Annual Progress Report (APR)

North Ayrshire Council
Comhairle Siorrachd Àir a Tuath

2018 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 2018

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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 2017. 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, $PM_{2.5}$.

Monitoring in previous years identified that the main air quality issue in North Ayrshire was 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. This still remains to be the case. The main pollutant of concern was NO_2 for both locations. These two areas have been identified and their details presented in previous reports which can be found here https://www.north-ayrshire.gov.uk/pests-pollution-and-food-hygiene/pollution/air-quality-management.aspx

2017 results show that a localised area of approximately 10 metres diameter on the High Street, Irvine continues to be the subject of an elevated level exceeding the NO_2 air quality annual mean objective of 40$\mu g/m^3$. Based on diffusion tube monitoring at the particular area there has been only 1 exceedance, of 41$\mu g/m^3$, at one location. This is down on the 2016 results where the same location had an exceedance of 43$\mu g/m^3$. PM_{10} was recorded at 13$\mu g/m^3$ for 2017 for High Street, Irvine. Down from 15$\mu g/m^3$ for 2016. The Scottish annual mean air quality objective for PM_{10} is 18$\mu g/m^3$. In 2017 $PM_{2.5}$ monitoring in High Street, Irvine recorded a result of 7$\mu g/m^3$, this was the same as 2016. The Scottish annual mean air quality objective for $PM_{2.5}$ is 10$\mu g/m^3$.

In New Street, Dalry NO_2 is noted to be down from 39$\mu g/m^3$ in 2016 to 38$\mu g/m^3$ in 2017 for the same corresponding diffusion tube of concern. However, it is anticipated that these levels may go up again during 2018 due an increased volume of traffic going through Dalry town centre as local peripheral roads are closed due to the construction of the new bypass around the town. This will be observed and detailed in future reports.

Overall, the automatic monitoring results for 2017 have shown that levels of NO_2 and PM10 levels have decreased in High Street, Irvine, and $PM_{2.5}$ levels have remained the same. NO_2 levels in New Street, Dalry have also shown a slight decrease. NO2 and PM monitoring has shown a downward trend in concentrations of these pollutants across North Ayrshire since 2013.

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.

Actions to Improve Air Quality

With regard to elevated levels of NO_2 in High Street, Irvine, Public Realm works (streetscape improvements) have now commenced (Monday 4th June 2018) and the programme of works and time scales are included in Appendix C, Figure 13. It is anticipated that monitoring data will be lost at some point during this works as the automatic station will have to be removed to allow pavement upgrading. All monitoring equipment will reinstalled at the same location within a new enclosure. An 18 month construction period is anticipated and updates will be provided in future reports. The preferred design is to widen the pavement on the side where the elevated levels are being recorded and to relocate one of the bus stops further along the High Street and one to nearby Bank Street. The existing frequency of service and convenient access to public transport will be maintained. This will not only move the source of pollution away from the receptor, but will also allow better dilution and dispersion of pollutants. Although out with the data capture range of this report (January – December 2017) it is worth noting that on 5th January of this year (2018) the bus operator, Stagecoach replaced their fleet of 27 buses on Route 11 with new Euro VI standard engine buses (Photo 1 below). Route 11 is the main service through High Street, Irvine with one bus approximately every 7-8 minutes. Monitoring to date is encouraging as it would appear that NO2 concentrations are reducing in High Street area and this will be reported accordingly in future reports.

Photo 1: Launch of new Stagecoach Route 11 Euro VI buses (January 2018).

(Irvine Times, January 2018).

It is anticipated that NO_2 levels will also be reduced significantly in Dalry once the proposed A737 Dalry Bypass has been constructed as it will separate local and through traffic and reduce congestion. These works have now started and are well underway. The official ground-breaking ceremony was undertaken by the then Minister for Transport and the Islands, Humza Yousaf on 13th July 2017. It is anticipated that construction will be completed by the end of 2019. All the details pertaining to the project can be found here https://www.transport.gov.scot/projects/a737-dalry-bypass/

All relevant locations in Dalry will continue to be monitored until there is confidence that the levels of pollutants will remain below the objective limits.

In addition to LAQM 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.

North Ayrshire Council has now successfully implemented their Sustainable Business Travel Plan Car Pool Scheme. The scheme has 762 members who have access to 21 cars (3 electric and 4 hybrid vehicles) at 5 council office locations and 123,869 business miles were undertaken in 2017 with these shared vehicles. During 2018 the number of vehicles will be increased to 33 and will include additional electric and hybrid models. The next stage is to identify locations where these vehicles may be made available to Community Groups and the public during out of office hours.

North Ayrshire Council participated in the first National Clean Air Day on Thursday 15th June 2017 and encouraged staff to actively travel to work. North Ayrshire

Council staffed Pledged to do various activities throughout Clean Air Day, these ranged from Cycling To Work, participating in our Daily Step Count Challenge & Leaving The Car At Home. Those who used an alternative mode of transport to the car was rewarded with a free healthy breakfast. A photo of the staff with their pledges is shown below.

Photo 2: Staff with their pledges.

(North Ayrshire Council)

The event was promoted to staff and schools via internal News Letters, Facebook and Twitter. For information on how to become involved in air quality events around the UK and free promotional material please visit https://www.cleanairday.org.uk/

A new Environmental Sustainability & Climate Change Strategy has been developed for 2017-20, and 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.

The ambitious £4.25 million programme of lighting improvements to introduce LED white lighting and reduce our energy use and carbon emissions and the LUNAR (Lighting Up North Ayrshire Responsibly) projects have now been completed. These "invest-to-save" projects have provide significant reductions in energy consumption and associated CO_2 emissions.

In 2017, in excess of £1.3M was spent on path networks to support active travel. This included: new path construction; path improvements across the area; designs for new paths and path upgrades; installation of new signage and path infrastructure. A range of improvements were also delivered to local bus stops across North Ayrshire to improve access to public transport in partnership with SPT.

The Council's Travel Smart behaviour change project continues to promote modal shift to active and sustainable travel. 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: bike maintenance training; an I Bike Officer to encourage/promote active travel on the school journey within the Garnock Valley and North Coast; a Workplace Engagement Officer to promote active and sustainable travel to/from work; and a Schools and Workplaces Active Travel Programme.

This project worked with a number of local employers including NHS Ayrshire and Arran, KA Leisure, EDF Energy, J and D Pierce, VOCA and Stellar. It has:

- Supported 7 local businesses to become Cycle Friendly Employers
- Delivered 13 bike maintenance sessions
- Developed 2 active travel action plans
- Organised 3 walking challenges

Work commenced on the development of the Irvine Active Travel Hub with the appointment of an Active Travel Hub Officer and development of the designs for the Hub, upgrade of the local path network and Closed Cycle Loop Facility. This is funded through the European Regional Development Fund (ERDF) Low Carbon Travel and Transport Challenge Fund. In 2018 this project will: establish a bike

library and support cycle parking; public cycle pumps; public cycle tools and an e-bike charging station.

A pool bike scheme has also been developed to encourage staff to cycle to meetings instead of taking the car. The bikes are also available at evenings and weekends to encourage cycling and build confidence.

During 2017 our Workplace Engagement Officers organised 47 events and visited 7 work places, engaging with 742 staff to help facilitate and encourage alternative active travel in the work place.

Funding has been secured in principle to install an Urban Traffic Control (UTC) system a tool for managing and controlling traffic signals in urban areas that responds to fluctuations in traffic flow through the use of detectors, for High Street, Irvine however, the viability of this project is still being evaluated.

Local Priorities and Challenges

The priorities for North Ayrshire Council in addressing air quality for the coming year are a) to continue with monitoring and characterising air quality within its area, particularly in High Street, Irvine and New Street, Dalry, b) to progress the proposed public realm works in High Street, Irvine, c) to evaluate extending the sustainable staff pool car scheme to Community Groups and the public during non-office hours d) continue to promote, support and help facilitate Active Travel and e) to implement the Actions in the Council's Environmental Sustainability & Climate Change Strategy 2017-20

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, b) any Public Realm design works are concluded on schedule and c) 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 https://www.north-ayrshire.gov.uk/leisure-parks-and-events/leisure-parks-and-events.aspx

North Ayrshire Council participated in the National Clean Air Day on Thursday 21th June 2018 and encouraged staff to actively travel to work. The event was promoted

to staff and schools via internal News Letters, 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 https://www.cleanairday.org.uk/

Further information on our local air quality can also be found here http://www.scottishairquality.co.uk/latest/site-info?site_id=IRV on the National 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 http://www.scottishairquality.co.uk/know-and-respond/. Know and Respond can also be accessed via an iPhone and Android app which is free to download at http://www.scottishairquality.co.uk/stay-informed/apps.

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1. Local Air Quality Management

This report provides an overview of air quality in North Ayrshire Council during 2017. 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		Date to be achieved by
	Concentration	Measured as	
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	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
	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
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Lead	0.25 µg/m^3	Annual Mean	31.12.2008

2. Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12 months, setting out measures it intends to put in place in pursuit of the objectives. North Ayrshire Council currently does not have any AQMAs.

With regard to elevated levels of NO_2 in High Street, Irvine, public realm works (streetscape improvements) are proposed. The design team proceeded successfully through a tender for the works package during 2017 and works have now commenced (4th June 2018). The programme of works and time scales are included in Appendix C, Figure 13 and an 18 month construction period is anticipated. The preferred design is to widen the pavement on the side where the elevated levels are being recorded and to relocate one of the bus stops further along the High Street and one to nearby Bank Street. The existing frequency of service and convenient access to public transport will be maintained. This will not only move the source of pollution away from the receptor, but will also allow better dilution and dispersion of pollutants. in January of this year (2018) the bus operator, Stagecoach replaced their fleet of 27 buses on Route 11 with new Euro VI standard engine buses. Route 11 is the main service through High Street, Irvine with one bus approximately every 7-8 minutes. Monitoring to date is encouraging as it would appear that NO2 concentrations are reducing in High Street area. A graph of data from an indicative automatic monitor (AQ Mesh) located near the main bus stop of one month before and after the introduction of the new buses (December 2017/January 2018) is shown in Appendix C: Figure 18. However, it should be borne in mind that this is a very small data period and other influencing factors has not been considered eg weather. This will be monitored and reported accordingly in future reports.

It is anticipated that NO_2 levels will be reduced significantly in Dalry once the proposed A737 Dalry Bypass has been constructed as it will separate local and through traffic and reduce congestion. The successful bidder of the works tender was appointed in June 2017 and construction of the bypass is now underway. Completion of the project is expected by the end of 2019. All the details pertaining to

the project can be found here https://www.transport.gov.scot/projects/a737-dalry-bypass/

All relevant locations in Dalry will continue to be monitored until there is confidence that the levels of pollutants will remain below the objective limits.

2.2 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 at http://www.gov.scot/Publications/2015/11/5671/17. 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 a Travel Plan which can be accessed here https://www.north-ayrshire.gov.uk/council/strategies-plans-and-policies/transport-strategy.aspx

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

A new Environmental Sustainability & Climate Change Strategy has been developed for 2017-20, and 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.

The Environmental Sustainability & Climate Change Strategy 2014-17 provided actions to make North Ayrshire a more sustainable place. These actions were detailed under five thematic workstreams (Affordable Warmth, Green Economy, Transport & Travel, Natural Environment, and Sustainable Operations). The strategy has supported continued investigation into district heating scheme and solar PV projects, the extension of the ECO Schools programme to include the Primary School's Energy Challenge, the reduction of carbon emissions by almost 32% (from 2005/06 baseline) through the Carbon Management Plan, and delivering insulation measures to over 1,000 homes in North Ayrshire to alleviate fuel poverty. Furthermore, the Council has continued to invest in renewable technologies, with 29 properties having now been fitted with either biomass heating plant, solar panels or both, providing carbon emission reductions of almost 5,000 tonnes.

Key actions completed, in progress or planned since last year, and outcomes in terms of benefits for air quality can be found in Appendix 1 of the 2014-17 Strategy's Action Plan here

http://naconnects.north-ayrshire.gov.uk/documents/strategies/environmental-sustainability-climate-change-strategy-procurement.pdf

2.2.3 Further Actions

The pilot staff pool car share scheme which North Ayrshire Council implemented in October 2015 as part of the Business Travel Plan progressed well through 2017 with a permanent partnership contract being awarded for a three year period. There are now 25 cars, including 3 electric and 4 hybrid ones. To date (end of June 2018) approximately 328,798 miles have been covered with an estimated saving of 11.12 tonnes of carbon dioxide (CO2). During 2018 the number of vehicles will be increased to 33 and will include additional electric and hybrid models. The cars are available at five locations throughout North Ayrshire. The next stage is to identify where these vehicles may be made available to Community Groups and the public during out of office hours.

3. Air Quality Monitoring Data and Comparison with Air Quality Objectives

3.1 Summary of Monitoring Undertaken

A fixed ROMON unit 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 immission measurement system for the continuous and simultaneous measurement of PM_1, $PM_{2.5}$ as per EN 14907 and PM_{10} as per EN12341 since 14th April 2015. This monitoring station is also the site being used for the triplicate co-location of NO_2 diffusion tubes.

The data capture rate in 2017 for both NOx and PMs was 100% and ensure we have a good data set to analyse.

Calibration checks are conducted every 2 weeks on site by Local Authority Officers and collected data is forwarded to Ricardo - EE who validate and ratify the data. The unit is calibrated by Ricardo - EE every 6 months. Ricardo - EE reports are included in Appendix C, Figures 1 & 2.

Twenty two diffusion tubes monitoring NO_2 are also located at various locations in towns throughout North Ayrshire and data capture rate was 97%. 2017 results show that a localised area of approximately 10 meters diameter on the High Street, Irvine continues to be the subject of an elevated level exceeding the NO_2 air quality annual mean objective of 40μg/m^3. Based on diffusion tube monitoring this has been the only exceedance (41μg/m3). No other monitoring results within North Ayrshire has exceeded any relevant EU Limit Value.

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 2017. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at http://www.scottishairquality.co.uk/#site_info.

Maps showing the location of the monitoring site is provided in Appendix D: Figure 14. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

In addition three AQ Mesh mobile air monitoring pods to measure NO_2 and PM_{10}, which can provide real time data over an online connection, were deployed in the High Street to monitor ambient air quality and are collocated with diffusion tubes (Appendix C: Figure 16). AQ Mesh pods are indicative instruments which allow daily trends to be characterised which in turns leads to an understanding of the area and a can assist informed decisions to be made.

3.1.2 Non-Automatic Monitoring Sites

North Ayrshire Council undertook non-automatic (passive) monitoring of NO_2 at twenty two sites during 2017. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D: Figures 15. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

3.2 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.

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 general downward trend since 2013. It is unclear if this is due to favourable climatic conditions as the trend appears to be widespread across local areas with different geographical locations. PM_{10} levels have shown a decrease and $PM_{2.5}$ have remained the same in the High Street, Irvine for 2017. A new leisure centre that was being constructed and refurbishment of the Town House adjacent to the automatic monitoring station in High Street, Irvine are now complete.

NO_2 levels in New Street, Dalry have also shown a slight decrease. Graphs of the trends are included in Appendix C: Figures 8 – 11.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B.

As previously stated, based on diffusion tube monitoring there has been only 1 exceedance, of 41µg/m^3, at one roadside location in High Street, Irvine in 2017. This location is within a potential AQMA but not at a location of direct relevant exposure. In accordance with 7.77 to 7.79 of LAQM TG16 an estimate of the concentration at the nearest receptor has been calculated before and after proposals to widen the pavement at this location as part of public realm works. Following the procedure, results show that the predicted levels should currently be 32µg/m^3 at the relevant receptor, this is value similar with the two nearby diffusion tubes located at the receptor which recorded Annual Mean concentrations of 27µg/m^3 and 32µg/m^3. Following the widening of the pavement, according to the calculation, the Annual Mean concentration should be 28µg/m^3 and this would be 12µg/m^3 below the National Objective of 40µg/m^3. Results are shown in Appendix C: Figure 12.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 Hourly Mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year. There has been no exceedance of over 18 times per year for the 2013 to 2017 reporting period.

Although there is one diffusion tube at or near the objective limit of 40µg/m^3 in Dalry, the Drop of With Distance calculation has not been made as the tube, usually giving the highest reading in this area, has recorded a level of 38µg/m^3 this year. It is also attached to a downpipe on the building façade next to the receptor of a flatted residential dwelling therefore no calculation can be made.

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 5 years with the air quality objective of 18µg/m^3. Results show there has been one exceedance in 2013 with a concentration of 21µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 7 times per year.

There have been no exceedances of over 7 times per year for the 2013 to 2017 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 5 years with the air quality objective of 10µg/m^3.

The information presented in Table A.7 in Appendix A for 2015 is for illustrative purposes only as monitoring of $PM_{2.5}$ comenced in April of that year for the first time in North Ayrshire. An Annual Mean value of 10µg/m^3 has now been set for $PM_{2.5}$ for local authorities to achieve by the year 2020 but $PM_{2.5}$ has not been monitored for long enough in North Ayrshire to estabish any trends. However, considering the previous years' PM_{10} trends and the known PM_{10} to $PM_{2.5}$ ratio it is not anticipated that any $PM_{2.5}$ exceedance will be breached within North Ayrshire. $PM_{2.5}$ recorded a reading of 7µg/m^3 for 2017. This was the same as 2016.

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 SO_2 monitoring can be found in North Ayrshire Council's previous Air Quality Reports which are available online at:

https://www.north-ayrshire.gov.uk/pests-pollution-and-food-hygiene/pollution/air-quality-management.aspx

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:

https://www.north-ayrshire.gov.uk/pests-pollution-and-food-hygiene/pollution/air-quality-management.aspx

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 has been two significant housing developments proposed during 2017 which were considered to have the potential to increase traffic numbers and flows in and around their respective areas. The applicants were requested to undertake an Air Quality Assessment and submit a report to demonstrate whether the proposed development would have any detrimental effect on local air quality via an attached relevant Planning Condition. The application details are retained by the Planning Authority and can be found here:

16/00581/PPPM

https://www.eplanning.north-ayrshire.gov.uk/OnlinePlanning/simpleSearchResults.do?action=firstPage

17/00584/PPM

https://www.eplanning.north-ayrshire.gov.uk/OnlinePlanning/simpleSearchResults.do?action=firstPage

Two applications were received Biomass installations during 2017. One installation of 3 x 60kw wood pellet boilers and another installation of 3 x 1MW. Chimney Height applications and screening tool assessments were satisfactory at the time of application.

4.1 Road Traffic Sources

North Ayrshire Council confirms that there are no new/newly identified: 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; junctions; roads with significantly changed traffic flows and no relevant bus stations in the Local Authority area. Construction work started on the 737 Dalry Bypass in June 2017 and is progressing well. It is anticipated that construction will be completed by the end of 2019. All the details pertaining to the project can be found here https://www.transport.gov.scot/projects/a737-dalry-bypass/

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.

4.3 Industrial Sources

North Ayrshire Council confirms that there are no 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.

4.4 Commercial and Domestic Sources

North Ayrshire Council is aware of two biomass combustion plants being installed during 2017. One installation of 3 x 60kw wood pellet boilers at a Care Home and another installation of 3 x 1MW to facilitate the drying of woodchip for resale. Chimney Height applications and screening tool assessments were satisfactory at the time of application.

North Ayrshire Council confirms that there is no areas of significant domestic fuel use or Combined Heat and Power 9CHP) plant in the Local Authority area that we are aware of at this time.

4.5 New Developments with Fugitive or Uncontrolled Sources

North Ayrshire Council is aware of one potential new source of fugitive particulate matter emissions within the Local Authority area. The facility has open yardage and the potential to release fugitive emissions from the chipping, sorting and drying process of logs. Various woodchip products are produced for resale.

5. Planning Applications

Relevant new local developments are also discussed at Section 4 of this report. In 2017 applications were submitted for two proposed significant housing developments which were assessed for local air quality purposes. Planning Conditions were attached to ensure that Air Quality Assessment reports were provided prior to development commencing. The screening reports submitted were satisfactory at the time of assessment. Details of the applications are retained by the Planning Authority online at:

17/00581/PPPM

https://www.eplanning.north-ayrshire.gov.uk/OnlinePlanning/simpleSearchResults.do?action=firstPage

17/00584/PPM

https://www.eplanning.north-ayrshire.gov.uk/OnlinePlanning/simpleSearchResults.do?action=firstPage

6. Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

NO_2 diffusion tube monitoring data for 2017 has shown one exceedence for High Street Irvine. All other NO_2 diffusion tube sites and automatic monitoring within North Ayrshire Council complied with the 40μg/m^3 NO_2 Air Quality Objective set out in the Directive.

The single tube that failed the Objective, located in High Street, Irvine is adjacent to a major bus route through the town. As outlined earlier in this report, this street is the hub of the public transport (buses) serving North Ayrshire.

Diffusion tube monitoring has shown that the exceedence area is highly localised to an area approximately 10m wide. The two nearest tubes are approximately 10m away and both revealed compliant NO_2 Annual Mean concentrations of 27μg/m^3 and 32μg/m^3. All the remaining tubes in the vicinity ranged between 22μg/m^3 and 25μg/m^3, confirming that overall the street complies with the Air Quality Objective and the exceedence is concentrated in one spot.

In addition, the Drop-off with Distance calculator was used to more accurately quantify the NO_2 level at the receptors for the 2017 results and also to predict the likely levels when the new widening of the pavement is in place at this location. The results are detailed in the Table below. It is anticipated that the amended pavement layout will have a significant impact on dispersion and dilution of the pollutants from buses and will result in significantly lower Annual Mean levels. In addition to this, the main bus operator in the area, Stagecoach, changed their fleet of 27 buses on Route 11 in January 2018 to Euro VI. Monitoring results to date appear to be favourable, showing reduced levels of CO2.

Drop-off with Distance for NO2 Tube Exceedence at High Street, Irvine

Location	Distance from Kerb		Annual Mean NO_2		Predicted NO2 at Receptor
	Site	Receptor	Background	Site	
79 High Street, Irvine	1.5m	5m	6ug/m^3	41ug/m^3	32ug/m^3
(Actual)					
NEW widened pavement (predicted)	*1.5m*	*8.2m*	*6ug/m^3*	*41ug/m^3*	*28ug/m^3*

The Scottish Air Quality Objective of 18μg/m^3 for PM_{10}, and 10μg/m^3 for $PM_{2.5}$ was not exceeded with the annual means measured at 13μg/m^3 and 7μg/m^3 respectively in High Street, Irvine. The European Directive Air Quality Directive (40μg/m^3) was not exceeded. Automated monitoring at this site will continue for 2018.

6.2 Conclusions relating to New Local Developments

Planning applications for two significant housing developments were received in 2017. Considered was given to these applications as they had potential to increase traffic numbers and flows in and around the local area of their location. The applicants were requested to undertake Air Quality Assessments 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 reports provided were satisfactory.

6.3 Proposed Actions

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

Irvine

Considering the monitoring data and planned alterations at High Street, Irvine, it is expected that the street layout and Public Realm changes will have the desired impact on reducing NO_2 levels at the localised hot spot.

The programme and time scale for this project is shown in Appendix C: Figure 13. It is proposed that NO_2 sampling continues in this area with close supervision of future developments.

Dalry

It is proposed that monitoring is continued in this area and, in addition to the existing NO_2 diffusion tubes, an AQ Mesh pod may also be deployed in this area which will allow more robust data to be collated on a real time basis.

The tender for the construction of the A737 Dalry Bypass was awarded to the preferred bidder in June 2017. The works have now started and we will continue to work with our partners Transport Scotland and their contractors Farrans Roadbridge JV when required to support this project.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
ROM	ROMON	Roadside	232188	638861	NO_2; PM_{10}; $PM_{2.5}$	N	Chemiluminescent; Optical Light Scatter	20	2.5	2.0

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

(2) N/A if not applicable.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?
DT1	**35 East Road, Irvine**	Roadside	**232323**	**638892**	**NO_2**	**N**	1	2.5	N
DT2	**18 Bank St, Irvine**	Roadside	**232202**	**638952**	**NO_2**	**N**	2.5	1.6	N
DT3	**147 High Street, Irvine**	Roadside	**232077**	**638990**	**NO_2**	**N**	0	4	N
DT4	**85 High St, Irvine**	Roadside	**232158**	**638882**	**NO_2**	**N**	0	3.7	N
DT5	**79 High St, Irvine**	Roadside	**232169**	**638878**	**NO_2**	**N**	3.5	1.5	N
DT6	**75 High St, Irvine HIGH**	Roadside	**232170**	**638871**	**NO_2**	**N**	0	5	N
DT7	**65a High Street, Irvine, (ROMON)**	Roadside	**232188**	**638861**	**NO_2**	**N**	4.7	1.7	Y
DT8	**65 High Street, Irvine, (ROMON)**	Roadside	**232188**	**638861**	**NO_2**	**N**	4.7	1.7	Y
DT9	**63 High Street, Irvine, (ROMON)**	Roadside	**232188**	**638861**	**NO_2**	**N**	4.7	1.7	Y
DT10	**34 Kirkgate Irvine**	Urban Background	**232085**	**638774**	**NO_2**	**N**	10	0.5	N
DT11	**25 Main Rd, Springside**	Kerbside	**236813**	**638659**	**NO_2**	**N**	5	1	N
DT12	**Auchengate (Bridge)**	Urban Background	**233332**	**635558**	**NO_2**	**N**	N/A	32	N

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?
DT13	**Dalry Rd, Kilwinning**	Kerbside	**229928**	**643400**	**NO_2**	**N**	2	1	N
DT14	**Vernon St, Saltcoats**	Kerbside	**224697**	**641366**	**NO_2**	**N**	0	1	N
DT15	**12 Garnock St, Dalry**	Urban Background	**229326**	**649250**	**NO_2**	**N**	10	0.5	N
DT16	**67 New St, Dalry**	Kerbside	**229338**	**649337**	**NO_2**	**N**	0	0.5	N
DT17	**45 New St, Dalry**	Kerbside	**229286**	**649365**	**NO_2**	**N**	0	0.5	N
DT18	**2 Townhead St, Dalry**	Roadside	**229230**	**649338**	**NO_2**	**N**	0	3	N
DT19	**Highfield Hamlet, Dalry**	Urban Background	**230943**	**650280**	**NO_2**	**N**	10	1	N
DT20	**85 Main Street, Largs**	Kerbside	**220333**	**659322**	**NO_2**	**N**	1.5	0	N
DT21	**Hunterston Road**	Rural	**219582**	**650020**	**NO_2**	**N**	N/A	N/A	N
DT22	**Princess St/Glasgow St, Ardrossan**	Kerbside	**219582**	**650020**	**NO_2**	**N**	0	0.5	N

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2013	2014	2015	2016	2017
ROMON	Roadside	Automatic	-	100	31	29	28	25	21
DT1	Roadside	Diffusion Tube	-	92	27	23	22	22	22
DT2	Roadside	Diffusion Tube	-	100	28	25	22	23	22
DT3	Roadside	Diffusion Tube	-	100	31	34	24	25	21
DT4	Roadside	Diffusion Tube	-	100	36	32	31	29	27
DT5	Kerbside	Diffusion Tube	-	100	**59**	**53**	**51**	**43**	**41**
DT6	Roadside	Diffusion Tube	-	92	**48**	**45**	37	30	32
DT7	Roadside	Diffusion Tube	-	92	32	29	28	25	25
DT8	Roadside	Diffusion Tube	-	100	32	28	29	25	24
DT9	Roadside	Diffusion Tube	-	100	33	27	27	25	23
DT10	Urban Background	Diffusion Tube	-	100	13	11	8	9	8
DT11	Kerbside	Diffusion Tube	-	92	17	15	15	14	14

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2013	2014	2015	2016	2017
DT12	Urban Background	Diffusion Tube	-	92	12	11	10	12	12
DT13	Kerbside	Diffusion Tube	-	100	23	22	19	18	19
DT14	Kerbside	Diffusion Tube	-	92	14	11	9	11	9
DT15	Urban Background	Diffusion Tube	-	92	33	30	30	31	29
DT16	Kerbside	Diffusion Tube	-	100	**45**	**42**	36	39	38
DT17	Kerbside	Diffusion Tube	-	100	33	32	28	24	27
DT18	Roadside	Diffusion Tube	-	100	22	23	18	20	19
DT19	Urban Background	Diffusion Tube	-	92	25	19	18	19	17
DT20	Kerbside	Diffusion Tube	-	100	7	7	5	5	5
DT21	Rural	Diffusion Tube	-	100	23	18	18	17	15
DT22	Kerbside	Diffusion Tube	-	100	26	21	21	18	19

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

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

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

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

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

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2013	2014	2015	2016	2017
ROMON	Roadside	Automatic	-	100	0	0	**1**	0	0

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} Annual Mean Concentration (µg/m^3) (3)				
				2013	2014	2015	2016	2017
ROMON	Roadside	-	100	21	16	14	15	13

Notes: Exceedences of the PM_{10} annual mean objective of 18µg/m^3 are shown in **bold.**

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2013	2014	2015	2016	2017
CM1	Roadside	-	100	0	0	0	0	0

Notes: Exceedences of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 7 times/year) are shown in **bold.**

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
				2013	2014	2015	2016	2017
CM1	Roadside	-	100	-	-	6	7	7

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

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

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

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

Appendix B: Full Monthly Diffusion Tube Results for 2017

Table B.1 – NO_2 Monthly Diffusion Tube Results for 2017

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
DT1	31.5	26.8	26..3	24.3	16.2	21.1	13.4	20.3	25.9	23.8	34.9	-	23.8	22
DT2	28.9	33.5	28.7	9.0	24.4	18.6	16.5	20.5	22.4	25.6	22.7	33.1	23.7	22
DT3	33.5	31.9	14.8	6.1	28.7	17.1	21.6	19.2	35.0	19.1	21.6	33.6	23.5	21
DT4	40.1	33.4	31.0	7.8	28.3	25.9	24.5	33.3	32.0	35.8	30.3	27.2	29.1	27
DT5	46.1	40.5	39.3	21.8	38.9	44.2	39.8	51.9	61.6	58.6	47.8	49.5	**45.0**	**41**
DT6	40.3	36.4	37.2	16.9	31.2	35.1	35.2	36.0	40.0	40.6	34.6	-	34.9	32
DT7	33.8	29.8	27.4	18.7	23.7	24.1	22.9	24.3	31.2	30.2	33.1	-	27.2	25
DT8	30.8	26.8	29.0	12.6	23.5	24.3	21.6	22.1	30.5	29.2	32.6	33.2	26.4	24
DT9	30.3	28.4	33.3	13.5	22.3	21.5	21.9	25.0	31.5	19.5	30.0	26.9	25.3	23
DT10	12.7	13.5	13.1	2.0	7.4	5.8	7.2	4.8	8.3	8.4	9.8	17.0	9.2	8
DT11	23.9	20.2	17.0	3.7	13.4	11.4	11.2	14.8	16.3	17.3	23.5	-	15.7	14
DT12	19.8	18.6	-	6.7	12.2	7.8	8.4	9.3	10.9	12.2	16.6	16.7	12.7	12
DT13	30.6	28.7	21.3	7.8	18.0	17.3	13.6	17.5	21.1	24.3	19.3	24.8	20.4	19
DT14	19.8	16.2	-	4.6	8.0	6.0	5.6	5.8	7.7	8.9	11.5	15.8	10.0	9
DT15	45.0	35.9	-	11.2	22.8	31.8	24.5	28.5	39.6	39.4	41.8	34.9	32.3	29
DT16	56.6	46.7	36.8	21.6	40.7	37.7	32.1	41.0	45.7	51.4	42.4	47.5	**41.7**	38
DT17	41.4	38.3	28.5	9.9	31.1	26.3	27.0	35.0	33.8	21.7	31.4	34.9	29.9	27
DT18	28.2	22.1	34.5	4.8	24.2	16.3	15.1	17.8	16.9	22.7	22.8	22.3	20.6	19
DT19	22.8	-	19.3	4.8	21.7	20.1	16.6	17.6	25.1	14.9	27.1	20.9	19.2	17
DT20	7.6	7.9	5.4	1.9	5.3	4.9	3.8	4.1	5.9	5.5	2.6	5.0	5.0	5
DT21	20.9	22.5	20.0	7.3	21.1	15.9	12.4	14.8	14.9	16.5	13.9	18.4	16.6	15
DT22	28.4	24.3	25.8	11.3	23.7	19.2	17.6	20.0	22.4	20.5	21.4	19.9	21.2	19

(1) See Appendix C for details on bias adjustment

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

Figure 1: RICARDO-EE Air Pollution Report

Air Pollution Report

Air Quality in Scotland

1st January to 31st December 2017

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	-	365	-	363	363
Number Days Moderate	-	0	-	0	0
Number Days High	-	0	-	0	0
Number Days Very High	-	0	-	0	0
Max Daily Mean	95	61	207	46	34
Annual Max	260	113	511	346	94
Annual Mean	23	21	57	13	7
98th Percentile of daily mean	-	-	-	32	-
90th Percentile of daily mean	-	-	-	20	-
99.8th Percentile of hourly mean	-	94	-	-	-
98th Percentile of hourly mean	103	68	220	36	25
95th Percentile of hourly mean	84	57	182	28	17
50th Percentile of hourly mean	11	15	32	11	6
% Annual data capture	**99.61%**	**99.55%**	**99.55%**	**99.53%**	**99.53%**

Instruments: PM_{10}: 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 2: RICARDO-EE Certificate of Calibration.

RICARDO

CERTIFICATE OF CALIBRATION

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

Telephone 01235 753642

0401

Authorised Signatories: D Hector
S Stratton✓

Signed: Date of Issue: 28th June 2017

Certificate Number: 3743

Page 1 of 2

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 North Ayrshire Irvine High St air monitoring station.

Site / Date Test Carried Out	Species	Analyser Serial No.	Zero Response [1]	Uncertainties ppb	Calibration Factor [2]	Uncertainties %	Converter eff. (%) [3]
Irvine High St 22nd February 2017	NO_x	2981873	5.0	2.5	0.9310	2.5	88.6
	NO		0.0	2.5	0.9177	5.1	

The reported expanded uncertainty is 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 is a trading name of Ricardo-AEA Ltd.

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Certificate Number: 3743

Site / Date Test Carried Out	Species	Analyser Serial No.	Parameter	Specified Value	Measured Value	Deviation %	Uncertainty %
Irvine High St 22nd February 2017	FIDAS	6251	Total Flow[4]	4.83	4.68	-3.19	2.25

The gaseous ambient analysers listed above have been tested for zero response, calibration factor, linearity and converter efficiency (NO_x analysers only) 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, NO_x, SO_2, O_3 and ppm for CO. Where 1 ppm = 1000 ppb). 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 applicable) is the flow rate through the sensor unit of the TEOM particulate analyser under test. The measured aux flow rate (where applicable) is the flow rate through the bypass tubing 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. 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.

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

Figure 3: NOx & PM Fidas Service Report

SERVICE REPORT

AirMonitors.co.uk
Quality - Service - Innovation

Customer :	North Ayrshire	**Job No:**	gc110417 Irv
Site Name:	Irvine	**Start Date**	11/04/17
		Start Time	09:45
		End Date	11/04/17
		End Time	12:25

Reason for visit: NOX

Additional Reason for visit: Please select

Fidas

Action Taken:
Nox: Pre-stats and zero/span
Stripped and cleaned reaction chamber, orifices and valves
replaced sinter filters, o-rings, dfu and sample filter
Pump good at 25.5"
Calibrated analyser
Post stats and zero/span

Fidas: pre-stats and checks
clean filter and housing
run optical clean test
adjust flows
post stats and checks

Parts Used

Model Used on:	Part No: (Must be completed)	Description:	Qty	Invoice
Nox	10010	large o-rings	4	
Nox	10012	Small o-rings	6	
Nox	f010004	Sinter filter	3	
Nox	dif-bn50	Small DFU	1	
Nox	25000447-008	O-ring	1	
		Consumables		

Engineer: (Enter Name)
Gareth C
Visit Type: Routine Service

Complete site inventory

For Office Use Only:

TTS 1.75

VDT A

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

Figure 4: QA/QC Data

Diffusion Tube Bias Adjustment Factors

National Adjustment Factors

Diffusion tubes (20% TEA/Water) used in the sampling period for 2017 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 in Figure 5 below. The Tube Precision and AIR results for the laboratory are shown in Figure 6 below. The resultant bias for GSS is **0.91** based on 6 studies with 2 of poor precision.

Factor from Local Co-location Studies

The automatic monitoring station (ROMON) 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 - EE. The unit is audited every 6 months by Ricardo - EE and is serviced every 6 months under contract to another company. Corresponding data was entered in the "Checking Precision and Accuracy of Triplicate Tubes" spreadsheet provided by Ricardo - EE Energy & Environment (Figure 7 below). The resulting Bias factor for 2017 data is **0.81** using all 12 periods.

Discussion of Choice of Factor to Use

Although the diffusion tube co-location study for North Ayrshire Council has "Good" precision and corresponding "Good" overall Data Capture from the ROMON it is felt that the local derived bias factor of 0.78 – 0.81 is significantly lower than that of other years. Records show that previously local derived bias factors ranged from 0.91 – 1 between 2009 and 2016 and the National Bias Adjustment Factor from GSS is more in accordance with these values and when applied reflects this more accurately on the true values of air quality when considered over the entire district. Using the national bias factor reflects a more realistic trend for NO_2 pollution levels.

PM Monitoring Adjustment

The automatic monitoring station (ROMON – Fidas 200) is visually checked every 2 weeks during the NOx calibration check. The PM_{10} and $PM_{2.5}$ data collected by the ROMON is processed and ratified by Ricardo - EE. The Air Pollution Report for North Ayrshire, Irvine High Street for 1st January to 31st December 2017 is included above.

QA/QC of automatic monitoring

The automatic monitoring station (ROMON – NOx) has an onsite calibration check conducted every 2 weeks by Local Authority Officers. All checks are carried out in accordance with procedures laid out by Ricardo - EE and calibration check sheets are forwarded to them after each visit. The site is visited by Ricardo - EE engineers every 6 months to carry out calibration tests and the unit is serviced twice yearly. Reports from these visits are included above.

Figure 5: Bias Factor Spreadsheet (Glasgow Scientific)

National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 03/18

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 2018

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@uk.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	2017	UB	Glasgow City Council	12	34	25	32.9%	G	**0.75**
Glasgow Scientific Services	20% TEA in water	2017	R	Glasgow City Council	12	38	37	2.9%	G	**0.97**
Glasgow Scientific Services	20% TEA in water	2017	R	Glasgow City Council	10	35	34	3.6%	P	**0.97**
Glasgow Scientific Services	20% TEA in water	2017	KS	Glasgow City Council	12	63	59	6.2%	G	**0.94**
Glasgow Scientific Services	20% TEA in water	2017	R	Glasgow City Council	12	45	36	24.5%	P	**0.80**
Glasgow Scientific Services	20% TEA in water	2017	KS	Marylebone Road Intercomparison	12	77	79	-2.2%	G	**1.02**
Glasgow Scientific Services	20% TEA in water	2017		**Overall Factor[3] (6 studies)**				**Use**		**0.91**

Figure 6: Tube Precision & AIR Results

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 $\leq \pm 2$ as defined above.

AIR PT Round	AIR PT AR013	AIR PT AR015	AIR PT AR016	AIR PT AR018	AIR PT AR019	AIR PT AR021	AIR PT AR022	AIR PT AR024
Round conducted in the period	April – May 2016	July – August 2016	September – October 2016	January – February 2017	April – May 2017	July – August 2017	September – October 2017	January – February 2018
Aberdeen Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Cardiff Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Edinburgh Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Environmental Services Group, Didcot [1]	75 %	75 %	100 %	100 %	100 %	100 %	100 %	100 %
Exova (formerly Clyde Analytical)	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Glasgow Scientific Services	100 %	0 %	100 %	100 %	50 %	0 %	100 %	100 %
Gradko International [1]	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Kent Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Kirklees MBC	100 %	100 %	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Lambeth Scientific Services	100 %	100 %	75 %	100 %	NR [2]	NR [2]	100 %	NR [2]
Milton Keynes Council	100 %	100 %	75 %	100 %	75 %	0 %	75 %	100 %
Northampton Borough Council	100 %	NR [2]	75 %	0 %	NR [3]	NR [3]	NR [3]	NR [3]
Somerset Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	75 %	100 %
South Yorkshire Air Quality Samplers	100 %	75 %	100 %	100 %	100 %	100 %	100 %	100 %
Staffordshire County Council	75 %	100 %	NR [2]	100 %	100 %	100 %	100 %	50 %
Tayside Scientific Services (formerly Dundee CC)	NR [2]	100 %	NR [2]	100 %	NR [2]	100 %	NR [2]	100 %
West Yorkshire Analytical Services	100 %	NR [2]	50 %	100 %	100 %	100 %	100 %	50 %

[1] Participant subscribed to two sets of test samples (2 x 4 test samples) in each AIR PT round.
[2] NR No results reported
[3] Northampton Borough Council, Kent Scientific Services, Cardiff Scientific Services, Kirklees MBC and Exova (formerly Clyde Analytical) no longer carry out NO_2 diffusion tube monitoring and therefore did not submit results.

Figure 7: 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	06/12/2017	31/01/2017	33.8	30.8	30.3	32	1.9	6	4.7	25.4	100	Good	Good
2	31/01/2017	28/02/2017	29.8	26.8	28.4	28	1.5	5	3.7	21.5	97	Good	Good
3	28/02/2017	28/03/2017	27.4	29.0	33.3	30	3.1	10	7.6	27	100	Good	Good
4	28/03/2017	28/04/2017	18.7	12.6	13.5	15	3.3	22	8.2	25.8	100	Poor Precision	Good
5	28/04/2017	26/05/2017	23.7	23.5	22.3	23	0.8	3	1.9	18	100	Good	Good
6	26/05/2017	28/06/2017	24.1	24.3	21.5	23	1.6	7	3.9	17.1	100	Good	Good
7	28/06/2017	02/08/2017	22.9	21.6	21.9	22	0.7	3	1.7	14.8	100	Good	Good
8	02/08/2017	30/08/2017	24.3	22.1	25.0	24	1.5	6	3.8	15	99	Good	Good
9	30/08/2017	28/09/2017	31.2	30.5	31.5	31	0.5	2	1.3	20.3	99	Good	Good
10	28/09/2017	01/11/2017	30.2	29.2	19.5	26	5.9	22	14.7	17.6	99	Poor Precision	Good
11	01/11/2017	06/12/2017	33.1	32.6	30.0	32	1.7	5	4.1	25.7	100	Good	Good
12	06/12/2017	03/01/2017		33.2	26.9	30	4.5	15	40.0	28.8	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

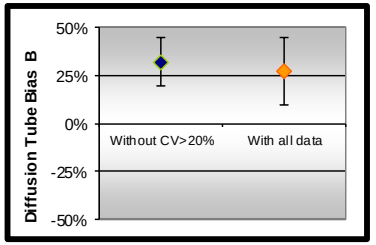
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	High St., 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	0.78 (0.71 - 0.86)
Bias B	29% (16% - 42%)
Diffusion Tubes Mean:	28 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	21 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	21 (20 - 24) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.81 (0.71 - 0.95)
Bias B	23% (6% - 41%)
Diffusion Tubes Mean:	26 µgm^{-3}
Mean CV (Precision):	9
Automatic Mean:	21 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	21 (19 - 25) 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

Diffusion Tube Accuracy NAC (cont'd)

Adjustment of SINGLE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tube Measurements

Site Name/ID	Periods													Raw Mean	Valid periods
	1	2	3	4	5	6	7	8	9	10	11	12	13		
1. 35 East Road Irvine	31.5	26.8	26.3	24.3	16.2	21.1	13.4	20.3	25.9	23.8	34.9			24.0	11
2. 18 Bank St, Irvine	28.9	33.5	28.7	9.0	24.4	18.6	16.5	20.5	22.4	25.6	22.7	33.1		23.7	12
3. 147 High Street, Irvine	33.5	31.9	14.8	6.1	28.7	17.1	21.6	19.2	35.0	19.1	21.6	33.6		23.5	12
4. 85 High St, Irvine	40.1	33.4	31.0	7.8	28.3	25.9	24.5	33.3	32.0	35.8	30.3	27.2		29.1	12
5. 79 High St, Irvine	46.1	40.5	39.3	21.8	38.9	44.2	39.8	51.9	61.6	58.6	47.8	49.5		45.0	12
6. 75 High St, Irvine	40.3	36.4	37.2	16.9	31.2	35.1	35.2	36.0	40.0	40.6	34.6			34.9	11
7. 65a High Street, Irvine,	33.8	29.8	27.4	18.7	23.7	24.1	22.9	24.3	31.2	30.2	33.1			27.2	11
8. 65 High Street, Irvine	30.8	26.8	29.0	12.6	23.5	24.3	21.6	22.1	30.5	29.2	32.6	33.2		26.4	12
9. 63 High Street, Irvine	30.3	28.4	33.3	13.5	22.3	21.5	21.9	25.0	31.5	19.5	30.0	26.9		25.3	12
10. 34 Kirkgate Irvine	12.7	13.5	13.1	2.0	7.4	5.8	7.2	4.8	8.3	8.4	9.8	17.0		9.2	12
11. 25 Main Rd, Springside	23.9	20.2	17.0	3.7	13.4	11.4	11.2	14.8	16.3	17.3	23.5			15.7	11
12. Auchengate (Bridge)	19.8	18.6		6.7	12.2	7.8	8.4	9.3	10.9	12.2	16.6	16.7		12.7	11
13. Dalry Rd , Kilwinning	30.6	28.7	21.3	7.8	18.0	17.3	13.6	17.5	21.1	24.3	19.3	24.8		20.4	12
14. 12 Garnock St, Dalry	19.8	16.2		4.6	8.0	6.0	5.6	5.8	7.7	8.9	11.5	15.8		10.0	11
15. 67 New St, Dalry	45.0	35.9		11.2	22.8	31.8	24.5	28.5	39.6	39.4	41.8	34.9		32.3	11
16. 45 New St Dalry	56.6	46.7	36.8	21.6	40.7	37.7	32.1	41.0	45.7	51.4	42.4	47.5		41.7	12
17. 2 Townhead, St, Dalry	41.4	38.3	28.5	9.9	31.1	26.3	27.0	35.0	33.8	21.7	31.4	34.9		29.9	12
18. Highfield Hamlet , Dalry	28.2	22.1	34.5	4.8	24.2	16.3	15.1	17.8	16.9	22.7	22.8	22.3		20.6	12
19. 85 Main Street , Largs	22.8		19.3	4.8	21.7	20.1	16.6	17.6	25.1	14.9	27.1	20.9		19.2	11
20. Hunterston Road	7.6	7.9	5.4	1.9	5.3	4.9	3.8	4.1	5.9	5.5	2.6	5.0		5.0	12
21. Princes St, Ardrossan	20.9	22.5	20.0	7.3	21.1	15.9	12.4	14.8	14.9	16.5	13.9	18.4		16.6	12
22. Vernon St, Saltcoats	28.4	24.3	25.8	11.3	23.7	19.2	17.6	20.0	22.4	20.5	21.4	19.9		21.2	12

Adjusted measurement (95% confidence interval)
with all the data
12 periods used in this calcuations

Bias Factor A 0.81 (0.71 - 0.95)
Bias B 23% (6% - 41%)
Tube Precision: 9 Automatic DC: 100%

Adjusted with 95% CI	**19 (17 - 23)**
Adjusted with 95% CI	**19 (17 - 22)**
Adjusted with 95% CI	**19 (17 - 22)**
Adjusted with 95% CI	**24 (21 - 28)**
Adjusted with 95% CI	**36 (32 - 43)**
Adjusted with 95% CI	**28 (25 - 33)**
Adjusted with 95% CI	**22 (19 - 26)**
Adjusted with 95% CI	**21 (19 - 25)**
Adjusted with 95% CI	**21 (18 - 24)**
Adjusted with 95% CI	**7 (7 - 9)**
Adjusted with 95% CI	**13 (11 - 15)**
Adjusted with 95% CI	**10 (9 - 12)**
Adjusted with 95% CI	**16 (14 - 19)**
Adjusted with 95% CI	**8 (7 - 9)**
Adjusted with 95% CI	**26 (23 - 31)**
Adjusted with 95% CI	**34 (30 - 40)**
Adjusted with 95% CI	**24 (21 - 28)**
Adjusted with 95% CI	**17 (15 - 20)**
Adjusted with 95% CI	**16 (14 - 18)**
Adjusted with 95% CI	**4 (4 - 5)**
Adjusted with 95% CI	**13 (12 - 16)**
Adjusted with 95% CI	**17 (15 - 20)**

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

Diffusion Tube Accuracy NAC (cont'd)

Adjustment of DUPLICATE or 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 Average	Standard Deviation	CV	95% CI mean	Data Quality Check: Diffusion Tubes Precision Check
1	06/12/2017	31/01/2017	33.8	30.8	30.3	31.6	1.89	5.98	4.70	Good
2	31/01/2017	28/02/2017	29.8	26.8	28.4	28.3	1.50	5.30	3.73	Good
3	28/02/2017	28/03/2017	27.4	29.0	33.3	29.9	3.05	10.20	7.58	Good
4	28/03/2017	28/04/2017	18.7	12.6	13.5	14.9	3.29	22.05	8.18	Poor Precision
5	28/04/2017	26/05/2017	23.7	23.5	22.3	23.2	0.76	3.27	1.88	Good
6	26/05/2017	28/06/2017	24.1	24.3	21.5	23.3	1.56	6.70	3.88	Good
7	28/06/2017	02/08/2017	22.9	21.6	21.9	22.1	0.68	3.08	1.69	Good
8	02/08/2017	30/08/2017	24.3	22.1	25.0	23.8	1.51	6.36	3.76	Good
9	30/08/2017	28/09/2017	31.2	30.5	31.5	31.1	0.51	1.65	1.27	Good
10	28/09/2017	01/11/2017	30.2	29.2	19.5	26.3	5.91	22.47	14.68	Poor Precision
11	01/11/2017	06/12/2017	33.1	32.6	30.0	31.9	1.66	5.22	4.13	Good
12	06/12/2017	03/01/2017		33.2	26.9	30.1	4.45	14.82	40.02	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 St., Irvine

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

Bias calculated using 10 periods of data
Tube Precision: 6 Automatic DC: 100%
Bias factor A: 0.78 (0.71 - 0.86)
Bias B: 29% (16% - 42%)

Information about tubes to be adjusted
Diffusion Tube average: 28 μgm^{-3}
Average Precision (CV): 6
Adjusted Tube average: 21 +/- 2 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data

Bias calculated using 12 periods of data
Tube Precision: 9 Automatic DC: 100%
Bias factor A: 0.81 (0.71 - 0.95)
Bias B: 23% (6% - 41%)

Information about tubes to be adjusted
Diffusion Tube average: 26 μgm^{-3}
Average Precision (CV): 9
Adjusted Tube average: 21 +/- 5 μgm^{-3}

Figure 8: Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites in Irvine 2013 - 2017.

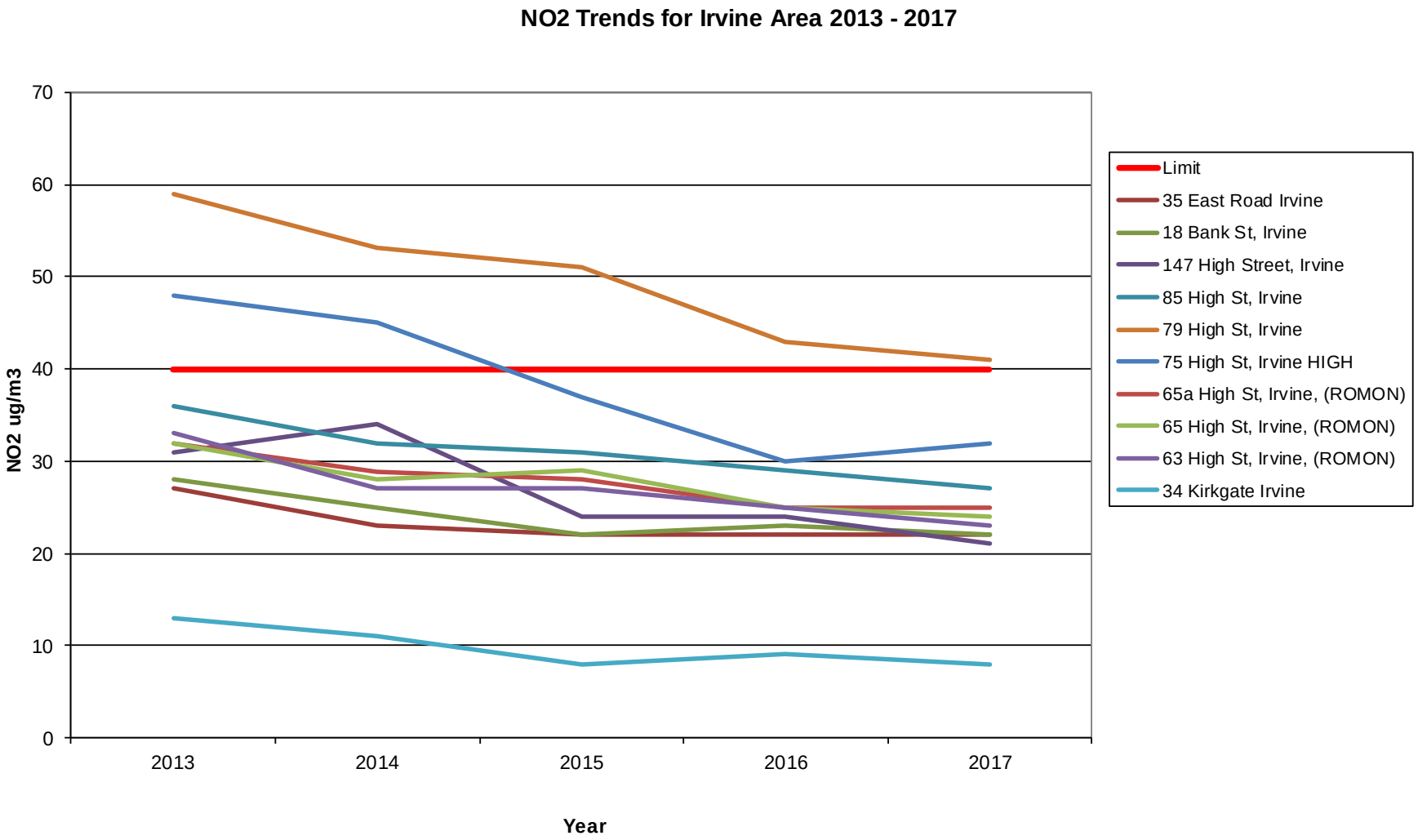


Figure 9: Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites in Dalry 2013 - 2017.

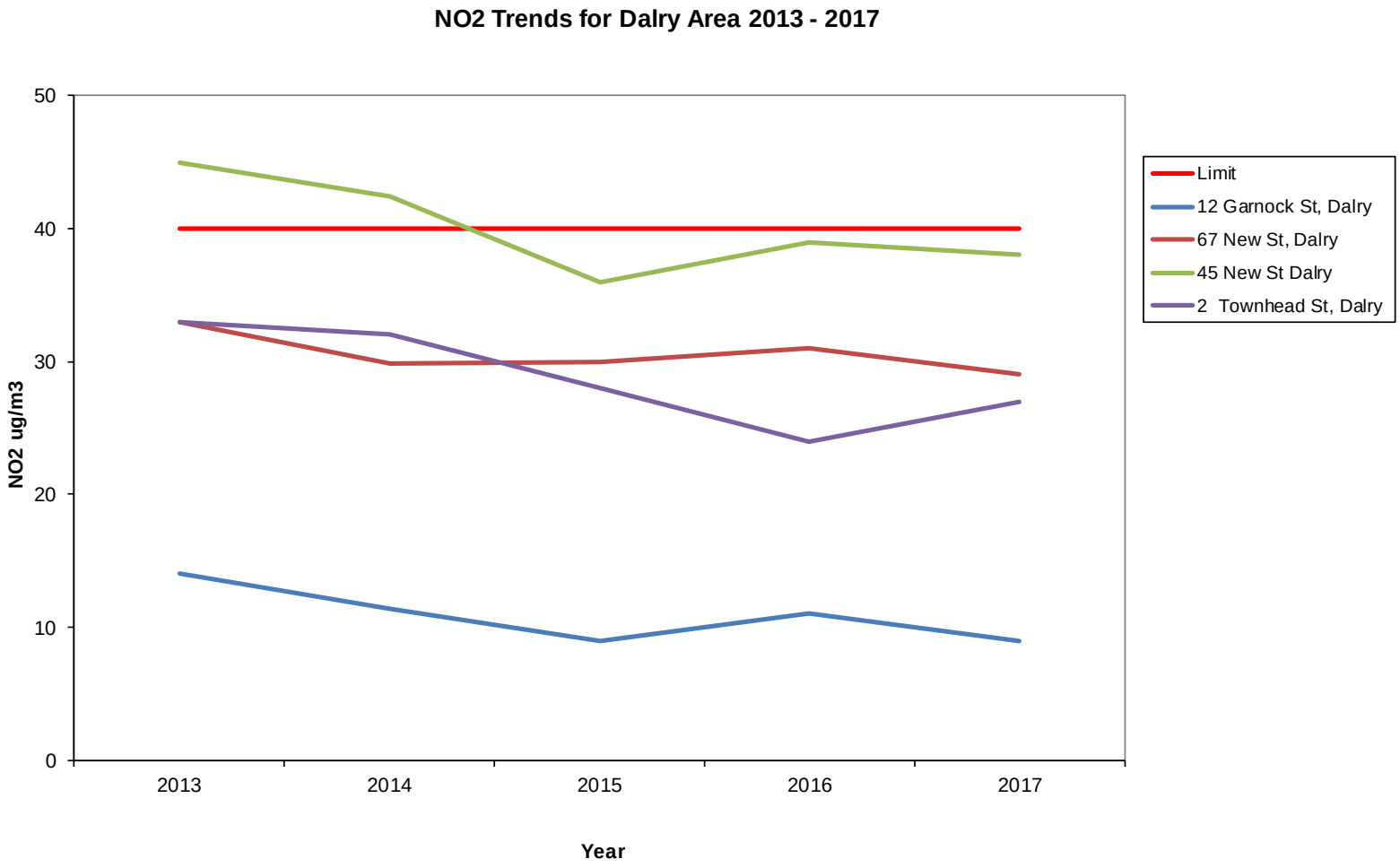


Figure 10: Trends in Annual Mean PM10 Concentrations measured at Automatic Station (ROMON) in High Street, Irvine 2013 - 2017.

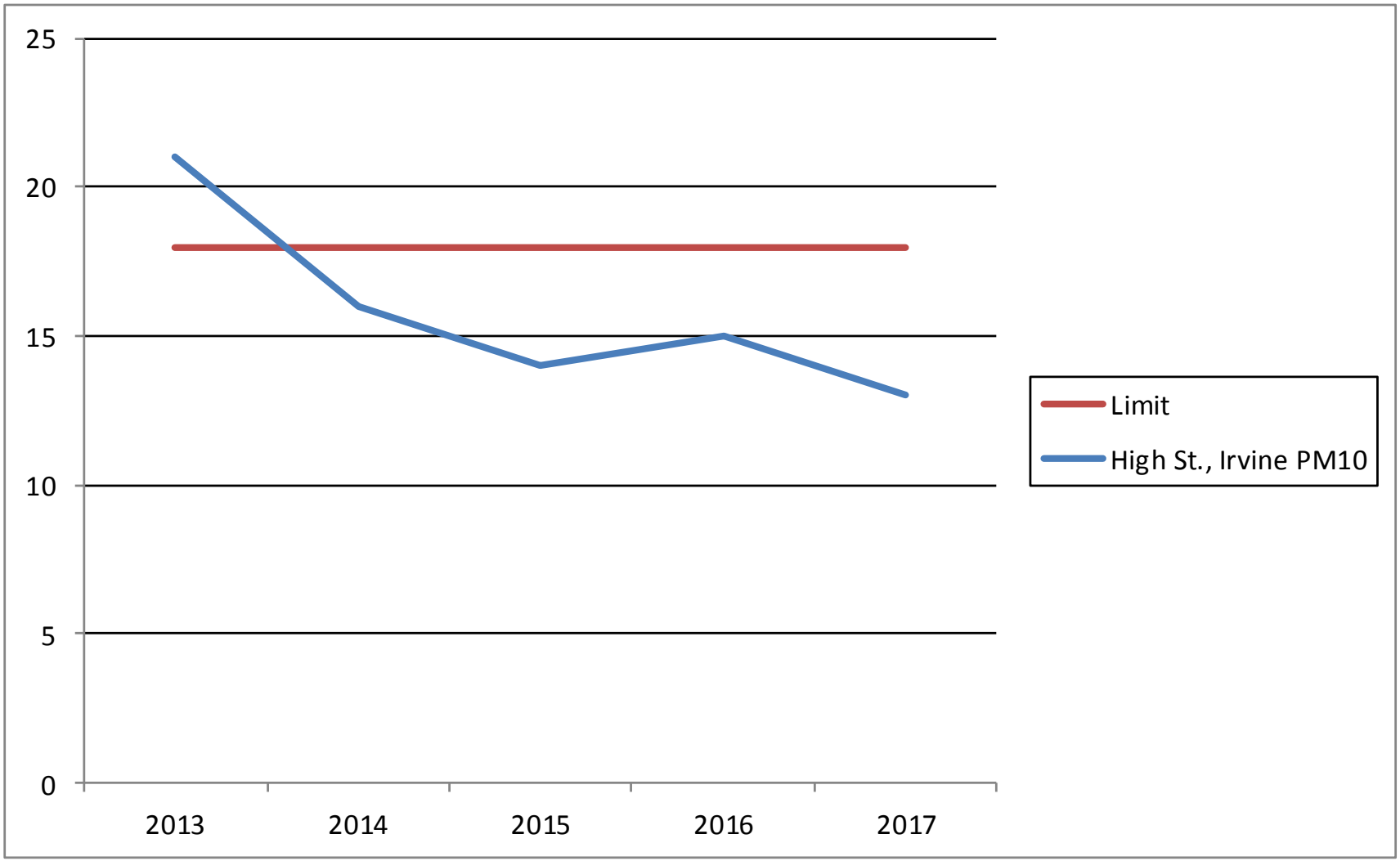


Figure 11: Trends in Annual Mean PM2.5 Concentrations measured at Automatic Station (ROMON) in High Street, Irvine 2015 - 2017.

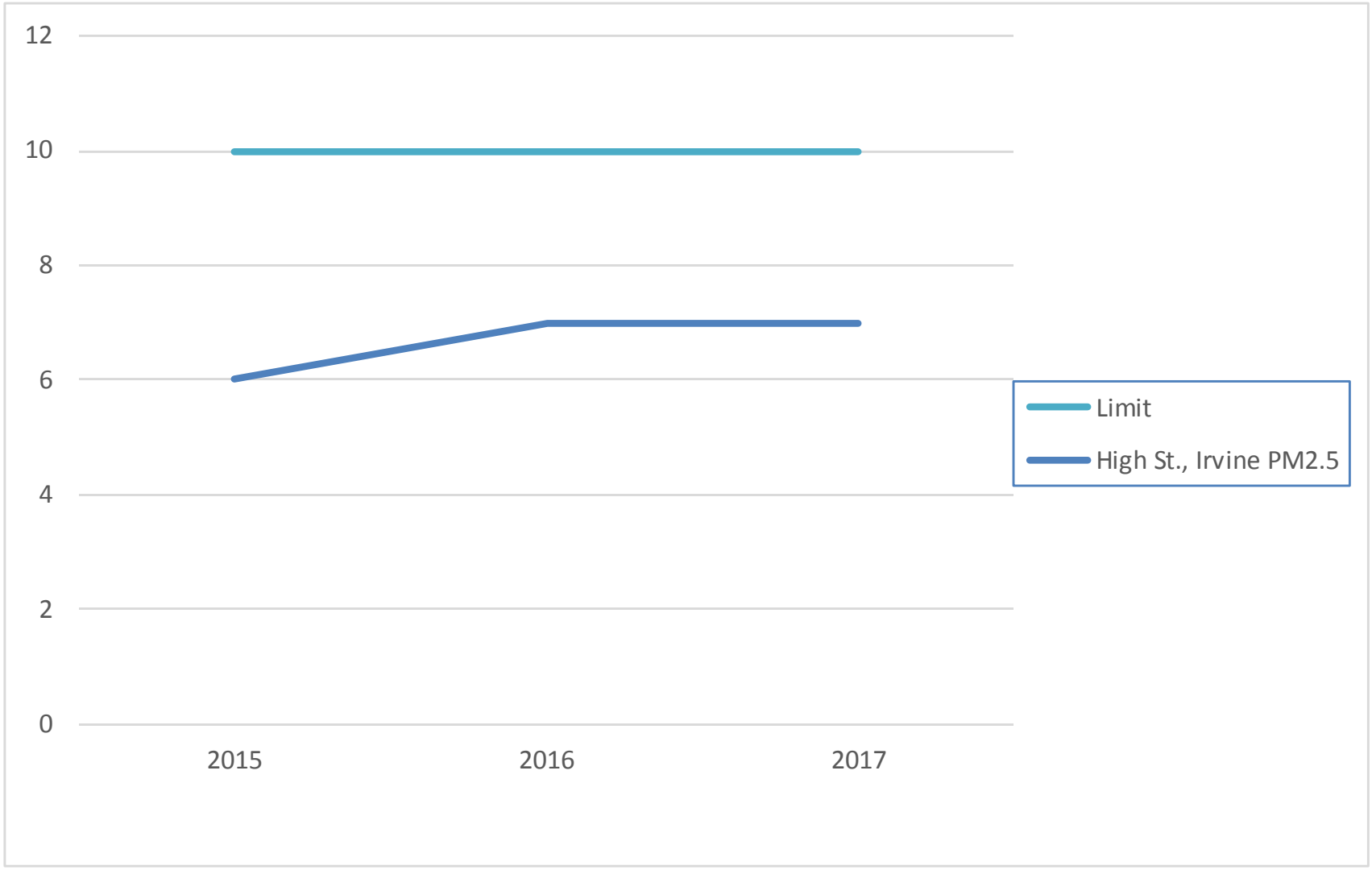
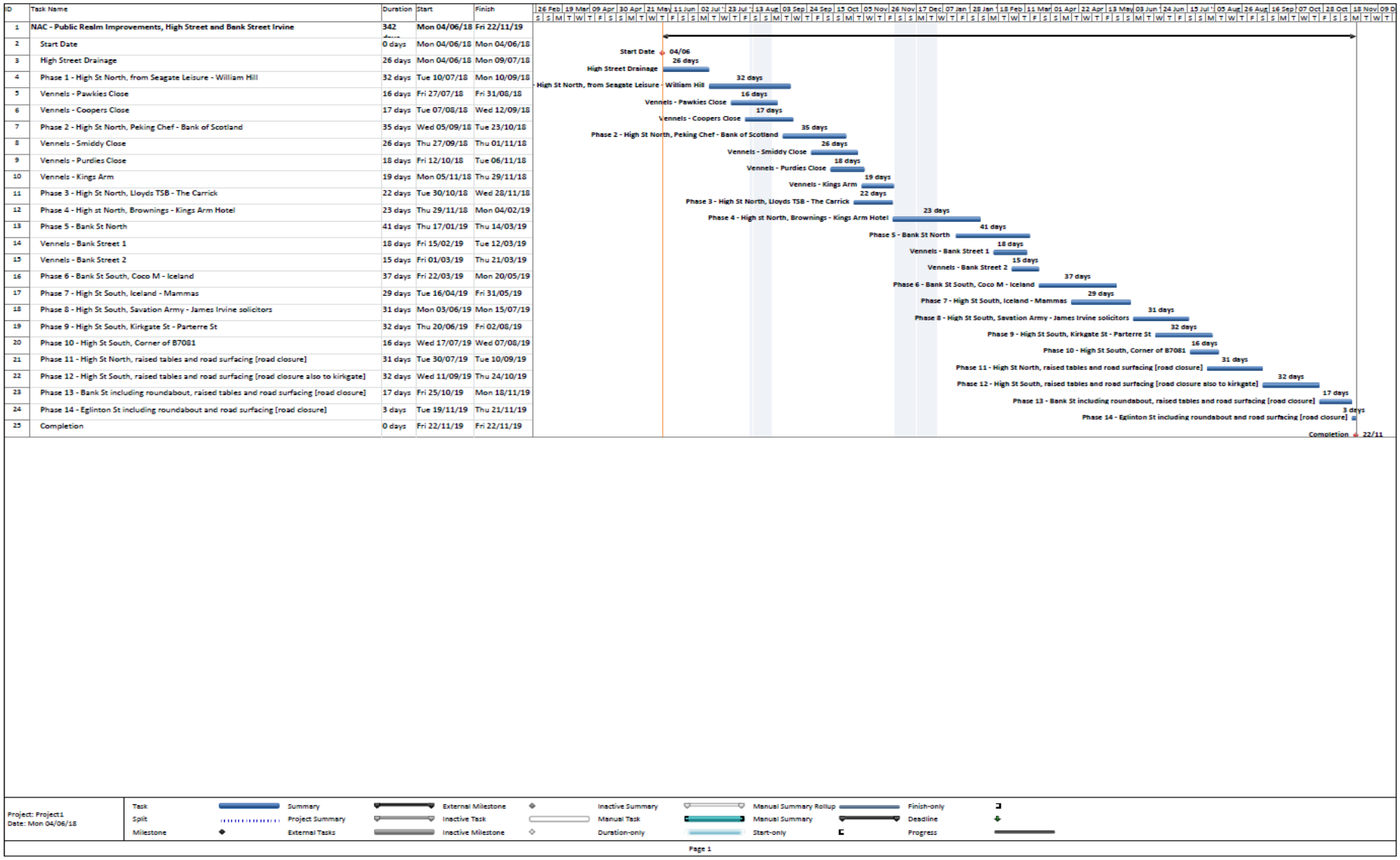


Figure 12: Drop-off with Distance for NO2 Tube Exceedences in High Street, Irvine.

Location	Distance from Kerb		Annual Mean NO_2		Predicted NO2 at Receptor
	Site	Receptor	Background	Site	
79 High Street, Irvine *(Actual)*	1.5m	5m	6ug/m^3	41ug/m^3	32ug/m^3
NEW widened pavement (predicted)	*1.5m*	*8.2m*	*6*ug/m^3	41ug/m^3	28ug/m^3

Figure 13: Irvine High Street, Irvine Public Realm Works Timescale



ID	Task Name	Duration	Start	Finish
1	NAC - Public Realm Improvements, High Street and Bank Street Irvine	342 days	Mon 04/06/18	Fri 22/11/19
2	Start Date	0 days	Mon 04/06/18	Mon 04/06/18
3	High Street Drainage	26 days	Mon 04/06/18	Mon 09/07/18
4	Phase 1 - High St North, from Seagate Leisure - William Hill	32 days	Tue 10/07/18	Mon 10/09/18
5	Vennels - Pawkies Close	16 days	Fri 27/07/18	Fri 31/08/18
6	Vennels - Coopers Close	17 days	Tue 07/08/18	Wed 12/09/18
7	Phase 2 - High St North, Peking Chef - Bank of Scotland	35 days	Wed 05/09/18	Tue 23/10/18
8	Vennels - Smiddy Close	26 days	Thu 27/09/18	Thu 01/11/18
9	Vennels - Purdies Close	18 days	Fri 12/10/18	Tue 06/11/18
10	Vennels - Kings Arm	19 days	Mon 05/11/18	Thu 29/11/18
11	Phase 3 - High St North, Lloyds TSB - The Carrick	22 days	Tue 30/10/18	Wed 28/11/18
12	Phase 4 - High st North, Brownings - Kings Arm Hotel	23 days	Thu 29/11/18	Mon 04/02/19
13	Phase 5 - Bank St North	41 days	Thu 17/01/19	Thu 14/03/19
14	Vennels - Bank Street 1	18 days	Fri 15/02/19	Tue 12/03/19
15	Vennels - Bank Street 2	15 days	Fri 01/03/19	Thu 21/03/19
16	Phase 6 - Bank St South, Coco M - Iceland	37 days	Fri 22/03/19	Mon 20/05/19
17	Phase 7 - High St South, Iceland - Mammas	29 days	Tue 16/04/19	Fri 31/05/19
18	Phase 8 - High St South, Savation Army - James Irvine solicitors	31 days	Mon 03/06/19	Mon 15/07/19
19	Phase 9 - High St South, Kirkgate St - Parterre St	32 days	Thu 20/06/19	Fri 02/08/19
20	Phase 10 - High St South, Corner of B7081	16 days	Wed 17/07/19	Wed 07/08/19
21	Phase 11 - High St North, raised tables and road surfacing [road closure]	31 days	Tue 30/07/19	Tue 10/09/19
22	Phase 12 - High St South, raised tables and road surfacing [road closure also to kirkgate]	32 days	Wed 11/09/19	Thu 24/10/19
23	Phase 13 - Bank St including roundabout, raised tables and road surfacing [road closure]	17 days	Fri 25/10/19	Mon 18/11/19
24	Phase 14 - Eglinton St including roundabout and road surfacing [road closure]	3 days	Tue 19/11/19	Thu 21/11/19
25	Completion	0 days	Fri 22/11/19	Fri 22/11/19

Appendix D: Supporting Figures

Figure 14: Automatic Monitoring Site Location

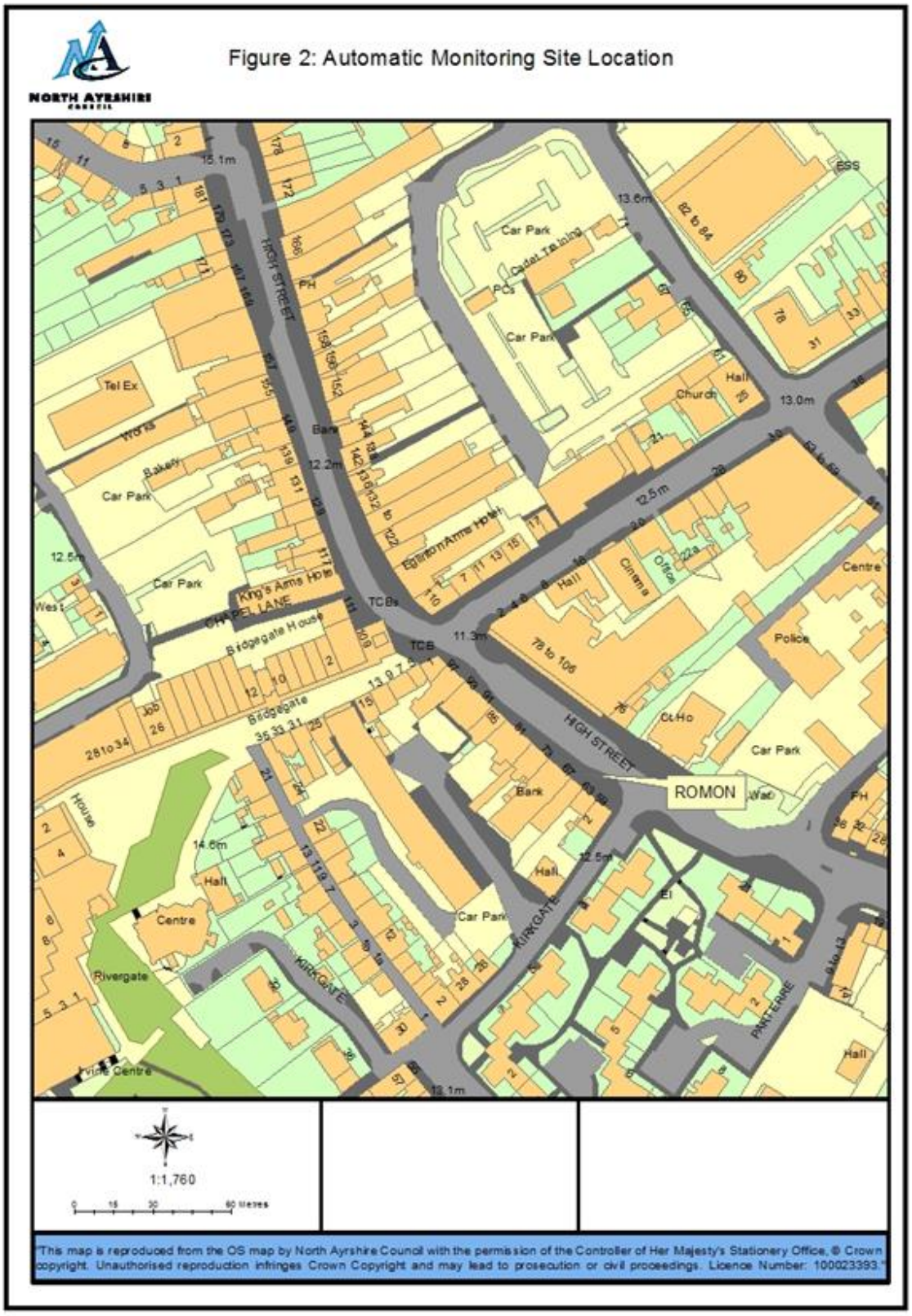


Figure 15: Non-Automatic Monitoring Site Locations

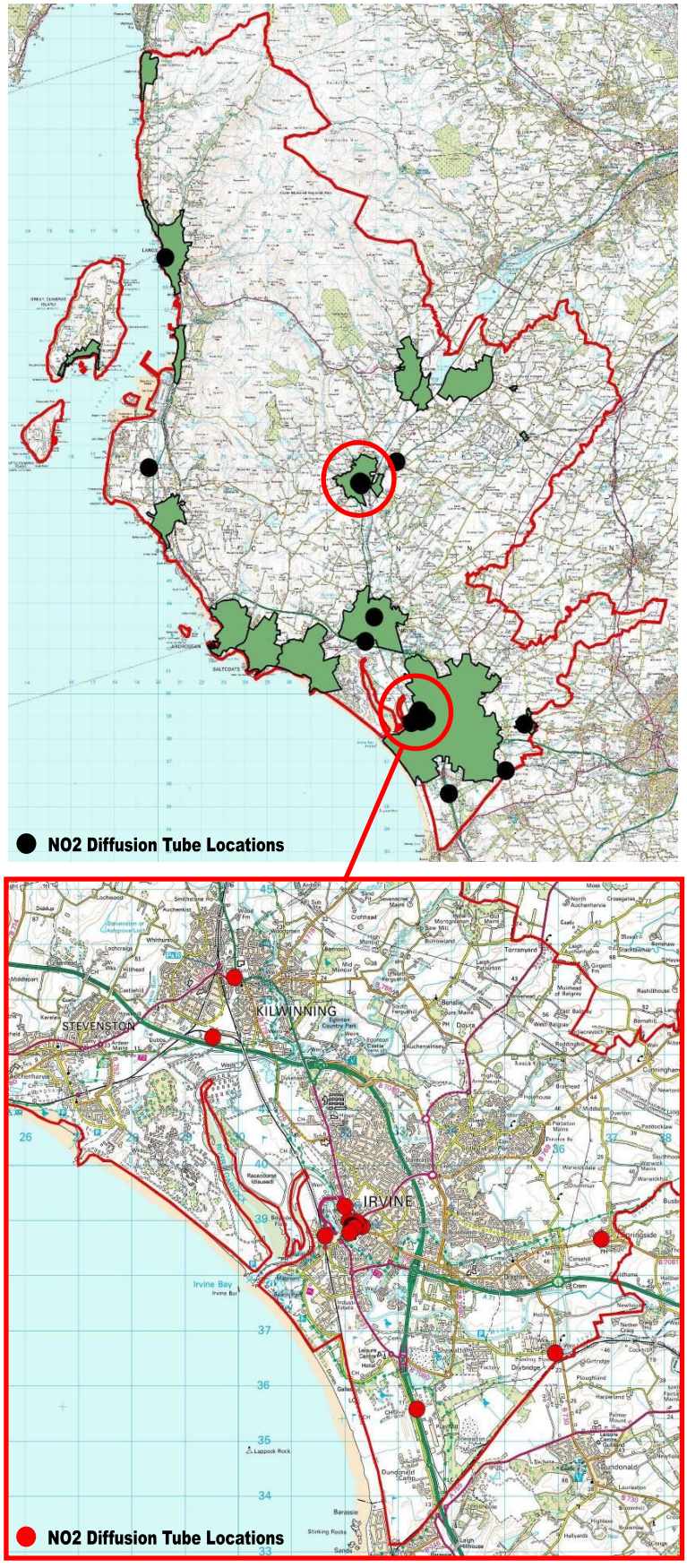


Figure 16: High Street, Irvine Diffusion Tube Site Locations

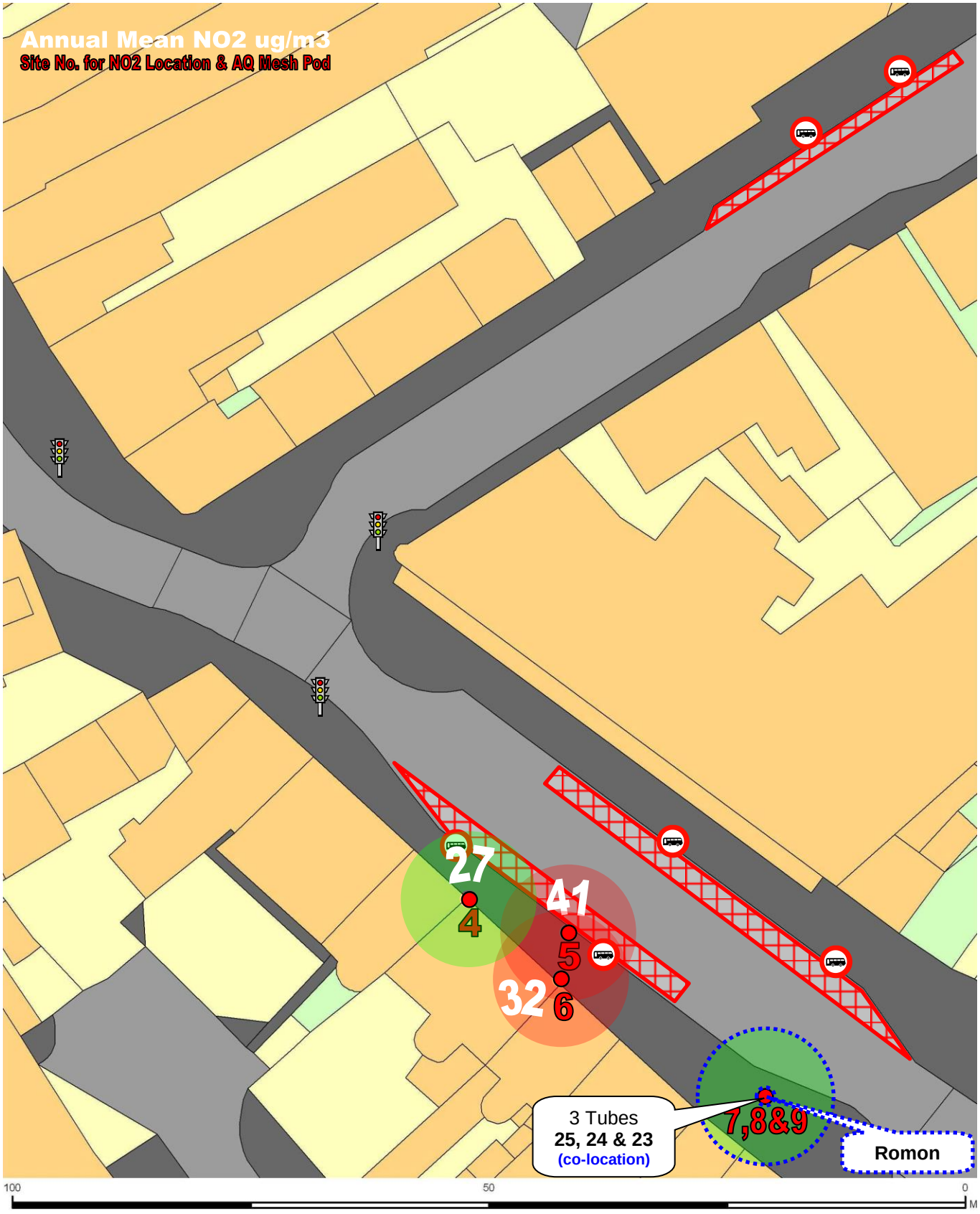


Figure 17: Dalry Diffusion Tube Site Locations

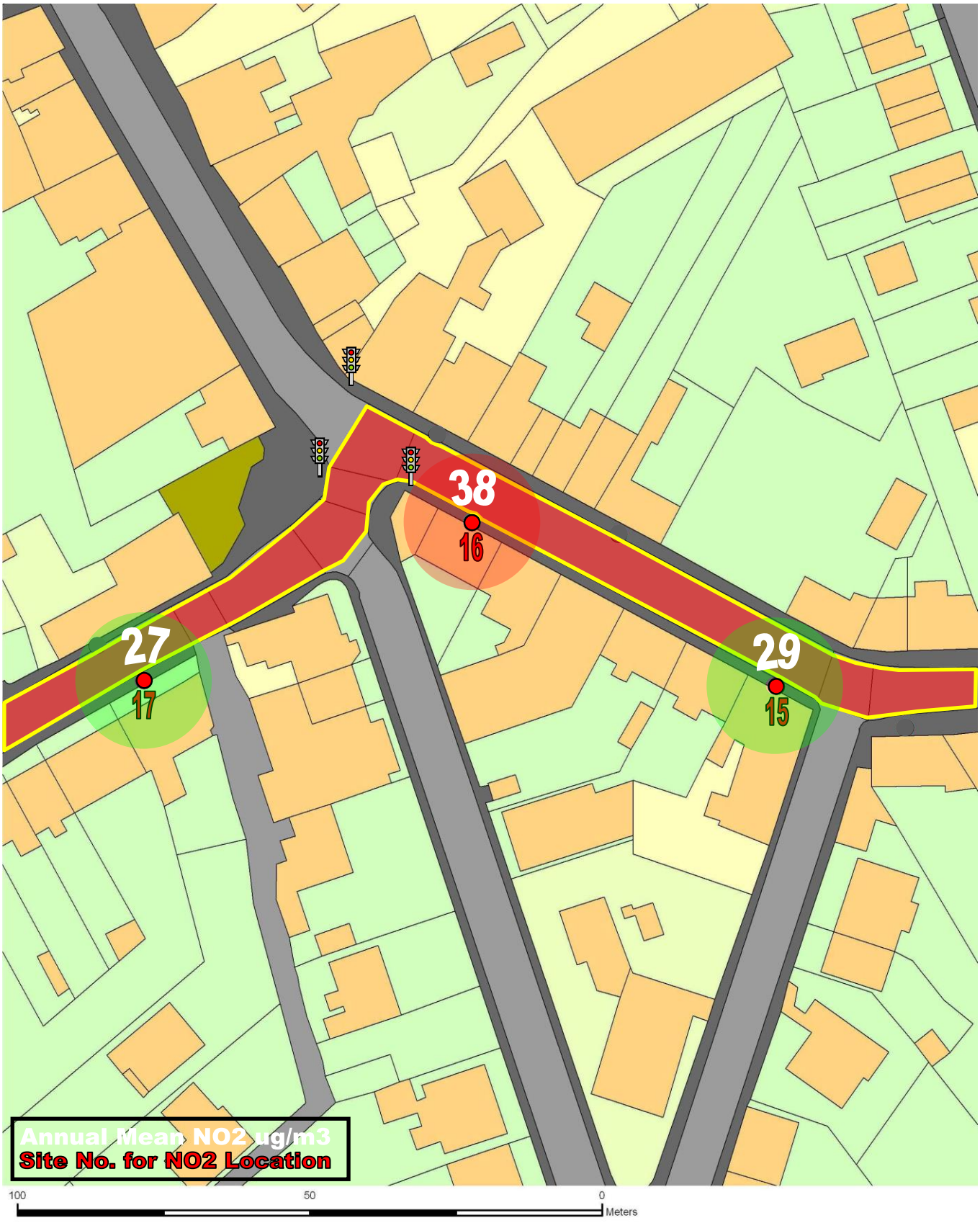
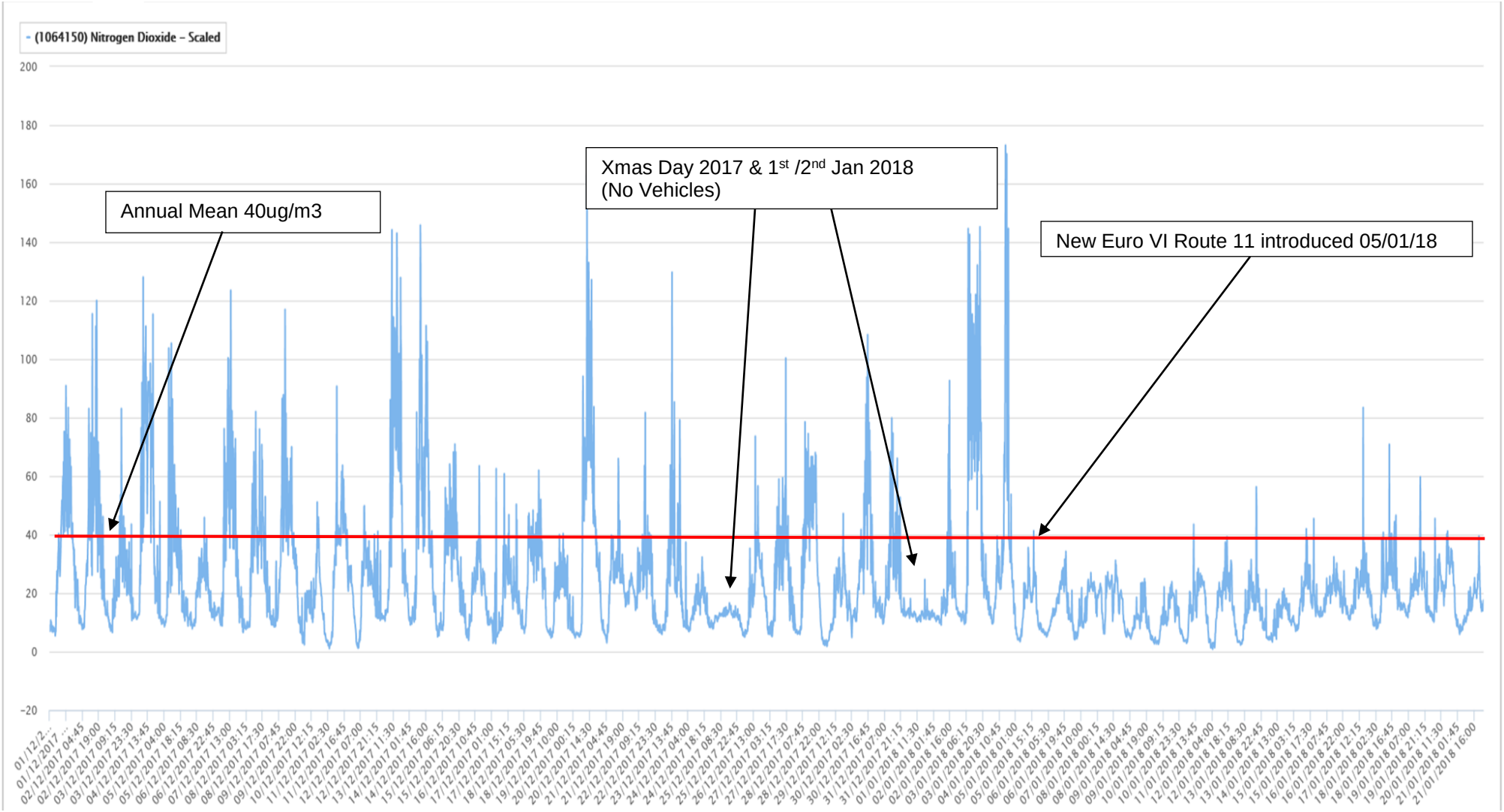


Figure 18: Graph showing potential change in NO2 concentrations following Euro VI buses introduction.



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)
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

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3. Environmental Sustainability & Climate Change Strategy 2014-2017 http://naconnects.north-ayrshire.gov.uk/documents/strategies/environmental-sustainability-climate-change-strategy-procurement.pdf
4. Local Air Quality Management, Technical Guidance LAQM.TG (16), April 2016.
5. Irvinetimes.com http://www.irvinetimes.com/news/15810855.New_year__new_Number_11/?ref=arc