Annual Progress Report (APR)

North Ayrshire Council
Comhairle Siorrachd Àir a Tuath

2017 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 2017

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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 2016. 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

2016 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 43$\mu g/m^3$, at one location. This is down on the 2015 results where the same location had an exceedance of 51$\mu g/m^3$. PM_{10} was recorded at 15$\mu g/m^3$ for 2016 for High Street, Irvine. Slightly up from 14$\mu g/m^3$ for 2015. The Scottish annual mean air quality objective for PM_{10} is 18$\mu g/m^3$. Throughout 2016 a new leisure centre was being constructed and refurbishment of the Town House was being undertaken adjacent to the monitoring station and this may have resulted in the slight increase of PM_{10} levels. 2016 was the first full year of $PM_{2.5}$ monitoring in High Street, Irvine and this has recorded a result of 7$\mu g/m^3$, the Scottish annual mean air quality objective for PM10 is 10$\mu g/m^3$.

In New Street, Dalry NO_2 is noted to be up from 36$\mu g/m^3$ in 2015 to 39$\mu g/m^3$ in 2016 for the same corresponding diffusion tube of concern.

Overall, the monitoring results for 2016 have shown that levels of NO_2 have decreased significantly in High Street, Irvine, but PM_{10} levels have shown a slight increase. NO_2 levels in New Street, Dalry have also shown an increase.

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) are proposed. The design team are now in the Design Development & Procurement phase of the project and time scales are included in Appendix C, Figure 9. A technical design to form a tender for the works package in August/September of this year is currently being formulated and an early 2018 site start 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.

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. 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 and supporting teams.

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 continues as does the LUNAR (Lighting Up North Ayrshire Responsibly) project which has already seen LED lantern units installed throughout North Ayrshire as part of a major programme to replace up to 13,500 lights. This “invest-to-save” project is nearing completion and has continued to provide significant reductions in energy consumption and associated CO_2 emissions.

In 2016, in excess of £1.1M 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 to promote modal shift to active and sustainable travel 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 has also supported a number of local businesses to become Cycle Friendly Employers. Funding has been secured through the European Regional Development Fund (ERDF) Low Carbon Travel and Transport Challenge Fund to develop an Active Travel Hub in Irvine. This will establish a bike library and support cycle parking; public cycle pumps; public cycle tools and an e-bike charging station. The Council will also construct a closed cycle loop and invest in the upgrade of a number of path routes to support travel into the town centre and across the town. Funding has been secured in principle to install SCOOT (Split Cycle Offset Optimisation Technique), a tool for managing and controlling traffic signals in urban areas that responds automatically to fluctuations in traffic flow through the use of on-street

detectors embedded in the road, 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 implement a permanent staff pool car scheme and d) 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, tenders 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 first National Clean Air Day on Thursday 15th June 2017 and encouraged staff to actively travel to work. Those who used an alternative mode of transport to the car was rewarded with a free healthy breakfast. 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/

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 2016. 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 are now in the Design Development & Procurement phase of the project and time scales are included in Appendix C, Figure 9. A technical design to form a tender for the works package in August/September of this year is currently being formulated and an early 2018 site start 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.

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. 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 continues. There are now 14 cars, including 3 electric ones and to date (end of June 2017) approximately 171,500 miles have been covered with an estimated saving of 5.8 tonnes of carbon dioxide (CO2). It is anticipated that this scheme will be made permanent and a number of cars will be available at strategic council offices throughout North Ayrshire by the end of 2017.

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 2016 for NOx and PMs was 100% and 99% respectively and ensure we have 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, Figure 1.

Twenty two diffusion tubes monitoring NO_2 are also located at various locations in towns throughout North Ayrshire and data capture was 99%. 2016 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 (43μg/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 2016 using Equivalence tested NO_x and PM reference analysers. Table A.1 in Appendix A shows the details of the site. National monitoring results are available at http://www.scottishairquality.co.uk/#site_info

A map showing the location of the monitoring site is provided in Appendix D: Figure 10. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C: Figure 1.

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. 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.

Figures 12 and 13 in Appendix D demonstrate NO_2 trends over the 2015/16 festive holiday period and what effect wind speed and direction have on concentrations respectively in relation to building height and street orientation. These factors have been discussed in previous detailed reports which can be found here:

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

3.1.2 Non-Automatic Monitoring Sites

North Ayrshire Council undertook non-automatic (passive) monitoring of NO_2 at twenty two sites during 2016. Table A.2 in Appendix A shows the details of the sites.

A map showing the location of the monitoring sites is provided in Appendix D: Figure 11. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C: Figure 1.

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: Figures 1 – 4.

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. However, it is noted that PM_{10} levels have shown a slight increase in the High Street, Irvine for 2016. Throughout 2016 a new leisure centre was being constructed and refurbishment of the Town House was being undertaken adjacent to the monitoring station and this may have resulted in the

slight increase of PM_{10} levels due to dust from construction works. NO_2 levels in New Street, Dalry have also shown an increase. Graphs of the trends are included in Appendix C: Figures 5 - 7.

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 2016 dataset of Monthly Mean values is provided in Appendix B: Table B.1.

As previously stated, based on diffusion tube monitoring there has been only 1 exceedance, of 43µg/m^3, at one roadside location in High Street, Irvine in 2016. 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 33µg/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 29µg/m^3 and 30µg/m^3. Following the widening of the pavement, according to the calculation, the Annual Mean concentration should be 29µg/m^3 and this would be 11µg/m^3 below the National Objective of 40µg/m^3. Results are shown in Appendix C: Figure 8.

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 2012 to 2015 reporting period.

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} 24 Hour Mean 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 2012 to 2016 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.

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 2016 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 applications are at various stages in the process and no Air Quality Assessments have been submitted as yet. The application details are retained by the Planning Authority and can be found here:

16/00561/PPPM

https://www.eplanning.north-ayrshire.gov.uk/OnlinePlanning/applicationDetails.do?keyVal=O8IFI6LEK9X00&activeTab=summary

16/00397/PPPM

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

No applications have been received for any Biomass installations that we are aware of at this time.

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 has recently started on the 737 Dalry Bypass (June 2017) and progress on this will be reported in future reports.

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 confirms that there has been no installation of any biomass plants that we are aware of at this time nor has there been any areas of significant domestic fuel use in the Local Authority area.

4.5 New Developments with Fugitive or Uncontrolled Sources

North Ayrshire Council confirms that there are no new potential sources of fugitive particulate matter emissions in the Local Authority area.

5. Planning Applications

Relevant new local developments are also discussed at Section 4 of this report. In 2016 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 will be provided prior to development commencing. These applications are at various stages and the reports are awaited. Details of the applications are retained by the Planning Authority online at:

16/00561/PPPM

https://www.eplanning.north-ayrshire.gov.uk/OnlinePlanning/applicationDetails.do?keyVal=O8IFI6LEK9X00&activeTab=summary

16/00397/PPPM

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 2016 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 29μg/m^3 and 30μg/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 2016 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.

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 *(Actual)*	1.5m	5m	6ug/m^3	43ug/m^3	33ug/m^3
NEW widened pavement (predicted)	*1.5m*	*8.2m*	*6*ug/m^3	43ug/m^3	29ug/m^3

The Scottish Air Quality Objective of 18μg/m^3 for PM_{10}, was not exceeded with the annual mean measured at 16μg/m^3 in High Street, Irvine. The European Directive Air Quality Directive (40μg/m^3) was not exceeded. Automated monitoring at this site will continue for 2017.

6.2 Conclusions relating to New Local Developments

Planning applications for two significant housing developments were received in 2016. 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. These two applications are still on going and 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 reports are awaited and will be evaluated when they are submitted prior to development commencing.

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. Full details can be found in Agenda Item 6 of the Cabinet meeting https://north-ayrshire.cmis.uk.com/North-Ayrshire/-ayrshire.cmis.uk.com/North-Ayrshire/-ayrshire.cmis.uk.com/north-ayrshire/CommitteesMeetings/MeetingsCalendar/tabid/70/ctl/ViewMeetingPublic/mid/397/Meeting/2651/Committee/5/Default.aspx

The time scale for this project is shown in Appendix, Figure 9. 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 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 2016 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2012	2013	2014	2015	2016
ROMON	Roadside	Automatic	100	100	31	31	29	28	25
DT1	Roadside	Diffusion Tube	100	100	27	27	23	22	22
DT2	Roadside	Diffusion Tube	100	100	28	28	25	22	23
DT3	Roadside	Diffusion Tube	100	92	31	31	34	24	25
DT4	Roadside	Diffusion Tube	100	100	34	36	32	31	29
DT5	Kerbside	Diffusion Tube	100	100	**59**	**59**	**53**	**51**	**43**
DT6	Roadside	Diffusion Tube	100	92	**46**	**48**	**45**	37	30
DT7	Roadside	Diffusion Tube	100	100	32	32	29	28	25
DT8	Roadside	Diffusion Tube	100	100	31	32	28	29	25
DT9	Roadside	Diffusion Tube	100	100	33	33	27	27	25
DT10	Urban Background	Diffusion Tube	100	100	14	13	11	8	9
DT11	Kerbside	Diffusion Tube	100	100	19	17	15	15	14

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2012	2013	2014	2015	2016
DT12	Urban Background	Diffusion Tube	100	100	13	12	11	10	12
DT13	Kerbside	Diffusion Tube	100	100	26	23	22	19	18
DT14	Kerbside	Diffusion Tube	100	100	14	14	11	9	11
DT15	Urban Background	Diffusion Tube	100	100	26	33	30	30	31
DT16	Kerbside	Diffusion Tube	100	92	**44**	**45**	**42**	36	39
DT17	Kerbside	Diffusion Tube	100	100	33	33	32	28	24
DT18	Roadside	Diffusion Tube	100	100	21	22	23	18	20
DT19	Urban Background	Diffusion Tube	100	100	24	25	19	18	19
DT20	Kerbside	Diffusion Tube	100	100	7	7	7	5	5
DT21	Rural	Diffusion Tube	100	100	19	23	18	18	17
DT22	Kerbside	Diffusion Tube	100	100	25	26	21	21	18

Notes: Exceedences of the NO_2 annual mean objective of 40µg/m3 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 2016 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2012	2013	2014	2015	2016
ROMON	Roadside	Automatic	100	100	0(117)	0	0	**1**	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 2016 (%) (2)	PM_{10} Annual Mean Concentration (µg/m^3) (3)				
				2012	2013	2014	2015	2016
ROMON	Roadside	99	99	17	**21**	16	14	15

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 2016 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2012	2013	2014	2015	2016
ROMON	Roadside	99	99	**2**	**1**	0	**1**	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 90.4th 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 2016 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
				2012	2013	2014	2015	2016
ROMON	Roadside	99	99	-	-	-	*7	7

Notes: Exceedences of the $PM_{2.5}$ 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.

*This value is indicative for information only. The Fidas 200 fine dust monitor was installed in April 2015 and there are no other similar sites or reliable results with which to annualise data.

Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 – NO_2 Monthly Diffusion Tube Results for 2016

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	19.10	29.80	25.50	10.07	16.30	13.80	16.10	20.70	21.60	24.10	34.70	33.00	22.1	22
DT2	29.70	27.50	28.50	10.00	15.80	14.30	15.40	19.60	28.10	22.80	36.00	34.00	23.5	23
DT3	37.40	30.90	27.70	10.40	22.30	16.20	13.00	-	25.10	18.70	34.00	32.10	24.3	24
DT4	31.10	33.60	31.50	15.10	22.30	17.80	30.20	28.50	36.70	24.80	35.00	36.80	28.6	29
DT5	59.60	33.00	45.30	24.80	28.00	25.10	58.30	52.80	52.30	35.30	49.80	50.10	42.9	43
DT6	42.00	32.70	44.30	21.00	35.30	18.50	20.30	8.60	-	27.20	45.60	38.10	30.3	30
DT7	15.10	21.00	26.80	15.60	20.00	19.40	24.50	29.10	29.00	28.10	38.70	28.30	24.6	25
DT8	34.40	19.40	26.40	17.30	19.80	18.90	23.20	27.60	24.40	25.80	36.60	28.90	25.2	25
DT9	26.20	21.10	27.10	22.10	17.70	15.90	25.60	27.90	25.20	27.70	34.80	29.70	25.1	25
DT10	14.10	11.00	2.40	6.00	3.70	2.50	2.10	6.80	9.60	12.90	18.00	16.30	8.8	9
DT11	18.30	9.90	17.60	5.30	9.60	5.60	5.40	20.00	15.70	17.40	22.60	21.30	14.1	14
DT12	16.20	10.50	14.60	8.00	7.10	1.60	5.50	9.20	12.00	19.00	18.90	20.40	11.9	12
DT13	26.10	16.30	21.10	7.20	10.50	10.50	10.00	16.00	20.10	23.00	26.90	30.30	18.2	18
DT14	17.70	11.80	12.90	4.40	6.90	4.60	2.10	6.60	7.00	13.40	19.70	21.90	10.8	11

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)
DT15	27.80	39.30	39.60	15.20	29.70	14.30	29.00	34.00	28.50	29.30	47.00	40.90	31.2	31
DT16	38.10	52.70	37.60	-	29.90	18.40	40.40	35.90	40.50	33.50	53.20	49.40	39.1	39
DT17	17.80	23.60	18.40	15.00	24.50	12.80	25.10	25.40	32.60	33.90	41.00	22.60	24.4	24
DT18	13.10	16.30	31.80	9.80	12.70	14.20	10.40	19.20	18.20	31.50	29.60	31.20	19.8	20
DT19	11.40	16.10	22.60	12.00	17.30	18.10	15.70	23.10	18.00	25.20	27.60	21.40	19.0	19
DT20	3.00	4.20	5.40	2.10	2.40	3.60	2.10	5.20	5.10	7.80	5.90	8.00	4.6	5
DT21	11.50	15.30	22.00	12.30	15.70	10.60	13.60	17.40	16.00	22.90	22.80	22.30	16.9	17
DT22	12.60	15.10	22.80	13.60	14.80	10.40	18.20	20.70	24.00	20.10	27.70	18.60	18.2	18

(1) See Appendix C for details on bias adjustment

(-) No Return/value.

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

Figure 1: RICARDO-EE Air Pollution

Air Pollution Report

1st January to 31st December 2016

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	-	361	361
Number Days Moderate	-	0	-	0	0
Number Days High	-	0	-	0	0
Number Days Very High	-	0	-	0	0
Max Daily Mean	108	66	227	49	20
Annual Max	369	158	724	330	55
Annual Mean	25	25	63	15	7
98th Percentile of daily mean	-	-	-	34	-
90th Percentile of daily mean	-	-	-	23	-
99.8th Percentile of hourly mean	-	119	-	-	-
98th Percentile of hourly mean	124	84	266	49	20
95th Percentile of hourly mean	98	70	217	32	17
50th Percentile of hourly mean	11	18	36	12	6
% Annual data capture	**99.56%**	**99.53%**	**99.53%**	**98.91%**	**98.90%**

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.

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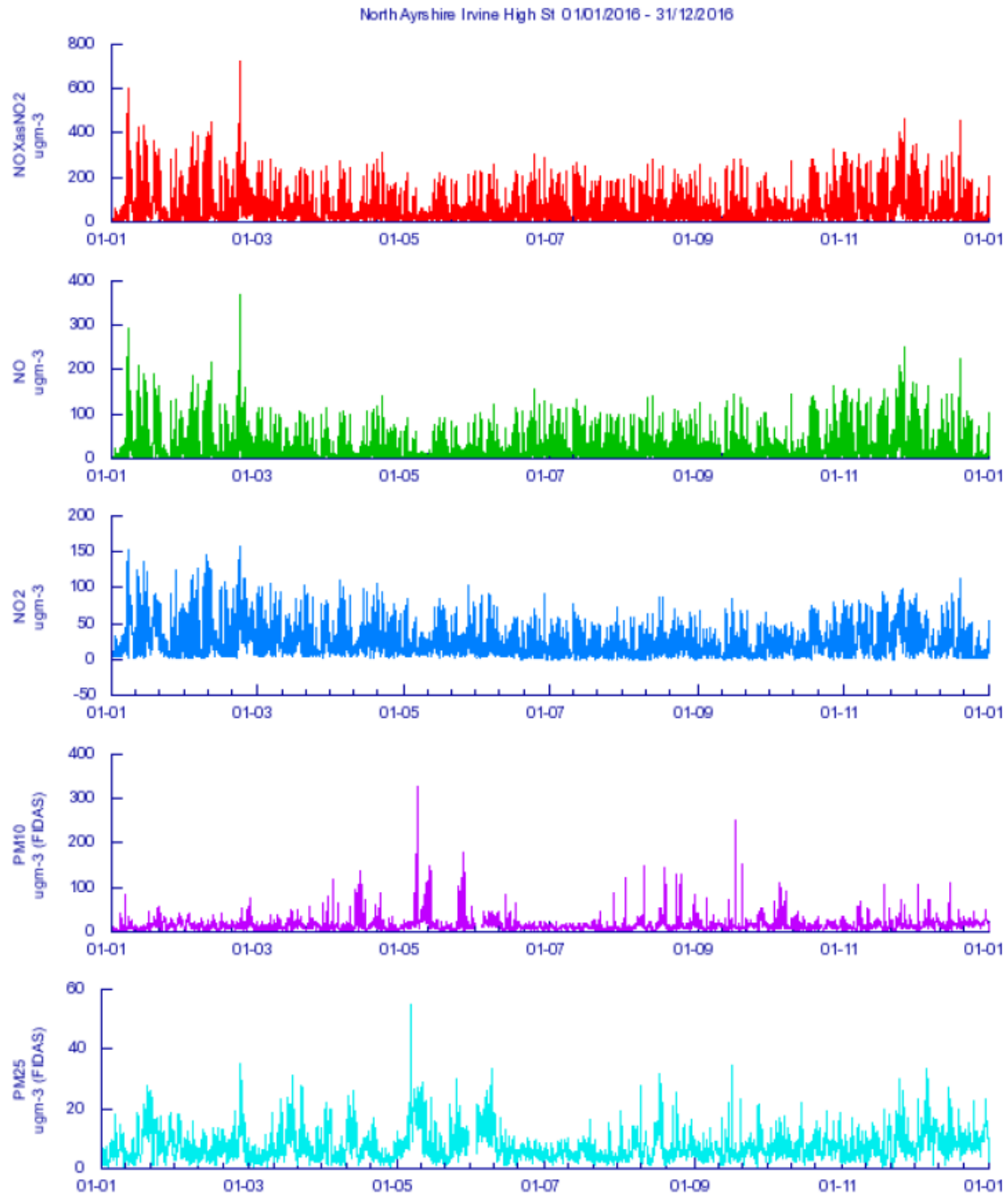
RICARDO-EE Air Pollution Report Cont'd.

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	-

RICARDO-EE Air Pollution Report Cont'd.

Annual Graph



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Report produced by Ricardo Energy & Environment

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

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.

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GB 212 8365 24

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.

0401

CERTIFICATE OF CALIBRATION

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Authorised Signatories: D Hector
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Signed: Date of Issue: 28th June 2017

Certificate Number: 3742

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 8th July 2016	NO_x	2981873	2.0	2.5	1.0280	3.5	98.6
	NO		0.0	2.5	1.0281	3.5	

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.

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Site / Date Test Carried Out	Species	Analyser Serial No.	Parameter	Specified Value	Measured Value	Deviation %	Uncertainty %
Irvine High St 8th July 2016	FIDAS	6251	Total Flow[4]	4.82	3.88	-19.44	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.

QA/QC Data

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 4 below). The resulting Bias factor for 2016 data is **1** using all 12 periods.

Diffusion Tube Bias Adjustment Factors

Diffusion tubes (20% TEA/Water) used in the sampling period for 2016 were supplied and analysed by Glasgow Scientific Services (GSS). Diffusion Tube Bias Adjustment Factors for tubes provided by GSS are listed in Figure 2 below. The resultant bias for GSS is **0.97** based on 9 studies with 7 of poor precision.

Discussion of Choice of Factor to Use

The co-location study for North Ayrshire Council has "good" precision and high quality results from the ROMON, although there has been poor precision for 1 month during the year. Use of the local co-location bias factor reflects more accurately on the true values of air quality when considered over the entire district. This is particularly noticeable for the long term background results where there are no significant sources of pollution; using the local 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 2016 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.

QA/QC of diffusion tube monitoring

Workplace Analysis Scheme for Proficiency (WASP) for the diffusion tube provider, Glasgow Scientific Services is provided in Figure 3 below.

Figure 2: Bias Factor Spreadsheet (Glasgow Scientific)

National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 03/17 V2

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 2017

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/m³)**	**Automatic Monitor Mean Conc. (Cm) (µg/m³)**	**Bias (B)**	**Tube Precision[6]**	**Bias Adjustment Factor (A) (Cm/Dm)**	
Glasgow Scientific Services	20% TEA in water	2016	KS	Glasgow City Council	12	60	65	-7.5%	P	**1.08**	
Glasgow Scientific Services	20% TEA in water	2016	R	Glasgow City Council	11	36	33	8.8%	P	**0.92**	
Glasgow Scientific Services	20% TEA in water	2016	R	Glasgow City Council	12	40	36	10.7%	P	**0.90**	
Glasgow Scientific Services	20% TEA in water	2016	UB	Glasgow City Council	12	29	26	9.8%	P	**0.91**	
Glasgow Scientific Services	20% TEA in water	2016	R	East Dunbartonshire Council	11	34	37	-8.8%	P	**1.10**	
Glasgow Scientific Services	20% TEA in water	2016	R	East Dunbartonshire Council	12	35	36	-2.6%	G	**1.03**	
Glasgow Scientific Services	20% TEA in water	2016	R	East Dunbartonshire Council	12	28	27	6.0%	P	**0.94**	
Glasgow Scientific Services	20% TEA in water	2016	R	East Dunbartonshire Council	12	24	24	-2.7%	P	**1.03**	
Glasgow Scientific Services	20% TEA in water	2016	KS	Marylebone Road Intercomparison	12	93	79	17.4%	G	**0.85**	
Glasgow Scientific Services	20% TEA in water	2016		**Overall Factor[3] (9 studies)**				**Use**		**0.97**	

Figure 3: Tube Precision & WASP 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 AR007	AIR PT AR009	AIR PT AR010	AIR PT AR012	AIR PT AR013	AIR PT AR015	AIR PT AR016	AIR PT AR018
Round conducted in the period	April – May 2015	July – August 2015	October – November 2015	January – February 2016	April – May 2016	July – August 2016	September – October 2016	January – February 2017
Aberdeen Scientific Services	100 %	75 %	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]	100 %	100 %	100 %	100 %	75 %	75 %	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 %	100 %	100 %	75 %	100 %	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 %	100 %	100 %	100 %	100 %	NR [2]	NR [2]
Lambeth Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	75 %	100 %
Milton Keynes Council	100 %	100 %	100 %	50 %	100 %	100 %	75 %	100 %
Northampton Borough Council	100 %	100 %	100 %	50 %	100 %	NR [2]	75 %	0 %
Somerset Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
South Yorkshire Air Quality Samplers	100 %	100 %	75 %	100 %	100 %	75 %	100 %	100 %
Staffordshire County Council	100 %	75 %	75 %	75 %	75 %	100 %	NR [2]	100 %
Tayside Scientific Services (formerly Dundee CC)	NR [2]	NR [2]	NR [2]	100 %	NR [2]	100 %	NR [2]	100 %
West Yorkshire Analytical Services	75 %	75 %	75 %	75 %	100 %	NR [2]	50 %	100 %

[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] Kent Scientific Services, Cardiff Scientific Services and Exova (formerly Clyde Analytical) no longer carry out NO_2 diffusion tube monitoring and therefore did not submit results.

Figure 4: 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	06/01/2016	02/02/2016	15.1	34.4	26.2	25	9.7	38	24.1	31	100	Poor Precision	Good
2	02/02/2016	02/03/2016	21.0	19.4	21.1	21	1.0	5	2.4	37	100	Good	Good
3	02/03/2016	30/03/2016	26.8	26.4	27.1	27	0.4	1	0.9	30	98	Good	Good
4	30/03/2016	27/04/2016	15.6	17.3	22.1	18	3.4	18	8.4	29	100	Good	Good
5	27/04/2016	24/05/2016	20.0	19.8	17.7	19	1.3	7	3.2	23	99	Good	Good
6	24/05/2016	29/06/2016	19.4	18.9	15.9	18	1.9	10	4.7	20	98	Good	Good
7	29/06/2016	26/07/2016	24.5	23.2	25.6	24	1.2	5	3.0	18	100	Good	Good
8	26/07/2016	24/08/2016	29.1	27.6	27.9	28	0.8	3	2.0	19	100	Good	Good
9	24/08/2016	28/09/2016	29.0	24.4	25.2	26	2.5	9	6.1	16	100	Good	Good
10	28/09/2016	26/10/2016	28.1	25.8	27.7	27	1.2	5	3.1	21	100	Good	Good
11	26/10/2016	30/11/2016	38.7	36.6	34.8	37	2.0	5	4.8	35	100	Good	Good
12	30/11/2016	06/01/2016	28.3	28.9	29.7	29	0.7	2	1.7	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

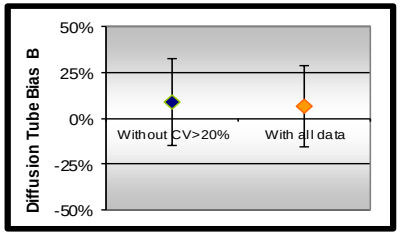
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	High St., Irvine

Precision: 11 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 11 periods of data	
Bias factor A	0.98 (0.8 - 1.28)
Bias B	2% (-22% - 26%)
Diffusion Tubes Mean:	25 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	25 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	24 (20 - 32) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	1 (0.82 - 1.29)
Bias B	0% (-23% - 22%)
Diffusion Tubes Mean:	25 µgm^{-3}
Mean CV (Precision):	9
Automatic Mean:	25 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	25 (20 - 32) 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	19.1	29.8	25.5	10.1	16.3	13.8	16.1	20.7	21.6	24.1	34.7	33.0		22.1	12
2. 18 Bank St, Irvine	29.7	27.5	28.5	10.0	15.8	14.3	15.4	19.6	28.1	22.8	36.0	34.0		23.5	12
3. 147 High Street, Irvine	37.4	30.9	27.7	10.4	22.3	16.2	13.0		25.1	18.7	34.0	32.1		24.3	11
4. 85 High St, Irvine	31.1	33.6	31.5	15.1	22.3	17.8	30.2	28.5	36.7	24.8	35.0	36.8		28.6	12
5. 79 High St, Irvine	59.6	33.0	45.3	24.8	28.0	25.1	58.3	52.8	52.3	35.3	49.8	50.1		42.9	12
6. 75 High St, Irvine	42.0	32.7	44.3	21.0	35.3	18.5	20.3	8.6		27.2	45.6	38.1		30.3	11
7. 65a High Street, Irvine,	15.1	21.0	26.8	15.6	20.0	19.4	24.5	29.1	29.0	28.1	38.7	28.3		24.6	12
8. 65 High Street, Irvine	34.4	19.4	26.4	17.3	19.8	18.9	23.2	27.6	24.4	25.8	36.6	28.9		25.2	12
9. 63 High Street, Irvine	26.2	21.1	27.1	22.1	17.7	15.9	25.6	27.9	25.2	27.7	34.8	29.7		25.1	12
10. 34 Kirkgate Irvine	14.1	11.0	2.4	6.0	3.7	2.5	2.1	6.8	9.6	12.9	18.0	16.3		8.8	12
11. 25 Main Rd, Springside	18.3	9.9	17.6	5.3	9.6	5.6	5.4	20.0	15.7	17.4	22.6	21.3		14.1	12
12. Auchengate (Bridge)	16.2	10.5	14.6	8.0	7.1	1.6	5.5	9.2	12.0	19.0	18.9	20.4		11.9	12
13. Dalry Rd , Kilwinning	26.1	16.3	21.1	7.2	10.5	10.5	10.0	16.0	20.1	23.0	26.9	30.3		18.2	12
14. 12 Garnock St, Dalry	17.7	11.8	12.9	4.4	6.9	4.6	2.1	6.6	7.0	13.4	19.7	21.9		10.8	12
15. 67 New St, Dalry	27.8	39.3	39.6	15.2	29.7	14.3	29.0	34.0	28.5	29.3	47.0	40.9		31.2	12
16. 45 New St Dalry	38.1	52.7	37.6		29.9	18.4	40.4	35.9	40.5	33.5	53.2	49.4		39.1	11
17. 2 Townhead, St, Dalry	17.8	23.6	18.4	15.0	24.5	12.8	25.1	25.4	32.6	33.9	41.0	22.6		24.4	12
18. Highfield Hamlet , Dalry	13.1	16.3	31.8	9.8	12.7	14.2	10.4	19.2	18.2	31.5	29.6	31.2		19.8	12
19. 85 Main Street , Largs	11.4	16.1	22.6	12.0	17.3	18.1	15.7	23.1	18.0	25.2	27.6	21.4		19.0	12
20. Hunterston Road	3.0	4.2	5.4	2.1	2.4	3.6	2.1	5.2	5.1	7.8	5.9	8.0		4.6	12
21. Princes St, Ardrossan	11.5	15.3	22.0	12.3	15.7	10.6	13.6	17.4	16.0	22.9	22.8	22.3		16.9	12
22. Vernon St, Saltcoats	12.6	15.1	22.8	13.6	14.8	10.4	18.2	20.7	24.0	20.1	27.7	18.6		18.2	12

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

Bias Factor A 1 (0.82 - 1.29)
Bias B 0% (-23% - 22%)
Tube Precision: 9 Automatic DC: 100%

Adjusted with 95% CI	22 (18 - 28)
Adjusted with 95% CI	23 (19 - 30)
Adjusted with 95% CI	24 (20 - 31)
Adjusted with 95% CI	29 (23 - 37)
Adjusted with 95% CI	43 (35 - 55)
Adjusted with 95% CI	30 (25 - 39)
Adjusted with 95% CI	25 (20 - 32)
Adjusted with 95% CI	25 (21 - 33)
Adjusted with 95% CI	25 (21 - 32)
Adjusted with 95% CI	9 (7 - 11)
Adjusted with 95% CI	14 (12 - 18)
Adjusted with 95% CI	12 (10 - 15)
Adjusted with 95% CI	18 (15 - 23)
Adjusted with 95% CI	11 (9 - 14)
Adjusted with 95% CI	31 (26 - 40)
Adjusted with 95% CI	39 (32 - 50)
Adjusted with 95% CI	24 (20 - 31)
Adjusted with 95% CI	20 (16 - 26)
Adjusted with 95% CI	19 (16 - 25)
Adjusted with 95% CI	5 (4 - 6)
Adjusted with 95% CI	17 (14 - 22)
Adjusted with 95% CI	18 (15 - 23)

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
1	06/01/2016	02/02/2016	15.1	34.4	26.2	25.2	9.69	38.39	24.06
2	02/02/2016	02/03/2016	21.0	19.4	21.1	20.5	0.95	4.65	2.37
3	02/03/2016	30/03/2016	26.8	26.4	27.1	26.8	0.35	1.31	0.87
4	30/03/2016	27/04/2016	15.6	17.3	22.1	18.3	3.37	18.39	8.37
5	27/04/2016	24/05/2016	20.0	19.8	17.7	19.2	1.27	6.65	3.17
6	24/05/2016	29/06/2016	19.4	18.9	15.9	18.1	1.89	10.48	4.70
7	29/06/2016	26/07/2016	24.5	23.2	25.6	24.4	1.20	4.92	2.98
8	26/07/2016	24/08/2016	29.1	27.6	27.9	28.2	0.79	2.81	1.97
9	24/08/2016	28/09/2016	29.0	24.4	25.2	26.2	2.46	9.38	6.11
10	28/09/2016	26/10/2016	28.1	25.8	27.7	27.2	1.23	4.52	3.05
11	26/10/2016	30/11/2016	38.7	36.6	34.8	36.7	1.95	5.32	4.85
12	30/11/2016	06/01/2016	28.3	28.9	29.7	29.0	0.70	2.42	1.74
13									

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

Data Quality Check
Diffusion Tubes Precision Check
Poor Precision
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good

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 11 periods of data
Tube Precision: 6 **Automatic DC: 100%**
Bias factor A: 0.98 (0.8 - 1.28)
Bias B: 2% (-22% - 26%)

Information about tubes to be adjusted
Diffusion Tube average: 25 μgm^{-3}
Average Precision (CV): 6
Adjusted Tube average: 24 +/- 7 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: 1 (0.82 - 1.29)
Bias B: 0% (-23% - 22%)

Information about tubes to be adjusted
Diffusion Tube average: 25 μgm^{-3}
Average Precision (CV): 9
Adjusted Tube average: 25 +/- 6 μgm^{-3}

Figure 5: Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites in Irvine 2012 - 2016.

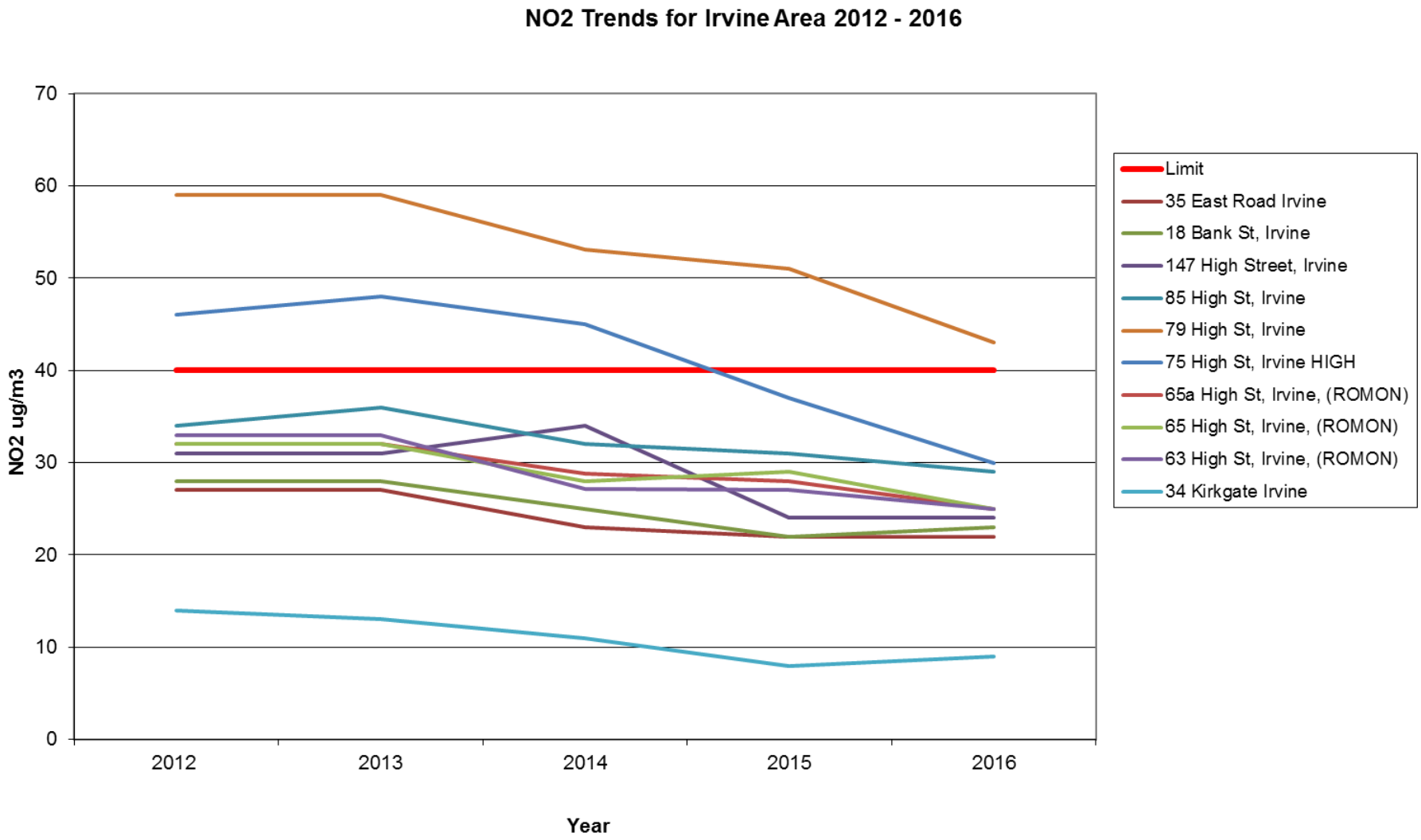


Figure 6: Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites in Dalry 2012 - 2016.

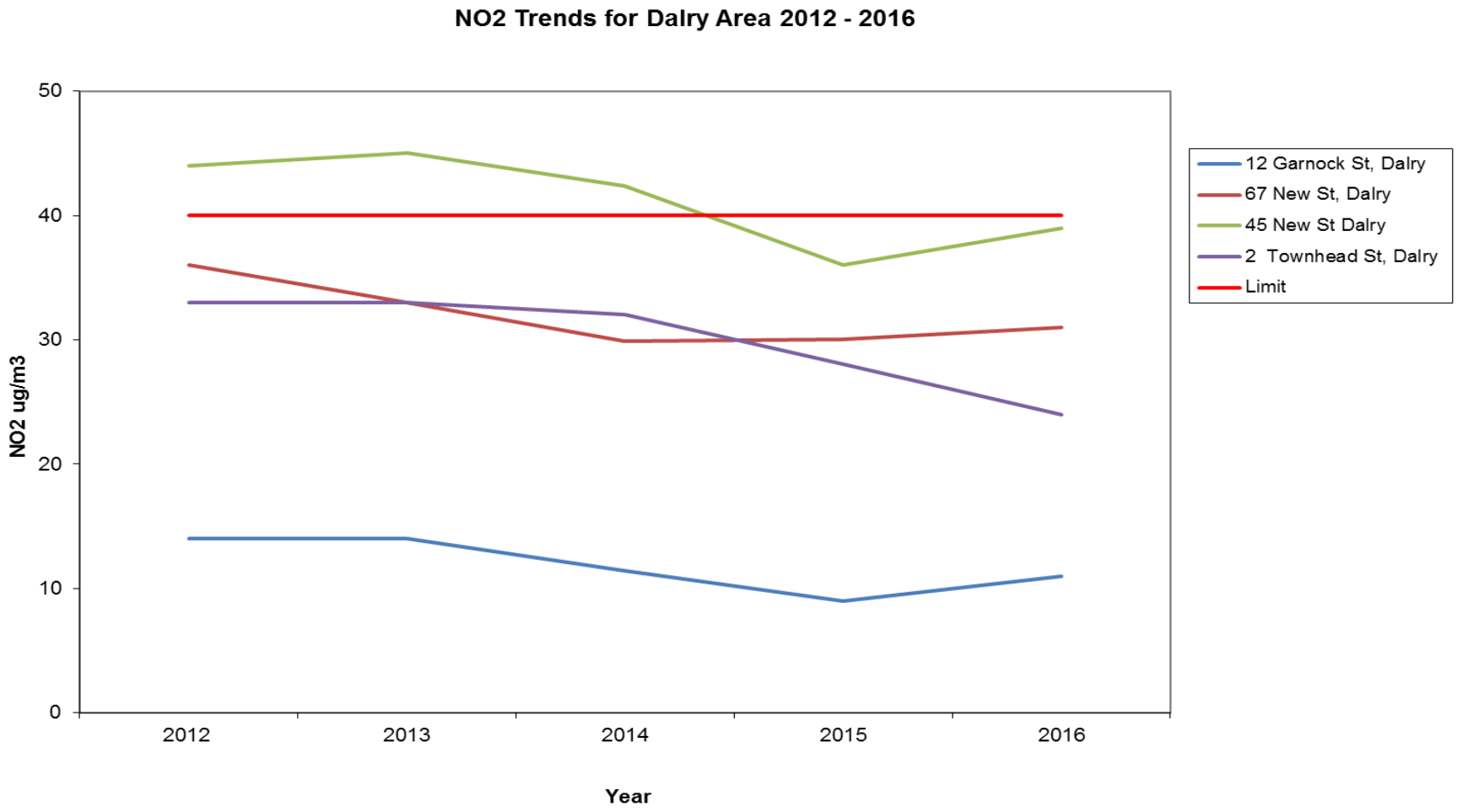


Figure 7: Trends in Annual Mean PM10 Concentrations measured at Automatic Station (ROMON) in High Street, Irvine 2012 - 2016.

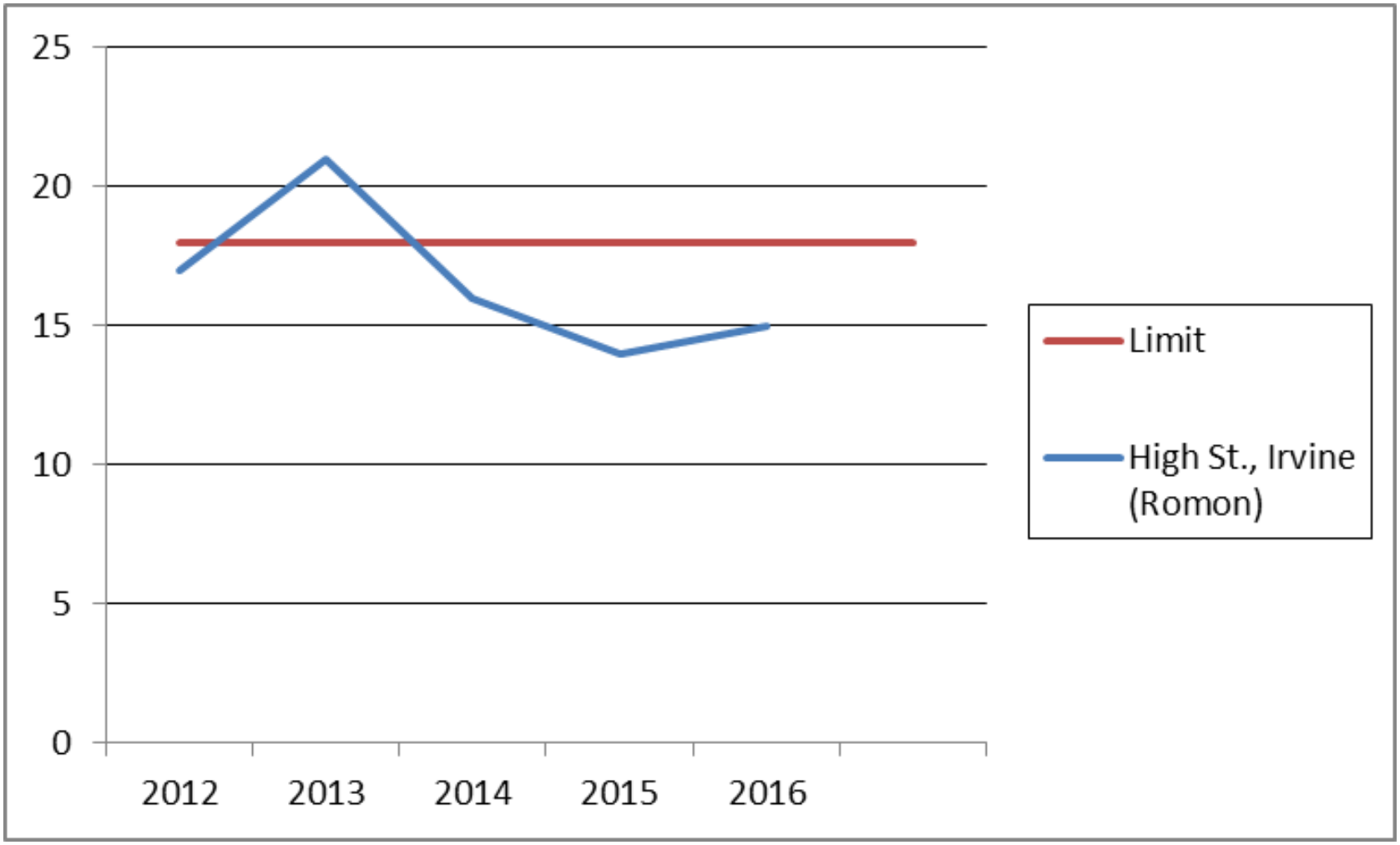


Figure 8: Drop-off with Distance for NO2 Tube Exceedences

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	43ug/m^3	33.2ug/m^3
NEW widened pavement (predicted)	*1.5m*	*8.2m*	*6*ug/m^3	43ug/m^3	29.2ug/m^3

Figure 9: Public Realm Proposed Works Timetable

Task Name	Duration	Start	Finish	Predecessors
Tender	30 days	Mon 29/04/16	Fri 08/06/16	1
Evaluation & Appointment	14 days	Mon 11/06/16	Thu 28/06/16	2
Develop Design	90 days	Mon 02/07/16	Fri 02/11/16	3
Public Consultation	35 days	Mon 05/09/16	Fri 21/10/16	4
Employer Approval	0 days	Fri 21/10/16	Fri 21/10/16	5
Stat Consents	100 days	Mon 24/10/16	Fri 10/03/17	6
Design Development & Procurement	110 days	Mon 09/01/17	Fri 09/06/17	
Construction	505 days	Mon 12/06/17	Fri 17/05/19	8

Appendix D: Supporting Figures

Figure 10: Automatic Monitoring Site Location

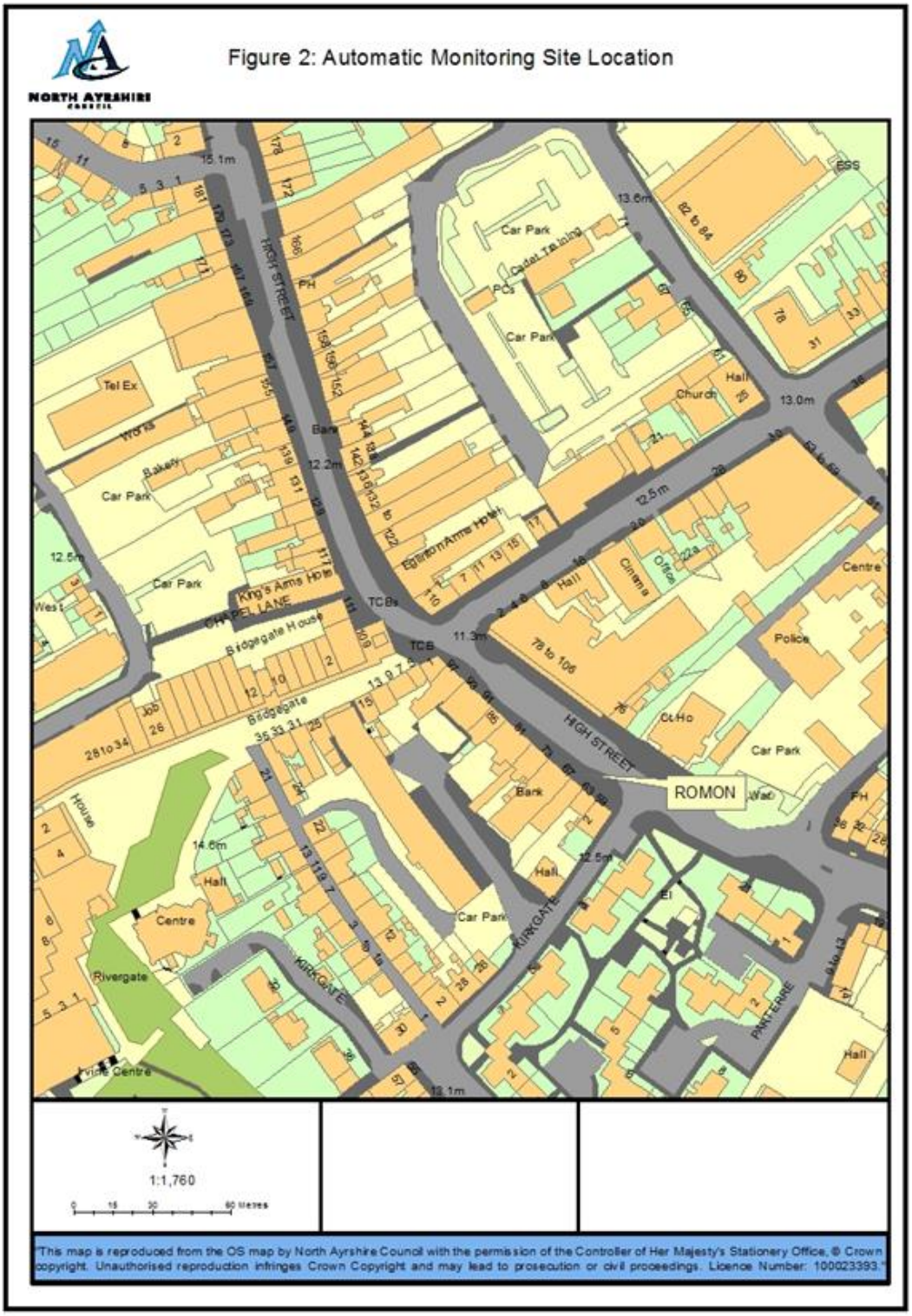


Figure 11: Non-Automatic Monitoring Site Locations

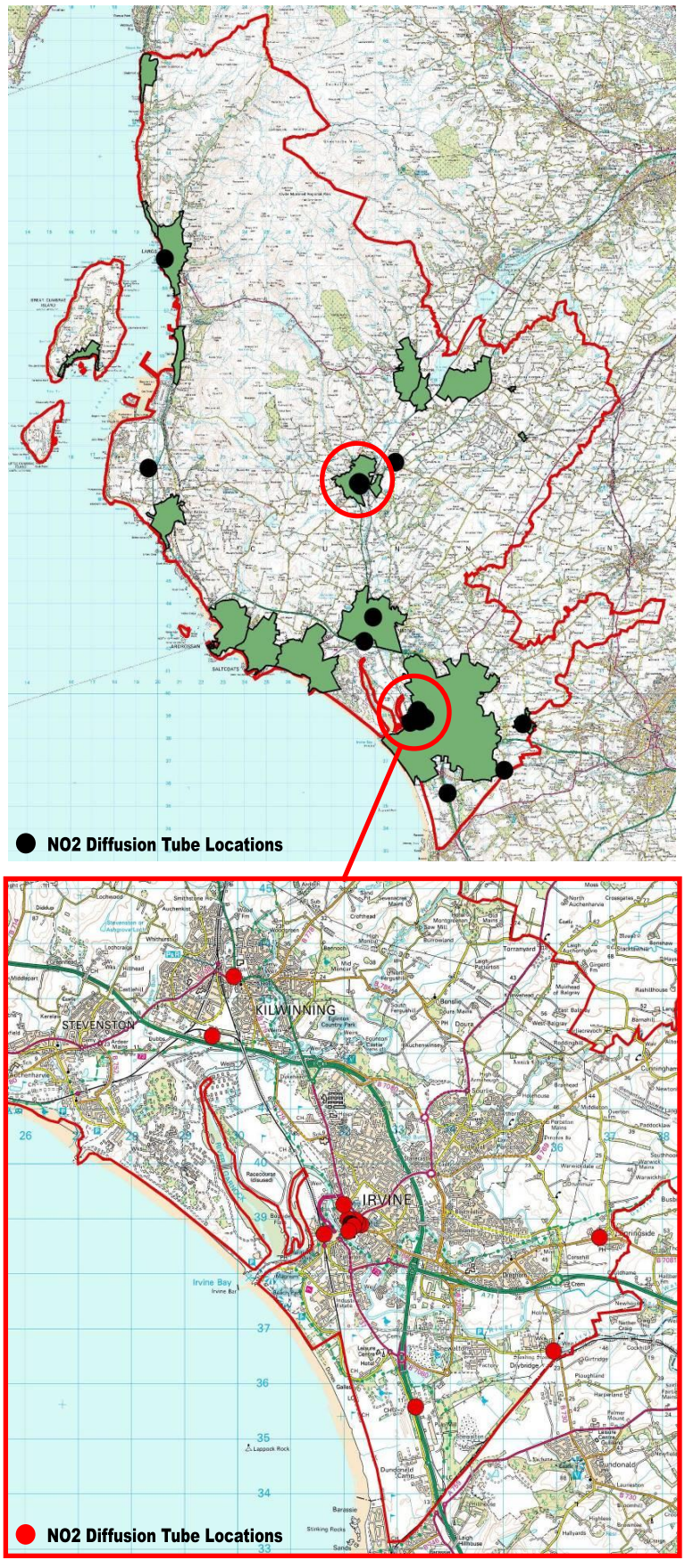


Figure 12: 2015/16 Festive Period NO_2 levels in High Street, Irvine and AQ Pod corresponding with Reference analyser.

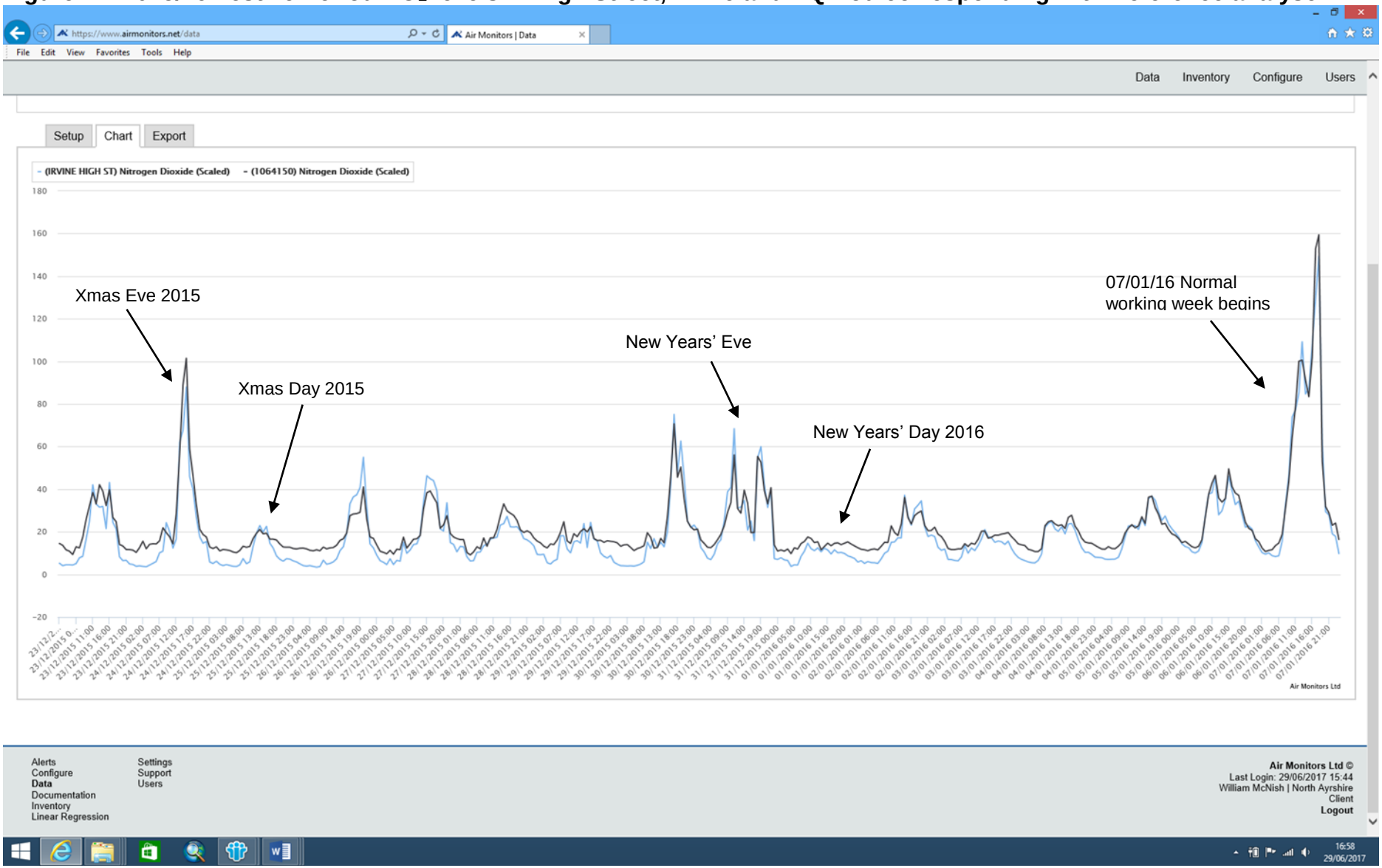
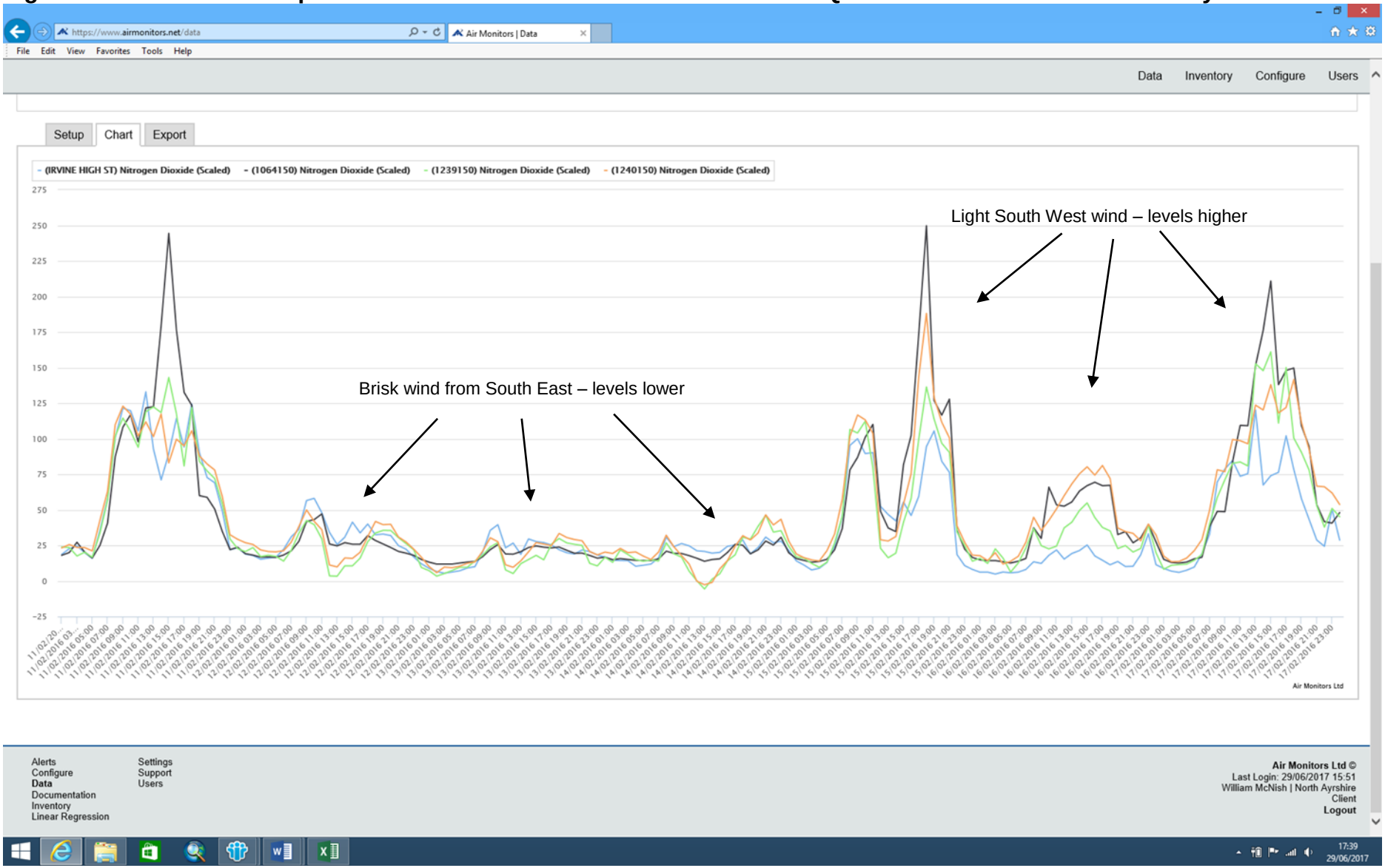


Figure 13: Effect of wind speed and direction on NO_2 concentrations of AQ Mesh Pods and Reference Analyser.



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

1. Checking Precision and Accuracy of Triplicate Tubes (Version 05 - Feb 2012).
2. Distance from Roads Calculator www.laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html
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