Annual Progress Report (APR)

North Ayrshire Council
Comhairle Siorrachd Àir a Tuath

2021 Air Quality Annual Progress Report (APR) for
North Ayrshire Council

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

June 2021

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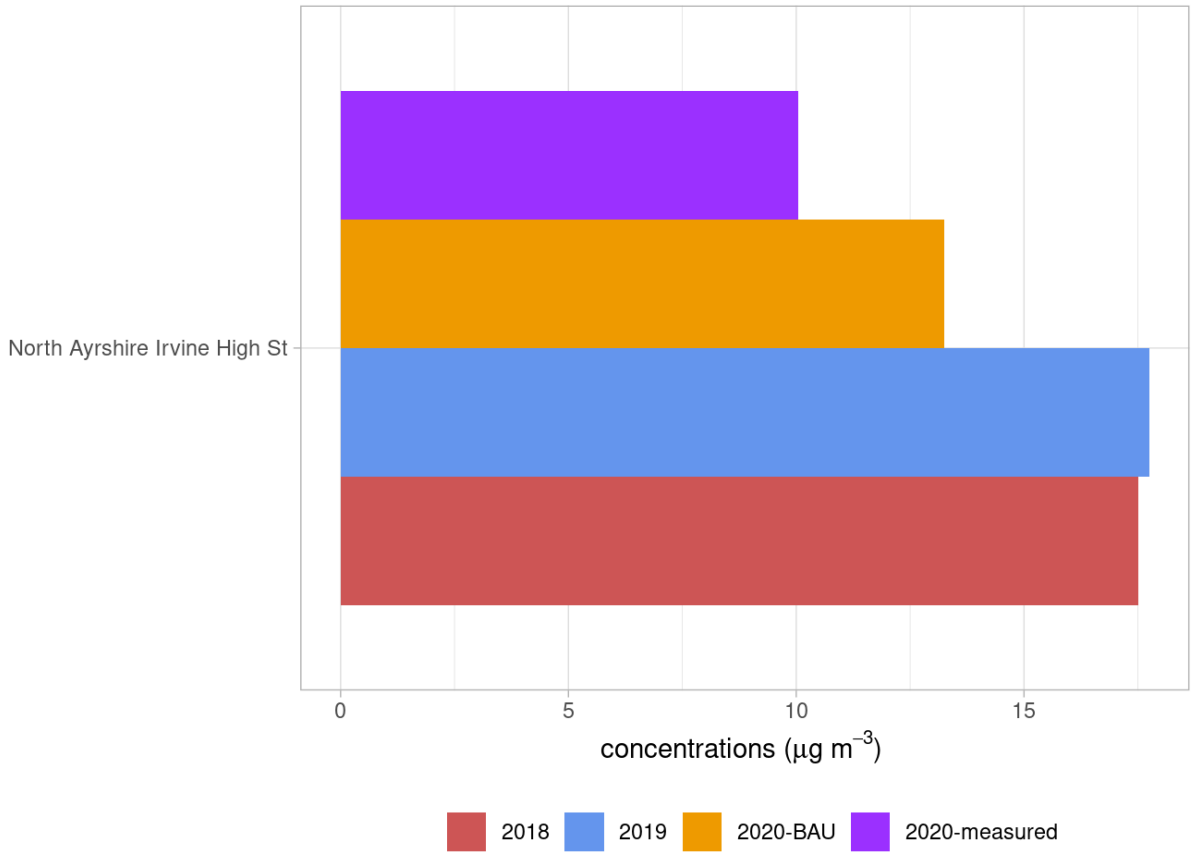
Executive Summary: Air Quality in Our Area

Air Quality in North Ayrshire Council

This report was prepared in accordance with the Local Air Quality Management (LAQM) Technical Guidance 2016 (TG16) and sets out the air quality monitoring carried out in North Ayrshire, with results and conclusions of data collected for 2020. Monitoring is carried out in North Ayrshire for Nitrogen Dioxide (NO_2) and Particulate Matter (PM), particles of soot (carbon), metals or inorganic salts of sizes less than or equal to 10micrometers, PM_{10}; and less than or equal to 2.5micrometers, $PM_{2.5}$.

2020 has been an exceptionally unusual year for air quality monitoring that has seen a significant reduction in pollutant concentrations, particularly NO_2 and PMs, due to less traffic on the roads following COVID-19 travel restrictions. COVID-19 effects on air quality within North Ayrshire Council can be found by accessing the specific report here Lockdown Effects on Air Quality (scottishairquality.scot). The annual average concentrations for NO_2 for 2018 and 2019 are shown below for the automatic monitoring site in High Street, Irvine along with the predicted Business As Usual (BAU) and measured averages for 2020. There was a significant reduction of NO_2 measured during 2020.



(Source: Ricardo Energy & Environment)

The operational impacts of COVID-19 on LAQM are presented in Section 6 of this report.

Monitoring in previous years identified that the main air quality issue in North Ayrshire was associated with NO_2 and related to a) traffic congestion in High Street, Irvine and b) queuing traffic in New Street, Dalry. Mitigation projects have now been completed successfully for the two areas and monitoring results reflect the changes in ambient air quality, showing a downward trend accordingly.

As expected, NO_2 at the three diffusion tube monitors of previous years' concern in High Street, Irvine, decreased significantly from 17,20, 20ug/m^3 in 2019 to 10,12,12ug/m^3 in 2020 respectively. The nearby automatic monitor station has also shown a decrease in NO_2 from 16ug/m^3 (Annualised) in 2019 to 10ug/m^3 for 2020.

In New Street, Dalry, NO_2 has reduced from 26ug/m^3 in 2019 to 16ug/m^3 in 2020 for the same corresponding diffusion tube of concern.

PM_{10} reduced from 14ug/m^3 (Annualised) in 2019 to 11ug/m^3 in 2020 in High Street, Irvine. The Scottish annual mean air quality objective for PM_{10} is 18ug/m^3. $PM_{2.5}$ reduced from

8ug/m^3 (Annulised) in 2019 to 6ug/m^3 in 2020 for the same location. The Scottish annual mean air quality objective for $PM_{2.5}$ is 10ug/m^3.

A new Serinus S40 NO_x analyser was installed within the automatic monitoring station cabinet on High Street, Irvine and replaced the faulty ML9841B analyser.

Overall, monitoring results for 2020 have shown that all levels of NO_2 and PMs have decreased in High Street. NO_2 levels in New Street, Dalry have also shown a decrease. NO_2 and PMs levels has shown a downward trend across the whole of North Ayrshire since 2016.

North Ayrshire Council has one officer located within Environmental Health who implements the LAQM requirements: ensuring monitoring equipment is maintained correctly; dealing with any enquiries, planning permissions and complaints; report writing and liaising with relevant colleagues in other departments, and close consultation with our partners as required e.g. SEPA and Transport Scotland.

2020 data appears to show that there is no air quality issues within North Ayrshire Council at this time.

Actions to Improve Air Quality

North Ayrshire Council has Energy and Sustainability Officers, an Access Officer, a School Travel Plan Co-ordinator, Traffic and Transportation Managers, a Business Change Project Manager, Workplaces Engagement Officers and supporting teams who collectively promote modal shift and actions to improve air quality and well as wellbeing.

North Ayrshire Council has a Sustainable Business Travel Plan Car Pool Scheme in partnership with Enterprise CarClub. Across January – December 2020, this car-share scheme had between 27 and 29 vehicles, with 251,979 miles being travelled on these. Of this, a total of 21,817 miles was travelled on 100% Electric Vehicles – around 8.6% of the total CarClub miles. At the time of writing (June 2021) there are now over 1300 members who have access to 22 vehicles (8 all-electric and 14 petrol / petrol- hybrid vehicles) across 10 council office locations. During 2021 - 2022, the number of vehicles may increase again, as meetings/site visits begin to resume, pushing demand for staff transport. The next stage is to continue improving on charge-infrastructure so that we may further increase our use of electric vehicles across NAC, as this is in line with our sustainability aims.

During 2020 our Workplace Engagement Officers organised 55 events within 4 work places, engaging with 372 staff to help facilitate and encourage alternative active travel in the work place. COVID restrictions impacted the number of events that would normally have taken place throughout the year, resulting in fewer events and participants.

The Council's Travel Smart behaviour change project continued to promote modal shift to active and sustainable travel, but also focused on Mental and Physical Wellbeing whilst employees were working at home. It has been recognised locally and nationally as good practice. This is funded by the Smarter Choices Smarter Places programme and delivered a wide range of activities including: E-Bike Loans to workplace staff members; One Workplace Engagement Officers is appointed within North Ayrshire Council to promote active and sustainable travel to/from work; and a Schools and Workplaces Active Travel Programme, but also to support and promote the number of infrastructure projects currently being worked on between Sustrans and North Ayrshire Council.

This project worked with a number of local employers including NHS Ayrshire and Arran, KA Leisure, GSK, and Booth Welsh. It has:

- The Scottish Workplace Journey Challenge, was re-branded the TheActiveCommute Club, and focused on employees undertaking a ‘Fake Commute’ whilst working from home. A Strava group was created for participants to register their activities. 108 participants registered onto the group.
- Delivered 18 Information stalls, engaging with 194 employees from 3 various workplaces.
- Performed 3 Personal Travel Plans to provide Active Travel options to employees within workplaces.
- Promoted Cycle To Work Day to all workplaces.
- 68 North Ayrshire Council Staff purchased new bikes through the Cycle To Work Scheme.
- Since the purchase of the ebikes in 2018, 3 ebikes remain within various services within the council as a means for employees to consider cycling for work related duties in replacement of a motor vehicle, since this has been in place these 3 ebikes have clocked up approx. 1200 miles.

1 workplace benefited from long term loans of an ebikes for 5 months, allowing for employees to trail an ebike at anytime.

24 employees within North Ayrshire Council have borrowed an ebike for the following timescales:

The Travel Smart Team also provided an e-bike tandem to a visually impaired North Ayrshire Council employee, tohelp support his physical and mental wellbeing throughout COVID restrictions, allowing for him to maintain his physical exercise but also engage with his pilot for mental support:

- 4 Employees borrowed e-bikes for up to 1 week
- 8 Employees borrowed e-bikes between a 1-3 month period
- 4 Employees borrowed e-bikes between a 3-4 month period
- The Travel Smart Team also provided 7 Key workers with bikes, allowing for them to carry on their working routine without having to use Public Transport. 5 Key Workers are still using the bikes provided at the time of reporting.
- 122 employees within North Ayrshire Council took part in Paths For All StepCount Challenge in October 2020 clocking up 37 million steps and walking approx. 16000 miles.

Local Priorities and Challenges

The priorities for North Ayrshire Council in addressing air quality for the coming year are a) to continue with monitoring air quality within its area, particularly in High Street, Irvine and New Street, Dalry, to ensure concentrations remain below the relevant objective levels following the improvement works and to ensure post COVID-19 pandemic pollutant levels remain within objective levels b) to continue improving on charge-infrastructure so that we may further increase our use of electric vehicles across NAC, c) continue to promote, support and help facilitate Active Travel and d) to implement the Actions in the Council's Environmental Sustainability & Climate Change Strategy 2018-20.

The challenges will be to ensure that a) any LAQM monitoring equipment malfunction is rectified timeously and the data capture rate is maintained at a high level and b) any

targets with regard to improving air quality, directly or indirectly within North Ayrshire are achieved.

How to Get Involved

If you would like to become involved and participate in helping improving air quality in the area, details of alternative modes of travel, route options and projects can be found at Leisure, parks and events (north-ayrshire.gov.uk).

During 2020 Clean Air Day (CAD) was postponed from 20th June to 8th October 2020 due to the coronavirus pandemic. North Ayrshire Council participated in CAD and encouraged staff to actively travel to work. The event was promoted to staff and schools via internal Newsletters, Facebook and Twitter. North Ayrshire Council will continue to support and promote this event. For information on how to become involved in air quality events around the UK and free promotional material please visit Clean Air Day - the UK's largest clean air campaign.

Further information on our local air quality can also be found here Site Info - Air Quality in Scotland (scottishairquality.scot) on the Air Quality in Scotland website where information is updated every hour. A free service to subscribers in Scotland (that may be of benefit to people whose breathing gets worse when air pollution increases) is Know & Respond – Scotland. The service sends an alert message to registered members if air pollution in their area is forecast to be moderate, high or very high and this may be of benefit to pollution sensitive individuals who want to take steps to minimise the effects of any pollution incidents. To register for Know & Respond – Scotland please visit: Know & Respond - Scotland, the free air pollution alert messaging system - Air Quality in Scotland (scottishairquality.scot).

Know and Respond can also be accessed via an iPhone and Android app which is free to download at: Apps for iPhone and Android - Air Quality in Scotland (scottishairquality.scot).

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1 Local Air Quality Management

This report provides an overview of air quality in North Ayrshire Council 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 or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Progress Report (APR) is summarises the work being undertaken by North Ayrshire Council to improve air quality and any progress that has been made.

Table 1.1 – 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

2 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. North Ayrshire Council currently does not have any AQMAs.

Monitoring in previous years identified that the main air quality issue in North Ayrshire was associated with NO_2 and related to a) traffic congestion caused by a small section of High Street, Irvine being used as a bus terminus and b) queuing traffic in New Street, Dalry as a result of traffic lights on the main A737 passing through the town. The history of these two areas and mitigation measures have been discussed in previous reports which can be found here LAQM reports - Air Quality in Scotland (scottishairquality.scot). Mitigation projects have now been completed successfully for both areas and monitoring results reflect the changes in ambient air quality, showing a downward trend accordingly.

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 North Ayrshire Council against relevant actions within this strategy is demonstrated below.

2.2.1 Transport – Avoiding Travel – T1

North Ayrshire Council has Travel Plan which can be accessed here:

Transport strategy (north-ayrshire.gov.uk)

The 2015-20 Local Transport Strategy (LTS) is still current and was scheduled to be updated in 2020 but this was delayed due to the COVID-19 pandemic and the impact it

had on travel behaviour. It is anticipated that a new LTS will be complete and published by the end of 2021/22.

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

North Ayrshire Council has developed their Environmental Sustainability & Climate Change Strategy for 2017 – 2020 (ESCCS 2). It contains an ambition to achieve a 40% reduction in carbon emissions North Ayrshire wide by 2030, based on a 2005 baseline year. This would equate to a reduction of 581,000 tonnes CO2 across North Ayrshire in total since 2005, and 27,088 tonnes within the Council estate.

Key actions completed, in progress or planned and outcomes in terms of benefits for air quality can be found in Appendix 1 of the Strategy's Action Plan here:

Environmental Sustainability & Climate Change Strategy (north-ayrshire.gov.uk)

However, North Ayrshire Council's Cabinet approved the third iteration of the Environmental Sustainability & Climate Change Strategy for 2021 – 2023 in June 2020 (ESCCS 3). It builds on the previous strategy and it contains an ambition to achieve net-zero carbon emissions by 2030. Publishing of ESCCS 3) has been delayed due to the COVID-19 pandemic.

2.2.3 Further Actions

North Ayrshire Council implemented a Sustainable Business Travel Plan Car Pool Scheme alongside Enterprise CarClub. Across January – December 2020, this car-share scheme had between 27 and 29 vehicles, with 251,979 miles being travelled on these. Of this, a total of 21,817 miles was travelled on 100% Electric Vehicles – around 8.6% of the total CarClub miles. At the time of writing there are now over 1300 members who have access to 22 vehicles (8 all-electric and 14 petrol / petrol- hybrid vehicles) across 10 council office locations. We revised our vehicle numbers and locations as a response to Covid-19, ensuring we had vehicles available for our key-workers, and at suitable locations where demand was highest. During 2021 - 2022, the number of vehicles may increase again, as meetings/site visits begin to resume, pushing demand for staff transport. The next stage is to continue improving on charge-infrastructure so that we may

further increase our use of electric vehicles across NAC, as this is in line with our sustainability aims.

North Ayrshire Council's Cabinet also approved the first Electric Vehicle (EV) Strategy (2021-2125). It includes an action to work in partnership with government agencies to explore potential for further EV charging infrastructure. Encouraging the uptake of EVs will help reduce greenhouse gas emissions and help improve local air quality. Publishing the strategy has been delayed due to the COVID-19 pandemic.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives

Summary of Monitoring Undertaken

A fixed automatic monitoring station is located in High Street, Irvine. It has contained a chemiluminescent NO_x analyser monitor since its installation in 2009 and a Fidas 200 fine dust and monitoring emission measurement system for the continuous and simultaneous measurement of PM1, PM2.5 as per EN 14907 and PM10 as per EN12341 since 14th April 2015. This monitoring station is also the site being used for the triplicate co-location of NO2 diffusion tubes.

Calibration checks are conducted every 2 weeks on site by Local Authority Officers and collected data is forwarded to Ricardo - AEA who validate and ratify the data. The unit is calibrated by Ricardo - AEA every 6 months. Ricardo - AEA reports are included in Appendix C, Figure 4: RICARDO - AEA Air Pollution Report. & Figure 5: Ricardo - AEA Certificates of Calibration.

Twenty-two diffusion tubes also monitor NO_2 at various locations in towns throughout North Ayrshire and the data capture rate was 95%.

As expected, due to the travel restrictions in place during the pandemic, 2020 results show that all pollutants were significantly reduced throughout North Ayrshire. This trend is in accordance with the rest of the UK. No monitoring results for 2020 within North Ayrshire has exceeded any relevant UK or EU Limit Value. The effects that the pandemic has had on monitoring are discussed further in Section 6 below: Impact of COVID-19 upon LAQM.

None of these changes have led to the declaration of an AQMA, decision to amend or revoke an AQMA, or appropriate local strategy.

3.1.1 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.

North Ayrshire Council undertook automatic (continuous) monitoring at one site during 2020. **Error! Reference source not found.** in Appendix A shows the details of the sites. National monitoring results are available at: Latest pollution map - Air Quality in Scotland (scottishairquality.scot).

A map showing the location of the monitoring site is provided in Appendix C: Figure 11: Automatic Monitoring Site Location, High Street, Irvine 2020. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC.

3.1.2 Non-Automatic Monitoring Sites

North Ayrshire Council undertook non-automatic (passive) monitoring of NO_2 at twenty-two sites during 2019. **Error! Reference source not found.** in Appendix A shows the details of the sites. National non-automatic monitoring sites and results are available at:

Latest pollution map - Air Quality in Scotland (scottishairquality.scot)

Maps showing the location of the monitoring sites and further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC.

Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias and annualised. Further details on adjustments are provided in Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 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.

Annual Mean NO_2 Concentrations measured at the Automatic monitoring site in High Street, Irvine and Diffusion Tube monitoring sites located throughout North Ayrshire have shown a downward trend since 2016. There has been a particularly noticeable decline in

the NO_2 concentrations since 2017 in and around Irvine and Dalry following mitigation measures to ease traffic congestion. There has also been significant decline during 2020 due the COVID-19 pandemic. A graph of these trends is included in Appendix C: Figure 7: Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites in Irvine 2016 - 2020. & Figure 8: Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites in Dalry 2016 - 2020.

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. There has been no exceedance of over 18 times per year for the 2016 to 2020 reporting period with North Ayrshire Council.

None of these changes have led to the declaration of an AQMA.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 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.

PM_{10} levels remained steady during 2018 – 2019 at 14µg/m^3 but decresed to 11µg/m^3 during 2020 at High Street, Irvine. A graph showing this trend is included in Appendix C: Figure 9: Trends in Annual Mean PM10 Concentrations measured at Automatic Station (ROMON) in High Street, Irvine 2016 - 2020.

There have been no exceedances of over 7 times per year for the 2016 to 2020 reporting period.

None of these changes have led to the declaration of an AQMA.

3.2.3 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.

$PM_{2.5}$ levels remained steady during 2018 – 2019 at 8µg/m^3 but decresed to 6µg/m^3 during 2020 at High Street, Irvine. A graph showing this trend is included in Appendix C: Figure 10: Trends in Annual Mean PM2.5 Concentrations measured at Automatic Station (ROMON) in High Street, Irvine 2016 - 2020.

None of these changes have led to the declaration of an AQMA.

3.2.4 Sulphur Dioxide (SO_2)

Monitoring for sulphur dioxide and smoke has been discontinued in North Ayrshire since 2004. Historical monitoring data is available for nearly every town in the area and there is no indication from these results that the air quality standard is likely to be breached even around local industrial sources.

Further details of historic SO2 monitoring can be found in North Ayrshire Council's previous Air Quality Reports which are available online at:

LAQM reports - Air Quality in Scotland (scottishairquality.scot)

There has been no evidence of any change to sulphur dioxide production or release in North Ayrshire. Similarly, there has been no development likely to result in any increase in sulphur dioxide levels at locations where there could be relevant public exposure.

3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene

No recent monitoring of Carbon Monoxide, Lead and 1,3-Butadiene has been undertaken.

Further details of historic Carbon Monoxide, Lead and 1,3-Butadiene monitoring can be found in North Ayrshire Council's previous Air Quality Reports which are available online at:

LAQM reports - Air Quality in Scotland (scottishairquality.scot)

There has been no evidence of any change to Carbon Monoxide, Lead and 1,3- Butadiene production or release in North Ayrshire. Similarly, there has been no development likely to result in any increase in Carbon Monoxide, Lead and 1,3- Butadiene levels at locations where there could be relevant public exposure.

4 New Local Developments

There was only one significant housing development proposed during 2020 that was considered to have the potential to increase traffic numbers and flows in and around the relevant area. This is listed below:

19/00930/PPM

19/00930/PPM | Erection of 77 no dwellinghouses to include associated roads, footpaths, open space, landscaping and associated SuDS infrastructure | Phase 2 Site To North Of Tarryholme Pond Irvine Ayrshire (north-ayrshire.gov.uk)

No detailed air quality report was required as screening showed that it did not meet all the required criteria in accordance with the relevant guidance.

4.1 Road Traffic Sources

North Ayrshire Council confirms that there are no new/newly: narrow congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb; busy streets where people may spend 1 hour or more close to traffic; roads with high flows of buses/heavy delivery vehicles; busy junctions/busy roads; roads with significantly changed traffic flows and no relevant bus stations in the Local Authority area identified during 2020.

4.2 Other Transport Sources

North Ayrshire Council confirms that there are no: airports in the Local Authority area; 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; or ports or shipping that meet the specified criteria within the Local Authority area identified during 2020.

4.3 Industrial Sources

There was one significant industrial installation, an energy from waste plant, proposed that was considered to require air quality assessment carried out. This is listed below and was granted permission in January 2020:

19/00539/PPM

19/00539/PPM | Development of Energy Recovery Facility (ERF) to include (1) the erection of materials recycling/fuel preparation building; (2) the erection of energy recovery building for the production of electricity and heat with associated (60m high) exhaust flue; and (3) the provision of associated site facilities to include silos, access roads, parking, attenuation pond, landscaping and security fencing | 16-20 Murdoch Place Oldhall West Industrial Estate Irvine Ayrshire KA11 5DG (north-ayrshire.gov.uk)

A detailed Air Quality Assessment was submitted satisfactorily in support of the application. This installation will be regulated by the Scottish Environment Protection Agency and will require a Pollution Prevention and Control Licence to be issued by them.

North Ayrshire Council confirms that there are no other new or proposed industrial installations: for which an air quality assessment has been carried out; existing installations where emissions have increased substantially, or new relevant exposure has been introduced; significantly changed installations with no previous air quality assessment; major fuel storage depots storing petrol; petrol stations or poultry farms that we are aware of during 2020.

4.4 Commercial and Domestic Sources

There were two Community Heating Schemes that were developed under Local Authority Permitted Development: Sheltered Housing Complex, Sharon Street, Dalry and Flatt Road, Largs. Air Quality Assessment were deemed satisfactory.

4.5 New Developments with Fugitive or Uncontrolled Sources

North Ayrshire Council is not aware of any new developments with fugitive or uncontrolled sources within the Local Authority area in 2020 at this time.

5 Planning Applications

Relevant new local developments are detailed above in Section 4 of this report.

6 Impact of COVID-19 upon LAQM

Monitoring was not completed in adherence with the 2020 Diffusion Tube Monitoring Calendar due to the COVID-19 lockdown periods and essential travel restrictions and these details are discussed under the heading of QA/QC of Diffusion Tube Monitoring in Appendix C below.

Automatic air quality monitoring site visits were maintained as normal (LSO visits, etc.) during 2020, including over the lockdown period.

No low-cost monitoring during 2020 was carried out during 2020, including over the lockdown period.

There are no ongoing issues with North Ayrshire Council's local air quality monitoring network related to the Covid-19 response at this time.

7 Conclusions and Proposed Actions

7.1 Conclusions from New Monitoring Data

All NO_2, PM_{10} and $PM_{2.5}$ monitoring data within North Ayrshire Council for 2020 complied with the 40μg/m^3, 18μg/m^3 and 10μg/m^3 respective Air Quality Objectives as set out in the Directive. Monitoring will continue at all the existing sites for 2021.

7.2 Conclusions relating to New Local Developments

Planning applications for one significant housing developments was received in 2020. Consideration was given to the application as it had the potential to increase traffic numbers and flows in and around the local area. The applicant was requested to undertake an Air Quality Screening Assessment and submit a report to demonstrate whether their proposed development would have any detrimental effect on local air quality via the Planning process. The resultant screening report provided was satisfactory.

7.3 Proposed Actions

2020 monitoring data has not identified any new exceedances of the objectives for any pollutant or any need for additional monitoring or changes to the existing monitoring programme within North Ayrshire.

Irvine

As outlined earlier in this report, following the introduction of mitigation measures to reduce congestion, a significant reduction in NO_2 has been recorded in High Street since. Monitoring showed that levels reduced further during 2019 and have continued to fall during 2020, albeit partly due to COVID-19 travel restrictions. It is proposed that NO_2 sampling continues in this area to monitor the effects of post COVID-19 easing to observe the return to business as normal. This will establish the effects mitigation measures have had without abnormal effects. Close supervision of any future developments in the area shall also be observed if required.

Dalry

Monitoring showed that the opening of the Dalry Bypass in May 2019 eased traffic congestion significantly through the town and NO_2 concentrations were seen to reduce accordingly. The continued reduction shown by monitoring during 2020 will also have been

affected by COVID-19 travel restrictions and it is proposed that monitoring is continued in this area to establish normal levels following post COVID-19 lockdown easing.

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)
ROM	ROMON	Roadside	232189	638857	NO_2; PM_{10}; $PM_{2.5}$	No	Chemiluminescent; Optical Light Scatter	20	4.88	2.15

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)
DT1	**35 East Road, Irvine**	Roadside	**232323**	**638892**	**NO2**	**N**	1	2.5	N	2.5
DT2	**18 Bank Street, Irvine**	Roadside	**232202**	**638952**	**NO2**	**N**	2.5	1.6	N	2.5
DT3	**147 High Street, Irvine**	Roadside	**232077**	**638990**	**NO2**	**N**	0	4	N	2.5
DT4	**85 High Street, Irvine**	Roadside	**232158**	**638882**	**NO2**	**N**	0	3.7	N	3.0
DT5	**79 High St, Irvine**	Roadside	**232169**	**638878**	**NO2**	**N**	3.5	1.5	N	2.5
DT6	**75 High St, Irvine HIGH**	Roadside	**232170**	**638871**	**NO2**	**N**	0	5	N	3.0
DT7	**65a High Street, Irvine, (ROMON)**	Roadside	**232192**	**638827**	**NO2**	**N**	4.7	1.7	Y	2.15
DT8	**65 High Street, Irvine, (ROMON)**	Roadside	**232192**	**638827**	**NO2**	**N**	4.7	1.7	Y	2.15
DT9	**63 High Street, Irvine, (ROMON)**	Roadside	**232192**	**638827**	**NO2**	**N**	4.7	1.7	Y	2.15
DT10	**34 Kirkgate Irvine**	Urban Background	**232085**	**638774**	**NO2**	**N**	10	0.5	N	2.5
DT11	**25 Main Rd, Springside**	Kerbside	**236813**	**638659**	**NO2**	**N**	5	1	N	2.5
DT12	**Auchengate (Bridge)**	Urban Background	**233332**	**635558**	**NO2**	**N**	N/A	32	N	2.5
DT13	**Dalry Rd, Kilwinning**	Kerbside	**229928**	**643400**	**NO2**	**N**	2	1	N	2.5
DT14	**Vernon St, Saltcoats**	Kerbside	**224697**	**641366**	**NO2**	**N**	0	1	N	2.5
DT15	**12 Garnock St, Dalry**	Urban Background	**229326**	**649250**	**NO2**	**N**	10	0.5	N	2.5
DT16	**67 New St, Dalry**	Kerbside	**229338**	**649337**	**NO2**	**N**	0	0.5	N	2.5
DT17	**45 New St, Dalry**	Kerbside	**229286**	**649365**	**NO2**	**N**	0	0.5	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)
DT18	**2 Townhead St, Dalry**	Roadside	**229230**	**649338**	**NO2**	**N**	0	3	N	2.0
DT19	**Highfield Hamlet, Dalry**	Urban Background	**230943**	**650280**	**NO2**	**N**	10	1	N	2.0
DT20	**85 Main Street, Largs**	Kerbside	**220333**	**659322**	**NO2**	**N**	1.5	0	N	2.0
DT21	**Hunterston Road**	Rural	**219582**	**650020**	**NO2**	**N**	N/A	N/A	N	2.0
DT22	**Princess St/Glasgow St, Ardrossan**	Kerbside	**219582**	**650020**	**NO2**	**N**	0	0.5	N	2.5

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
ROMON	Roadside	Automatic	-	100	25	21	18	16	10
DT1	Roadside	Diffusion Tube	-	83	22	22	21	20	13
DT2	Roadside	Diffusion Tube	-	92	23	22	25	19	11
DT3	Roadside	Diffusion Tube	-	83	25	21	23	16	11
DT4	Roadside	Diffusion Tube	-	100	29	27	18	17	10
DT5	Kerbside	Diffusion Tube	-	100	43	41	23	20	12
DT6	Roadside	Diffusion Tube	-	100	30	32	22	20	12
DT7	Roadside	Diffusion Tube	-	100	25	25	20	20	10
DT8	Roadside	Diffusion Tube	-	92	25	24	21	19	12
DT9	Roadside	Diffusion Tube	-	92	25	23	19	19	12
DT10	Urban Background	Diffusion Tube	-	92	9	8	11	9	7
DT11	Kerbside	Diffusion Tube	-	92	14	14	13	13	10
DT12	Urban Background	Diffusion Tube	-	92	12	12	12	11	10
DT13	Kerbside	Diffusion Tube	-	100	18	19	21	17	13
DT14	Kerbside	Diffusion Tube	-	100	11	9	10	9	6
DT15	Urban Background	Diffusion Tube	-	100	31	29	25	21	12
DT16	Kerbside	Diffusion Tube	-	100	39	38	34	26	16
DT17	Kerbside	Diffusion Tube	-	92	24	27	26	21	11
DT18	Roadside	Diffusion Tube	-	100	20	19	17	14	8
DT19	Urban Background	Diffusion Tube	-	100	19	17	18	16	12
DT20	Kerbside	Diffusion Tube	-	83	5	5	5	5	3
DT21	Rural	Diffusion Tube	-	100	17	15	16	15	12
DT22	Kerbside	Diffusion Tube	-	100	18	19	17	14	11

Notes:

Exceedances of the NO_2 annual mean objective of $40\mu g/m^3$ 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
ROMON	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 (µg/m^3)

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
ROMON	Roadside	-	99	15	13	14	14	11

Notes:

Exceedances of the PM_{10} annual mean objective of 18 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%).

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
ROMON	Roadside	-	99	0	0	0	0	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
ROMON	Roadside	-	99	7	7	8	8	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)
DT1	22	18.2	-	-	10.8	12.1	6.9	6.8	17.1	16.9	13.7	13.7	13.8	13
DT2	15.4	13.7	13.8	13.8	7.2	9.5	6.3	9.4	18.6	-	15.3	15.3	12.6	11
DT3	12.1	15.2	10.3	10.3	4.5	10.5	7.8	10.4	-	-	26.8	26.8	13.5	11
DT4	15.9	11.5	11.7	11.7	7.3	8.4	7.1	7.6	11	10.2	14	14	10.9	10
DT5	19.2	19.8	15.9	15.9	5.6	9.1	8.9	8.2	8.9	17.1	11.8	11.8	12.7	12
DT6	21.3	9.5	15.1	15.1	12.2	12	7.1	14.5	9.4	14.6	11.2	11.2	12.8	12
DT7	12.6	17.8	11.8	11.8	7.5	8.7	6.1	11.7	8.4	14.6	12.8	12.8	11.4	10
DT8	-	16.9	13.5	13.5	8.3	8.7	5.8	5.2	9.2	16.4	15.1	15.1	11.6	12
DT9	-	16.1	12	12	7.3	10	7.1	11.9	9	14.7	13.4	13.4	11.5	12
DT10	6.2	8.5	7.4	7.4	4.3	5.3	-	5	6.2	10.1	11.3	11.3	7.5	7
DT11	10.9	12.1	12.8	12.8	12.5	7.8	-	5.5	4.6	5	15.7	15.7	10.5	10
DT12	11.8	14.6	11.5	11.5	12.4	5.2	-	6.2	4.3	7.5	16.8	16.8	10.8	10
DT13	17.9	19.9	16	16	9.6	10.8	5.3	14.9	9.3	16.7	16.3	16.3	14.1	13
DT14	5.5	8.6	9	9	5.6	6.1	3.4	8	3.2	1.7	7.1	7.1	6.2	6
DT15	15	18.1	16.1	16.1	10.3	8.8	8.9	9.9	7	17.8	15.2	15.2	13.2	12
DT16	15.3	23.2	18.4	18.4	2.6	45.2	10.9	13.9	10.2	20.7	16.4	16.4	17.6	16
DT17	15.7	-	13.8	13.8	7.1	14.8	6.5	14.5	8.2	17.8	11.4	11.4	12.3	11
DT18	5.1	8.9	9.3	9.3	10.3	8.6	3.7	8.4	7.1	7.7	13.3	13.3	8.8	8
DT19	10.4	13.5	10.5	10.5	8.3	11.9	6.2	20.4	14	17.5	15.8	15.8	12.9	12
DT20	2	4	4.8	4.8	4.4	6.1	2.4	3.7	3.1	2.5	-	-	3.8	3
DT21	10.2	12.5	17.2	17.2	8.1	11	6.8	16.5	10.7	7.2	17.2	17.2	12.7	12
DT22	13.9	14	13.5	13.5	10.7	12.5	6	10.9	11	7.2	16.4	16.4	12.2	11

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 North Ayrshire Council During 2020

North Ayrshire Council has identified one new source relating to air quality within the reporting year of 2020. This is the development of an Energy Recovery Facility which has been granted planning permission. Emissions from the plant will be regulated by the Scottish Environment Protection Agency under the Pollution Prevention And Control regime. The full details can be found here:

19/00539/PPM | Development of Energy Recovery Facility (ERF) to include (1) the erection of materials recycling/fuel preparation building; (2) the erection of energy recovery building for the production of electricity and heat with associated (60m high) exhaust flue; and (3) the provision of associated site facilities to include silos, access roads, parking, attenuation pond, landscaping and security fencing | 16-20 Murdoch Place Oldhall West Industrial Estate Irvine Ayrshire KA11 5DG (north-ayrshire.gov.uk)

Additional Air Quality Works Undertaken by North Ayrshire Council During 2020

North Ayrshire Council has not completed any additional works within the reporting year of 2020.

QA/QC of Diffusion Tube Monitoring

Glasgow Scientific Services (GSS) was the supplier used for diffusion tubes within 2020 and the method of preparation was 20% TEA in water and has been supplying North Ayrshire Council's diffusion since December 2013.

GSS are UKAS accredited, and their process is based on the AEA and DEFRA procedure. They participate in the AIR-PT analysis scheme and in the annual field inter-comparison exercise. The results of which are presented below in Figure 3 below.

Monitoring was not completed in adherence with the 2020 Diffusion Tube Monitoring Calendar due to the COVID-19 lockdown periods and essential travel restrictions. All diffusion tubes were left in-situ over March/April and November/December and averaging

periods calculated by the laboratory accordingly within permissible guidelines. This has resulted in concentrations being the same for both months ie March/April and November/December. It was considered appropriate to include all results in analysis as both pairs of months were within the same season ie March/April in Spring and November/December in Winter. In addition to this a review of the concentrations of the same months for previous years were broadly compatible with 2020 concentrations. Although the results should be considered with this in mind, including all data was considered better than excluding data from the relevant four months and replacing it with annualised data.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within North Ayrshire Council recorded data capture of 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 33% do not require annualisation.

Diffusion Tube Bias Adjustment Factors

North Ayrshire Council have applied a local bias adjustment factor of **0.92** to the 2020 monitoring data. A summary of bias adjustment factors used by North Ayrshire Council over the past five years is presented in Table C.1 below.

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2020	Local	-	0.92
2019	National	03/20	0.86
2018	National	03/18	0.91
2017	National	03/18	0.91
2016	Local	-	1.00

National Adjustment Factors

Diffusion tubes (20% TEA/Water) used in the sampling period for 2020 were supplied and analysed by Glasgow Scientific Services (GSS). Diffusion Tube Bias Adjustment Factors for tubes provided by GSS are listed in the National Diffusion Tube Bias Adjustment Factor Spreadsheet Version 03/21 in Figure 2 below. The Tube Precision and AIR results for the laboratory are shown in Figure 3 below. The resultant

bias for GSS is **0.96** based on 10 studies with 8 of poor precision.

Factor from Local Co-location Studies

The automatic monitoring station (ROMON) on High Street, Irvine has been operational since early 2009 and is the site being used for three co-location tubes. The unit is permanently located here and allows for full "calendar year" data to be collected.

The ROMON has fortnightly checks carried out in accordance with the prescribed methodology as issued by Ricardo - AEA. The unit is audited every 6 months by Ricardo - AEA and is serviced every 6 months under contract to a specialist company. Corresponding data was entered in the "Checking Precision and Accuracy of Triplicate Tubes" spreadsheet (Figure 1 below). The resulting Bias Factor for 2020 data is **0.92** using 10 periods.

Discussion of Choice of Factor to Use

The diffusion tube co-location study for North Ayrshire Council shows this has "Good" precision and corresponding "Good" overall Data Capture from the ROMON and it is felt that the local derived bias factor range of 0.73 – 1.23 is within the corresponding parameters of other years. Records show from Table C.1 that previous derived bias factors over the last four years ranged from 0.86 – 1 between 2016 and 2019. The National Bias Adjustment Factor from GSS is based on ten studies, only two of which had "Good" precision. Therefore, it is considered that the Local National Bias Adjustment Factor when applied to the data reflects more accurately on the true values of air quality when over the entire district. Using the local bias factor of **0.92** reflects a more realistic trend for NO_2 pollution levels within North Ayrshire Council.

NO_2 Fall-off with Distance from the Road

No diffusion tube NO_2 monitoring locations within North Ayrshire Council required distance correction during 2020.

QA/QC of Automatic Monitoring

The automatic monitoring instruments housed within the roadside cabinet has Local Site Operator (LSO) onsite calibration and data management checks conducted every 2 weeks by a Local Authority Officer. All checks are carried out in accordance with procedures laid out by Ricardo - AEA and calibration check sheets are forwarded to them after each visit. The site is visited by Ricardo - AEA engineers every 6 months to carry

out calibration audit tests and the Annual Report and Certificates from these visits are included in Figure 4 & 5 below. The instrument units are also serviced twice yearly by a specialist company and reports from these visits are included in Figure 6 below. Data derived from the automatic monitors and presented within this report has all been ratified by Ricardo AEA. All live and historic data pertaining to North Ayrshire Council is available through the Air Quality in Scotland website Latest pollution map - Air Quality in Scotland (scottishairquality.scot).

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

The Fidas 200 type of PM_{10}/$PM_{2.5}$ monitor utilised within North Ayrshire Council does not require the application of a correction factor.

Automatic Monitoring Annualisation

All automatic monitoring locations within North Ayrshire Council recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 33% do not require annualisation.

NO_2 Fall-off with Distance from the Road

No automatic NO_2 monitoring locations within North Ayrshire Council required distance correction during 2020.

Figure 1: Diffusion Tube Accuracy.

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	06/01/2020	04/02/2020	12.6	34.9	28.6	25	11.5	45	28.6	10.6	100	Poor Precision	Good
2	04/02/2020	02/03/2020	17.5	16.9	16.1	17	0.7	4	1.7	10.7	100	Good	Good
3	02/03/2020	29/04/2020	11.8	13.5	12.0	12	0.9	7	2.3	11.1	99	Good	Good
4	02/03/2020	29/04/2020	11.8	13.5	12.0	12	0.9	7	2.3	6.6	100	Good	Good
5	29/04/2020	03/06/2020	7.5	8.3	7.3	8	0.5	7	1.3	6	100	Good	Good
6	03/06/2020	01/07/2020	8.7	8.7	10.0	9	0.8	8	1.9	6	100	Good	Good
7	01/07/2020	29/07/2020	6.1	5.8	7.1	6	0.7	11	1.7	7	100	Good	Good
8	29/07/2020	02/09/2020	11.7	5.2	11.9	10	3.8	40	9.5	9	100	Poor Precision	Good
9	02/09/2020	30/09/2020	8.4	9.2	9.0	9	0.4	5	1.0	10	100	Good	Good
10	30/09/2020	04/11/2020	14.6	16.4	14.7	15	1.0	7	2.5	12	100	Good	Good
11	04/11/2020	06/01/2021	12.8	15.1	13.4	14	1.2	9	3.0	15	100	Good	Good
12	04/11/2020	06/01/2021	12.8	15.1	13.4	14	1.2	9	3.0	22	100	Good	Good
13													
											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

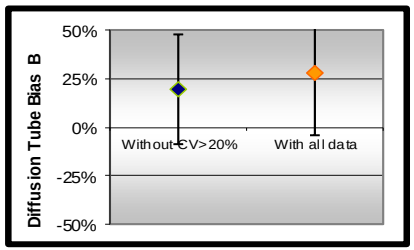
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	High Street, Irvine

Precision: 10 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 10 periods of data	
Bias factor A	0.92 (0.73 - 1.23)
Bias B	9% (-19% - 37%)
Diffusion Tubes Mean:	12 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	11 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	11 (9 - 14) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.84 (0.66 - 1.15)
Bias B	19% (-13% - 52%)
Diffusion Tubes Mean:	13 µgm^{-3}
Mean CV (Precision):	13 caution
Automatic Mean:	11 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	11 (8 - 15) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

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

Adjustment of SINGLE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tube Measurements

Site Name/ID	Periods													Raw Mean	Valid periods	Adjusted measurement (95% confidence interval) with all the data 12 periods used in this calcuations
	1	2	3	4	5	6	7	8	9	10	11	12	13			Bias Factor A 0.84 (0.66 - 1.15) Bias B 19% (-13% - 52%) Tube Precision: 13 Automatic DC: 100%
35 East Road Irvine	22.0	18.2			10.8	12.1	6.9	6.8	17.1	16.9	13.7	13.7		13.8	10	Adjusted with 95% CI **12 (9 - 16)**
22 Bank St, Irvine (Murray Gillies & Wilson Solicitors)	15.4	13.7	13.8	13.8	7.2	9.5	6.3	9.4	18.6		15.3	15.3		12.6	11	Adjusted with 95% CI **11 (8 - 14)**
147 High Street, Irvine (Browings)	12.1	15.2	10.3	10.3	4.5	10.5	7.8	10.4			26.8	26.8		13.5	10	Adjusted with 95% CI **11 (9 - 15)**
85 High St, Irvine (Shoe Repair/Indian Palace)	15.9	11.5	11.7	11.7	7.3	8.4	7.1	7.6	11.0	10.2	14.0	14.0		10.9	12	Adjusted with 95% CI **9 (7 - 12)**
79 High St, Irvine (Fishmongers)	19.2	19.8	15.9	15.9	5.6	9.1	8.9	8.2	8.9	17.1	11.8	11.8		12.7	12	Adjusted with 95% CI **11 (8 - 15)**
75 High St, Irvine (Yoohoo/The Meridian Room)	21.3	9.5	15.1	15.1	12.2	12.0	7.1	14.5	9.4	14.6	11.2	11.2		12.8	12	Adjusted with 95% CI **11 (8 - 15)**
65a High Street, Irvine, (AUTO MONITOR STATION)	12.6	17.8	11.8	11.8	7.5	8.7	6.1	11.7	8.4	14.6	12.8	12.8		11.4	12	Adjusted with 95% CI **10 (8 - 13)**
65 High Street, Irvine, (AUTO MONITOR STATION)		16.9	13.5	13.5	8.3	8.7	5.8	5.2	9.2	16.4	15.1	15.1		11.6	11	Adjusted with 95% CI **10 (8 - 13)**
65 High Street, Irvine, (AUTO MONITOR STATION)		16.1	12.0	12.0	7.3	10.0	7.1	11.9	9.0	14.7	13.4	13.4		11.5	11	Adjusted with 95% CI **10 (8 - 13)**
34 Kirkgate Irvine	6.2	8.5	7.4	7.4	4.3	5.3		5.0	6.2	10.1	11.3	11.3		7.5	11	Adjusted with 95% CI **6 (5 - 9)**
25 Main Rd, Springside	10.9	12.1	12.8	12.8	12.5	7.8		5.5	4.6	5.0	15.7	15.7		10.5	11	Adjusted with 95% CI **9 (7 - 12)**
Auchengate (Bridge)	11.8	14.6	11.5	11.5	12.4	5.2		6.2	4.3	7.5	16.8	16.8		10.8	11	Adjusted with 95% CI **9 (7 - 12)**
Dalry Rd , Kilwinning	17.9	19.9	16.0	16.0	9.6	10.8	5.3	14.9	9.3	16.7	16.3	16.3		14.1	12	Adjusted with 95% CI **12 (9 - 16)**
12 Garnock St, Dalry	5.5	8.6	9.0	9.0	5.6	6.1	3.4	8.0	3.2	1.7	7.1	7.1		6.2	12	Adjusted with 95% CI **5 (4 - 7)**
67 New St, Dalry (Royal Hotel)	15.0	18.1	16.1	16.1	10.3	8.8	8.9	9.9	7.0	17.8	15.2	15.2		13.2	12	Adjusted with 95% CI **11 (9 - 15)**
45 New St Dalry (Zain's Curry House)	15.3	23.2	18.4	18.4	2.6	45.2	10.9	13.9	10.2	20.7	16.4	16.4		17.6	12	Adjusted with 95% CI **15 (12 - 20)**
2 Townhead, St, Dalry (Housing Office)	15.7		13.8	13.8	7.1	14.8	6.5	14.5	8.2	17.8	11.4	11.4		12.3	11	Adjusted with 95% CI **10 (8 - 14)**
Highfield Hamlet , Dalry	5.1	8.9	9.3	9.3	10.3	8.6	3.7	8.4	7.1	7.7	13.3	13.3		8.8	12	Adjusted with 95% CI **7 (6 - 10)**
85 Main Street , Largs (Key Centre)	10.4	13.5	10.5	10.5	8.3	11.9	6.2	20.4	14.0	17.5	15.8	15.8		12.9	12	Adjusted with 95% CI **11 (9 - 15)**
Hunterston Road/Cycle Track	2.0	4.0	4.8	4.8	4.4	6.1	2.4	3.7	3.1	2.5				3.8	10	Adjusted with 95% CI **3 (2 - 4)**
41-43 Princes St, Ardrossan	10.2	12.5	17.2	17.2	8.1	11.0	6.8	16.5	10.7	7.2	17.2	17.2		12.7	12	Adjusted with 95% CI **11 (8 - 15)**
21 Vernon St, Saltcoats	13.9	14.0	13.5	13.5	10.7	12.5	6.0	10.9	11.0	7.7	16.4	16.4		12.2	12	Adjusted with 95% CI **10 (8 - 14)**

The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										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 Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check
1	06/01/2020	04/02/2020	12.6	34.9	28.6	25.4	11.50	45.32	28.56	Poor Precision
2	04/02/2020	02/03/2020	17.5	16.9	16.1	16.8	0.70	4.17	1.74	Good
3	02/03/2020	29/04/2020	11.8	13.5	12.0	12.4	0.93	7.47	2.31	Good
4	02/03/2020	29/04/2020	11.8	13.5	12.0	12.4	0.93	7.47	2.31	Good
5	29/04/2020	03/06/2020	7.5	8.3	7.3	7.7	0.53	6.87	1.31	Good
6	03/06/2020	01/07/2020	8.7	8.7	10.0	9.1	0.75	8.22	1.86	Good
7	01/07/2020	29/07/2020	6.1	5.8	7.1	6.3	0.68	10.75	1.69	Good
8	29/07/2020	02/09/2020	11.7	5.2	11.9	9.6	3.81	39.71	9.47	Poor Precision
9	02/09/2020	30/09/2020	8.4	9.2	9.0	8.9	0.42	4.70	1.03	Good
10	30/09/2020	04/11/2020	14.6	16.4	14.7	15.2	1.01	6.64	2.51	Good
11	04/11/2020	06/01/2021	12.8	15.1	13.4	13.8	1.19	8.67	2.96	Good
12	04/11/2020	06/01/2021	12.8	15.1	13.4	13.8	1.19	8.67	2.96	Good
13										

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

Jaume Targa, for AEA

Version 04 - February 2011

Site Name/ ID: High Street, Irvine

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%

Bias calculated using 10 periods of data
Tube Precision: 7 Automatic DC: 100%
Bias factor A: 0.92 (0.73 - 1.23)
Bias B: 9% (-19% - 37%)

Information about tubes to be adjusted
Diffusion Tube average: 12 μgm^{-3}
Average Precision (CV): 7
Adjusted Tube average: 11 +/- 3 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data

Bias calculated using 12 periods of data
Tube Precision: 13 Automatic DC: 100%
Bias factor A: 0.84 (0.66 - 1.15)
Bias B: 19% (-13% - 52%)

Information about tubes to be adjusted
Diffusion Tube average: 13 μgm^{-3}
Average Precision (CV): 13
Adjusted Tube average: 11 +/- 3 μgm^{-3}

Figure 2: Bias Factor Spreadsheet (Glasgow Scientific).

National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 03/21

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies

Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods

Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet

This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2021

LAQM Helpdesk Website

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

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

Step 1:	Step 2:	Step 3:	Step 4:
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	**Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.**
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data[2]	If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[5] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m^3)	Automatic Monitor Mean Conc. (Cm) (µg/m^3)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Glasgow Scientific Services	20% TEA in water	2020	R	East Dunbartonshire Council	11	23	19	16.3%	P	**0.86**
Glasgow Scientific Services	20% TEA in water	2020	R	East Dunbartonshire Council	9	16	19	-14.4%	P	**1.17**
Glasgow Scientific Services	20% TEA in water	2020	R	East Dunbartonshire Council	11	19	18	3.9%	G	**0.96**
Glasgow Scientific Services	20% TEA in water	2020	R	East Dunbartonshire Council	10	15	15	-0.1%	P	**1.00**
Glasgow Scientific Services	20% TEA in water	2020	KS	Marylebone Road Intercomparison	11	53	44	21.7%	G	**0.82**
Glasgow Scientific Services	20% TEA in water	2020	R	Glasgow City Council	12	26	23	13.1%	P	**0.88**
Glasgow Scientific Services	20% TEA in water	2020	R	Glasgow City Council	12	21	20	4.7%	P	**0.96**
Glasgow Scientific Services	20% TEA in water	2020	R	Glasgow City Council	11	22	23	-3.6%	P	**1.04**
Glasgow Scientific Services	20% TEA in water	2020	KS	Glasgow City Council	12	33	36	-8.4%	P	**1.09**
Glasgow Scientific Services	20% TEA in water	2020	UB	Glasgow City Council	12	19	17	6.9%	P	**0.94**
Glasgow Scientific Services	20% TEA in water	2020		**Overall Factor[3] (10 studies)**				**Use**		**0.96**

Figure 3: Tube Precision & AIR-PT Results.

Table 1: Laboratory summary performance for AIR NO_2 PT rounds AR0030, 31, 33, 34, 36. 37, 39 and 40

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent AIR NO_2 PT rounds and the percentage (%) of results submitted which were subsequently determined to be **satisfactory** based upon a z-score of ≤ ± 2 as defined above.

AIR PT Round	AIR PT AR030	AIR PT AR031	AIR PT AR033	AIR PT AR034	AIR PT AR036	AIR PT AR037	AIR PT AR039	AIR PT AR040
Round conducted in the period	January – February 2019	April – May 2019	July – August 2019	September – November 2019	January – February 2020	May – June 2020	July – August 2020	September – October 2020
Aberdeen Scientific Services	75 %	100 %	100 %	100 %	100 %	NR [4]	NR [4]	100 %
Cardiff Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [4]	NR [4]	NR [3]
Edinburgh Scientific Services	100 %	NR [2]	100 %	25 %	50 %	NR [4]	NR [4]	100 %
SOCOTEC	87.5 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	NR [4]	NR [4]	100 % [1]
Exova (formerly Clyde Analytical)	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [4]	NR [4]	NR [3]
Glasgow Scientific Services	100 %	100 %	100 %	50 %	100 %	NR [4]	NR [4]	100 %
Gradko International	75 %	100 %	100 %	100 %	75 %	NR [4]	NR [4]	75 %
Kent Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [4]	NR [4]	NR [3]
Kirklees MBC	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [4]	NR [4]	NR [3]
Lambeth Scientific Services	50 %	100 %	50 %	100 %	100 %	NR [4]	NR [4]	100 %
Milton Keynes Council	100 %	100 %	50 %	100 %	100 %	NR [4]	NR [4]	25 %
Northampton Borough Council	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [4]	NR [4]	NR [3]
Somerset Scientific Services	100 %	100 %	100 %	100 %	100 %	NR [4]	NR [4]	100 %
South Yorkshire Air Quality Samplers	100 %	100 %	100 %	75 %	100 %	NR [4]	NR [4]	100 %
Staffordshire County Council	100 %	75 %	75 %	75 %	100 %	NR [4]	NR [4]	50 %
Tayside Scientific Services (formerly Dundee CC)	100 %	NR [2]	100 %	NR [2]	100 %	NR [4]	NR [4]	100 %
West Yorkshire Analytical Services	100 %	100 %	100 %	50 %	100 %	NR [4]	NR [4]	NR [2]

[1] Participant subscribed to two sets of test results (2 x 4 test samples) in each AIR PT round.
[2] NR, No results reported.
[3] Cardiff Scientific Services, Exova (formerly Clyde Analytical), Kent Scientific Services, Kirklees MBC and Northampton Borough Council; no longer carry out NO2 diffusion tube monitoring and therefore did not submit results.
[4] Round was cancelled due to pandemic.

Figure 4: RICARDO - AEA Air Pollution Report.

Air Pollution Report

1st January to 31st December 2020

Air Quality in Scotland

North Ayrshire Irvine High St (Site ID: IRV)

These data have been fully ratified

Only relevant statistics for LAQM are presented in the table. Cells with - indicate no data available or calculated.

Pollutant	NO µg/m³	NO_2 µg/m³	NO_x as NO_2 µg/m³	PM_{10} µg/m³	PM_{25} µg/m³
Number Days Low	-	366	-	362	362
Number Days Moderate	-	0	-	0	0
Number Days High	-	0	-	0	0
Number Days Very High	-	0	-	0	0
Max Daily Mean	53	37	117	36	20
Annual Max	243	143	451	238	77
Annual Mean	6	10	19	11	6
98th Percentile of daily mean	-	-	-	24	-
90th Percentile of daily mean	-	-	-	17	-
99.8th Percentile of hourly mean	-	70	-	-	-
98th Percentile of hourly mean	35	42	90	27	18
95th Percentile of hourly mean	23	31	63	23	13
50th Percentile of hourly mean	2	7	11	10	5
% Annual data capture	**99.73%**	**99.73%**	**99.73%**	**98.87%**	**98.87%**

Instruments: PM_{10}: FIDAS

PM_{25}: FIDAS

All gaseous pollutant mass units are at 20°C and 1013mb. Particulate matter concentrations are reported at ambient temperature and pressure. NO_X mass units are NO_X as NO_2 µg m-3

Note: For a strict comparison against the objectives there must be a data capture of 85% or greater throughout the calendar year.

1 / 3

Report produced by Ricardo Energy & Environment

Pollutant	Air Quality Standards (Scotland) Regulations 2010	Exceedances	Days
PM10 particulate matter (Hourly measured)	daily mean > 50 microgrammes per metre cubed	0	0
PM10 particulate matter (Hourly measured)	Annual mean > 18 microgrammes per metre cubed	0	-
PM2.5 particulate matter (Hourly measured)	Annual mean > 12 microgrammes per metre cubed	0	-
Nitrogen dioxide	Hourly Mean > 200 microgrammes per metre cubed	0	0
Nitrogen dioxide	Annual Mean > 40 microgrammes per metre cubed	0	-

Annual Graph

No graph is currently available for this monitoring site

Figure 5: Ricardo - AEA Certificates of Calibration.

0401

CERTIFICATE OF CALIBRATION

Ricardo Energy & Environment 18 Blythswood Square, Glasgow, G2 4BG, UK

Tel: 012357753205

RICARDO

Page 1 of 3

Approved Signatories:

☐	S. Eaton	☐	B Stacey
☐	D Hector	☐	S Stratton
☐	N Rand	☑	S Telfer
☐	B Davies	☐	S Gray

Signed: STelfer

Date of issue: 01 July 2020

Certificate Number: 5066

Customer Name and Address:

Scottish Government
Water, Air, Soils and Flooding Division
Environmental Quality Directorate
Scottish Government
Victoria Quay
Edinburgh
EH6 6QQ

Description: Calibration factors for the air monitoring station(s) at North Ayrshire Council

Ricardo Energy & Environment ID: ED11194/5066

The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95% The uncertainty evaluation has been carried out in accordance with UKAS requirements.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory

Ricardo Energy & Environment

18 Blythswood Square (2nd Floor),
Glasgow,
G2 4BG

Tel: 01235 753205

Registered office
Shoreham Technical Centre
Shoreham-by-Sea
West Sussex
BN43 5FG

Registered in England No.
08229264

VAT Registration No.
GB 212 8365 24

ee.ricardo.com

CERTIFICATE OF CALIBRATION

Date of issue: 01 July 2020

Certificate Number: 5066

Ricardo Energy & Environment ID: ED11194/5066

North Ayrshire Council
NOx analysers

Station	Date of Audit	Species	Analyser Serial no	Zero Response[1]	Zero uncertainty ppb	Calibration Factor[2]	Factor uncertainty %	Converter eff. (%)[3]
North Ayrshire Irvine High Street	11 June 2020	NOx	19-2513	1.0	2.5	1.0404	3.50	99.1
		NO		0.0	2.7	1.0253	3.82	

FIDAS analysers

Station	Date of audit	Analyser Serial no	Calculated ko[3]	Uncertainty %	Total flow[4] l.min-1	Uncertainty %	Main flow l.min-1	Uncertainty %
North Ayrshire Irvine High Street	11 June 2020	6251			5.14	2.2		2.2

0401

CERTIFICATE OF CALIBRATION

Date of issue:	01 July 2020
Certificate Number:	5066
Ricardo Energy & Environment ID:	ED11194/5066

The gaseous ambient analysers listed above have been tested for zero response, calibration factor, linearity and converter efficiency (NOx analysers) by documented methods. The factors have been calculated using certified gas standards. The particulate analysers listed above have been tested for sample flow rates and k_0(where appropriate) by documented methods. Note that the test results are valid on the day of test only, as analyser drift over time cannot be quantified. All results for gaseous species are given in ppb (parts per billion) mole fractions or ppm (parts per million) mole fractions.

[1] The zero response is the zero reading on the data logging system of the analyser when audit zero gas was introduced to the analysers under test.

[2] The calibration factor is the multiplying factor required to scale the reading on the data logging system of the analyser into reported concentration units (ppb for NO, NOx, SO_2, O_3 and ppm for CO. Where 1ppm = 1000ppb). It should be used in conjunction with the zero response. A corrected concentration is calculated using the following equation:

Concentration = F(Output - Zero Response)
Where F = Calibration Factor provided on this certificate
Output = Reading on the data logging system of the analyser
Zero Response = Zero Response provided on this certificate

[3] Converter eff. is the measured efficiency of the NO_2 to NO converter within the oxides of nitrogen analyser under test.

[4] The measured main flow rate (where this is applicable) is the flow rate through the sensor unit of the TEOM particulate analyser under test. The measured total flow rate is the total flow rate through the particulate analyser under test. Units of flow are $l.min^{-1}$, reported at prevailing ambient conditions unless otherwise specified. Where flow rates are highlighted in bold, it indicates that measurements were not made at the analyser sample inlet. These measurements therefore may not accurately reflect analyser performance in normal operation.

[5] The calculated k_0 value (specifically for TEOM analysers) is the calculated k_0 spring constant based on tests undertaken with filters of known weight. The % deviation indicates the closeness of the calculated result to the manufacturer's specified value of k_0.

The calibration results shaded are those that fall within our scope of accreditation, all other results on this certificate are not UKAS accredited, but have been included for completeness.

CERTIFICATE OF CALIBRATION

Ricardo Energy & Environment 18 Blythswood Square, Glasgow, G2 4BG

Telephone 01235 753434

Approved Signatories:

☐	S. Eaton	☐	B Stacey
☐	D Hector	☐	S Stratton
☐	N Rand	☑	S Telfer
☐	B Davies	☐	S Gray

Signed: STelfer

Date of issue: 14 January 2021

Certificate Number: 5277

Customer Name and Address:

Scottish Government
Water, Air, Soils and Flooding Division
Environmental Quality Directorate
Scottish Government
Victoria Quay
Edinburgh
EH6 6QQ

Description: Calibration factors for the air monitoring station(s) at North Ayrshire Council

Ricardo Energy & Environment ID: ED11194/5277

The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95% The uncertainty evaluation has been carried out in accordance with UKAS requirements.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory

Ricardo Energy & Environment

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CERTIFICATE OF CALIBRATION

Date of issue: 14 January 2021

Certificate Number: 5277

Ricardo Energy & Environment ID: ED11194/5277

North Ayrshire Council
NOx analysers

Station	Date of Audit	Species	Analyser Serial no	Zero Response[1]	Zero uncertainty ppb	Calibration Factor[2]	Factor uncertainty %	Converter eff. (%)[3]
North Ayrshire Irvine High Street	16 December 2020	NOx	19-2513	0.0	2.5	1.0651	3.50	100.0
		NO		0.0	2.8	1.0387	3.50	

PM10 analysers

Station	Date of audit	Analyser Serial no	Calculated ko[3]	Uncertainty %	Total flow[4]	Uncertainty %	Main flow	Uncertainty %
North Ayrshire Irvine High Street	16 December 2020	6251			4.68	2.2		2.2

CERTIFICATE OF CALIBRATION

Date of issue:	14 January 2021
Certificate Number:	5277
Ricardo Energy & Environment ID:	ED11194/5277

The gaseous ambient analysers listed above have been tested for zero response, calibration factor, linearity and converter efficiency (NOx analysers) by documented methods. The factors have been calculated using certified gas standards. The particulate analysers listed above have been tested for sample flow rates and k0(where appropriate) by documented methods. Note that the test results are valid on the day of test only, as analyser drift over time cannot be quantified. All results for gaseous species are given in ppb (parts per billion) mole fractions or ppm (parts per million) mole fractions.

[1] The zero response is the zero reading on the data logging system of the analyser when audit zero gas was introduced to the analysers under test.

[2] The calibration factor is the multiplying factor required to scale the reading on the data logging system of the analyser into reported concentration units (ppb for NO, NOx, SO2, O3 and ppm for CO. Where 1ppm = 1000ppb). It should be used in conjunction with the zero response. A corrected concentration is calculated using the following equation:

Concentration = F(Output - Zero Response)

Where F = Calibration Factor provided on this certificate

Output = Reading on the data logging system of the analyser

Zero Response = Zero Response provided on this certificate

[3] Converter eff. is the measured efficiency of the NO2 to NO converter within the oxides of nitrogen analyser under test.

[4] The measured main flow rate (where this is applicable) is the flow rate through the sensor unit of the TEOM particulate analyser under test. The measured total flow rate is the total flow rate through the particulate analyser under test. Units of flow are $l.min^{-1}$, reported at prevailing ambient conditions unless otherwise specified. Where flow rates are highlighted in bold, it indicates that measurements were not made at the analyser sample inlet. These measurements therefore may not accurately reflect analyser performance in normal operation.

[5] The calculated k0 value (specifically for TEOM analysers) is the calculated k0 spring constant based on tests undertaken with filters of known weight. The % deviation indicates the closeness of the calculated result to the manufacturer's specified value of k0.

The calibration results shaded are those that fall within our scope of accreditation, all other results on this certificate are not UKAS accredited, but have been included for completeness.

Figure 6: NOx & PM Fidas Install/Service Reports.

SERVICE REPORT

AirMonitors.co.uk
Quality - Service - Innovation

Customer :	North Ayrshire Cou	**Date:**	KD250320_Irv	**Start Date**	25/03/20
				Start Time	10:45
Site Name:	Irvine High Street			**End Date**	25/03/20
				End Time	13:20

Reason for visit: Install

Action Taken:

Decommissioned ML9841B NOx.

NOx Commissioned instrument. Fitted new pump. Pump vacuum good at 26.75"
Carried out pre zero and span. Site bottle empy; used test bottle.

ML9841B NOx returned to the Scottish Office.

Adjusted unit ID form 40 to 111.

Comms tested ok.

***** Site bottle empty *****

Parts Used

Model Used on:	Part No: (Must be completed)	Description:	Qty	Invoice
		Consumables		
		Serinus S40	1	
		Thomas Single Head Pump	1	

Engineer: Kris Dalziel

Visit Type: Commissioning

Complete site inventory

For Office Use Only:

TTS 2

VDT

Air Monitors Ltd - Units 2/3 Miller Court - Severn Drive – Tew kesbury – Glos - GL20 8DN
Tel: 01684 857530 Fax 01684 857538 Email: service@airmonitors.co.uk Web: w w w .airmonitors.co.uk

SERVICE REPORT

AirMonitors.co.uk
Quality - Service - Innovation

Customer :	North Ayrshire	**Job No:**	SN160420_Nor	**Start Date**	16/04/20
				Start Time	10:30
Site Name:	Irvine High Street			**End Date**	16/04/20
				End Time	14:00

Reason for visit: Fidas - Service

Additional Reason for visit: Please select

Action Taken:

Fidas - Carried out pre flow and leak checks, zero test and measured peak. Carried out service. Removed filter holder and cleaned filter screen. Removed and cleaned aerosol filter and rebuilt.Post leak check passed. Performed sensor callibration. Callibrated flow and PM amplification. Deleted stored data files.

Parts Used

Model Used on:	Part No: (Must be completed)	Description:	Qty	Invoice
Fidas		Consumables	1	

Engineer: Stephen Nicol

Visit Type: Callout

Complete site inventory

For Office Use Only:

TTS 1.5

VDT

Air Monitors Ltd - Units 2/3 Miller Court - Severn Drive – Tewkesbury – Glos - GL20 8DN
Tel: 01684 857530 Fax 01684 857538 Email: service@airmonitors.co.uk Web: www.airmonitors.co.uk

Engineer Report

Report Ref:	FL_KD_03/12/20_Irvine_Service_Nox_Fi	**Job Number:**	
Client:	North Ayrshire Council	**Site:**	Irvine High St
Visit Type:	Routine Service	**Engineer Name:**	Frank laurence
Start Date:	03/12/2020	**End Date:**	03/12/2020
Start Time:	9:30:00 AM	**End Time:**	3:20:00 PM

Description of Works:

Include all works undertaken during the site visit & any issues or damanges that were present

Service'

NOx Carried out pre zero and span. Pump vacuum good at 25".
Serviced instrument; cleaned critical orifices, valves, reaction cell & case fan filters. Replaced internal and external 47mm Filter, Small DFU, O rings, Sintered Filters & PMT desiccant packs.
Reset service due date.
Carried out post zero and span. Calibrated instrument.
Gas analyser sample inlet checked.

FIDAS Carried out pre flow and leak checks. Cleaned TSP head.
Serviced instrument. Cleaned filter holder and suction filter.
Performed sensor calibration. Removed IADS and cleaned optical sensor using compressed dust remover. Performed hardware optical sensor clean. Carried out post flow and leak checks.
Calibrated PM Amplification.

Kris has moved the Fidas to COM Port 4 due to a no comms issue.

Comms tested ok.

Parts Required / Used / Delivered to site

Part No:	Required / Used / Delivered to site	Part Description:	Qty:	Inv
H010053	Used	Stainless Steel Sintered Filter {5.5mm} With Screw In	3	FALSE
H010047-01	Used	Stainless Steel Sintered Filter {5.5mm} With O-Ring G	1	FALSE
F010005	Used	23 Micron DFU	1	FALSE
O010013	Used	Viton O-Ring (5/32" ID X 1/16" W)	2	FALSE
AML-5SD-47	Used	47 mm Filter	2	FALSE
C050014	Used	5g Desiccant Pack	2	FALSE
		Consumables		FALSE
				FALSE
O010015	Used	Valve O ring	3	FALSE
				FALSE

Labour Times:

Travel	Workshop/Preparation	On-Site
4.5	0	6

Actions Required:

Include any actions that the administration team or client should undertake following this site visit

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Figure 7: Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites in Irvine 2016 - 2020.

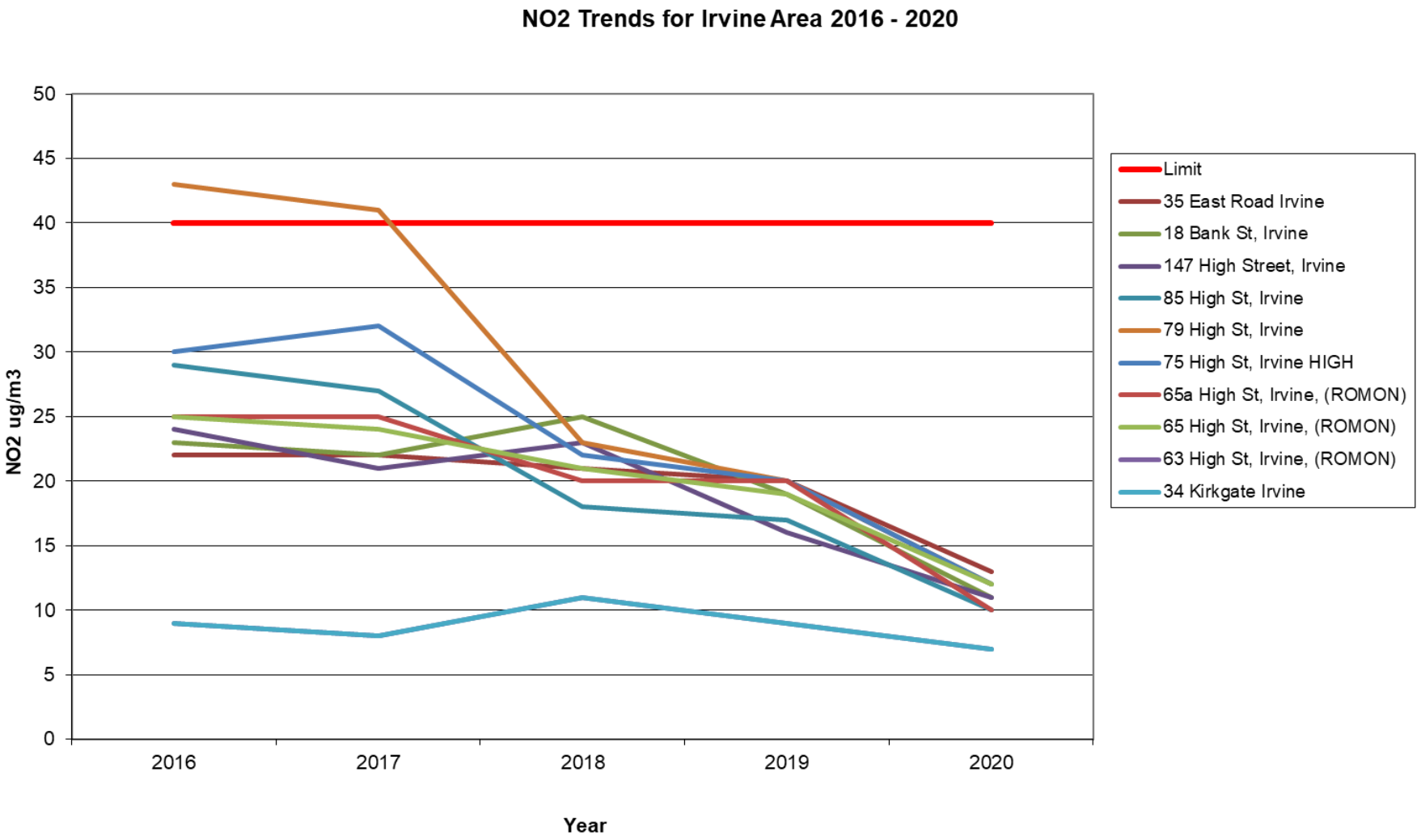


Figure 8: Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites in Dalry 2016 - 2020.

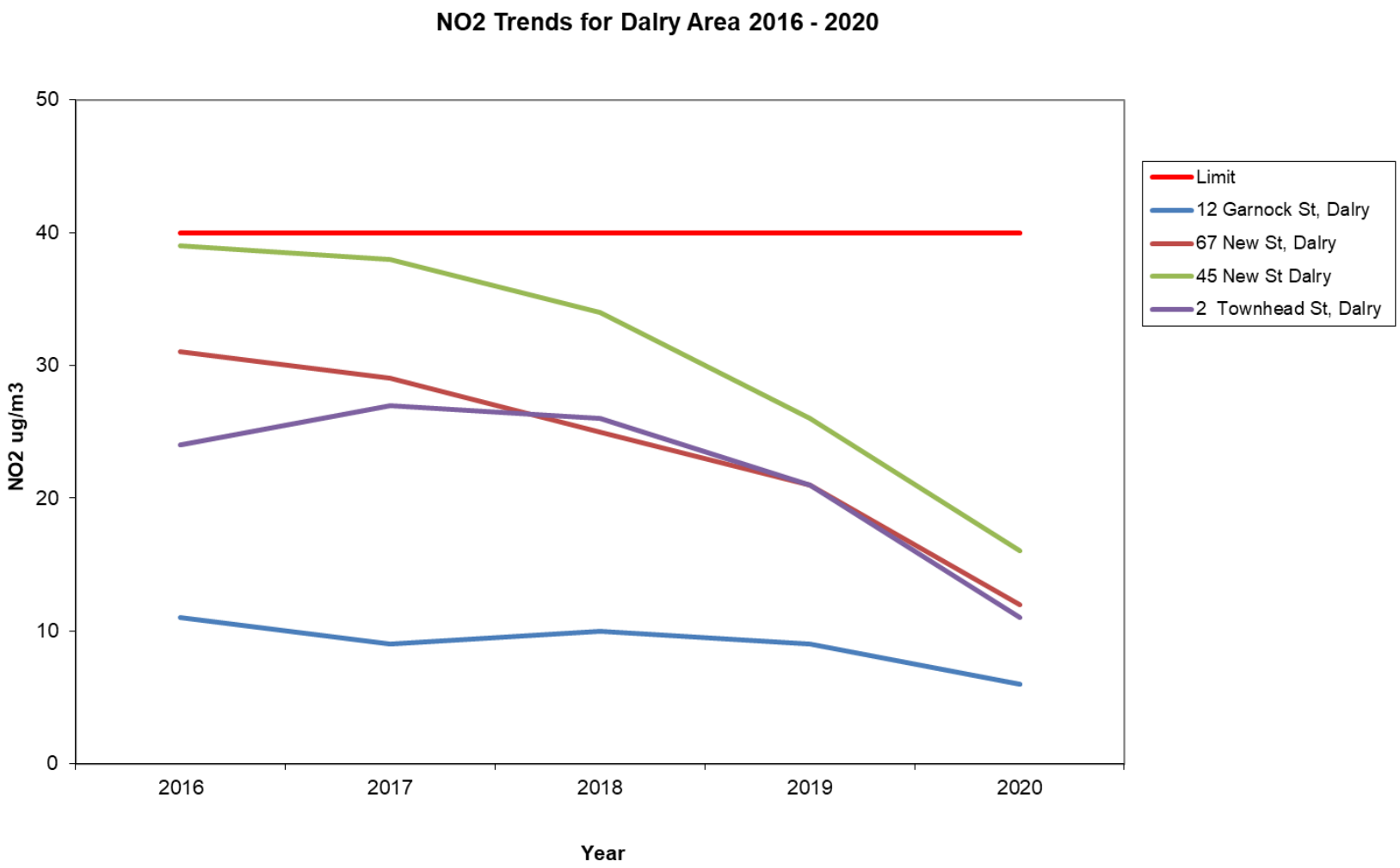


Figure 9: Trends in Annual Mean PM10 Concentrations measured at Automatic Station (ROMON) in High Street, Irvine 2016 - 2020.

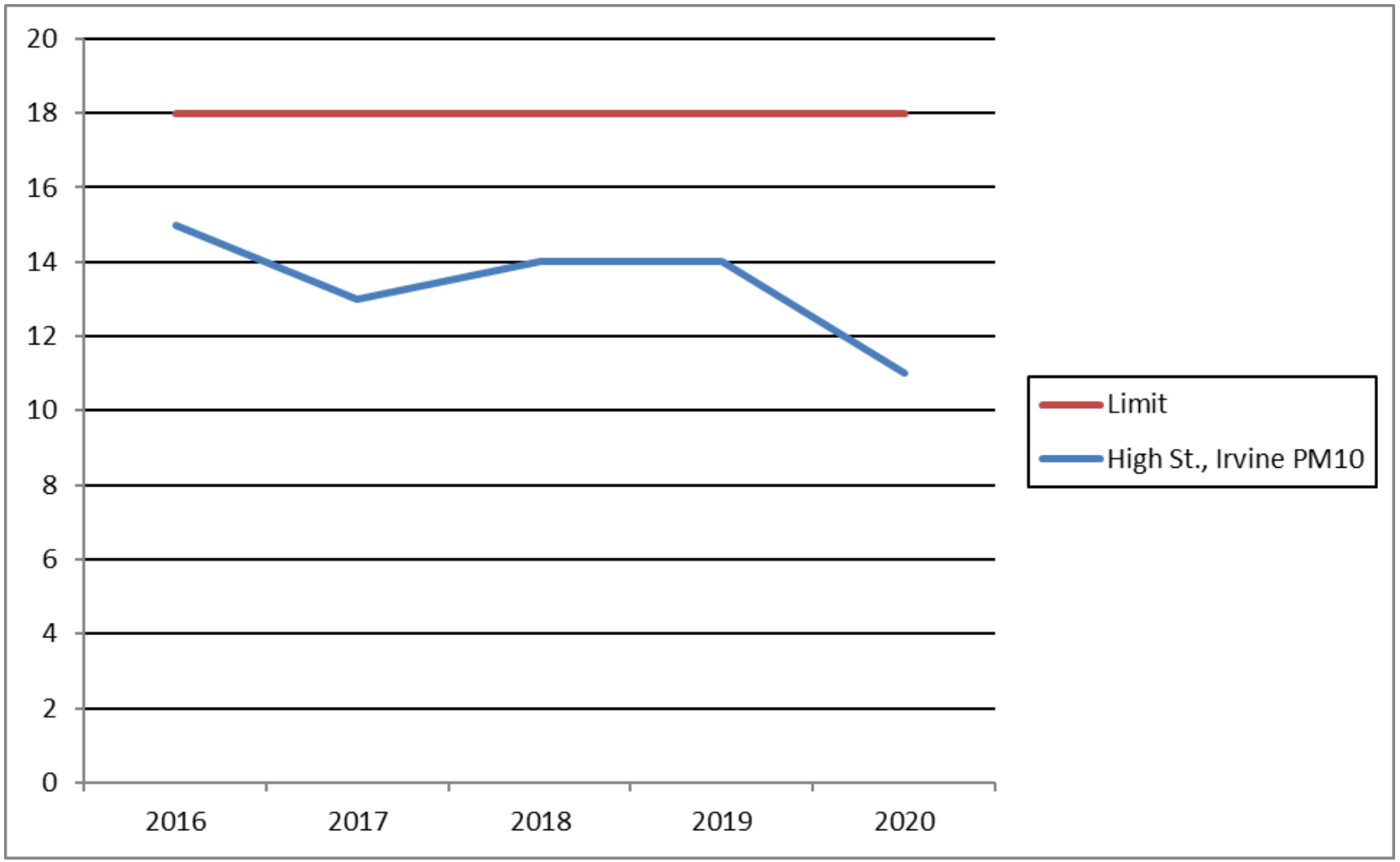


Figure 10: Trends in Annual Mean PM2.5 Concentrations measured at Automatic Station (ROMON) in High Street, Irvine 2016 - 2020.

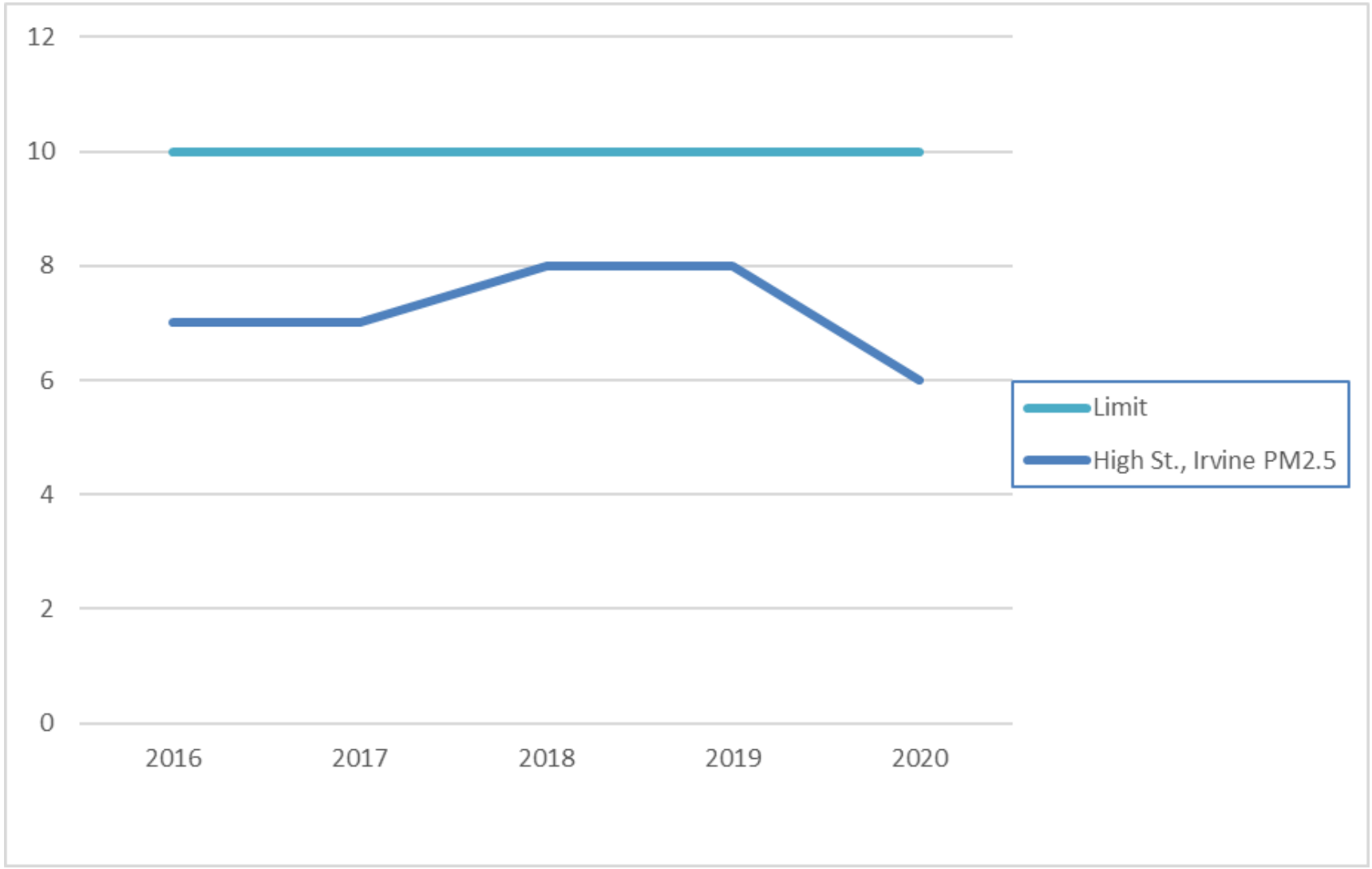


Figure 11: Automatic Monitoring Site Location, High Street, Irvine 2020.

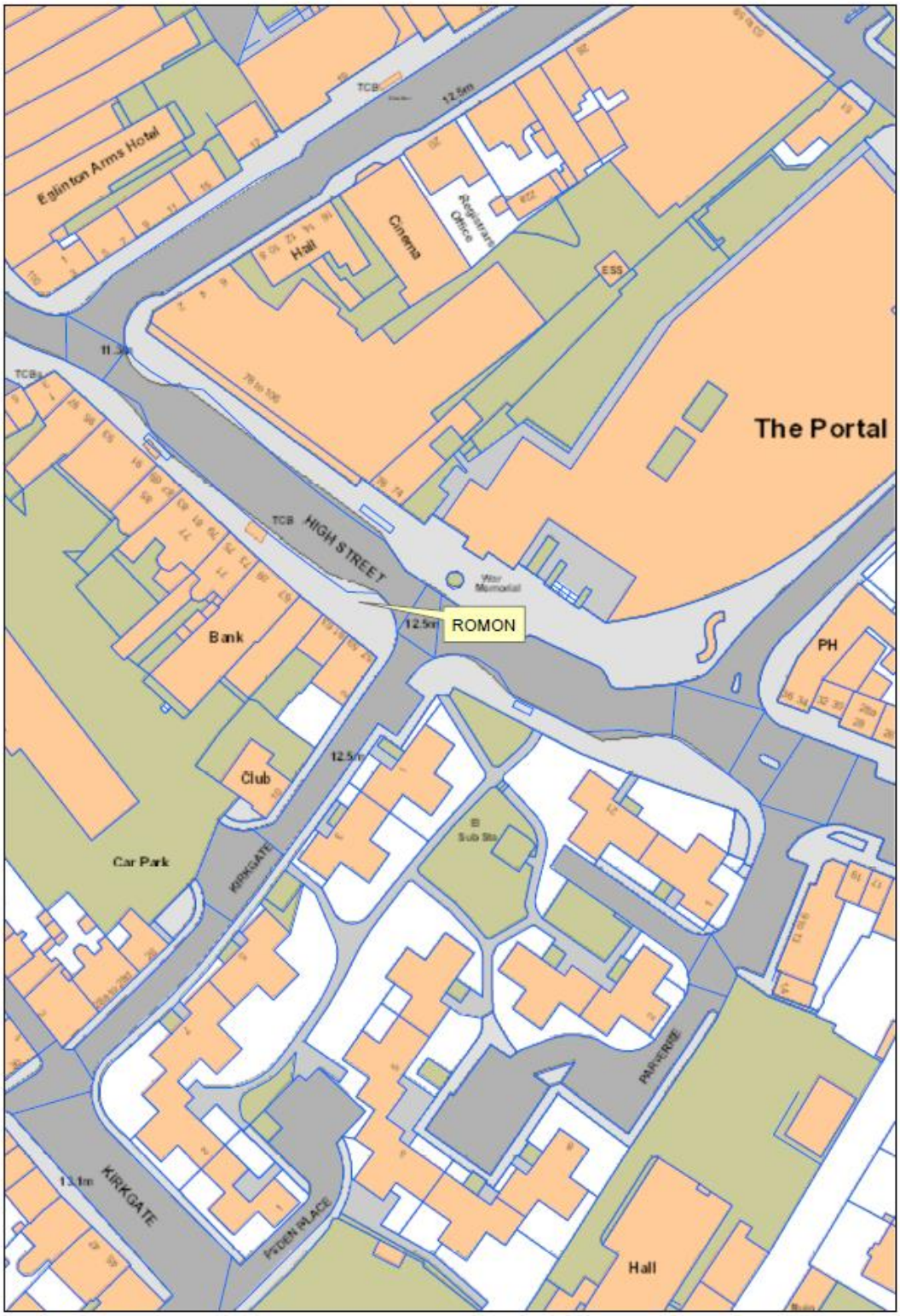


Figure 12: Non-Automatic Monitoring Site Locations 2020.

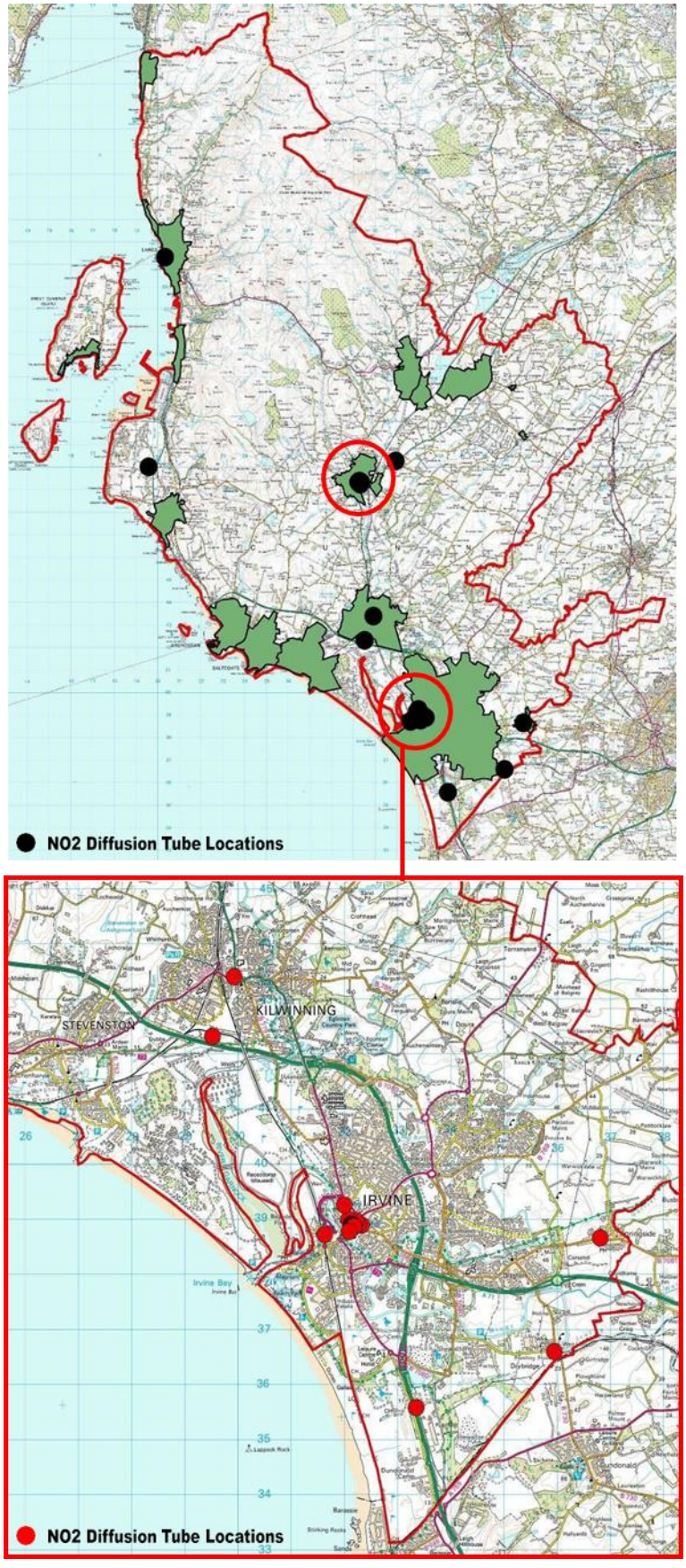


Figure 13: High Street, Irvine Diffusion Tube Site Locations & Concentrations 2020.

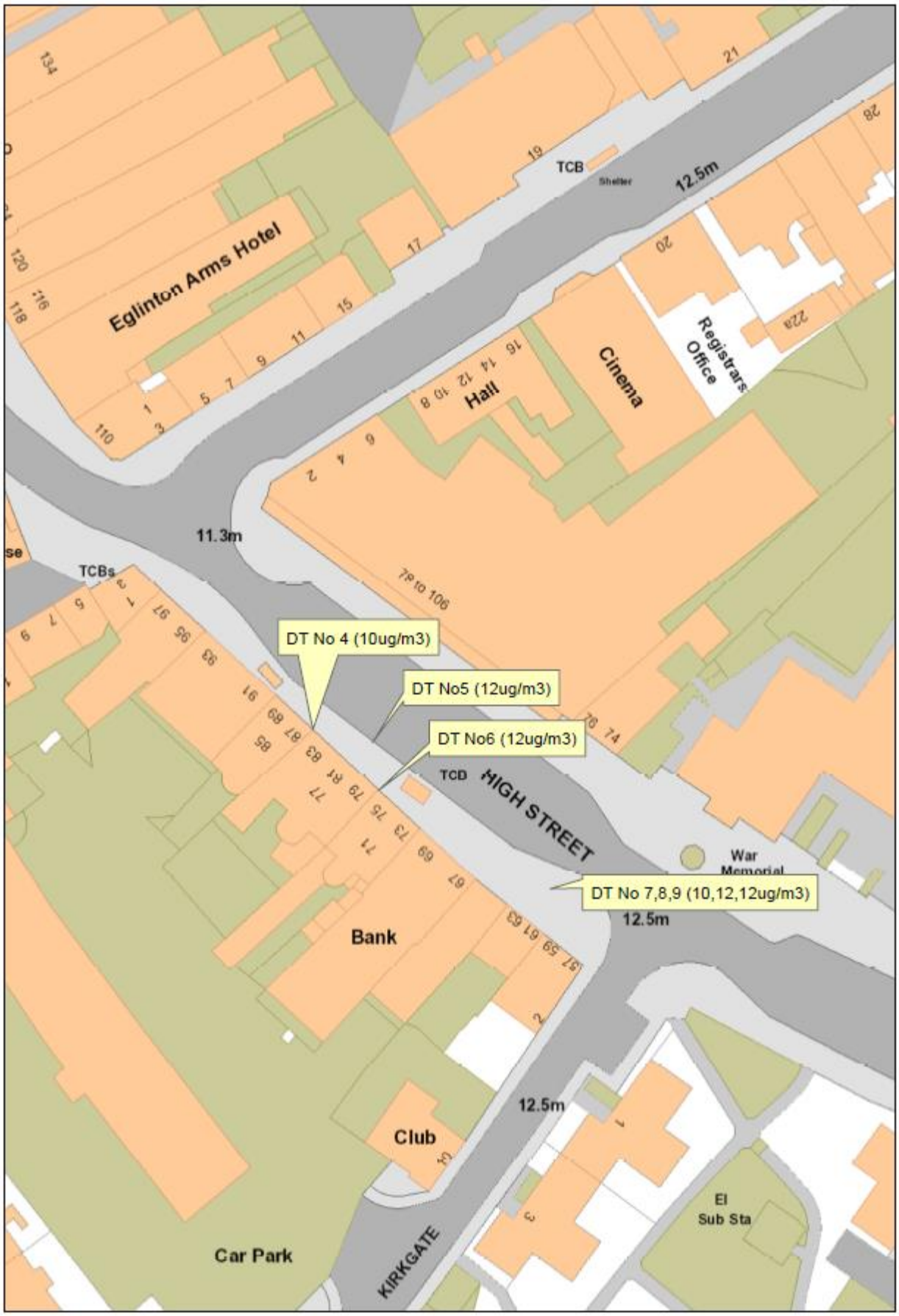
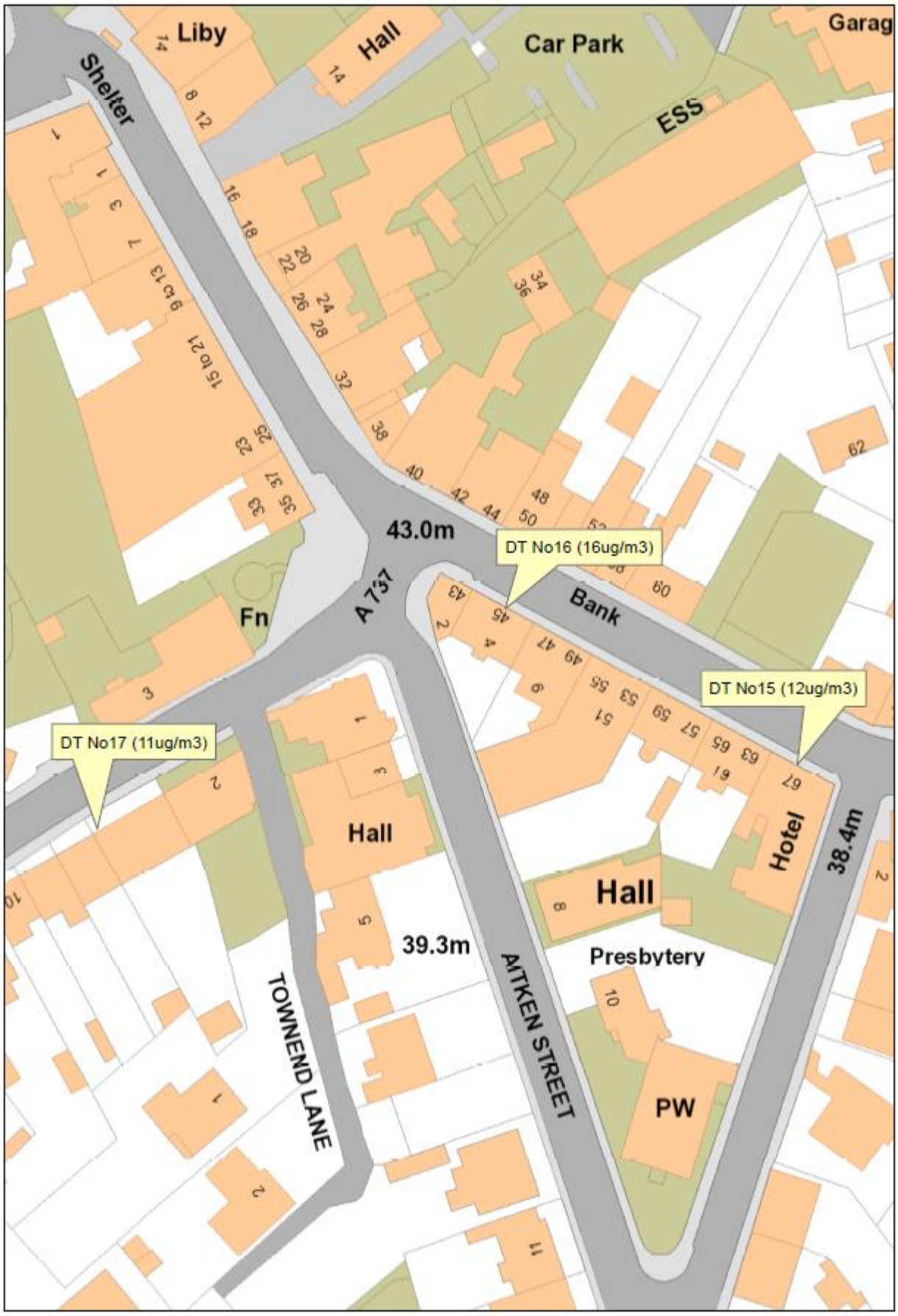


Figure 14: Dalry Diffusion Tube Site Locations & Concentrations 2020.



Glossary of Terms

Abbreviation	Description
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)
COVID-19	Coronavirus Disease
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
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

References

1. Checking Precision and Accuracy of Triplicate Tubes (Version 04 - Feb 2011).
2. Cleaner Air for Scotland Strategy – The Road to a Healthier Future (CAFS), November 2015.
3. Environment Act 1995 Part IV.
4. Local Air Quality Management, Technical Guidance LAQM.TG (16), April 2016.
5. National Diffusion Tube Bias Adjustment Factor Spreadsheet Version Number 03/21.
6. North Ayrshire Council Environmental Sustainability & Climate Change Strategy 2017-2020.
7. North Ayrshire Council Transport Strategy 2015-2020.