cumulative scenario should be included in the dispersion modelling, thus ensuring that all air quality objectives, both short-term and long-term, are not exceeded during the tests. Regarding the electrical back-up generator, calculations should also be provided to justify the flue height to ensure that this is not having a negative impact upon the air quality at nearby receptors. Ideally this will also be assessed in the dispersion model assessment.

Planning Application	Application Number	Air Quality Impacts
Proposed alterations and additions to the current recycling centre to allow for a Heat Distribution Facility Torry Heat Distribution Facility (HDF), Land To The South Of Greenbank Crescent	200868/PREAPP	Facility to install 4 gas boilers with 3.2 MW thermal input. HDF boilers also to operate during peak demand which the EFW plant cannot meet demand alone and when EFW plant is not operating due to maintenance. At pre-application the facility was classed as permitted development. Although not required to do so, the applicants plan to submit an Environmental Impact Assessment including an Air Quality Impact Assessment. The HDF will form part of the 'Torry Heat Network' project. Hot water from the Energy from Waste (EFW) site will be piped into the HDF for storage and temperature maintenance and then distributed into the network to supply local housing and community buildings with heating and hot water.

Impact of COVID-19 upon LAQM

Limited impact on air quality monitoring occurred following the national lockdown that commenced on 23 March 2020.

Diffusion tube collection was postponed until it was established that it was safe to undertake. This resulted in diffusion tube change out on 1 April 2020 being cancelled and no diffusion tube data being available for March and April. Tube collection resumed on 29 April 2020.

In relation to the diffusion tube colocation study, one months data was not obtained due to laboratory closure.

Infection control procedures were established for automatic monitoring site visits early in the pandemic, and no data was lost at any site due to COVID-19 related matters.

Conclusions and Proposed Actions

Conclusions from New Monitoring Data

Data from all continuous automatic monitoring sites was below the NO_2 annual mean objective of 40mg/m^3. NO_2 levels at all automatic monitoring sites have been below the objective level since 2018. Trends in NO_2 levels suggest that air quality continues to improve across the City.

The NO_2 automatic monitoring data collected at all sites in 2020 was significantly lower than in 2019 and other monitoring years. The majority of diffusion tube locations also showed significantly lower NO_2 concentrations compared to previous years. The main cause of this is likely to have been due to reduced road traffic during the COVID19 pandemic “lockdown” travel restrictions.

All diffusion tubes located in and outside of AQMAs suggest NO_2 levels below the objective level, except for DT9 located at 39 Market Street (city centre AQMA), with a annual average of 42 µg/m^3.

There were no exceedances of the NO_2 one hour mean objective at any of the automatic sites. Diffusion tube data also recorded no sites with an annual mean >60ugm^{-3} suggesting exceedances of the 1 hour objective were unlikely across the city.

The annual mean and 24 hour PM_{10} objectives were met at all monitoring locations and the concentrations at measurment locations across the city are comparable to annual monitoring data since 2016.

No exceedances of the $PM_{2.5}$ annual mean were recorded at the 5 continuous monitoring sites.

The 3 AQMAs in the City remain valid for NO_2 and PM_{10} annual means.

New monitoring data has not identified a need for any other changes to the existing AQMAs.

Conclusions relating to New Local Developments

Infrastructure measures around the Haudagain roundabout within the Anderson Drive AQMA are progressing and are predicted to be completed by the end of 2021. It is anticipated these improvement works will significantly improve traffic flow and local air quality and potentially enable the revocation of the AQMA.

Proposed Actions

1. Take forward an air quality education initiative in local primary schools using a mobile monitor to allow children to collect data and analyse the results. This project has been delayed due to the COVID-19 pandemic.
2. Replace particulate monitors at the Union Street and Anderson Drive automatic monitoring sites with new particulate monitoring equipment.
3. Submit the proposed preferred LEZ option to Committee in June 2021 and, should approval be granted, undertake a public and stakeholder consultation between June and August 2021.
4. Formally publish the proposed LEZ scheme and submit to Scottish Ministers in late 2021/early 2022 (where no substantial changes are required following the consultation).
5. Progress the equipment procurement process and other associated legal and infrastructure actions to support the implementation of a City Centre LEZ.
6. Continued implementation of the Actions within the Air Quality Action Plan 2011.
7. Submit the next air quality progress report.

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? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Errol Place	Urban Background	X394397	Y807392	PM_{10}, $PM_{2.5}$, O_3, NO_2 (NO, NO_x)	NO	FIDAS Chemiluminescence	N/A	N/A	3
CM2	Union Street	Roadside	X393656	Y805967	PM_{10}, $PM_{2.5}$ NO_2 (NO, NO_x)	YES City Centre	Dichotomous Monitor FDMS Chemiluminescence	2	2	2.5
CM3	Market Street	Roadside	X394560	Y805677	PM_{10}, $PM_{2.5}$ NO_2 (NO, NO_x)	YES City Centre	Fidas 200 Chemiluminescence	0	2	1.5
CM4	Anderson Drive	Roadside	X392506	Y804186	PM_{10}, NO_2 (NO, NO_x)	YES Anderson Drive	TEOM Chemiluminescence	10	6	1.5
CM5	Wellington Road	Roadside	X394395	Y804779	PM_{10}, $PM_{2.5}$ NO_2 (NO, NO_x)	YES Wellington Road	Fidas 200 Chemiluminescence	5	4	1.5
CM6	King Street	Roadside	X394333	Y808770	PM_{10}, $PM_{2.5}$ NO_2 (NO, NO_x)	NO	Fidas 200 Chemiluminescence	10	3	1.5

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? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT2	885 Gt Northern Rd	Roadside	391149	809164	NO_2	YES Anderson Dr	11	3	N	2.5
DT4	38 Ellon Rd	Roadside	394652	809714	NO_2	NO	7	3	N	2.3
DT5	520 King St	Roadside	394236	808066	NO_2	NO	9	0.1	N	2.6
DT6	86 Victoria Rd Torry	Roadside	394764	805197	NO_2	NO	0	3	N	2.3
DT7	Wellington Rd/Kerloch Pl	Roadside	394411	804407	NO_2	YES Wellington Rd	0	3	N	2.4
DT8	107 Anderson Dr	Roadside	392337	804340	NO_2	YES Anderson Dr	14	3	N	2.3
DT9	39 Market St	Roadside	394264	806146	NO_2	YES City Centre	0	3	N	2.1
DT10	184 Market St	Roadside	394530	805708	NO_2	YES City Centre	0	3	N	2.6

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT11	105 King St	Roadside	394406	806637	NO_2	YES City Centre	0	3	N	2.2
DT12	40 Union St	Roadside	394285	806285	NO_2	YES City Centre	0	3	N	2.4
DT13	Music Hall, Union St	Roadside	393777	806030	NO_2	YES City Centre	0	6	N	2.6
DT14	Dyce Primary Gordon Ter	Urban background	389046	812794	NO_2	NO	N/A	N/A	N	2
DT15	Northfield swimming pool	Urban background	390801	808132	NO_2	NO	N/A	N/A	N	2.4
DT16	1 Trinity Quay	Roadside	394336	806097	NO_2	YES City Centre	0	5	N	2.5
DT17	43/45 Union St	Roadside	394273	806255	NO_2	YES City Centre	0	3	N	2.1
DT18	14 Holburn St	Roadside	393305	805734	NO_2	YES City Centre	0	3	N	2.6
DT19	468 Union St	Roadside	393386	805826	NO_2	YES City Centre	0	3	N	2.4

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT20	212 King St	Roadside	394400	806842	NO_2	NO	0	4	N	2.3
DT21	26 King St	Roadside	394449	806453	NO_2	YES City Centre	0	4	N	2.4
DT22	104 King St	Roadside	394425	806634	NO_2	YES City Centre	0	4	N	2.3
DT24	40 Auchmill Rd	Roadside	389930	809603	NO_2	NO	0	3	N	2.2
DT25	21 Holburn St	Roadside	393332	805748	NO_2	YES City Centre	0	3	N	2.4
DT26	147 Holburn St	Roadside	393214	805367	NO_2	NO	0	3	N	2.3
DT28	61 Holburn St	Roadside	393275	805624	NO_2	YES City Centre	5	3	N	2.3
DT29	469 Union St	Roadside	393400	805811	NO_2	YES City Centre	0	3	N	2.4
DT30	335 Union St	Roadside	393619	805919	NO_2	YES City Centre	0	5	N	2.5
DT33	16 East North St	Roadside	394505	806531	NO_2	YES City Centre	0	4	N	2.3

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT34	404 King Street	Roadside	394317	807527	NO2	NO	0	9	N	2.6
DT36	115 Menzies Rd/Wellington Rd	Roadside	394403	804799	NO2	YES Wellington Rd	14	4	N	2.4
DT37	137 Wellington Road	Roadside	394697	803735	NO2	NO	17	14	N	1.6
DT39	819 Gt Northern Rd	Roadside	391293	809136	NO2	YES Anderson Dr	0	3	N	2.4
DT40	852 Fullerton Ct (facade)	Facade	391353	809158	NO2	YES Anderson Dr	0	7	N	2.5
DT41	852 Fullerton Ct (roadside)	Roadside	391352	809151	NO2	YES Anderson Dr	7	0.1	N	2.3
DT45	111 S Anderson Dr	Facade	392311	804349	NO2	YES Anderson Dr	0	13	N	1.9
DT46	West North Street	Roadside	394277	806671	NO2	YES City Centre	0	4	N	2.4

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT47	Powis Terrace	Roadside	393368	807511	NO2	NO	5	0.1	N	2.5
DT48	139 Gt. Northern Road	Roadside	393088	808232	NO2	NO	10	0.1	N	2.4
DT49	142 Gt. Northern Road	Roadside	392969	808460	NO_2	NO	11	3	N	2.4
DT50	St. Machar Dr/Dunbar St.	Roadside	394015	808483	NO_2	NO	6	0.1	N	2.2
DT54	36 - 38 School Road	Roadside	394358	808434	NO_2	NO	14	2	N	2
DT55	Ellon Rd/ Balgownie Crescent	Roadside	394629	809740	NO_2	NO	9	2	N	2.4
DT56	59 Fairview Drive	Urban Background	392239	810163	NO_2	NO	N/A	N/A	N	2.3

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT57	Park Place/ Constitution St	Roadside	394628	806692	NO_2	NO	16	0.1	N	2.3
DT58	47 Tillydrone Av	Roadside	393584	808729	NO_2	NO	8	4	N	2.4
DT59	735 Gt. Western Rd	Facade	391525	809080	NO_2	NO	0	8	N	2.5
DT60	Anderson Drive/ Beech Rd	Roadside	391287	807683	NO_2	YES Anderson Dr	N/A	0.1	N	2.5
DT62	35 Chestnut Row	Urban Background	392903	807302	NO_2	NO	N/A	N/A	N	2.7
DT63	93 Berryden Road	Roadside	393034	807392	NO_2	NO	11	2	N	2.4
DT64	102 Picktillum Place	Urban Background	393025	807828	NO_2	NO	N/A	N/A	N	2.5
DT65	90 Tillydrone Av	Roadside	393331	809073	NO_2	NO	8	3	N	2.4
DT66	10 Meadow Place	Roadside	393120	809284	NO_2	NO	3	3	N	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT67	37 Inverurie Rd	Roadside	389756	809583	NO_2	NO	6	3	N	2.5
DT70	Kirkhill Place Tullos Primary	Urban Background	395476	804452	NO_2	NO	N/A	N/A	N	2.4
DT71	Tullos Hill	Urban Background	39543	803410	NO_2	NO	N/A	N/A	N	2.6
DT72	North Loirston Souter Head Road Cove Allotments	Urban Background	394988	801940	NO_2	NO	N/A	N/A	N	2.5
DT73	61 Skene Square	Facade	393458	806768	NO_2	NO	0	6	N	2.4
DT74	5 Caroline Place	Roadside	393350	806922	NO_2	NO	5	3	N	2.6
DT75	Pentland Close	Urban Background	395964	805132	NO_2	NO	N/A	N/A	N	2.6
DT77	27 Skene Square	Roadside	393524	806701	NO_2	NO	0	5	N	2.4

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT78	42 Leslie Road	Roadside	393025	808297	NO_2	NO	0	6	N	2.5
DT79	67 Leslie Road	Roadside	393029	808327	NO_2	NO	3	6	N	2.4
DT80	27 Rosemount Place	Roadside	393410	806674	NO_2	NO	0	4	N	2.6
DT81	131 Rosemount Place	Roadside	393044	806537	NO_2	NO	0	2	N	2.5
DT82	7 Virgina Street	Roadside	394466	806248	NO_2	YES City Centre	0	8	N	2.5
DT83	Wellington Road Altens Round about (North)	Roadside	394574	802078	NO_2	NO	0	3	N	2.5
DT84	Wellington Road Altens Round about (South)	Roadside	394489	801970	NO_2	NO	0	3	N	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT85	Tullos Place	Urban Background	395216	804724	NO_2	NO	N/A	N/A	N	2.4
DT86	21 Manor Av	Roadside	391330	808904	NO_2	NO	10	0.1	N	2.4
DT88	31 St Clement St	Roadside	395118	806164	NO_2	NO	0	1	N	2.4
DT89	Pocra Quay	Urban Background	395837	805706	NO_2	NO	N/A	N/A	N	2.4
DT90	4 Westburn Road	Facade	393290	806942	NO_2	NO	N/A	3	N	2.5
DT91	155 Hutcheon Street	Facade	393367	806941	NO_2	NO	N/A	2	N	2.5
CL1	Errol Place	Urban Background	394397	807392	NO_2	NO	N/A	N/A	Y	3
CL2	Union Street	Roadside	393656	805967	NO_2	YES City Centre	2	2	Y	2.5
CL3	Market Street	Roadside	394560	805677	NO_2	YES City Centre	0	2	Y	1.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
CL4	Anderson Drive	Roadside	392506	804186	NO_2	YES Anderson Dr	10	6	Y	1.5
CL5	Wellington Road	Roadside	394395	804779	NO_2	YES Wellington Rd	5	4	Y	1.5
CL6	King Street	Roadside	394333	808770	NO_2	NO	10	3	Y	1.5

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 ($\mu g/m^3$)

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2020 (%) [2]	2016	2017	2018	2019	2020
CM1	Background	Automatic		94	23	21	22	20	14
CM2	Roadside	Automatic		98	**46**	**43**	**40**	38	24
CM3	Roadside	Automatic		100	36	35	31	33	22
CM4	Roadside	Automatic		82	22	21	19	17	12
CM5	Roadside	Automatic		100	40	**46**	39	39	25
CM6	Roadside	Automatic		100	28	28	23	22	16
DT2	Roadside	Diffusion Tube		50	**44**	**40**	37	29	30
DT4	Roadside	Diffusion Tube		83	37	33	29	27	19
DT5	Roadside	Diffusion Tube		83	33	31	47	27	20
DT6	Roadside	Diffusion Tube		75	32.5	27.8	28	30	21
DT7	Roadside	Diffusion Tube		83	37.4	33.2	32	31	22

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
DT8	Roadside	Diffusion Tube		83	**54**	**48**	**48**	39	31
DT9	Roadside	Diffusion Tube		75	**50.2**	**47.9**	46	**44**	**42**
DT10	Roadside	Diffusion Tube		83	**54.1**	**47.6**	47	**47**	33
DT11	Roadside	Diffusion Tube		83	**51.1**	**48.1**	48	**45**	34
DT12	Roadside	Diffusion Tube		67	**48.9**	**45.9**	44	**43**	26
DT13	Roadside	Diffusion Tube		83	**40.9**	N/A	N/A	35	22
DT14	Urban background	Diffusion Tube		83	9.6	10.1	10	8	6
DT15	Urban background	Diffusion Tube		83	12.1	13.0	11	9	7
DT16	Roadside	Diffusion Tube		83	**43.8**	37.4	37	39	27
DT17	Roadside	Diffusion Tube		83	**46.7**	**42.8**	**44**	**43**	28

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2020 (%) [2]	2016	2017	2018	2019	2020
DT18	Roadside	Diffusion Tube		75	**48.5**	**41.6**	39	39	25
DT19	Roadside	Diffusion Tube		83	**45.4**	**40.9**	**40**	**43**	27
DT20	Roadside	Diffusion Tube		75	32.1	30.8	30	27	21
DT21	Roadside	Diffusion Tube		83	**44.1**	**41.6**	34	33	23
DT22	Roadside	Diffusion Tube		83	39.3	36.2	36	34	24
DT24	Roadside	Diffusion Tube		67	31.6	28.0	24	21	14
DT25	Roadside	Diffusion Tube		83	**42.8**	37.1	37	35	26
DT26	Roadside	Diffusion Tube		83	26.6	23.8	24	23	15
DT28	Roadside	Diffusion Tube		58	37	32	32	29	22
DT29	Roadside	Diffusion Tube		75	**48.8**	**42.7**	**45**	**42**	28
DT30	Roadside	Diffusion Tube		83	**46.5**	**41.9**	**41**	39	24

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2020 (%) [2]	2016	2017	2018	2019	2020
DT33	Roadside	Diffusion Tube		83	**43.1**	**40.4**	**40**	35	29
DT34	Roadside	Diffusion Tube		83	28.7	27.6	26	24	18
DT36	Roadside	Diffusion Tube		75	**46**	**41**	**43**	39	29
DT37	Roadside	Diffusion Tube		83	30	24	23	22	17
DT39	Roadside	Diffusion Tube		83	**47.4**	**45.4**	**43**	37	27
DT40	Facade	Diffusion Tube		83	n/a	31.0	30	26	19
DT41	Roadside	Diffusion Tube		83	**48**	**44**	**40**	36	27
DT45	Facade	Diffusion Tube		83	30.6	25.2	24	21	16
DT46	Roadside	Diffusion Tube		75	26	25.5	26	24	17
DT47	Roadside	Diffusion Tube		83	**45**	**43**	**41**	**40**	30
DT48	Roadside	Diffusion Tube		58	31	29	28	26	19

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2020 (%) [2]	2016	2017	2018	2019	2020
DT49	Roadside	Diffusion Tube		83	37	32	31	30	22
DT50	Roadside	Diffusion Tube		83	27	25	23	22	17
DT54	Roadside	Diffusion Tube		75	24	24	20	20	16
DT55	Roadside	Diffusion Tube		83	30	24	25	22	14
DT56	Urban Background	Diffusion Tube		83	12.5	13.1	13	11	8
DT57	Roadside	Diffusion Tube		83	29	21	27	27	20
DT58	Roadside	Diffusion Tube		83	23	22.3	25	25	17
DT59	Facade	Diffusion Tube		83	24.2	21.4	20	19	14
DT60	Roadside	Diffusion Tube		83	32.9	32.4	31	27	20
DT62	Urban Background	Diffusion Tube		83	14.4	14.0	12	11	8
DT63	Roadside	Diffusion Tube		83	29	23	23	23	16

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2020 (%) [2]	2016	2017	2018	2019	2020
DT64	Urban Background	Diffusion Tube		75	16.9	17.2	17	14	11
DT65	Roadside	Diffusion Tube		75	19[3]	26	19	19	14
DT66	Roadside	Diffusion Tube		83	21[3]	26	21	21	16
DT67	Roadside	Diffusion Tube		83	35[3]	25	38	32	21
DT70	Urban Background	Diffusion Tube		83	n/a	14.7	14	13	10
DT71	Urban Background	Diffusion Tube		67	n/a	10.6	10	9	7
DT72	Urban Background	Diffusion Tube		75	n/a	7.8	8	7	5
DT73	Facade	Diffusion Tube		83	n/a	39.7	**40**	38	29
DT74	Roadside	Diffusion Tube		83	n/a	39	34	34	23
DT75	Urban Background	Diffusion Tube		83	n/a	19.1	16	15	12
DT77	Roadside	Diffusion Tube		83	n/a	n/a	37	38	27

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
DT78	Roadside	Diffusion Tube		83	n/a	n/a	21	20	13
DT79	Roadside	Diffusion Tube		67	n/a	n/a	20	20	14
DT80	Roadside	Diffusion Tube		83	n/a	n/a	24	23	14
DT81	Roadside	Diffusion Tube		83	n/a	n/a	30	27	16
DT82	Roadside	Diffusion Tube		75	n/a	n/a	**44**	**42**	32
DT83	Roadside	Diffusion Tube		83	n/a	n/a	27	26	17
DT84	Roadside	Diffusion Tube		83	n/a	n/a	18	19	13
DT85	Urban Background	Diffusion Tube		83	n/a	n/a	13	13	11
DT86	Roadside	Diffusion Tube		75	n/a	n/a	n/a	17	13
DT88	Roadside	Diffusion Tube		83	n/a	n/a	n/a	35	29

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
DT89	Urban Background	Diffusion Tube		83	n/a	n/a	n/a	21	20
DT90	Facade	Diffusion Tube		25	n/a	n/a	n/a	n/a	20
DT91	Facade	Diffusion Tube		25	n/a	n/a	n/a	n/a	36

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**.

Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

Table A.4 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
CM1	Background	Automatic		94	0	4	1	0	0
CM2	Roadside	Automatic		98	0	0	0	0	0
CM3	Roadside	Automatic		100	1	0	0	0	0
CM4	Roadside	Automatic		82	0	0	0	0(93)	0(78)
CM5	Roadside	Automatic		100	2	0	0	0	0
CM6	Roadside	Automatic		100	0	0	0	0	0

Notes:

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

If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

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

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

Table A.5 – Annual Mean PM_{10} Monitoring Results ($\mu g/m^3$)

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
CM1	Background		100	12	11	14	14	11
CM2	Roadside		59	13	13	15	12	10
CM3	Roadside		100	12	11	17	13	10
CM4	Roadside		95	12	12	14	13	9
CM5	Roadside		100	16	13	17	14	14
CM6	Roadside		100	16	12(4)	14	14	11

Notes:

Exceedances of the PM_{10} annual mean objective of 18 $\mu g/m^3$ are shown in bold.

All means have been "annualised" as per LAQM.TG(16), valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
CM1	Background		100	0	0	1	1	0
CM2	Roadside		59	0 (26)	0	0	0(32)	0(21)
CM3	Roadside		100	1	0	5	4	0
CM4	Roadside		95	0	0	0	3	0
CM5	Roadside		100	2	0	3	4	0
CM6	Roadside		100	1	0	5 (48)	3(45)	0

Notes:

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

If the period of valid data is less than 85%, the 98.1st percentile of 24-hour means is provided in brackets.

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

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

Table A.7 – Annual Mean $PM_{2.5}$ Monitoring Results (µg/m^3)

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
CM1	Background		100	5	6	7	7	5
CM2	Roadside		49	7	7	8	8	5
CM3	Roadside		100	6	6	8	7	5
CM4	Roadside		-	-	-	-	-	-
CM5	Roadside		100	n/a	6	8	7	6
CM6	Roadside		100	n/a	6	7	7	6

Notes:

Exceedances of the $PM_{2.5}$ annual mean objective of 10 µg/m^3 are shown in bold.

All means have been "annualised" as per LAQM.TG(16), valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(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%).

Appendix B: Full Monthly Diffusion Tube Results for 2020

Table B.1 – NO_2 2020 Monthly Diffusion Tube Results ($\mu g/m^3$)

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted (1)
DT02	48.0	37.0	-	-	23.0	34.0	27.0	31.0	-	-	-	-	33.3	30
DT04	42.0	30.0	-	-	14.0	15.0	17.0	17.0	23.0	28.0	35.0	14.0	23.5	19
DT05	36.0	29.0	-	-	14.0	15.0	16.5	19.0	24.0	27.5	36.0	31.0	24.8	20
DT06	28.5	25.0	-	-	19.0	-	20.5	24.5	22.5	41.0	27.0	29.5	26.4	21
DT07	29.0	26.0	-	-	20.0	28.0	22.0	26.0	24.0	33.0	34.0	31.0	27.3	22
DT08	45.0	40.0	-	-	26.0	41.0	32.0	38.0	32.0	45.0	53.0	44.0	39.6	31
DT09	-	42.0	-	-	29.0	46.5	38.0	68.5	45.2	62.5	65.5	83.5	53.4	**42**
DT10	43.0	43.5	-	-	30.0	40.5	36.5	43.5	38.0	48.0	48.0	44.0	41.5	33
DT11	59.0	45.0	-	-	27.5	34.5	31.0	37.5	40.0	59.5	47.5	48.5	43.0	34
DT12	44.0	50.0	-	-	31.0	31.0	-	-	34.0	40.0	40.0	36.0	38.3	26
DT13	34.0	31.0	-	-	22.0	22.0	20.0	29.0	27.0	32.0	34.0	32.0	28.3	22
DT14	16.0	9.0	-	-	5.0	5.0	5.0	5.0	7.0	10.0	16.0	13.0	9.1	6
DT15	13.0	9.0	-	-	6.0	7.0	5.0	8.0	8.0	9.0	15.0	15.0	9.5	7
DT16	36.5	32.0	-	-	26.5	38.5	32.0	39.5	18.0	42.5	42.5	36.5	34.5	27
DT17	40.5	41.0	-	-	28.5	34.0	27.5	37.5	30.5	34.5	40.0	42.5	35.7	28
DT18	-	42.0	-	-	20.0	22.0	25.0	28.5	31.5	41.0	40.0	38.5	32.1	25
DT19	47.5	43.5	-	-	21.5	19.0	23.5	26.0	29.0	48.0	38.0	44.5	34.1	27
DT20	-	30.0	-	-	18.5	18.5	19.0	22.5	25.0	27.5	44.0	32.0	26.3	21
DT21	38.5	30.0	-	-	23.0	25.0	21.0	27.5	24.0	32.0	34.0	31.0	28.6	23
DT22	39.5	30.5	-	-	22.0	27.0	23.0	31.0	28.0	33.5	38.0	32.0	30.5	24
DT24	28.0	28.0	-	-	-	-	13.0	16.0	17.0	22.0	23.0	21.0	21.0	14
DT25	39.0	36.0	-	-	22.0	27.0	25.0	31.0	28.0	33.0	34.0	51.0	32.6	26
DT26	29.0	20.0	-	-	11.0	18.0	13.0	20.0	18.0	22.0	24.0	18.0	19.3	15
DT28	38.0	27.0	-	-	18.0	24.0	18.5	26.0	22.0	-	-	-	24.8	22
DT29	54.0	46.0	-	-	23.0	23.0	27.0	35.0	34.0	35.0	44.0	-	35.7	28
DT30	50.0	42.0	-	-	21.0	21.0	22.0	29.0	27.0	33.0	36.0	29.0	31.0	24
DT33	52.0	39.5	-	-	25.5	29.0	27.5	31.5	31.5	37.5	45.5	51.5	37.1	29

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted (1)
DT34	35.0	27.0	-	-	14.5	16.0	16.5	19.0	20.5	23.5	33.5	28.0	23.4	18
DT36	39.5	37.0	-	-	27.5	40.5	31.0	-	35.0	45.5	40.0	39.5	37.3	29
DT37	28.0	23.0	-	-	14.0	16.0	17.0	16.0	21.0	24.0	29.0	25.0	21.3	17
DT39	49.0	50.0	-	-	24.0	27.0	27.0	28.0	32.0	34.0	41.0	35.0	34.7	27
DT40	35.0	33.0	-	-	18.0	12.0	19.0	17.0	21.0	28.0	35.0	24.0	24.2	19
DT41	56.0	40.0	-	-	10.0	19.0	30.0	26.0	32.0	36.0	51.0	40.0	34.0	27
DT45	29.0	20.0	-	-	14.0	22.0	15.0	19.0	14.0	22.0	24.0	25.0	20.4	16
DT46	-	25.0	-	-	16.0	18.0	17.0	20.0	18.0	21.0	30.0	25.0	21.1	17
DT47	54.0	40.0	-	-	23.0	29.0	31.0	35.0	35.0	41.0	49.0	39.0	37.6	30
DT48	-	-	-	-	15.0	17.0	17.0	21.0	23.0	27.0	-	29.0	21.3	19
DT49	38.0	29.0	-	-	17.0	20.0	18.0	24.0	25.0	30.0	37.0	37.0	27.5	22
DT50	33.0	25.0	-	-	16.0	14.0	13.0	17.0	17.0	22.0	32.0	24.0	21.3	17
DT54	31.0	22.0	-	-	-	12.0	13.0	14.0	14.0	21.0	29.0	25.0	20.1	16
DT55	6.0	23.0	-	-	14.0	16.0	14.0	20.0	19.0	19.0	27.0	21.0	17.9	14
DT56	15.0	10.0	-	-	7.0	7.0	6.0	9.0	9.0	13.0	17.0	13.0	10.6	8
DT57	42.0	30.0	-	-	19.0	20.0	17.0	21.0	10.0	25.0	36.0	30.0	25.0	20
DT58	37.0	21.0	-	-	14.0	13.0	15.0	18.0	21.0	25.0	26.0	28.0	21.8	17
DT59	24.0	13.0	-	-	13.0	10.0	12.0	14.0	16.0	21.0	26.0	23.0	17.2	14
DT60	36.0	21.0	-	-	15.0	20.0	18.0	24.0	25.0	27.0	34.0	30.0	25.0	20
DT62	19.0	12.0	-	-	8.0	9.0	6.0	9.0	8.0	12.5	17.5	16.0	11.7	8
DT63	29.0	22.0	-	-	13.0	15.0	15.0	20.0	18.0	24.0	26.0	25.0	20.7	16
DT64	23.0	16.0	-	-	9.0	10.0	8.0	-	19.5	14.5	22.5	20.0	15.8	11
DT65	28.0	18.0	-	-	-	10.0	9.0	12.0	13.0	17.0	34.0	23.0	18.2	14
DT66	35.0	27.0	-	-	11.0	10.0	10.0	14.0	15.0	21.0	32.0	27.0	20.2	16
DT67	32.0	29.0	-	-	18.0	25.0	21.0	27.0	24.0	33.0	30.0	33.0	27.2	21
DT70	19.3	14.3	-	-	8.7	12.3	7.3	12.0	13.7	15.7	19.3	20.3	14.3	10
DT71	13.7	8.5	-	-	6.3	10.0	-	8.7	10.7	12.3	13.0	-	10.4	7
DT72	-	7.3	-	-	5.0	6.0	5.0	5.0	6.0	8.3	9.7	10.7	7.0	5
DT73	51.0	37.0	-	-	23.0	30.0	30.0	37.0	33.0	39.0	44.0	41.0	36.5	29
DT74	34.0	29.0	-	-	20.0	28.0	23.0	21.0	29.0	37.0	35.0	35.0	29.1	23
DT75	19.3	13.3	-	-	12.3	12.0	11.3	12.3	16.0	19.7	20.3	26.3	16.3	12

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted (1)
DT77	51.0	39.0	-	-	19.0	26.0	23.0	30.0	30.0	36.0	43.0	50.0	34.7	27
DT78	17.0	14.0	-	-	12.0	15.0	11.0	18.0	15.0	19.0	26.0	23.0	17.0	13
DT79	-	24.0	-	-	11.0	14.0	11.0	16.0	15.0	20.0	-	23.0	16.8	14
DT80	22.0	18.0	-	-	11.0	15.0	10.0	14.0	11.0	22.0	22.0	36.0	18.1	14
DT81	32.0	32.0	-	-	15.0	17.0	11.0	14.0	13.0	19.0	29.0	19.0	20.1	16
DT82	54.0	50.5	-	-	28.0	36.5	30.5	39.0	36.5	44.0	48.5	-	40.8	32
DT83	35.0	28.0	-	-	14.0	17.0	15.0	17.0	15.0	28.0	27.0	22.0	21.8	17
DT84	24.0	14.0	-	-	9.0	15.0	10.0	14.0	24.0	18.0	18.0	18.0	16.4	13
DT85	19.0	11.7	-	-	10.3	15.0	8.0	14.7	13.0	19.0	17.3	20.0	14.8	11
DT86	25.0	16.0	-	-	10.0	12.0	11.0	18.0	17.0	20.0	21.0	-	16.7	13
DT88	50.0	52.0	-	-	26.0	26.0	28.0	27.0	33.0	36.0	47.0	40.0	36.5	29
DT89	36.0	47.0	-	-	20.0	11.0	21.0	14.0	24.0	31.0	40.0	34.0	27.8	20
DT90	-	-	-	-	-	-	-	-	-	25.0	25.0	26.0	25.3	20
DT91	-	-	-	-	-	-	-	-	-	37.0	57.0	43.0	45.7	36

Notes:

(1) See Appendix C for details on bias adjustment

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

New or Changed Sources Identified Within Aberdeen City Council During 2020

Aberdeen City Council has not identified any new sources relating to air quality within the reporting year of 2020.

Additional Air Quality Works Undertaken by Aberdeen City Council During 2020

Aberdeen City Council has not completed any additional works within the reporting year of 2020.

QA/QC of Diffusion Tube Monitoring

Diffusion tube monitoring is carried out in accordance with the procedures contained in the guidance 'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users' and LAQM.TG 16. All tubes, other than those co-located at the continuous analysers are attached to lampposts/downpipes at a height of approximately 2 meters above ground level and exposed for 4 to 5 weeks in line with the Defra calendar of exposure periods. Co-located tubes are in triplicate close to the analyser air intake. All exposure times are recorded. Unexposed field samples are submitted to the laboratory with each batch of exposed tubes.

Diffusion tubes are provided by Gradko International and analysed by Aberdeen City Council's Scientific Services Laboratory. The preparation technique is 20% tri-ethanolamine in water.

Aberdeen Scientific Services Laboratory is UKAS accredited for the analysis of diffusion tubes.

UKAS carried out an annual assessment of the laboratory in February 2021 to ensure laboratory guidance is being implemented. No problems were identified.

The laboratory participates in the Laboratory of the Government Chemist (LGC) AIR PT scheme. During 2020 (up to October), all results submitted were satisfactory (z-score < ±2). The rounds between May and August were cancelled due to the pandemic.

The laboratory also participates in the nitrogen dioxide "inter comparison" exercise, managed by the National Physical Laboratory. All results during 2020 were satisfactory and the annual summary (produced by AEA Energy & Environment) indicates that the results were classified as "Good" throughout 2020 with a "Bias Correction Factor A" of 0.75.

Triplicate and duplicate tube monitoring locations were assessed for precision and accuracy. Table C.4 details action taken for duplicate/triplicate tube results with poor precision. The action taken with duplicate/triplicate tubes with poor precision did not cause the annual mean to go above or below the annual mean objective level of 40 $\mu g/m^3$.

Diffusion Tube Annualisation

Annualisation of data was carried out in accordance with LAQM TG 16, where data capture was less than 75% but greater than 33% for the following diffusion tube locations in 2020:

- Diffusion Tube DT02
- Diffusion Tube DT12
- Diffusion Tube DT24
- Diffusion Tube DT28
- Diffusion Tube DT48
- Diffusion Tube DT71
- Diffusion Tube DT79

Diffusion tubes DT90 and DT91 were not annualised due to data capture for the year being less than 33%.

Two long term, urban background continuous monitoring sites, that form part of the national monitoring network have been used to carry out annualisation of the diffusion Tube sites in 2020:

- Aberdeen Erroll Place
- Dundee Mains Loan

Mains Loan is within a 55 mile radius of the monitoring locations in Aberdeen. There are no other background monitoring sites available. Valid data capture for Errol Place and Mains Loan is above 85% in 2020.

The DEFRA Diffusion Tube Data Processing Tool was used to calculate the annulisation factor. Results are summarised in Table C.2.

Diffusion Tube Bias Adjustment Factors

Aberdeen City Council have applied a local bias adjustment factor of 0.79 Roadside and 0.71 Urban Background to the 2020 monitoring data. A summary of bias adjustment factors used by Aberdeen City Council over the past five years is presented in Table C.1.

Aberdeen City Council operates a co-location study at all automatic monitoring sites across the city. All results are submitted to the national bias adjustment factors (NBAFS). The national diffusion tube bias adjustment factor spreadsheet version 3/21 advises to use 0.77 for Aberdeen City. Although the Aberdeen Scientific Services Laboratory undertakes the analysis of diffusion tubes from neighbouring authorities, Aberdeen City Council is the only authority with continuous monitoring stations that can be used to calculate bias adjustment factors. Accordingly, a locally derived bias factor based on the co-located tubes at all the Aberdeen continuous monitoring stations was used to adjust diffusion tube measurements at the other locations across the city. This process was considered appropriate due to the lack of other co-located studies using the laboratory for tube analysis, the remote location of Aberdeen from other conurbations and the good QA/QC performance of the laboratory.

Triplicate diffusion tubes are located adjacent to continuous monitor air analyser inlets. Tubes are exposed in 4 week periods throughout the year. Diffusion tubes are provided by Gradko International and analysed by Aberdeen City Council's Public Analyst. The preparation technique is 20% tri-ethanolamine in water.

In accordance with LAQM TG 16 the Local bias factor adjustment tool, downloaded from the DEFRA Local Air Quality Management website (AEA_DifTPAN_c04.xls), is used to calculate bias adjustment factors and the precision and accuracy of the triplicate co-located tubes. Table C.3 summarises the bias adjustment factors and

the AEA_DifTPAN_c04.xls records for each site. Only data with good precision has been used (coefficient of variation smaller than 20%).

Errol Place is an urban background site while the other sites are roadside.

LAQM TG 16 advises the value of a local co-location study (and the subsequent bias adjustment) will be improved if the concentrations being measured are similar to those in the wider survey. Therefore, separate bias adjustment has been derived for roadside and background.

In accordance with LAQM TG 16, Bias B values of all roadside continuous monitoring locations were averaged for the roadside locations and the inverse derived to obtain a bias adjustment factor of **0.79**. This provides a slightly greater conservative adjustment than the factor published by NBAFS. Table C.3a summarises the calculation.

A separate adjustment factor is derived for background sites using the Bias A, from Errol Place, of **0.71**.

Table C.1 – Bias Adjustment Factor

Report Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor Roadside	Adjustment Factor Background
2020	Local	-	0.79	0.71
2019	Local	-	0.80	0.79
2018	Local	-	0.78	0.78
2017	Local	-	0.86	0.79
2016	Local	-	0.86	0.79

NO_2 Fall-off with Distance from the Road

Distance correction should be considered at any monitoring site where the annual mean concentration is greater than 36µg/m^3 and the monitoring site is not located at a point of relevant exposure.

Diffusion tube monitoring sites not at point of exposure identified in Table A.2 recorded annual mean concentrations below 36µg/m^3 and therefore do require distance correction during 2020.

QA/QC of Automatic Monitoring

All equipment is subject to the QA/QC procedures recommended in LAQM.TG 16. Equipment is serviced at 6 monthly intervals. The contract includes call outs to site for repairs and the routine replacement of consumables. Local Site Operator duties are carried out by Aberdeen City Council Protective Services Officers.

The Errol Place, Union Street and Wellington Road sites are part of the UK's Automatic Urban Network. All sites are part of the Scottish Government data reporting process and subject to independent audit by Ricardo AEA (RAEA) at 6 monthly intervals. Data validation and ratification is also performed by RAEA.

The analysers perform daily automatic calibrations which are used to assess the routine performance of the analysers and any long term response drift. Manual calibrations are performed by trained Council officers every two weeks using a calibration mixture traceable to national standards. These calibrations act as a check on the operation of the analysers and enable determination of the instrument response factors used to calculate the concentration of NO_2.

Data is checked daily (Monday-Friday). Should a problem be identified either by Council officers or by RAEA the site is visited immediately and, if necessary, a further manual calibration is performed. Data considered suspect is deleted. Records are kept of instrument breakdowns, services and audits and any local activities or meteorological conditions that may influence readings.

Live and historical data is available at scottishairquality.scot

Historical data is also available at aberdeencity.gov.uk

PM_{10} and $PM_{2.5}$ Monitoring Adjustment

PM_{10} TEOM data at Anderson Drive is corrected to gravitational equivalent by RAEA using the Volatile Correction Model (VCM).

PM_{10} and $PM_{2.5}$ FDMS TEOM data at Union Street do not require correction.

FIDAS PM_{10} does not require correction.

FIDAS $PM_{2.5}$ is corrected using a factor of 0.943.

Automatic Monitoring Annualisation

Annualisation of data was carried out in accordance with LAQM TG 16 where there was insufficient data capture for the following locations:

- Union Street $PM_{2.5}$ and PM_{10}

Two long term, urban background continuous monitoring sites, that form part of the national monitoring network have been used to carry out annualisation of the diffusion tube sites in 2020:

- Aberdeen Erroll Place
- Dundee Mains Loan

Mains Loan is within a 55 mile radius of the monitoring locations in Aberdeen. There are no other background monitoring sites available. Valid data capture for Errol Place and Mains Loan is above 85% in 2020.

The average annualisation factor derived from Erroll Place and Mains Load PM2.5 data in 2020 was used to annualise the Union Street $PM_{2.5}$ and PM_{10} data.

Results are summarised in Table C.2.

NO_2 Fall-off with Distance from the Road

Distance correction should be considered at any automatic monitoring site where the annual mean concentration is greater than 36µg/m^3 and the monitoring site is not located at a point of relevant exposure.

No automatic NO_2 monitoring locations within Aberdeen City required distance correction during 2020. All roadside automatic monitoring sites not at point of exposure identified in Table A.2, recorded annual mean concentrations below 36µg/m^3 and therefore do require distance correction.

Erroll Place is an urban background site.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Erroll Place	Annualisation Factor Mains Loan Dundee	Annualisation Factor Site 3	Annualisation Factor Site 4	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
DT02	1.0487	1.2135	-	-	1.1311	33.3	37.7	
DT12	0.8504	0.8718	-	-	0.8611	38.3	32.9	
DT24	0.8318	0.8592	-	-	0.8455	21.0	17.8	
DT28	1.0605	1.1879	-	-	1.1242	24.8	27.9	
DT48	1.1259	1.1089	-	-	1.1174	21.3	23.8	
DT71	0.9022	0.9722	-	-	0.9372	10.4	9.7	
DT79	1.0677	1.0627	-	-	1.0652	16.8	17.8	
CM2	9.621	6.990	-	-	0.971	10.3	10.0	PM_{10} Annual mean
CM2	0.987	0.954			0.971	5.3	5.2	$PM_{2.5}$ Annual Mean

Table C.3 – Local Bias Adjustment Calculations

	Local Bias Adjustment Union St (CM2) Roadside	Local Bias Adjustment Market St (CM3) Roadside	Local Bias Adjustment Anderson Dr (CM4) Roadside	Local Bias Adjustment Wellington Rd (CM5) Roadside	Local Bias Adjustment King St (CM6) Roadside	Local Bias Adjustment Erroll Pl (CM1) Urban background
Periods used to calculate bias	12	12	9	12	12	10
Bias Factor A	0.8 (0.76 – 0.84)	0.74 (0.71 – 0.78)	0.76 (0.67 – 0.88)	0.82 (0.74 – 0.91)	0.82 (0.78 – 0.86)	0.71 (0.69 – 0.72)
Bias Factor B	25% (19% - 32%)	35% (29% - 41%)	31% (13% - 49%)	23% (10% - 35%)	22% (17% - 28%)	41% (38% - 44%)
Diffusion Tube Mean (µg/m^3)	31	30	16	32	20	21
Mean CV (Precision)	3%	5%	4%	6%	5%	5%
Automatic Mean (µg/m^3)	25.0	22.0	12.0	26	17	15
Data Capture	99%	100%	96%	100%	100%	98%
Adjusted Tube Mean (µg/m^3)	25 (23 – 26)	22 (21 – 23)	12 (11 – 14)	26 (24 – 29)	17 (17 – 17)	15 (14 – 15)

Notes:

A single local bias adjustment factor of 0.71 has been used to bias adjust the 2020 urban background diffusion tube results.

A combined local bias adjustment factor of 0.79 has been used to bias adjust the 2020 road side diffusion tube results. Calculation in Table C.3a

Local Bias Adjustment Union Street precision and accuracy record

AEA Energy & Environment

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
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	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	16/12/2019	16/01/2020	40.0	41.0	43.0	41	1.5	4	3.8	33	100.00	Good	Good
2	16/01/2020	11/02/2020	44.0	44.0	45.0	44	0.6	1	1.4	41.6	99.36	Good	Good
3	11/02/2020	09/03/2020	42.0	37.0	50.0	43	6.6	15	16.3	36.2	99.69	Good	Good
4	09/03/2020	06/04/2020	33.0	33.0	33.0	33	0.0	0	0.0	24	100.00	Good	Good
5	06/04/2020	04/05/2020								20.2	93.45		Good
6	04/05/2020	02/06/2020	20.0	20.0	20.0	20	0.0	0	0.0	16.4	100.00	Good	Good
7	02/06/2020	29/06/2020	20.0	20.0	20.0	20	0.0	0	0.0	15.5	99.85	Good	Good
8	29/06/2020	28/07/2020	22.0	22.0	22.0	22	0.0	0	0.0	15.8	99.86	Good	Good
9	28/07/2020	24/08/2020	26.0	26.0	26.0	26	0.0	0	0.0	19	88.72	Good	Good
10	24/08/2020	21/09/2020	24.0	25.0	25.0	25	0.6	2	1.4	17.6	95.98	Good	Good
11	21/09/2020	21/10/2020	31.0	28.0	33.0	31	2.5	8	6.3	25.2	99.86	Good	Good
12	21/10/2020	17/11/2020	29.0	29.0	31.0	30	1.2	4	2.9	22.9	100.00	Good	Good
13	17/11/2020	16/12/2019	34.0	37.0	34.0	35	1.7	5	4.3	27.4	99.85	Good	Good

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

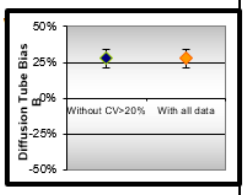
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Union St

Precision: 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.8 (0.76 - 0.84)
Bias B	25% (19% - 32%)
Diffusion Tubes Mean:	31 µgm^{-3}
Mean CV (Precision):	3
Automatic Mean:	25 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	25 (23 - 26) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.8 (0.76 - 0.84)
Bias B	25% (19% - 32%)
Diffusion Tubes Mean:	31 µgm^{-3}
Mean CV (Precision):	3
Automatic Mean:	25 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	25 (23 - 26) µgm^{-3}



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Local Bias Adjustment Market Street precision and accuracy record

AEA Energy & Environment

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
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	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	17/12/2019	14/01/2020	30.0	30.0	28.0	29	1.2	4	2.9	23.4	99.85	Good	Good
2	14/01/2020	12/02/2020	34.0	36.0	36.0	35	1.2	3	2.9	29.2	99.86	Good	Good
3	12/02/2020	13/03/2020	26.0	30.0	25.0	27	2.6	10	6.6	21.7	99.58	Good	Good
4	13/03/2020	08/04/2020	28.0	26.0	28.0	27	1.2	4	2.9	19.5	99.84	Good	Good
5	08/04/2020	05/05/2020								24.6	100.00		Good
6	05/05/2020	05/06/2020	24.0	23.0	23.0	23	0.6	2	1.4	17.3	99.87	Good	Good
7	05/06/2020	30/06/2020	35.0	36.0	40.0	37	2.6	7	6.6	26	99.83	Good	Good
8	30/06/2020	29/07/2020	25.0	25.0	25.0	25	0.0	0	0.0	16.7	99.86	Good	Good
9	29/07/2020	26/08/2020	37.0	38.0	35.0	37	1.5	4	3.8	24.4	99.55	Good	Good
10	26/08/2020	23/09/2020	24.0	22.0	24.0	23	1.2	5	2.9	16.3	100.00	Good	Good
11	23/09/2020	21/10/2020	35.0	37.0	34.0	35	1.5	4	3.8	27.1	99.85	Good	Good
12	21/10/2020	19/11/2020	27.0	28.0	28.0	28	0.6	2	1.4	19.5	97.41	Good	Good
13	19/11/2020	17/12/2019	32.0	37.0	33.0	34	2.6	8	6.6	26.4	99.20	Good	Good

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

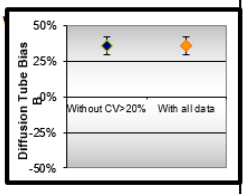
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Market Street

Precision: 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.74 (0.71 - 0.78)
Bias B	35% (29% - 41%)
Diffusion Tubes Mean:	30 µgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	22 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	22 (21 - 23) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.74 (0.71 - 0.78)
Bias B	35% (29% - 41%)
Diffusion Tubes Mean:	30 µgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	22 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	22 (21 - 23) µgm^{-3}



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Local Bias Adjustment Anderson Drive precision and accuracy record

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	18/12/2019	13/01/2020	11.0	15.0	15.0	14	2.3	17	5.7
2	13/01/2020	11/02/2020	19.0	17.0	19.0	18	1.2	6	2.9
3	11/02/2020	11/03/2020	11.0	11.0	11.0	11	0.0	0	0.0
4	11/03/2020	07/04/2020	14.0	14.0	15.0	14	0.6	4	1.4
5	07/04/2020	07/05/2020							
6	07/05/2020	02/06/2020	11.0	11.0	12.0	11	0.6	5	1.4
7	02/06/2020	29/06/2020	24.0	24.0	23.0	24	0.6	2	1.4
8	29/06/2020	28/07/2020	12.0	13.0	12.0	12	0.6	5	1.4
9	28/07/2020	26/08/2020	18.0	18.0	17.0	18	0.6	3	1.4
10	26/08/2020	21/09/2020	12.0	13.0	12.0	12	0.6	5	1.4
11	21/09/2020	20/10/2020	22.0	23.0	21.0	22	1.0	5	2.5
12	20/10/2020	17/11/2020	13.0	14.0	13.0	13	0.6	4	1.4
13	17/11/2020	15/12/2020	18.0	18.0	20.0	19	1.2	6	2.9

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
0	0	Good	or Data Capture
18	39	Good	or Data Capture
12	95	Good	Good
11	95	Good	Good
11	96		Good
9	96	Good	Good
16	96	Good	Good
8	96	Good	Good
10	95	Good	Good
8	96	Good	Good
18	98	Good	Good
10	71	Good	or Data Capture
16	96	Good	Good
Overall survey -->		Good precision	Poor Overall DC

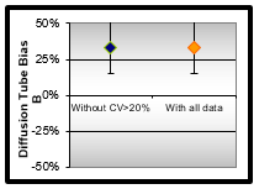
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Anderson Dr

Precision 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 9 periods of data
Bias factor A 0.76 (0.67 - 0.88)
Bias B 31% (13% - 49%)
Diffusion Tubes Mean: 16 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 12 µgm^{-3}
Data Capture for periods used: 96%
Adjusted Tubes Mean: 12 (11 - 14) µgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 9 periods of data
Bias factor A 0.76 (0.67 - 0.88)
Bias B 31% (13% - 49%)
Diffusion Tubes Mean: 16 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 12 µgm^{-3}
Data Capture for periods used: 96%
Adjusted Tubes Mean: 12 (11 - 14) µgm^{-3}



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Local Bias Adjustment Wellington Road precision and accuracy record

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	18/12/2019	14/01/2020	28.0	30.0	30.0	29	1.2	4	2.9
2	14/01/2020	11/02/2020	36.0	38.0	33.0	36	2.5	7	6.3
3	11/02/2020	13/03/2020	30.0	30.0	29.0	30	0.6	2	1.4
4	13/03/2020	08/04/2020	26.0	29.0		28	2.1	8	19.1
5	08/04/2020	05/05/2020							
6	05/05/2020	02/06/2020	24.0	23.0	27.0	25	2.1	8	5.2
7	02/06/2020	01/07/2020	38.0	36.0	37.0	37	1.0	3	2.5
8	01/07/2020	31/07/2020	31.0	26.0	25.0	27	3.2	12	8.0
9	31/07/2020	27/08/2020	34.0	34.0	38.0	35	2.3	7	5.7
10	27/08/2020	22/09/2020	27.0	28.0		28	0.7	3	6.4
11	22/09/2020	21/10/2020	46.0	41.0	43.0	43	2.5	6	6.3
12	21/10/2020	17/11/2020	35.0	33.0	29.0	32	3.1	9	7.6
13	17/11/2020	18/12/2019	33.0	34.0	34.0	34	0.6	2	1.4

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
25.9	99.85	Good	Good
32.5	99.70	Good	Good
25.5	98.52	Good	Good
21.8	100.00	Good	Good
22.9	99.84		Good
18.1	99.85	Good	Good
27.6	99.85	Good	Good
27.6	100.00	Good	Good
20.9	99.72	Good	Good
25.8	99.69	Good	Good
30.6	100.00	Good	Good
25.8	100.00	Good	Good
30.4	100.00	Good	Good
Overall survey -->		Good precision	Good Overall DC

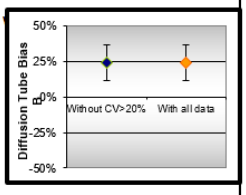
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Wellington Road

Precision 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 12 periods of data
Bias factor A 0.82 (0.74 - 0.91)
Bias B 23% (10% - 35%)
Diffusion Tubes Mean: 32 µgm^{-3}
Mean CV (Precision): 6
Automatic Mean: 26 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 26 (24 - 29) µgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A 0.82 (0.74 - 0.91)
Bias B 23% (10% - 35%)
Diffusion Tubes Mean: 32 µgm^{-3}
Mean CV (Precision): 6
Automatic Mean: 26 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 26 (24 - 29) µgm^{-3}



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Local Bias Adjustment King Street precision and accuracy record

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
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	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	17/12/2019	15/01/2020	30.0	26.0	28.0	28	2.0	7	5.0	23.40	100.00	Good	Good
2	15/01/2020	11/02/2020	35.0	33.0	33.0	34	1.2	3	2.9	27.90	99.69	Good	Good
3	11/02/2020	13/03/2020	23.0	23.0	21.0	22	1.2	5	2.9	19.50	99.33	Good	Good
4	13/03/2020	07/04/2020	18.0	16.0	15.0	16	1.5	9	3.8	11.80	99.83	Good	Good
5	07/04/2020	05/05/2020								11.30	100.00		Good
6	05/05/2020	04/06/2020	13.0	13.0	13.0	13	0.0	0	0.0	10.30	99.86	Good	Good
7	04/06/2020	30/06/2020	15.0	14.0	13.0	14	1.0	7	2.5	10.30	99.68	Good	Good
8	30/06/2020	30/07/2020	12.0	13.0	15.0	13	1.5	11	3.8	10.70	100.00	Good	Good
9	30/07/2020	24/08/2020	15.0	16.0	16.0	16	0.6	4	1.4	12.30	99.67	Good	Good
10	24/08/2020	23/09/2020	16.0	16.0	16.0	16	0.0	0	0.0	12.70	99.44	Good	Good
11	23/09/2020	21/10/2020	20.0	19.0	18.0	19	1.0	5	2.5	15.00	100.00	Good	Good
12	21/10/2020	19/11/2020	24.0	24.0	24.0	24	0.0	0	0.0	19.30	96.69	Good	Good
13	19/11/2020	17/12/2019	29.0	27.0	26.0	27	1.5	6	3.8	25.60	100.00	Good	Good
										Overall survey -->		Good precision	Good Overall DC

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

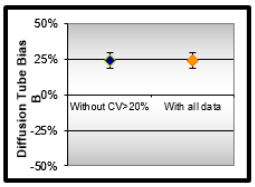
Site Name/ ID:	King Street

Precision: 12 out of 12 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%	
Bias calculated using 12 periods of data	
Bias factor A	0.82 (0.78 - 0.86)
Bias B	22% (17% - 28%)
Diffusion Tubes Mean:	20 µgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	17 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	17 (16 - 17) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.82 (0.78 - 0.86)
Bias B	22% (17% - 28%)
Diffusion Tubes Mean:	20 µgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	17 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	17 (16 - 17) µgm^{-3}



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Version 04 - February 2011

Local Bias Adjustment Erroll Place precision and accuracy record

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
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	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	17/12/2019	17/01/2020	31.0	29.0	31.0	30	1.2	4	2.9	20.3	99.87	Good	Good
2	17/01/2020	10/02/2020	35.0	35.0	32.0	34	1.7	5	4.3	23.5	99.83	Good	Good
3	10/02/2020	10/03/2020	24.0	24.0	21.0	23	1.7	8	4.3	17	99.43	Good	Good
4	10/03/2020	06/04/2020	10.0	18.0	17.0	15	4.4	29	10.8	10.5	99.38	Poor Precision	Good
5	06/04/2020	04/05/2020								9.7	99.40		Good
6	04/05/2020	02/06/2020	12.0	12.0	12.0	12	0.0	0	0.0	8.7	99.14	Good	Good
7	02/06/2020	29/06/2020	11.0	12.0	10.0	11	1.0	9	2.5	8	100.00	Good	Good
8	29/06/2020	28/07/2020	12.0	12.0	11.0	12	0.6	5	1.4	8.4	96.41	Good	Good
9	28/07/2020	24/08/2020	14.0	15.0	14.0	14	0.6	4	1.4	10.2	99.54	Good	Good
10	24/08/2020	21/09/2020	15.0	15.0	14.0	15	0.6	4	1.4	10.4	96.57	Good	Good
11	21/09/2020	20/10/2020	16.0	16.0	16.0	16	0.0	0	0.0	12.1	51.72	Good	or Data Capture
12	20/10/2020	17/11/2020	25.0	27.0	27.0	26	1.2	4	2.9	18.8	89.15	Good	Good
13	17/11/2020	15/12/2020	30.0	30.0	28.0	29	1.2	4	2.9	21	98.96	Good	Good
										Overall survey -->		Good precision	Good Overall DC

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

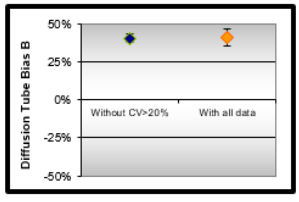
Site Name/ ID:	Erroll Pl

Precision: 11 out of 12 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%	
Bias calculated using 10 periods of data	
Bias factor A	0.71 (0.69 - 0.72)
Bias B	41% (38% - 44%)
Diffusion Tubes Mean:	21 µgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	15 µgm^{-3}
Data Capture for periods used:	98%
Adjusted Tubes Mean:	15 (14 - 15) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	0.71 (0.68 - 0.74)
Bias B	41% (36% - 47%)
Diffusion Tubes Mean:	20 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	14 µgm^{-3}
Data Capture for periods used:	98%
Adjusted Tubes Mean:	14 (14 - 15) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Table C.4a – Combined local bias adjustment factor calculation

Automatic roadside monitoring site	Bias B (%)
Anderson Drive	31
King Street	22
Market Street	35
Union Street	25
Wellington Road	23
Mean Bias B	27.2
Factor + 1	1.272
Inverse	**0.79**

Note

Calculation in accordance with LAQM TG16 Chapter 7

Table C.5 – Adjustment of Duplicate/Triplicate Tubes

Diffusion Tube Measurements									Data Quality Check	Action
Tube ID	Monitoring Period 2020	Tube 1 µgm-3	Tube 2 µgm-3	Tube 3 µgm-3	Triplicate Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check	Tube Adjustment
DT9	February	48.0	34.0	-	41.0	9.90	24.1	88.94	Poor Precision	Excluded from study
DT10	February	43.0	5.0	-	24.0	26.87	112.0	241.42	Poor Precision	Tube 1 included in study. Tube 2 excluded as outlier
DT18	February	36.0	51.0	-	43.5	10.61	24.4	95.30	Poor Precision	Excluded from study
DT36	September	39.0	22.0	-	30.5	12.02	39.4	108.00	Poor Precision	Excluded from study
DT64	September	12.0	7.0	-	9.5	3.54	37.2	31.77	Poor Precision	Excluded from study
DT71	July	5.0	5.0	8.0	6.0	1.73	28.9	4.30	Poor Precision	Excluded from study
DT72	February	10.0	10.0	5.0	8.3	2.89	34.6	7.17	Poor Precision	Excluded from study

Diffusion Tube Measurements									Data Quality Check	Action
Tube ID	Monitoring Period 2020	Tube 1 µgm-3	Tube 2 µgm-3	Tube 3 µgm-3	Triplicate Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check	Tube Adjustment
DT82	February	5.0	54.0	-	29.5	34.65	117.5	311.30	Poor Precision	Tube 2 included in study. Tube 1 excluded as outlier

Appendix D: Supporting Information Charts

Figure 1: Trend in NO2 Annual Mean Concentration (µg/m3) Continuous Monitoring Sites 2016 – 2020

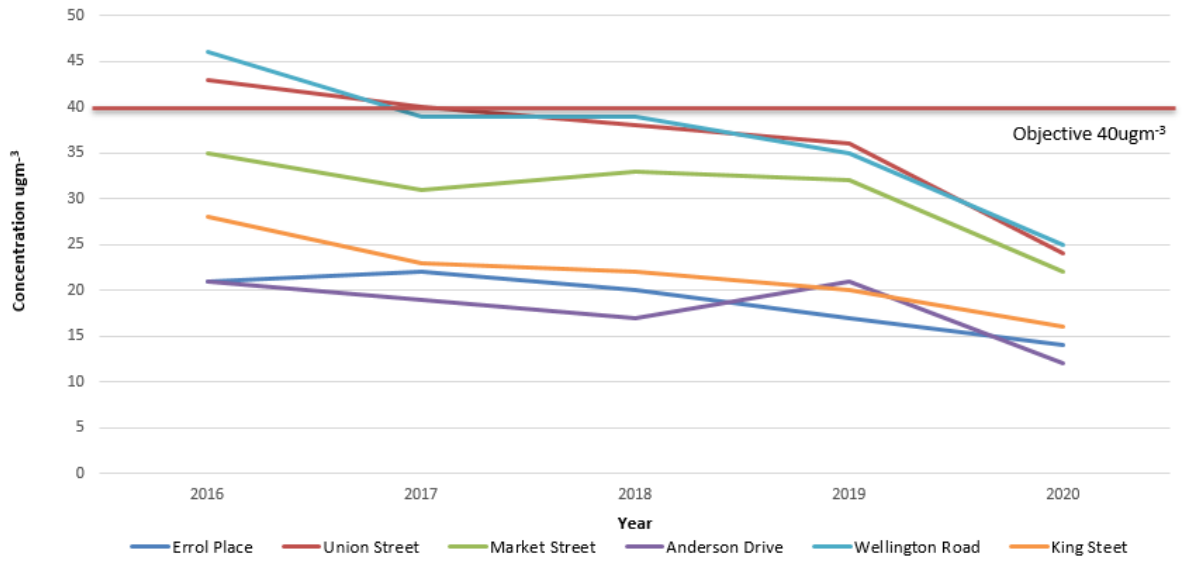


Figure 2: Trend in NO_2 Annual Mean Concentration (µg/m^3) at each Continuous Monitoring Sites 2016 – 2020

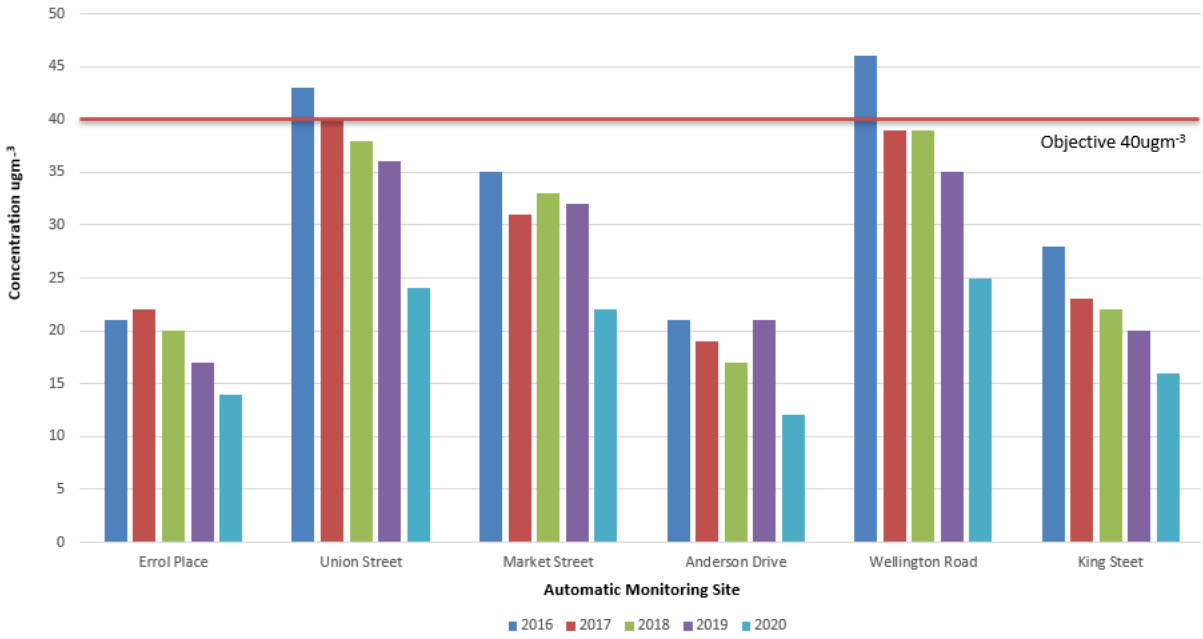
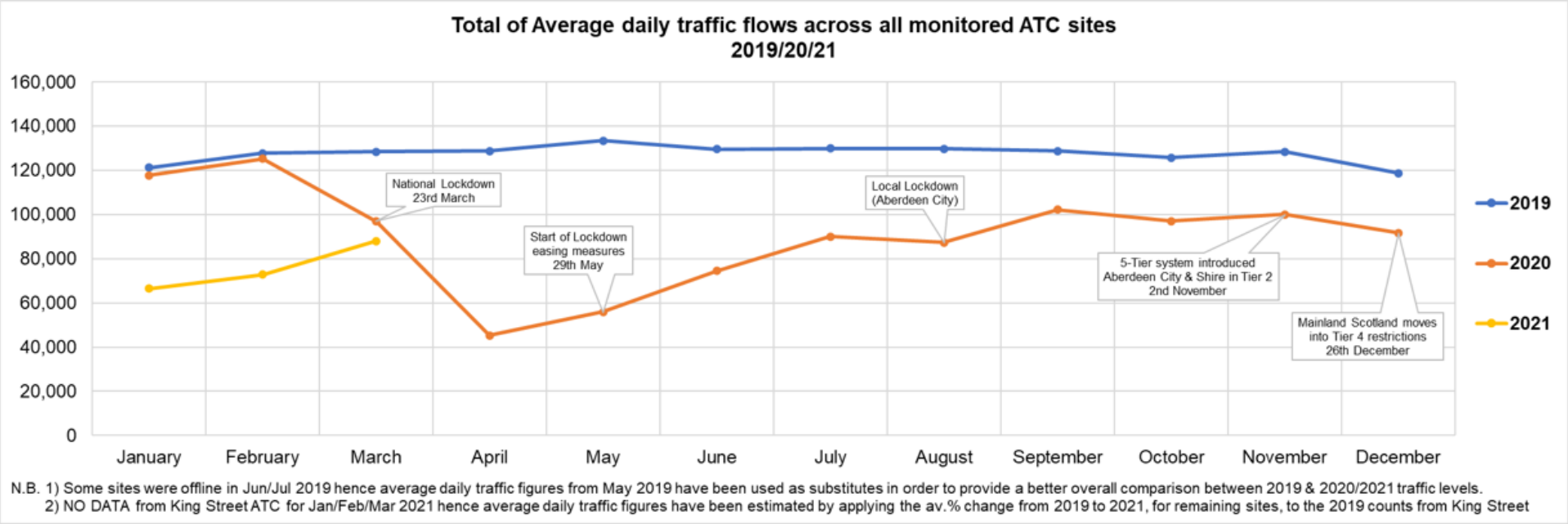


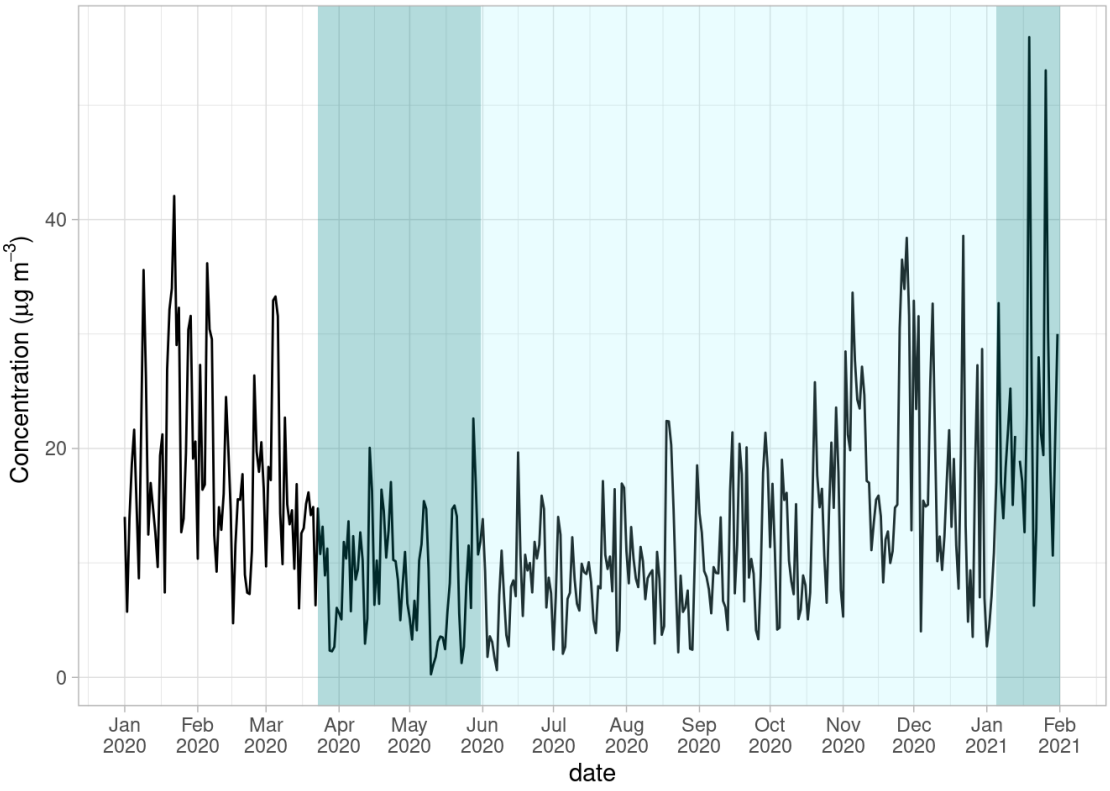
Figure 3: Average daily traffic flows from January 2019 to March 2021



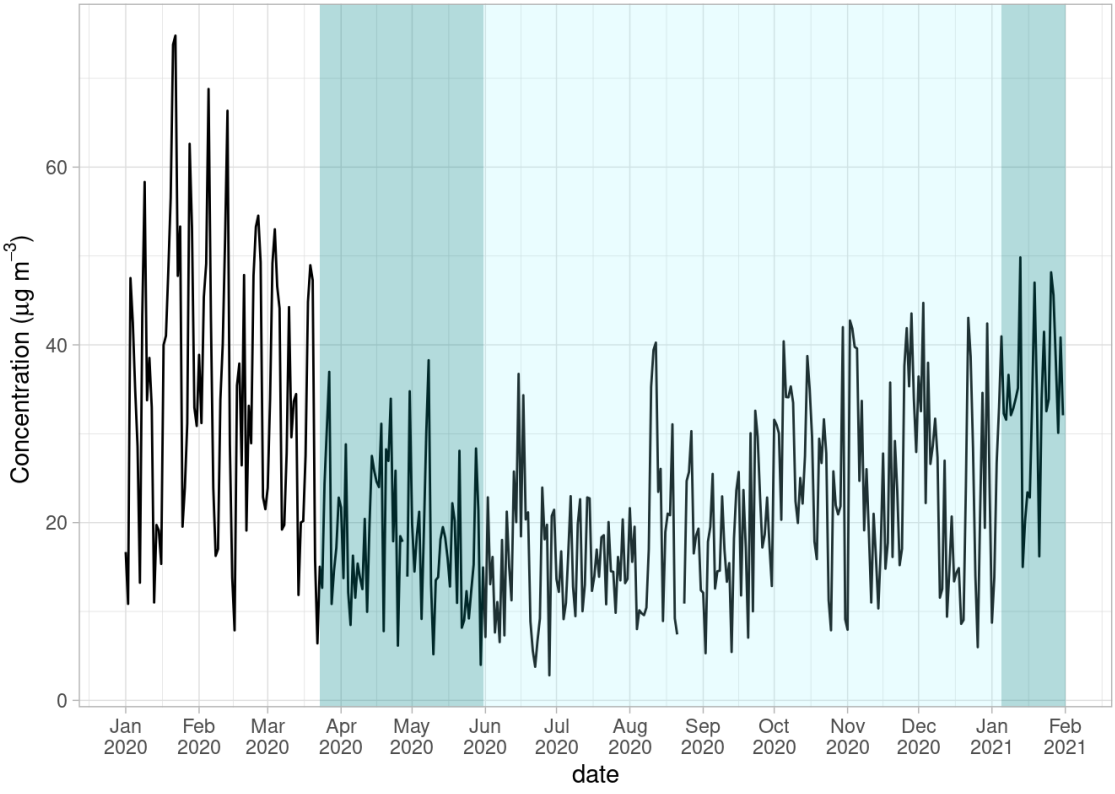
N.B. 1) Some sites were offline in Jun/Jul 2019 hence average daily traffic figures from May 2019 have been used as substitutes in order to provide a better overall comparison between 2019 & 2020/2021 traffic levels.
2) NO DATA from King Street ATC for Jan/Feb/Mar 2021 hence average daily traffic figures have been estimated by applying the av.% change from 2019 to 2021, for remaining sites, to the 2019 counts from King Street

Figure 4: Time Series – NO_2 Daily concentrations 2020

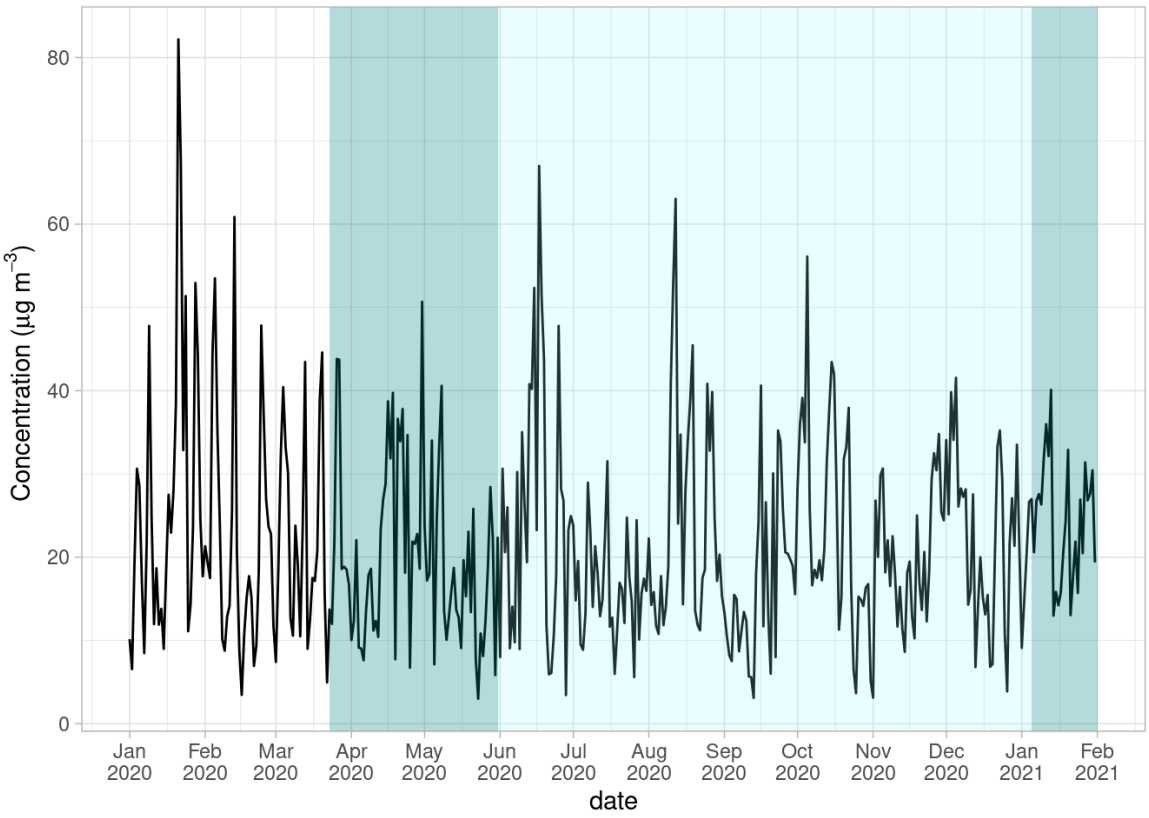
Erroll Place (Source:Ricardo Energy & Environment)



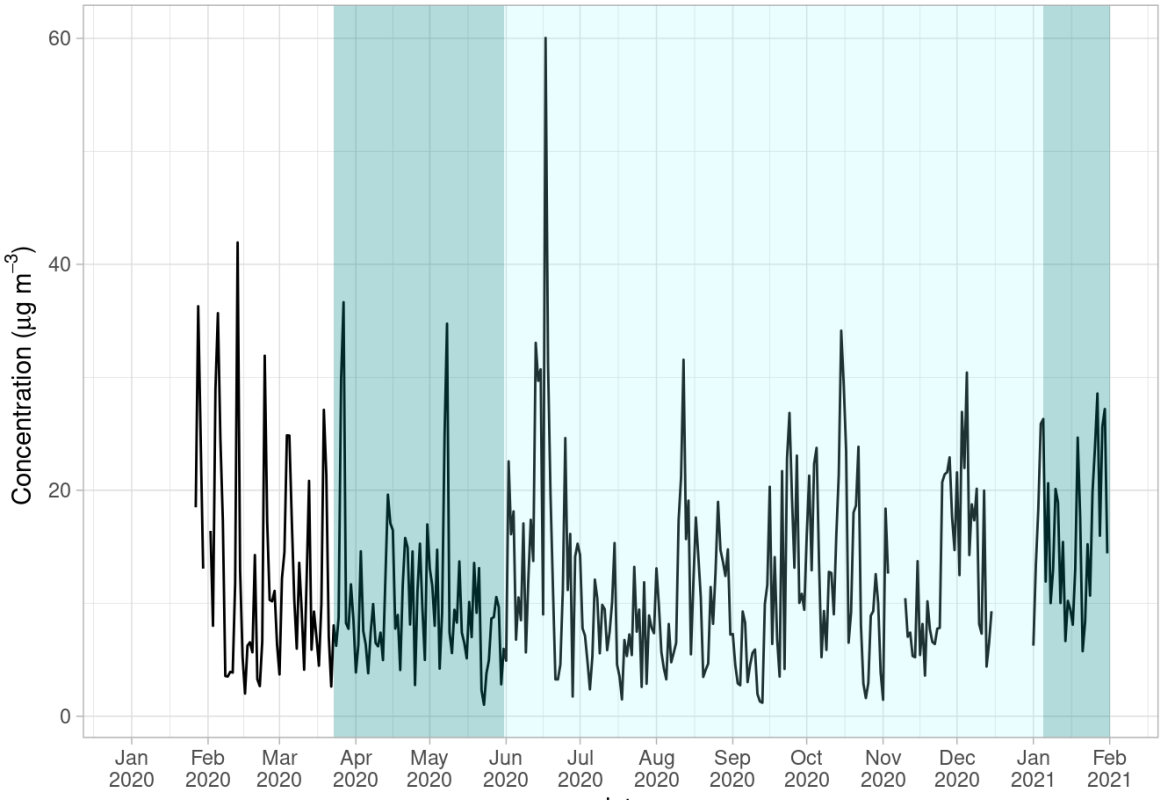
Union Street (Source:Ricardo Energy & Environment)



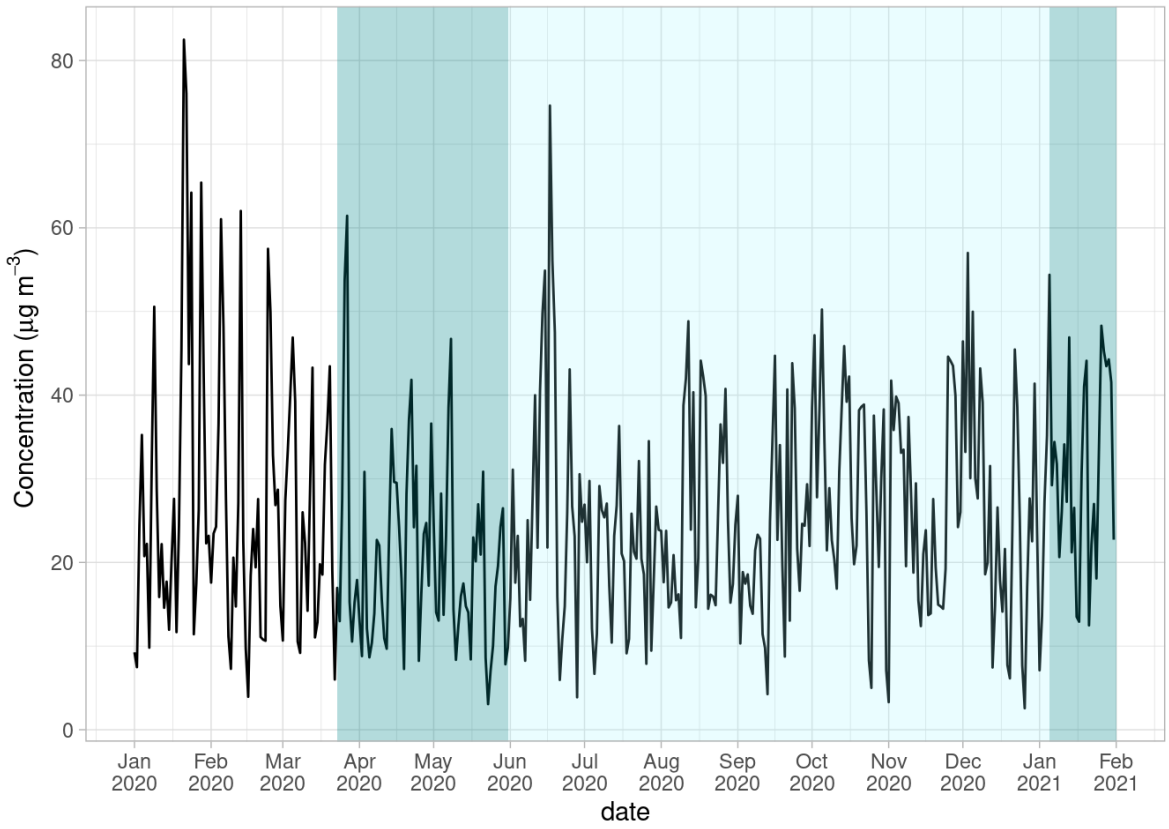
Market Street (Source:Ricardo Energy & Environment)



Anderson Drive (Source:Ricardo Energy & Environment)



Wellington Road (Source:Ricardo Energy & Environment)



King Street (Source:Ricardo Energy & Environment)

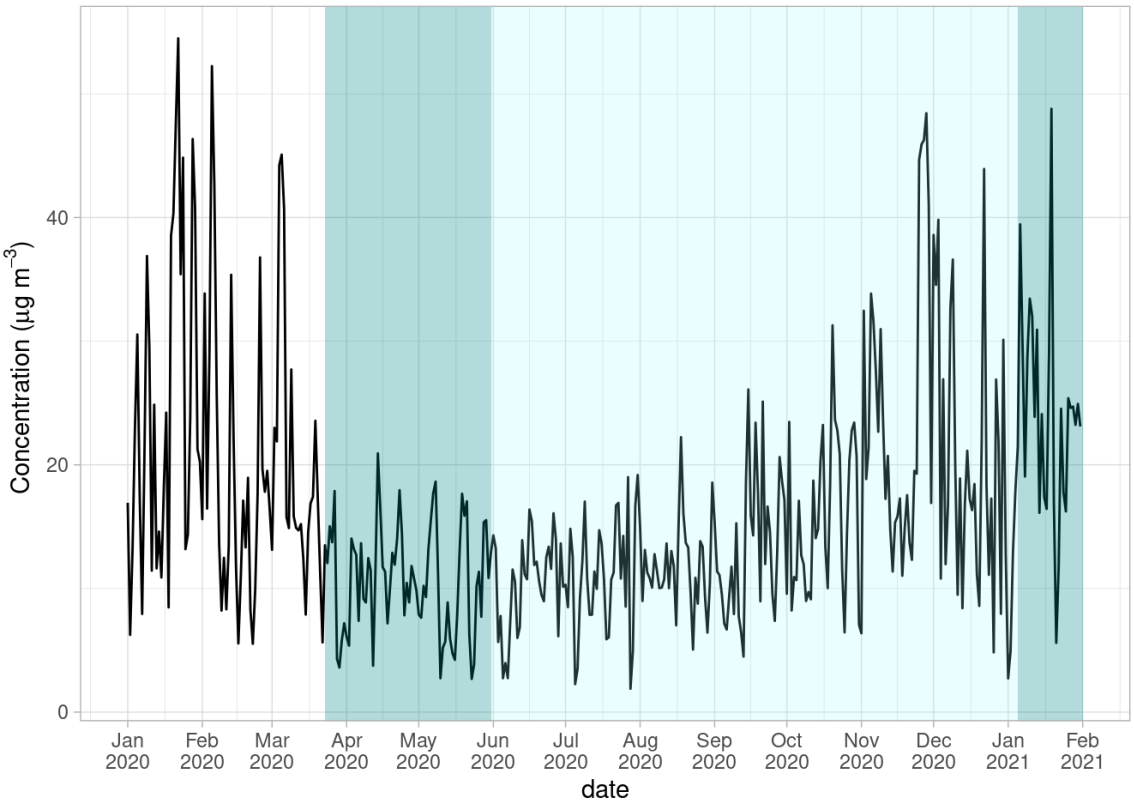
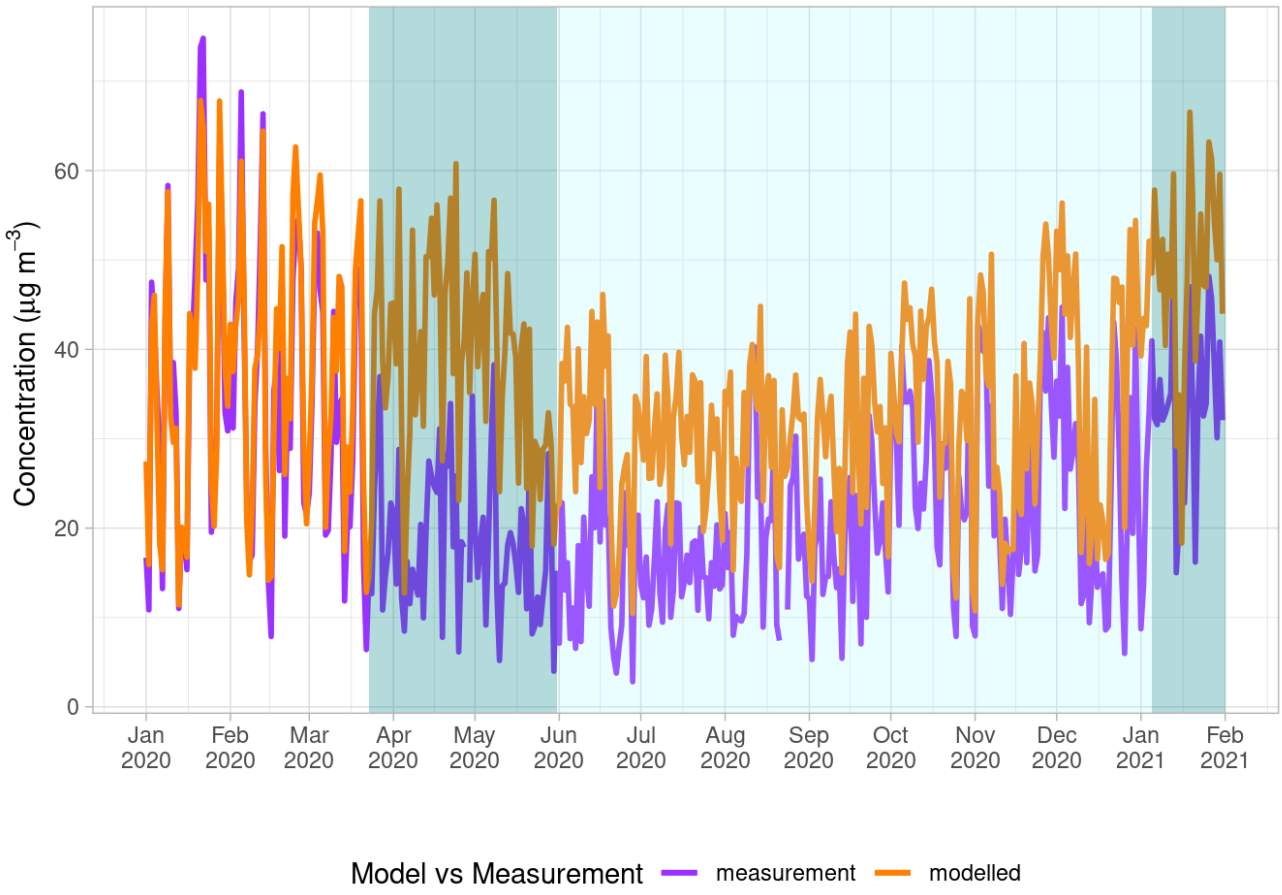
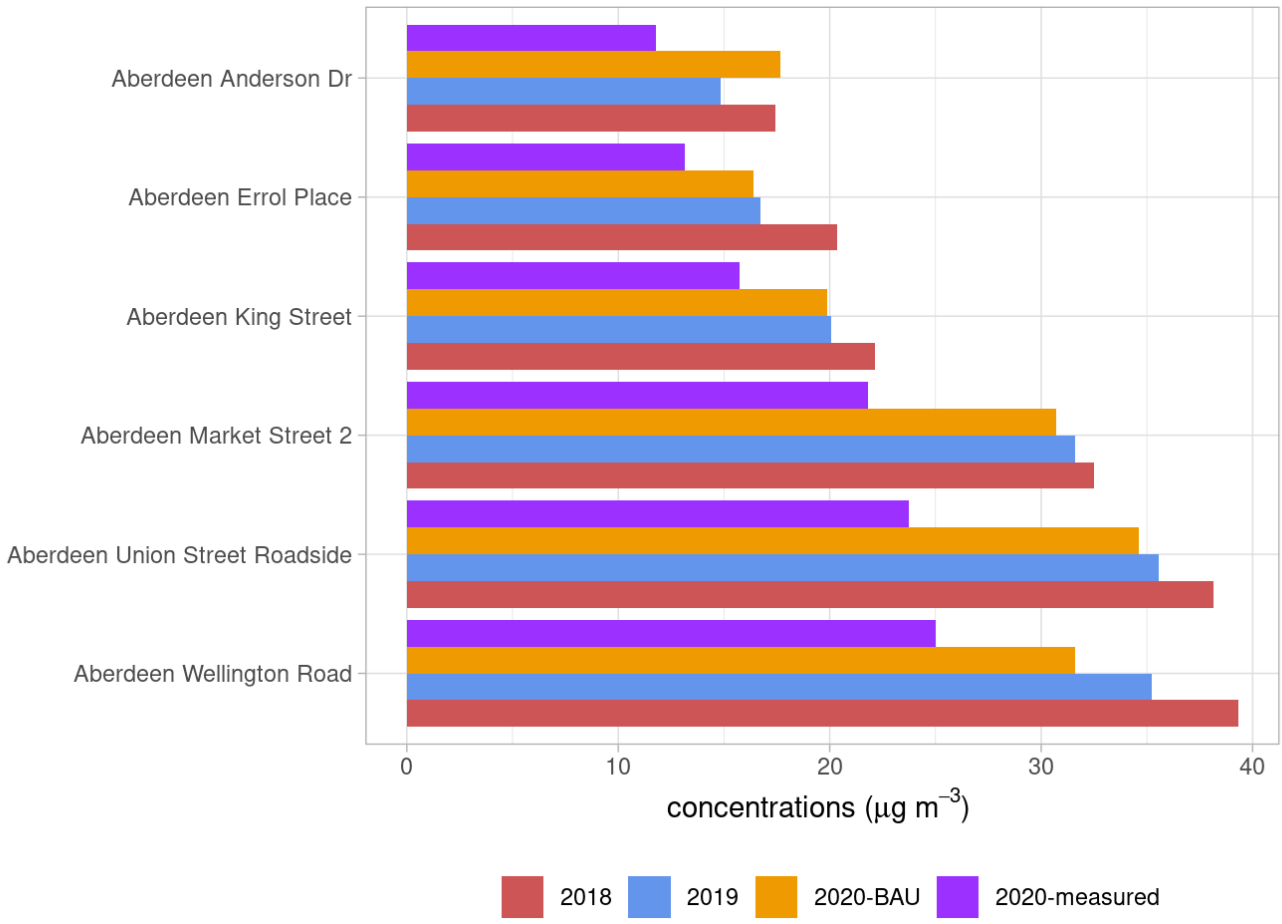


Figure 5: Simulated normal NO_2 concentrations Union Street 2020



(Source: Ricardo Energy & Environment)

Figure 6: Annual Average NO2 concentrations since 2018 with measured and modelled 2020 levels



(Source: Ricardo Energy & Environment)

Figure 7: Trend in PM_{10} Annual Mean Concentration (µg/m3) Continuous Monitoring Sites 2016 – 2020

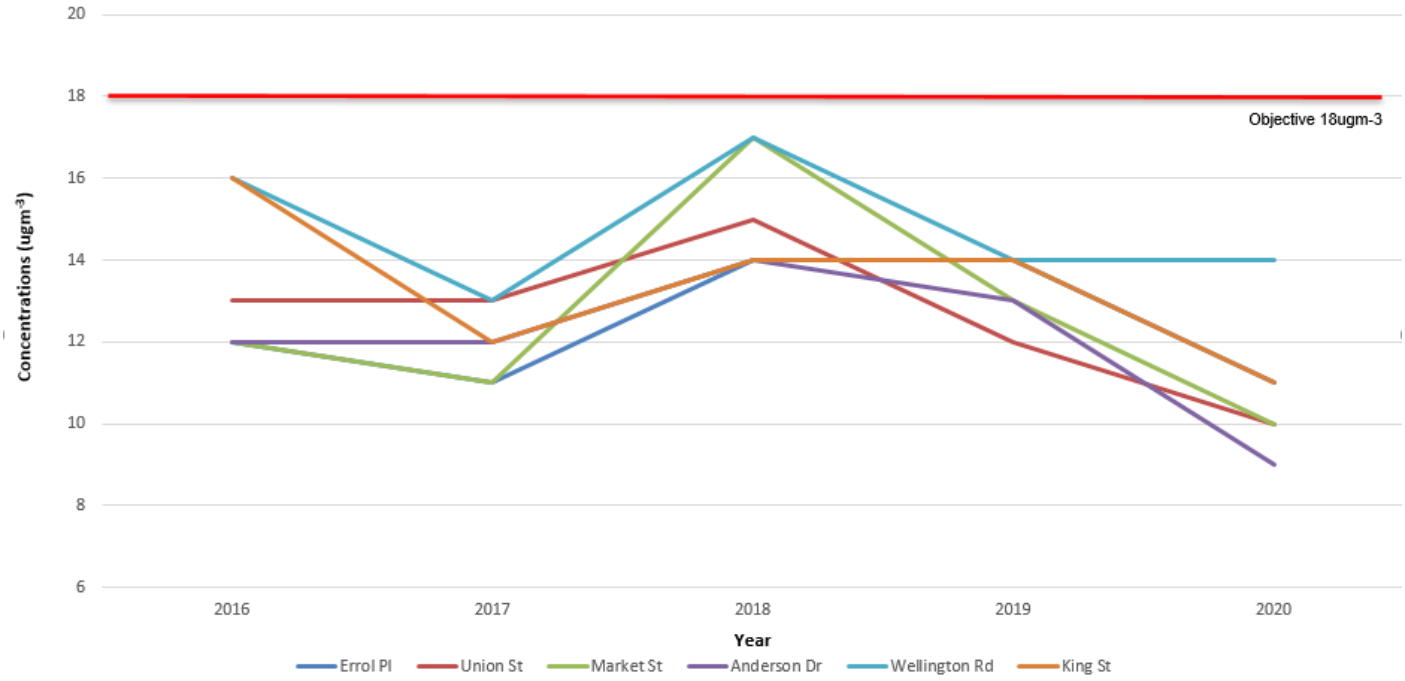
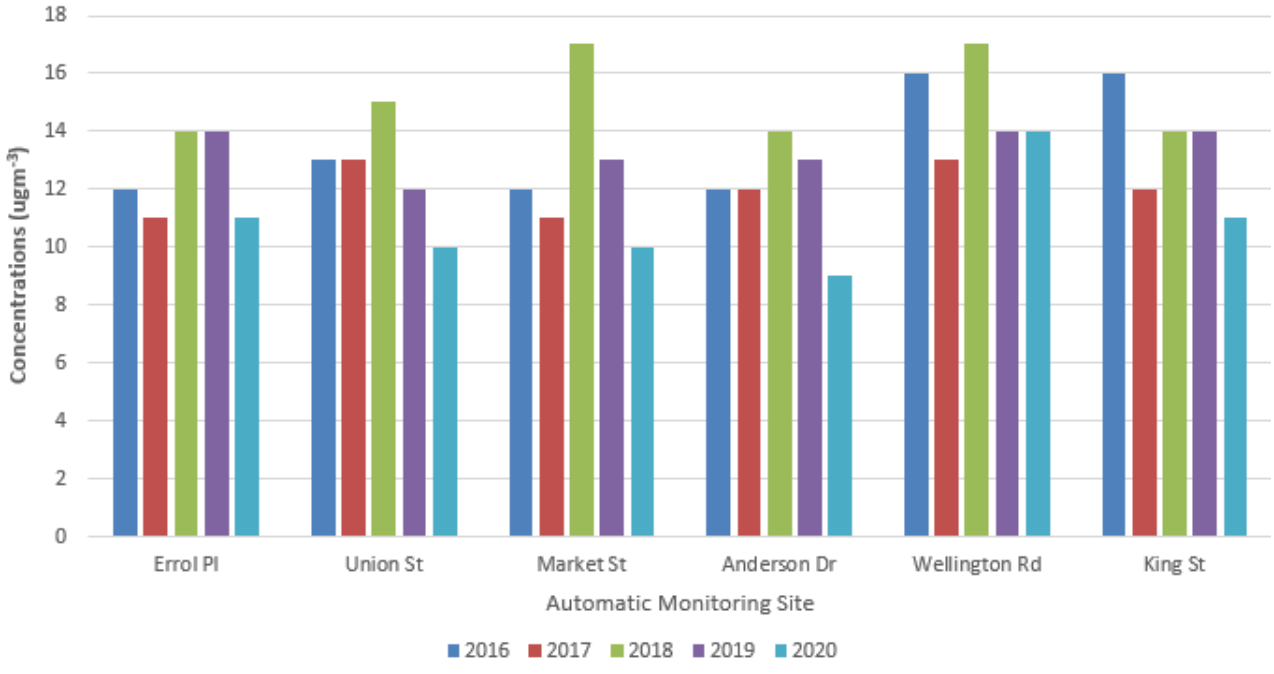


Figure 8: Trend in PM_{10} Annual Mean Concentration (µg/m3) at each Continuous Monitoring Site 2016 – 2020



Appendix E: Monitoring Locations

Figure 9: Aberdeen City AQMAs and Automatic Monitoring Locations

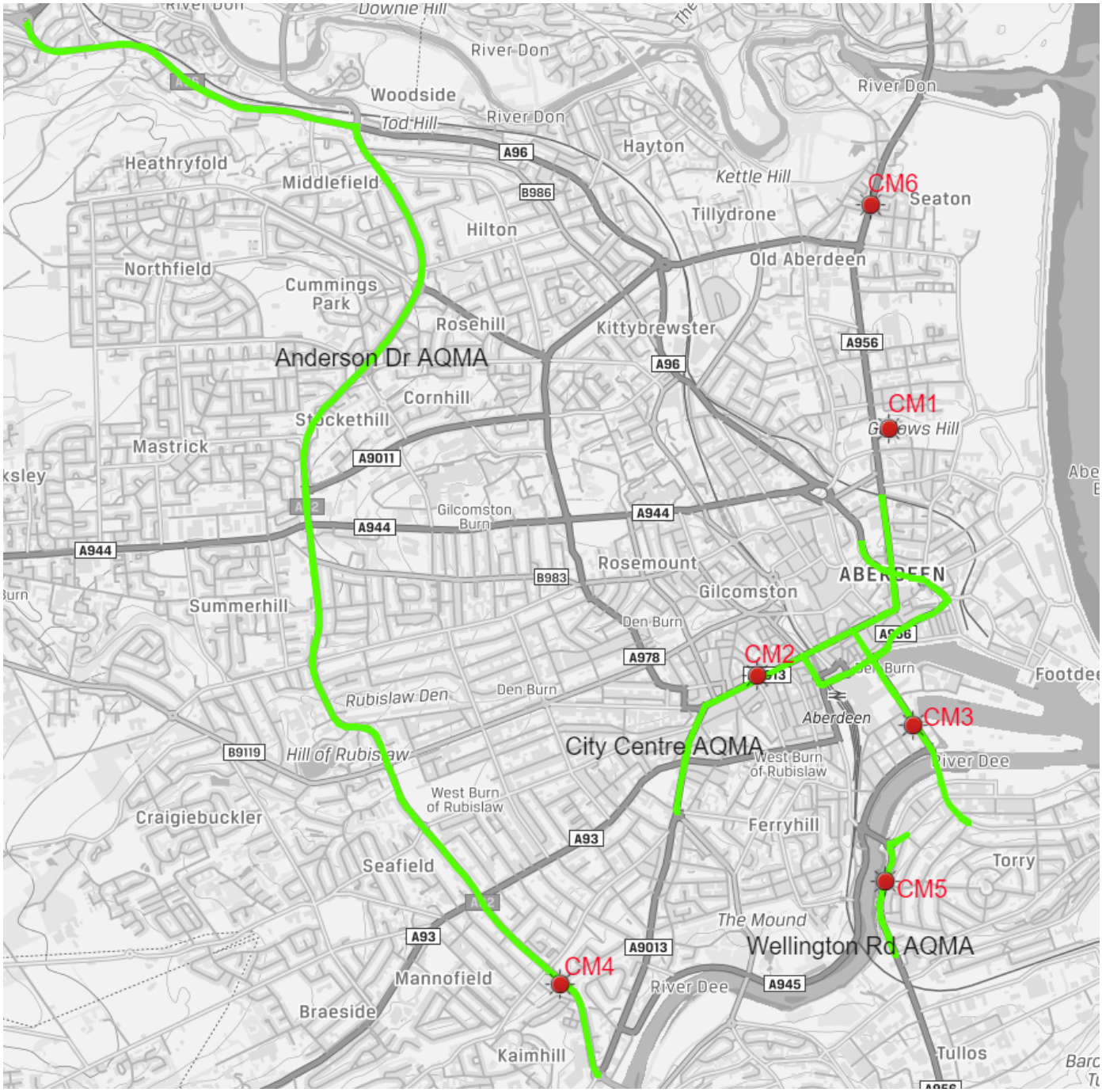


Figure 10: Diffusion tube locations across Aberdeen City

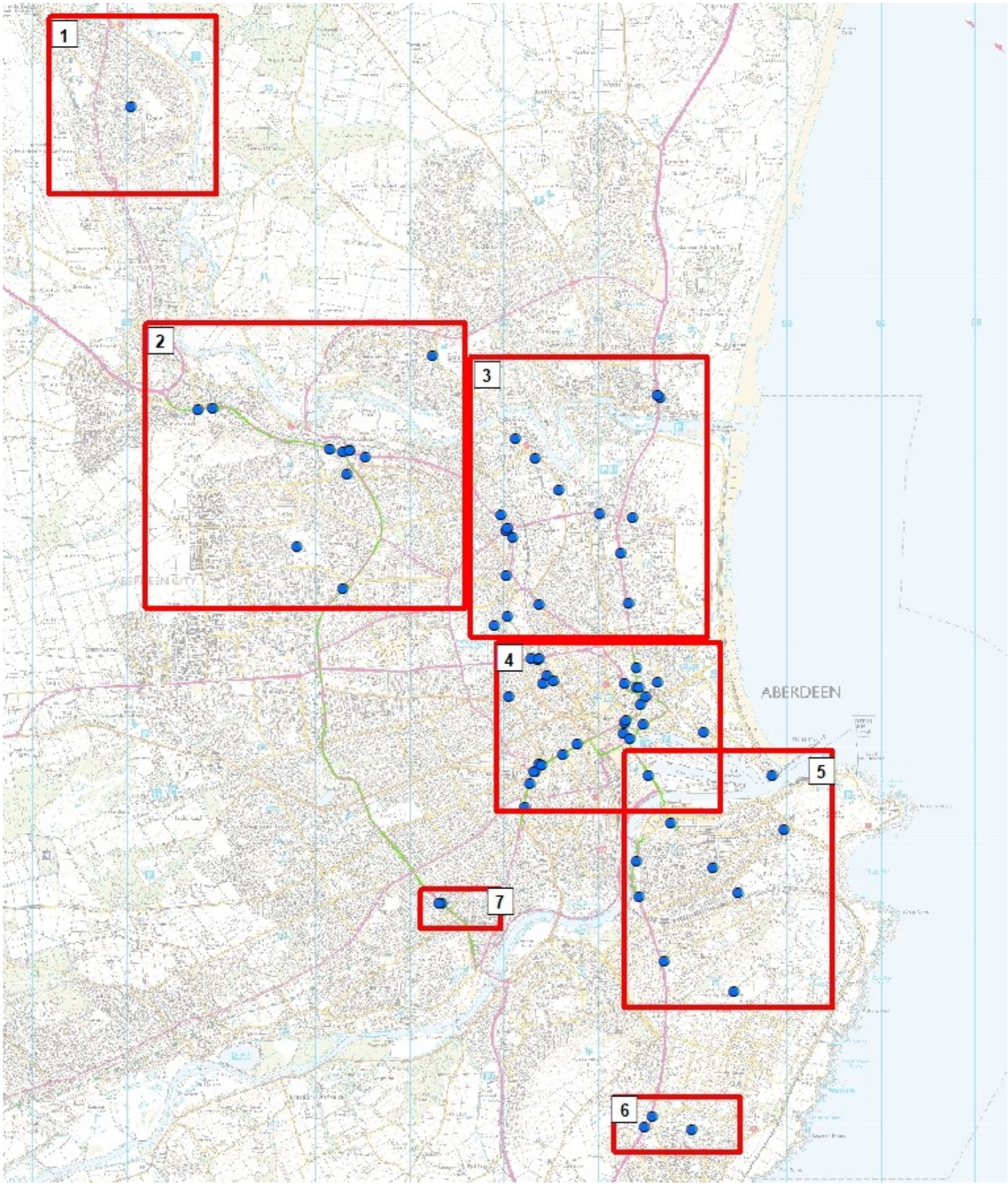


Figure 11: Plate 1 Diffusion tube location Dyce

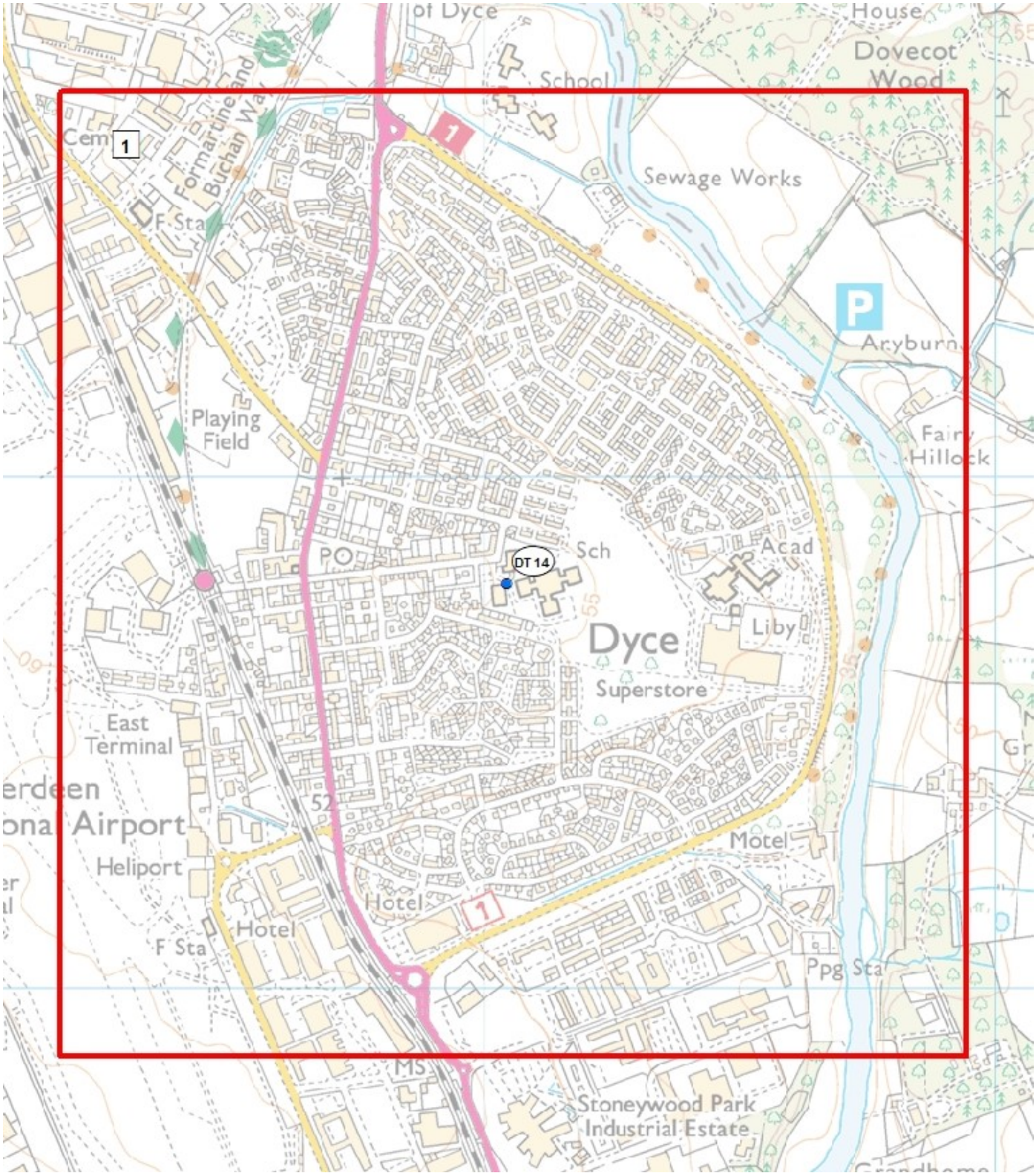


Figure 12: Plate 2 Diffusion tube locations

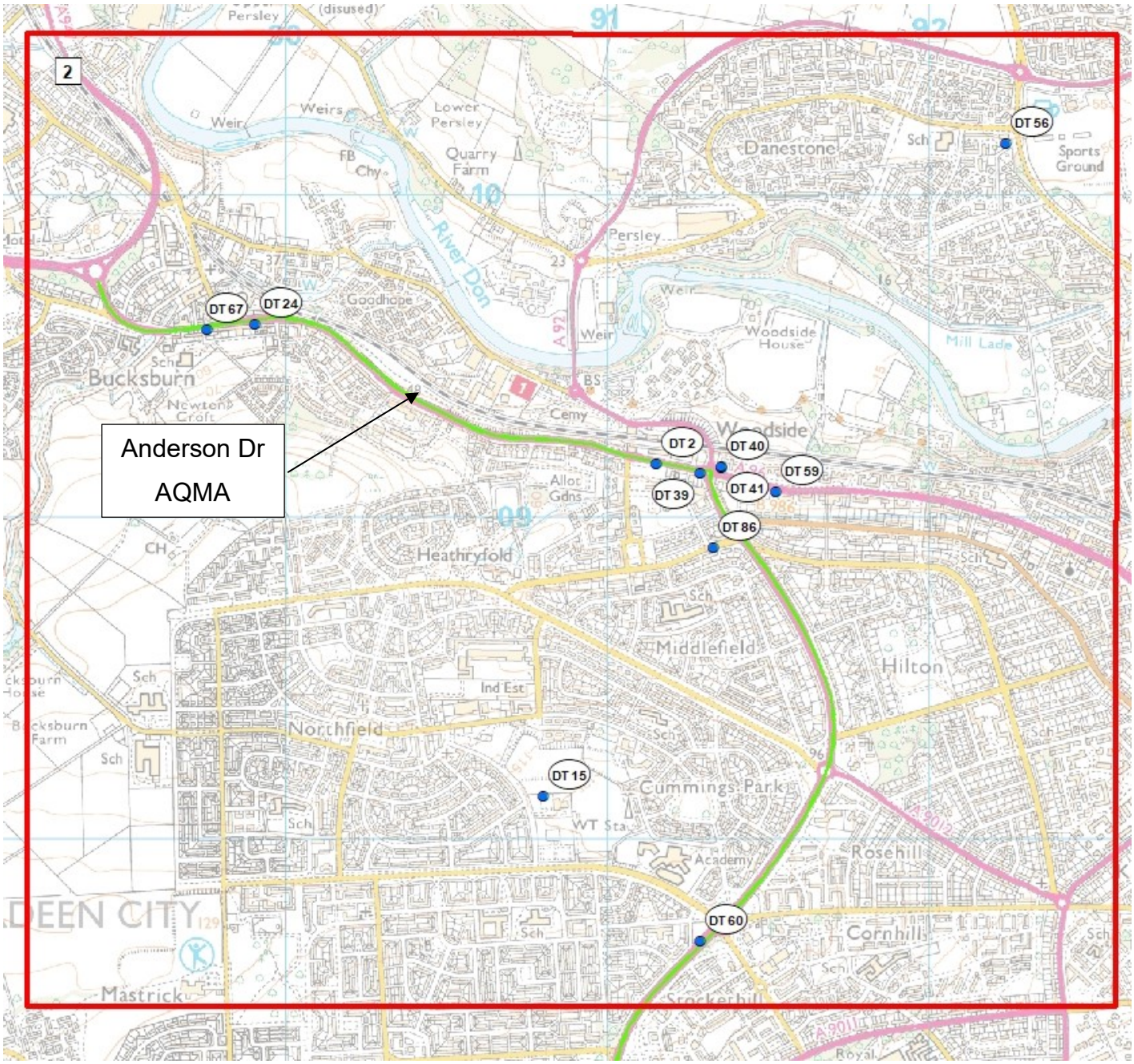


Figure 13: Plate 3 Diffusion tube locations

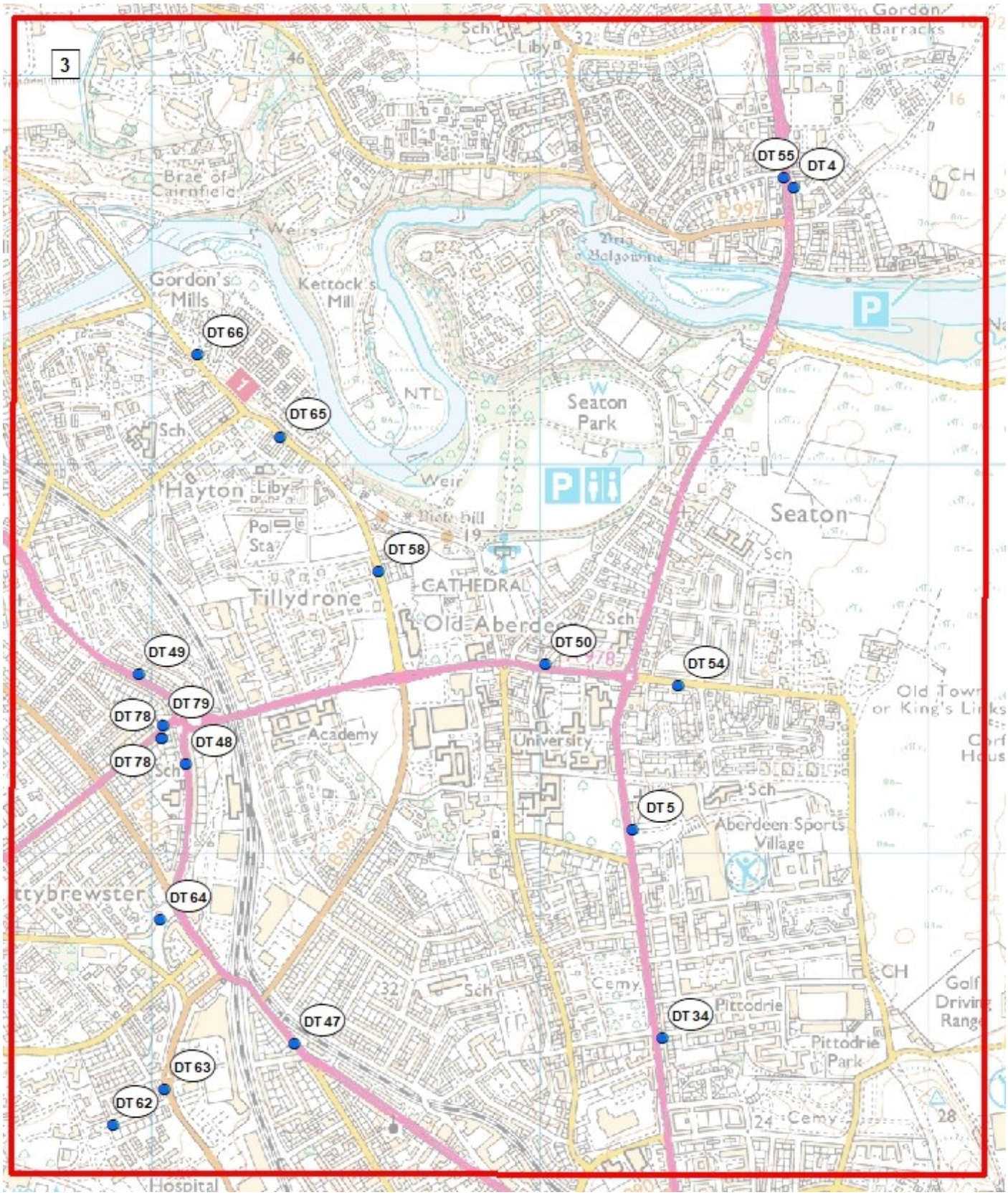


Figure 14: Plate 4 Diffusion tube locations

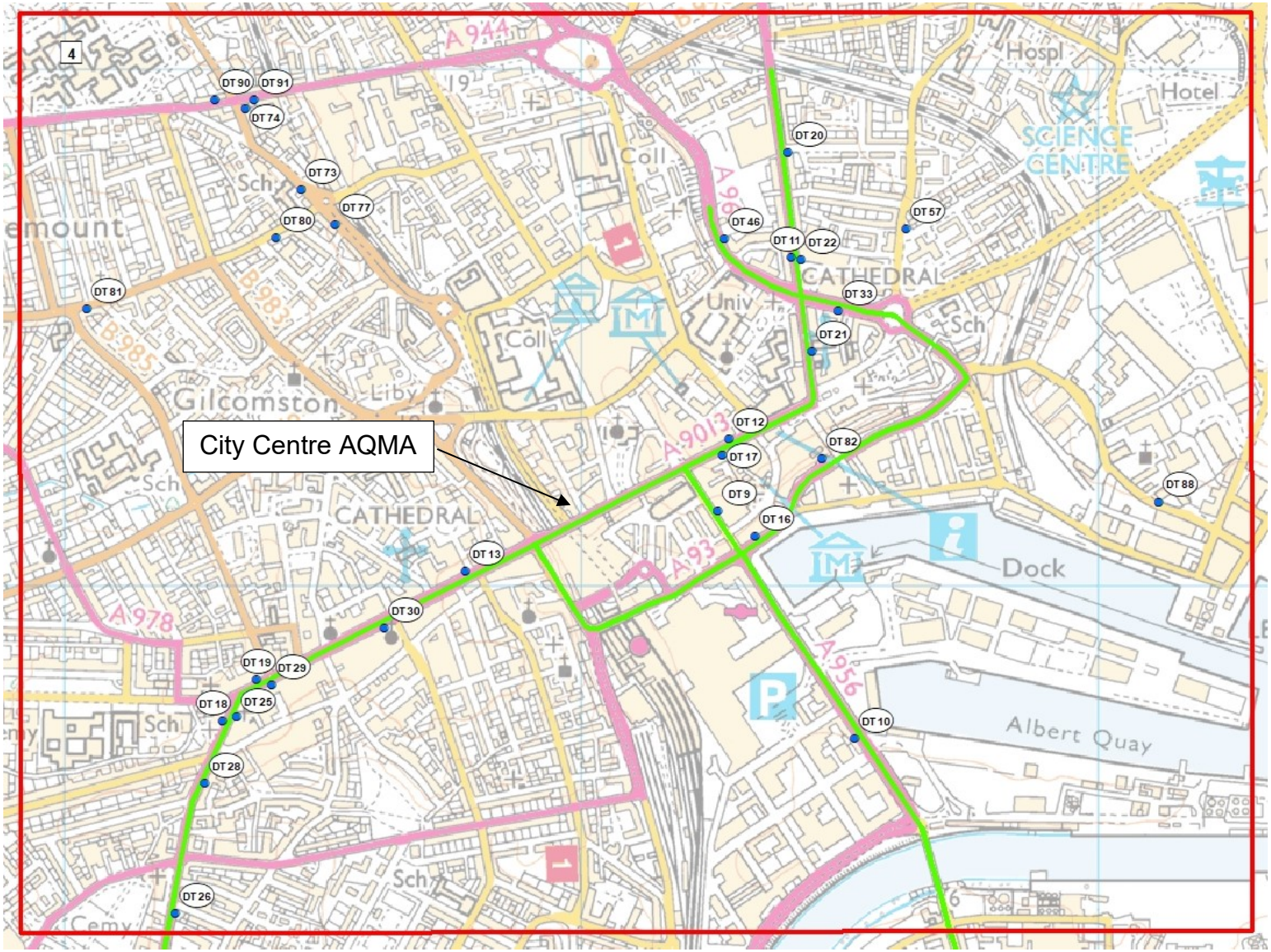


Figure 15: Plate 5 Diffusion tube locations

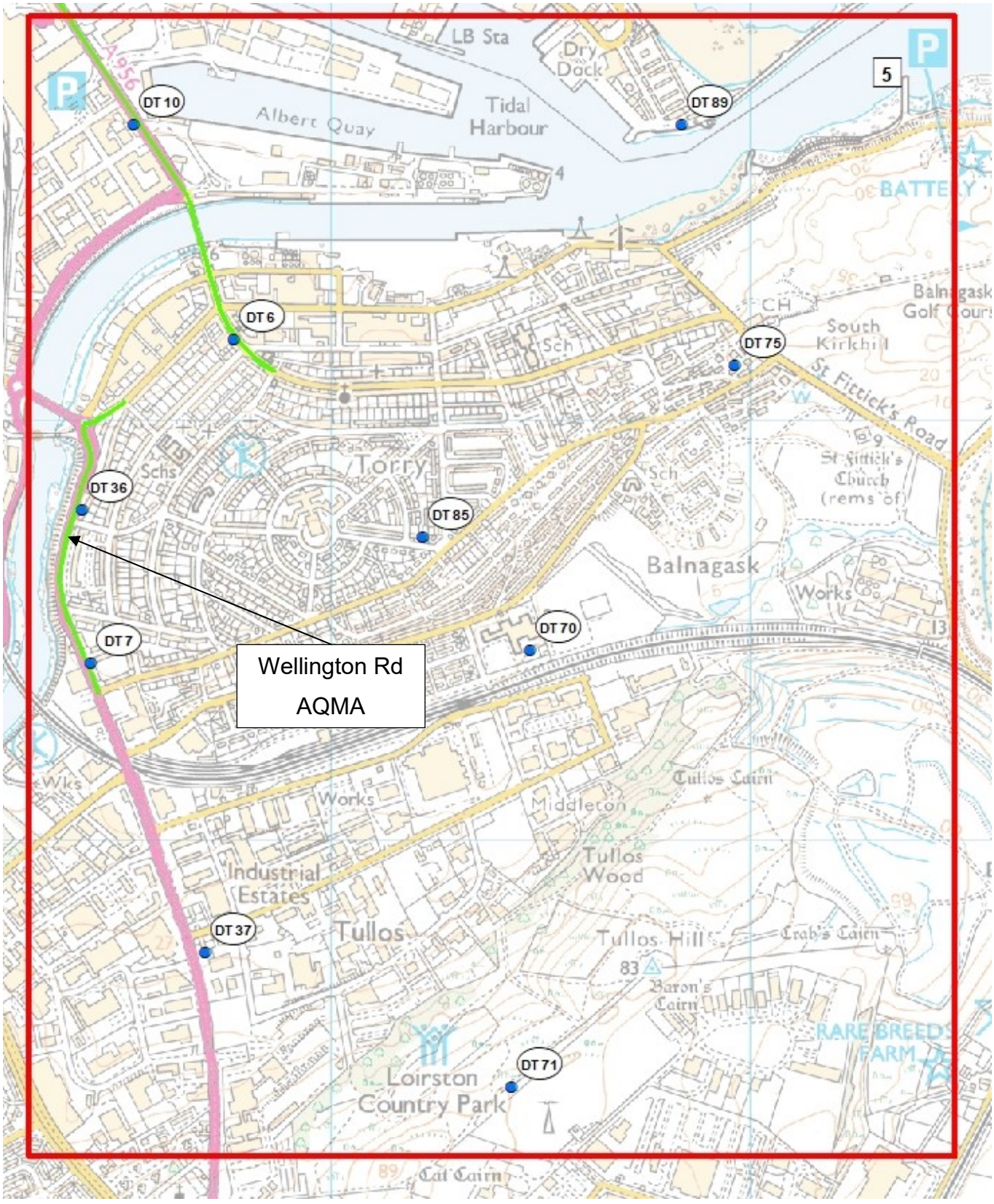


Figure 16: Plate 6 Diffusion tube locations

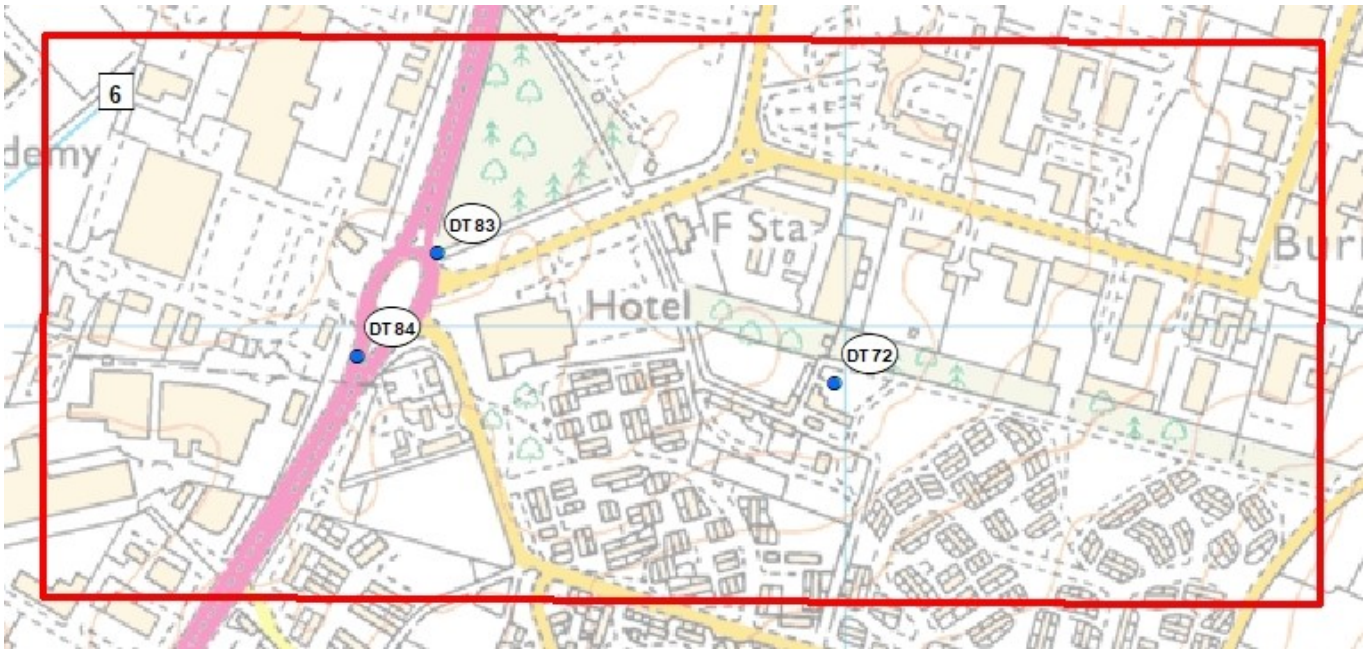


Figure 17: Plate 7 Diffusion tube locations

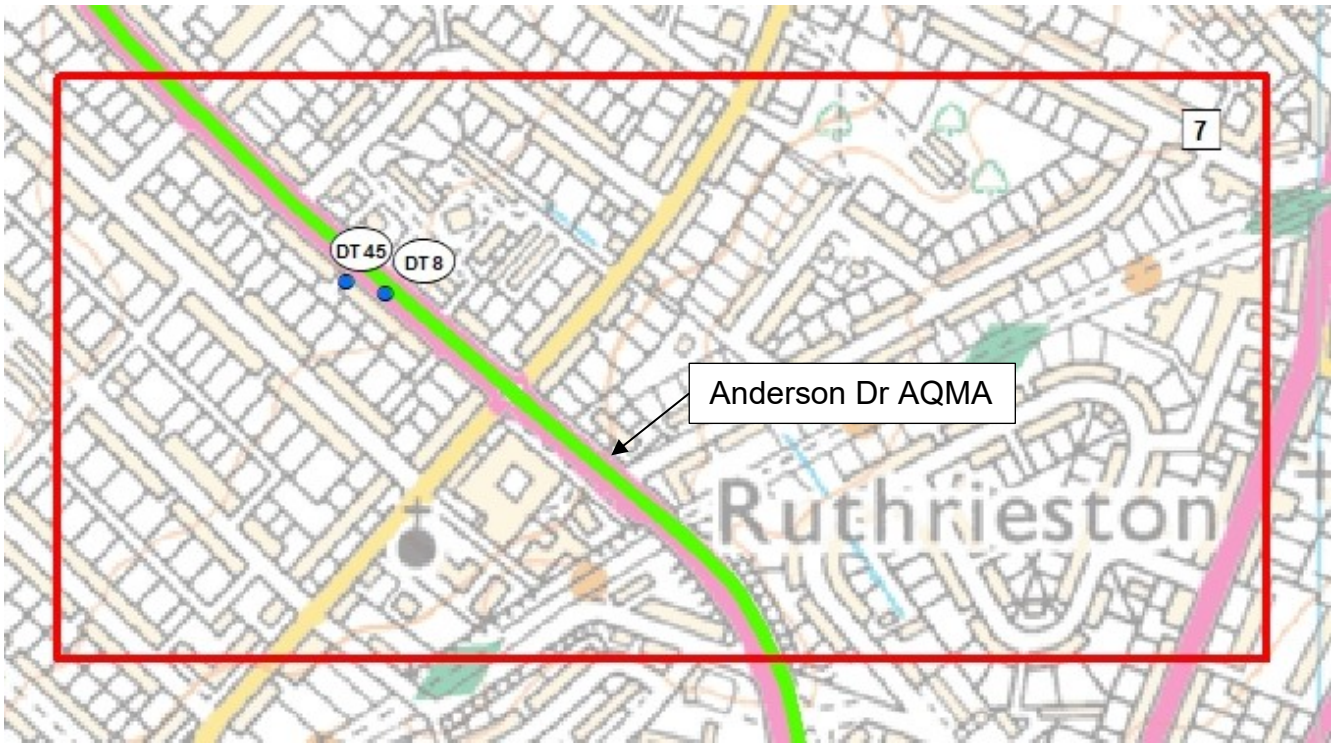
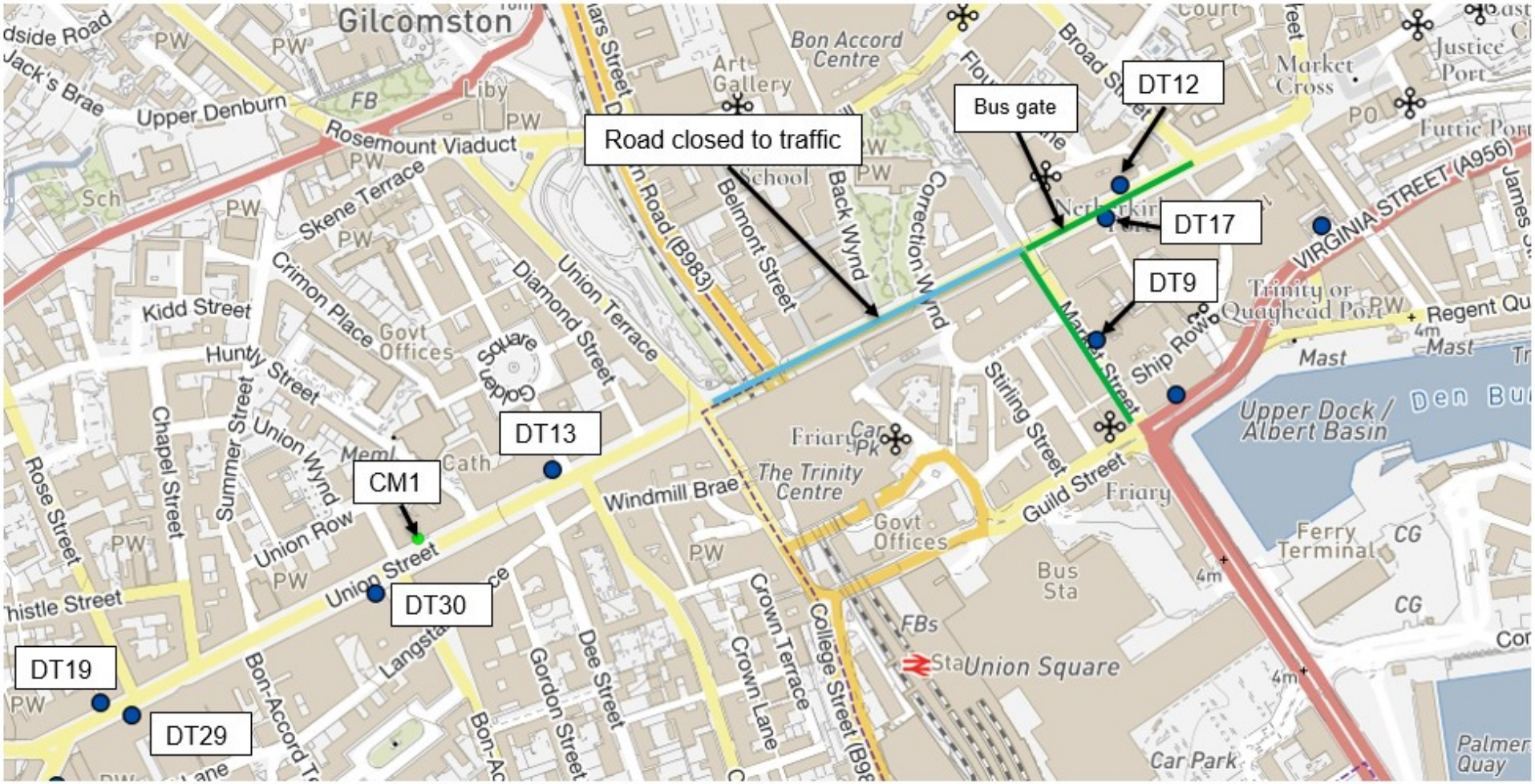


Figure 18: Union Street Monitoring Locations and Temporary Traffic Control



Glossary of Terms

Abbreviation	Description
AIR PT	AIR NO_2 Proficiency Testing Scheme
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA 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
APR	Air quality Annual Progress Report
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
BAU	Business As Usual
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
MCP	Medium Combustion Plant
NBAFS	National Bias Adjustment Factors
NLEF	National Low Emission Framework
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
STAG	Strategic Transport Analysis Guide

Abbreviation	Description
QA/QC	Quality Assurance and Quality Control
RAEA	Ricardo Energy and Environment
SEPA	Scottish Environmental Protection Agency
SO_2	Sulphur Dioxide

References

1. COVID19 lockdown effects on air quality. Ricardo Energy & Environment. 16 February 2021. www.scottishairquality.scot
2. Environment Act 1995.
3. The Air Quality (Scotland) Regulations 2000.
4. The Air Quality (Scotland)(Amendment) Regulations 2001.
5. Local Air Quality Management Technical Guidance LAQM, TG(16), DEFRA, April 2021
6. Local Air Quality Management Policy Guidance, (PG)(S)(16), DEFRA, March 2016
7. Aberdeen City Council Action Plan, March 2011
8. 2020 Air Quality Annual Progress Report (APR) for Aberdeen City Council