Annual Progress Report

Falkirk Council

2016 Air Quality Annual Progress Report (APR) for Falkirk Council

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

July 2016

Falkirk Council

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Executive Summary: Air Quality in Our Area

Air Quality in Falkirk Council

Falkirk Council has examined the air quality monitoring results in its area and concludes that no new Detailed Assessments are required of any pollutant.

In 2015 diffusion tube NA27 West Bridge St, recorded a concentration greater than the annual NO_2 national air quality strategy (NAQS) objective of 40 µg/m^3 with the application of the R&A bias factor. The diffusion tube is within the Falkirk Town Centre Air Quality Management Area (AQMA).

There were no other diffusion tubes that breached the annual NO_2 objective. In addition, no automatic monitoring sites breached the annual or daily NO_2 objectives in 2015.The West Bridge St automatic monitoring station recorded an annual mean NO_2 concentration of 37 µg/m^3 which is a reduction of 4 µg/m^3 compared to the 2014 concentration.

In addition, long term NO_2 monitoring data indicates a downward trend in NO_2 concentrations within the Falkirk area. The background Grangemouth AURN site shows a slight downward trend in NO_2 concentrations between 2001 and 2015. However, a significant decrease has been recorded at the Haggs automatic monitoring site compared to both the peak in 2010 and the concentrations recorded in 2009. This is likely to have occurred because of the completion of the M80 and a reduced speed limit of 30 mph on the A803 which has transferred traffic from the local to trunk road network.

The six SO_2 automatic monitors within the Falkirk network met all three (15-minute, hourly and daily) NAQS objectives during 2015. The 2015 results continue the objective compliance recorded both in 2013 and 2014.Long term SO_2 trend analysis at the Grangemouth AURN site shows a decline in SO_2 concentrations since the commissioning of the tail gas treatment (TGT) unit at INEOS Grangemouth in 2013. Exceedances of the 15-min SO_2 objective concentration have also declined at all sites within the Grangemouth AQMA since 2013.

The benzene and 1, 3-butadiene diffusion tube monitoring conducted in 2015 met the NAQS objectives. The $PM_{2.5}$ monitors at the Grangemouth AURN and Banknock 2 sites recorded $PM_{2.5}$ concentrations within the 10 µg/m^3 annual objective. Long term $PM_{2.5}$ monitoring at the Grangemouth AURN shows a gradual reduction in concentrations between 2011 and 2015. In addition the PM_{10} air quality objectives were met at all eight monitoring sites in 2015.

Falkirk Council continues to work closely with its partner organisations to manage local air quality. The council works closely with SEPA, INEOS and Petroineos to reduce exceedances of the SO_2 objectives within the Grangemouth AQMA.

Falkirk Council is also part the East Central Scotland Vehicle Emissions Partnership alongside West Lothian, East Lothian and Midlothian councils. The partnership aims to reduce harmful vehicle emissions by educating drivers about the effects.

Furthermore, Falkirk council continues to be a member of the Eco Stars fleet recognition scheme. The latest Falkirk Eco Stars report shows that recruitment in Falkirk is over target with 84 members operating 4060 vehicles. The membership consists of a variety of fleet sizes, company types and vehicles.

Actions to Improve Air Quality

There have been numerous changes to the automatic monitoring network in 2015. These changes include a new PM_{10} and $PM_{2.5}$ analyser at the Banknock 2 site installed in February 2015, a new SO_2 monitoring site installed at Grangemouth Zetland Park in May 2015 and a new NO_x and PM_{10} monitoring site installed at Main St, Bainsford in June 2015. Thus monitoring has commenced in the area of the only outstanding Detailed Assessment along Main St, Bainsford.

In addition, to ensure continued SO_2 monitoring capability within the Falkirk network; the Horiba SO_2 analysers at the Grangemouth Moray and Bo'ness automatic monitoring stations were replaced with new Horiba models in late 2015.

Furthermore, In June 2015 Falkirk Council adopted its Local Development Plan which includes a policy on Air Quality. Other actions to improve air quality include the extension of Falkirk's Eco Stars Scheme to include taxi services and private hire vehicles, the completion of improvement works to the three sets of traffic lights along the Main Street, Bainsford and Grahams Road route into Falkirk and vehicle emissions testing held March – October 2015.

In addition, nine out of the twelve Falkirk Council automatic monitoring sites are now affiliated to either the Automatic Urban and Rural Network (AURN) (one site) or the Scottish Air Quality Network (SAQN) (eight sites). This improves data capture thus allowing better comparison to NAQS objectives.

Local Priorities and Challenges

A Detailed Assessment of both annual mean NO_2 and PM_{10} concentrations along Main Street, Bainsford will be completed within the following year. Monitoring began at the site in June 2015 following the conclusions of the 2014 Progress Report. The results will be considered after one-year of monitoring as part of the Detailed Assessment.

SO_2 objectives have been met within the Grangemouth AQMA for three consecutive years. Falkirk Council considers that the Grangemouth AQMA remains justified based upon the

2014 monitoring results when the 15-min objective was close to being breached at the Grangemouth Municipal Chambers site.

The Falkirk Town Centre AQMA remains justified with a breach of the NO_2 objective along Falkirk West Bridge St. The Haggs AQMA is under review as the NO_2 and PM_{10} objectives continue to be met at the automatic monitoring station.

In the coming year Falkirk Council will replace the PM_{10} monitor at Falkirk West Bridge Street and add $PM_{2.5}$ capability to this AQMA. This will enable Falkirk council to begin expanding the $PM_{2.5}$ monitoring network since the 10 µg/m^3 objective has been placed into legislation.

In addition Falkirk Council will continue to implement an APSA 360 SO_2 analyser replacement programme. Grangemouth Municipal Chambers is the priority site for a replacement SO_2 analyser in 2016. The analysers at the AURN, Moray and Bo'ness sites have already been replaced with newer models.

An Air Quality Progress Report as required by the Scottish Government shall be submitted for 2016.

How to Get Involved

To obtain further information on air quality within the Falkirk Council area please visit our air policy webpage at http://www.falkirk.gov.uk/services/environment/environmental-policy/air-quality/

There are twelve automatic air quality monitoring sites across the Falkirk area. The data from nine of the sites can be viewed on the Scottish Air Quality website at http://www.scottishairquality.co.uk/

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1. Local Air Quality Management

This report provides an overview of air quality in Falkirk Council during 2015. 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 Falkirk Council to improve air quality and any progress that has been made.

Table 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
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.

A summary of AQMAs declared by Falkirk Council can be found in Table 2. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=371-see full list at http://uk-air.defra.gov.uk/aqma/list>.

Table 2 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	Description	Action Plan
Falkirk Town Centre	NO_2 annual mean PM_{10} 24-hour mean and annual mean	Falkirk	An area encompassing part of Falkirk Town Centre.	Air Quality Action Management Plan (Falkirk Town Centre and Haggs) http://www.falkirk.gov.uk/services/environment/environmental-policy/air-quality/docs/air-quality/Falkirk%20and%20Haggs%20Air%20Quality%20Action%20Plan.pdf?v=201507291154
Banknock	PM_{10} 24-hour mean	Banknock	The designated area includes an area of Banknock.	Air Quality Action Management Plan (Banknock) Available on request
Haggs	NO_2 annual mean	Haggs	An area encompassing parts of Banknock and Haggs around the junction of the A803 and M80	Air Quality Action Management Plan (Falkirk Town Centre and Haggs) http://www.falkirk.gov.uk/services/environment/environmental-policy/air-quality/docs/air-quality/Falkirk%20and%20Haggs%20Air%20Quality%20Action%20Plan.pdf?v=201507291154
Grangemouth	SO_2 15 minute mean	Grangemouth	An area encompassing Grangemouth petrochemical complex and adjacent areas.	Air Quality Action Management Plan (Grangemouth) Available on request

2.2 Progress and Impact of Measures to address Air Quality in Falkirk Council

Falkirk Council has taken forward a number of measures during the current reporting year of 2015 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. More detail on these measures can be found in the air quality Action Plan relating to each AQMA. Key completed measures are:

Measure 1:

Falkirk Council sends meteorological data and provisional SO_2 data to SEPA, INEOS and Petroineos when an SO_2 exceedance is recorded at a monitoring station within the Grangemouth AQMA. In addition, a monthly summary is sent. The monthly summary includes data for each site, a list of the exceedances and as necessary polar roses or other analysis.

Measure 3:

Falkirk Council's SO_2 exceedance text alert system for the Grangemouth AQMA was maintained throughout 2015. The Scottish Air Quality Network has recently launched an air quality alert system for the public (http://www.scottishairquality.co.uk/know-and-respond/). Falkirk Council will continue to run its system as it is pollutant and site specific.

Measure 4:

Nine of Falkirk Council's automatic monitoring stations are affiliated to either the AURN or the Scottish Air Quality Network with the data displayed on the appropriate website. This includes five of the six SO_2 analysers that are used for monitoring in relation to the Grangemouth AQMA. The data from the Bo'ness site is available on request.

Measure 5

Charging points at council depots and points beginning to be installed in public places. See https://www.zap-map.com/locations/falkirk-charging-points/# for a list of Electric vehicle charging points in the Falkirk Council area.

Measure 8

The improvements to the three sets of traffic lights along the Main Street, Bainsford and Grahams Road route into Falkirk have been completed.

Measure 14

In June 2015 Falkirk Council adopted its Local Development Plan which includes a policy on Air Quality. RW07 states:

"The Council will seek to contribute to the improvement of air quality. Impacts on air quality will be taken into account in assessing development proposals, particularly within Air Quality Management Areas (AQMAs). An Air Quality Assessment may be required for developments that are within AQMAs or where the proposed development may cause or significantly contribute towards a breach of National Air Quality Standards. Development proposals that result in either a breach of National Air Quality Standards or a significant increase in concentrations within an existing AQMA will not be permitted unless there are over-riding issues of national or local importance."

Measure 16

In February 2013 the Falkirk ECO Stars scheme was launched at the Falkirk Stadium (www.falkirk.gov.uk/ecostars). ECO Stars is an environmental fleet management recognition scheme for vans, lorries, buses and coaches. The scheme assesses individual vehicles and overall fleet operations to recognise levels of environmental performance. The Falkirk scheme has 84 members who operate 4,060 vehicles that are either based in or operate through the Falkirk Council area.

In November 2014 an extension of the ECO Stars scheme to permit taxis and private hire cars was approved. The recruitment of members is underway and a launch event was held in 2015.

Measure 18

Falkirk Council agreed to the following licensing changes to taxis and private hire car requirements:

"that the current policy on the age of vehicles is changed to reduce the age at which a vehicle can first enter the fleet from 6 years to 3 years but that this is done progressively by a reduction of 1 year each year starting on 1st April 2014"

"that a training requirement is introduced in regard to drivers standards for new taxi and private hire drivers only (with the option for the Civic Licensing Committee to attach the condition in other cases where it considers it necessary) and that officers are instructed to bring proposals on the content of the training requirement following discussion with training providers to a future Committee".

This has been followed by the extension of the ECO Stars scheme to permit taxis and private hire vehicles to become members of the scheme. These two actions therefore achieve a balance between legislative requirements and voluntary actions by operators to reduce their emissions.

Measure 19

Falkirk Council is part of a vehicle emissions partnership that aims to educate drivers with the aim of reducing harmful vehicle emissions.

The aim of vehicle emission testing is to emphasise the importance of well-maintained, clean and efficient vehicles which are cheaper to run, and will emit less pollution. The dates for the 2015 vehicle testing season at Central Retail Park, Falkirk were:

- March 24, 25, 26, 27, 28, 29
- April 21, 22, 23, 24
- May 19, 20, 21, 22
- June 16, 17, 18, 19
- July 28, 29, 30, 31
- August 01, 02, 25, 26, 27, 28
- September 22, 23, 24, 25
- October 20, 21, 22, 23.

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

Measure 7

The possibility of including ECO Stars in the assessment of tendered bus service contracts has been discussed with the Public Transport Co-ordinator. In addition, it is likely that operators will be invited to provide bids in relation to the provision of newer buses. However, the use of new vehicles will need to be balanced against the additional cost incurred (mostly due to reduction in fixed capital). The tendered network is currently under a review and new contracts will be considered during 2016.

Table 3 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Improving SO_2 data access	Public Information	Supplying SO_2 monitoring data to SEPA, Petroineos and INEOS	Falkirk Council	2013	2013	AQ Objectives met in 2013, 2014 and 2015.	Anticipated reduction in SO_2 concentration/ breaches of NAQS objectives.	Data sent after exceedances, monthly summary sent.	Completed and on-going.	
2	Grangemouth Working group.	Policy guidance and development control	Bring together, Petroineos, INEOS, S.Gov, SEPA and Falkirk Council.	Falkirk Council	2013	2013	AQ Objectives met in 2013, 2014 and 2015.	Reduction in SO_2 due to cooperative working and agreement of priorities.	Completed. TGU full commissioned in August 2013, meeting held in November 2013. Further meeting only if breach of objective occurs.	Completed.	
3	Text alert system.	Public Information	Real-time notification of exceedances	Falkirk Council	2013	2013	Text alerts received by Falkirk Council, SEPA, Petroineos and INEOS when an exceedance occurs in Grangemouth AQMA	Anticipated reduction in SO_2 objective exceedances due to real time alerts of NAQS objective concentration exceedances supplied to SEPA, Petroineos and INEOS so action to rectify any plant emission issues can be taken.	Completed and on-going. Grangemouth AURN sends text alerts if a breach of SO_2 objective concentration occurs.	Completed.	Falkirk Council's new Air Quality Specialist to be added to the text alert list.

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
4	Review monitoring network	Public Information	Grangemouth Moray SO_2 in SAQN. Monitoring conducted in Grangemouth Zetland Park.	Falkirk Council	Falkirk Park St ceased operation April 2014. Zetland Park commenced operation April 2015.	2014 and 2015	All Grangemouth automatic monitoring sites are affiliated with the SAQN.	Affiliation with the SAQN increases data capture allowing better comparison to the NAQS objectives.	Completed.	Completed.	
5	Electric vehicles and plug-ins	Promoting low emission transport	Cars	Falkirk Council	2013	2014 and 2015	Charging points at council depots	Anticipated reduction in NO_X and PM emissions due to increased use of electric vehicles.	Charging points at council depots and points beginning to be installed in public places.	Completed and on-going installation of charging points in public places.	
6	Eco-advanced driver training	Promoting low emission transport	All types of vehicle, fuel use and emissions	Falkirk Council	2014	2015	Offered to Council services by fleet	Anticipated reduction in NO_X and PM emissions due to promotion of efficient driving practices.	Offered to Council services by fleet.	Completed and on-going training offered.	
7	Review of school bus contracts with view to raising EURO standards	Vehicle fleet efficiency	Buses	Falkirk Council	2014	2016	n/a	Anticipated reduction in NO_X and PM emissions from busses.	Discussions with Public Transport Co-ordinator about summer procurement of services.	2016.	
8	Improvements of traffic lights at Bankside	Transport planning and infrastructure	Congestion	Falkirk Council	2013	2014	n/a	Anticipated reduction in NO_X and PM emissions due to traffic queue reduction at Bankside traffic lights.	Completed.	Completed.	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
9	Feasibility study of Haggs infrastructure changes	Transport planning and infrastructure	Congestion	Falkirk Council	Dependent on developer contributions and planning applications.	Dependent on developer contributions and planning applications.	n/a.	Anticipated reduction in NO_X and PM emissions.	Dependent on developer contributions and planning applications.	Dependent on developer contributions and planning applications.	
10	Feasibility study of West Bridge St and Town Centre traffic management changes (speed limits, TROs etc)	Transport planning and infrastructure	Congestion	Falkirk Council	Dependent on planning applications.	Dependent on planning applications.	n/a	Anticipated reduction in NO_X and PM emissions.	Dependent on planning applications.	Dependent on planning applications.	
11	Take the Right Route	Promote travel alternatives	Car travel	Falkirk Council	2009	2013	Scheme in place and publicly advertised on Falkirk Council website.	Anticipated reduction in NO_X and PM emissions due to an increase in green travel such as walking and cycling.	Scheme rolled out in Larbert, Stenhousemuir and Grangemouth. Work on going to include Graeme High School cluster area of Falkirk.	Completed and on-going.	
12	Bike hire scheme	Promote travel alternatives	Mode transfer	Falkirk Council	Future action.	Future action.	Unknown	Anticipated reduction in NO_X and PM emissions due to an increase in green travel alternatives.	Future action.	Future action	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
13	Soft measures e.g. travel planning (larger employers, schools), journey sharing, changes to mileage, home and mobile working.	Promote travel alternatives	Variety	Falkirk Council	2006	2014	Produce Supplementary Planning Guidance Develop for Travel Plans Development of Travel Plans	Anticipated reduction in NO_X and PM emissions due to promotion of travel alternatives.	Fuel efficient pool car vehicles for staff use as part of Council's travel plan Operational car sharing database for Falkirk Council area	Completed and On-going	
14	Consideration of air quality in local development plan.	Policy guidance and development control	Development	Falkirk Council	2015	2015	Air quality policy statement in local development plan	Air Quality Assessment required for developments within AQMAs.	Air quality policy statement in plan.	Completed	
15	Appropriate air quality monitoring in AQMAs.	Public Information	Improving data capture.	Falkirk Council	2005	2005	Good data capture (90%) in AQMAs	Good data capture will allow strict comparison of PM_{10}, $PM_{2.5}$, SO_2, NO_X concentrations against the objectives.	Monitoring maintained in AQMAs.	On-going	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
16	Promotion of ECO Stars	Vehicle fleet efficiency	Commercial vehicles, taxis and private hire cars.	Falkirk Council	2013	2013	The latest Falkirk Eco Stars report shows that recruitment in Falkirk is over target with 84 members operating 4060 vehicles	Anticipated reduction in NO_X and PM emissions due to promotion of efficient driving practices.	Commercial vehicles scheme launched February 2013, extension to taxis and private hire cars commenced November 2014. Member workshop held in February 2015.	On-going	Funding for Eco Stars 2016/17 secured.
17	Review of park and ride facilities	Transport planning and infrastructure	Cars	Sestran	Future action	Future action	Future action	Anticipated reduction in NO_X and PM emissions.	Future action	Future action	
18	Taxi licensing	Vehicle fleet efficiency	Taxis	Falkirk Council	2013	2015	Increase in taxi services signed up to Eco Stars Scheme.	Anticipated reduction in NO_X and PM emissions due to promotion of efficient driving and vehicles.	Changes to licensing in May 2013 and Eco Stars extended to taxis and private hire cars.	On-going	Funding for Eco Stars 2016/17 secured
19	Vehicle emissions partnership (testing and idling) - enforcement and fines rather than raising awareness.	Promoting low emission transport	Cars	Falkirk and other neighbouring authorities.	2012	2012	Continued testing at Falkirk central retail park throughout 2016.	Anticipated reduction in NO_X and PM emissions through anti-idling enforcement.	Falkirk central retail park testing schedule set for 2016.	On-going subject to annual funding allocation.	

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

3.1 Summary of Monitoring Undertaken

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.

Falkirk Council undertook automatic (continuous) monitoring at twelve sites during 2015 from Banknock in the west to Bo'ness in the east. The automatic monitoring measured $PM_{2.5}$, PM_{10}, NO_2 and SO_2. Table 1 in Appendix A shows the details of the sites. National monitoring results are available at http://www.scottishairquality.co.uk/

Maps showing the location of the monitoring sites are provided in Figure 12 in Appendix A. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Falkirk Council undertook non- automatic (passive) monitoring of NO_2 at sixty one sites during 2015.

Falkirk Council also undertook non-automatic (passive) monitoring of 1, 3-butadiene at three locations during 2015.

In addition Falkirk Council undertook non-automatic (passive) monitoring of benzene at sixteen locations. Benzene was also monitored at the Grangemouth AURN site in 2015 by pumped diffusion tube.

Table 5 in Appendix A shows the details of the non-automatic monitoring sites. 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.

3.2.1 Nitrogen Dioxide (NO_2)

Table 6 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.

Table 7 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.

For NO_2 diffusion tubes, the full 2015 dataset of monthly mean values is provided in Appendix B.

The 2015 monitoring results show that all seven automatic NO_2 analysers in Falkirk Council's automatic network met both of the NO_2 air quality objectives. The annual NO_2 results for Falkirk West Bridge St show a decrease of 4µg/m^3 from 2014. The Haggs monitoring site continues to record NO_2 concentrations within the objectives. All the results are shown in Appendix A.

The NA27 West Bridge St diffusion tube recorded a concentration greater than the annual NO_2 objective of 40 µg/m^3 in 2015 with the application of the R&A bias factor: This site is in the Falkirk Town Centre AQMA and is close to the Falkirk West Bridge St automatic monitoring site. The automatic monitoring site did not record a breach of the objective. The Falkirk West Bridge St site historically records a lower concentration as it is further from the kerb.

All other NO_2 diffusion tube sites recorded concentrations below the annual NO_2 objective in 2015 with the application of the R&A bias factor, however, the following diffusion tubes recorded a concentration close to the objective (36 to 40 µg/m^3) with the application of the R&A bias factor:

- NA24 Kerse Lane, Falkirk: this site is in the Falkirk Town Centre AQMA.
- NA62 Arnot Street, Falkirk: this site is in the Falkirk Town Centre AQMA.

Figures 1 to 4 in Appendix A show long term NO_2 trends for the Grangemouth AURN, Haggs, Falkirk Hope St and Falkirk West Bridge St sites. There is a slight downward trend in NO_2

concentrations at the background Grangemouth AURN site between 2001 and 2015. However, a significant decrease has been recorded at the Haggs site compared to both the peak in 2010 and the concentrations recorded in 2009. This is likely to have occurred because of the completion of the M80 and a reduced speed limit of 30 mph on the A803 which has transferred traffic from the local to trunk road network.

3.2.2 Particulate Matter (PM_{10})

Table 8 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.

Table 9 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.

Falkirk Council measured PM_{10} concentrations at eight locations during 2015. The PM_{10} air quality objectives were met at all eight sites.

The site with the greatest annual mean PM_{10} concentration, but within the Scottish annual PM_{10} objective was the Falkirk West Bridge St site, with an annual mean concentration of 18.0 µg/m^3. However, the site was below the data capture target with 80.3% achieved in 2015. Two daily exceedances of the Scottish PM_{10} objective concentration were also recorded at the Falkirk West Bridge St site, but this is within the Scottish daily PM_{10} objective which allows for seven exceeedances per year.

The Banknock 2 monitoring site recorded the greatest number of daily exceedances (three), but again this is within the Scottish daily PM_{10} objective. The full results are shown in Appendix A.

Figures 5 and 6 in Appendix A show long-term trends of PM_{10} concentrations at the Falkirk West Bridge St and Grangemouth AURN sites. The trend in PM_{10} at the Grangemouth AURN site should be treated with slight caution as there have been changes to the correction factor used and the monitoring technique used. However, there is long-term decline at the monitoring site although the concentrations have levelled out since early 2009.

The Falkirk West Bridge St monitoring site has recorded a slight decline in concentrations between its installation in September 2009 and December 2015. This reflects well the annual concentrations recorded and reported in Appendix A.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table 10 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.

$PM_{2.5}$ was measured at two locations during 2015, these being the Grangemouth AURN site and the Banknock 2 site. There were no exceedances of the $PM_{2.5}$ annual mean objective at either site. The AURN recorded an annual mean of 9.27µg/m^3. The Banknock site recorded an annual mean of 6.0µg/m^3. However, the site was just below the data capture target with 87.7% achieved in 2015.

The $PM_{2.5}$ concentrations at the Grangemouth AURN site have gradually reduced from 10.9 µg/m^3 in 2011 to 9.27 µg/m^3 in 2015. See Figure 7 in Appendix A for details. This reduction may be attributed to the commissioning of the tail gas treatment (TGT) unit at the INEOS Grangemouth complex in 2013. Since the commissioning of the TGT unit, SO_2 concentrations have reduced within the Grangemouth AQMA. As sulphate species are known to contribute towards the formation of secondary $PM_{2.5,}$ a reduction in SO_2 could impact local $PM_{2.5}$ concentrations.

Long term trend analysis cannot be completed for $PM_{2.5}$ concentrations at Banknock. Monitoring only commenced in Banknock in February 2015 with the installation of a FIDAS 200. The measurement of $PM_{2.5}$ at this monitoring site is primarily focused on assisting with source identification in the area. However, since the 10 µg/m^3 objective has been placed into legislation, the unit is now serving a secondary purpose for comparison against the objective.

To appraise compliance with the new $PM_{2.5}$ objective at locations that currently do not monitor $PM_{2.5}$ concentrations, Falkirk Council has applied locally derived correction factors of 0.54 (roadside) and 0.75 (urban background/ industrial) following guidance set out in LAQM TG (16). This methodology provides an estimation of $PM_{2.5}$ data from PM_{10} data where only one of the two metrics is available. For roadside sites the correction factor was derived using PM data from the Banknock 2 site and for the background/industrial sites the factor was derived using PM data from the Grangemouth AURN site. For further details see Appendix C.

The $PM_{2.5}$ estimations indicate that all six sites where the correction factor was applied met the $PM_{2.5}$ annual mean objective in 2015. Grangemouth Municipal Chambers recorded the highest estimated annual concentration of 9.7 µg/m^3. Falkirk Haggs and Falkirk West Bridge St had the second highest estimated annual concentrations, with both sites recording an estimated annual average concentration of 8.1 µg/m^3. See Table 10 in Appendix A for a full comparison of estimated $PM_{2.5}$ annual mean concentrations against the objective.

3.2.4 Sulphur Dioxide (SO_2)

Table 12 in Appendix A compares the ratified continuous monitored SO_2 concentrations for year 2015 with the air quality objectives.

In 2015 Falkirk Council monitored SO_2 at six locations. Four of the locations are located in the Grangemouth (15-minute) AQMA and two sites are positioned outside of the AQMA.

There were no breaches of the SO_2 objectives (15-minute, hourly or daily) recorded at any monitoring locations during 2015.

The site with the most exceedances of 15-min objective concentration (266 µg/m^3) in 2015 was Grangemouth Municipal Chambers. The site recorded eight exceedances of the 15-minute standard concentration, a number well below the maximum permitted by the objective (35). The Grangemouth Moray site recorded two exceedances of the 15-minute standard concentration and the Grangemouth AURN site recorded one exceedance. Grangemouth Zetland Park recorded zero exceedances.

This is the second consecutive year that no breaches of the 15-minute objective have been recorded at any site in the Grangemouth AQMA. It is important to stress that although there were still exceedances of the air quality 15- minute standard concentration, the number was below the maximum permitted by the objective. In-line with previous years the hourly and daily objectives were met at all monitoring sites.

Long term trend analysis of SO_2 concentrations within the Grangemouth AQMA shows that the number of exceedances has significantly reduced since 2013. This reduction is attributed to the commissioning of the TGT unit at the INEOS Grangemouth plant in 2013. Figure 8 in Appendix A shows the running annual total exceedances from 2011 – 2015. A decrease in exceedances is clearly shown after 2013.

The polar plots suggest that the reduction in the number of exceedances goes beyond any changes that could relate to only short-term meteorological conditions. In general, the average concentrations at the Grangemouth sites have reduced across a variety of wind directions and speeds. For example in 2012 at the Grangemouth AURN site, the polar plots indicate the highest average concentrations during particular wind conditions were greater than 80µg/m^3. In 2015 the highest average concentrations at the AURN site have reduced to 50µg/m^3. Polar roses for the Grangemouth sites are shown in Figure 9 in Appendix A.

3.2.5 Carbon Monoxide, Lead, 1,3-Butadiene and Benzene

Carbon Monoxide

No monitoring undertaken.

Lead

No monitoring undertaken.

1, 3-Butadiene

In 2015 Falkirk Council monitored 1, 3-butadiene at three locations using passive diffusion tubes. All the results were within the objective and are shown in Table 12 in Appendix A. No changes have occurred since the submission of the previous report.

Benzene

In 2015 Falkirk Council monitored benzene at sixteen locations using passive diffusion tubes. In addition, at the Grangemouth AURN site a pumped diffusion tube operates as part of the AURN network. The results from the passive diffusion tubes are shown in Table 13 in Appendix A with the pumped diffusion tube results shown in Table 14 in Appendix A.

All the benzene concentrations recorded by the tubes were within the air quality objectives. All benzene diffusion tubes achieved 100% data capture. In 2015 the pumped diffusion tube at the Grangemouth AURN site recorded an annual average concentration of 0.72 µg/m^3. The concentration recorded continues to be within the relevant objectives and is a decrease compared to 2014. It is also the lowest annual concentration recorded since monitoring began in 2002.

4. New Local Developments

4.1 Road Traffic Sources

4.1.2 Narrow Congested Streets

There are no new locations that are likely to be congested residential streets that have not been considered before or are not already in AQMAs.

4.1.3 Busy Streets

Falkirk Council is not aware of any links where there are any new locations where people may spend 1-hour or more in proximity to traffic.

In addition, the automatic monitoring network recorded no exceedances of the hourly NO_2 objective concentration and all of the diffusion tubes recorded concentrations below 60 $\mu g/m^3$.

4.1.4 Roads with high flow of buses and/or HGVs

There are no stretches of roads in the Falkirk Council area where the percentage of HDVs is greater than 20%. Therefore no further consideration is required.

4.1.5 Junctions

There are no new junctions that have been completed recently. A new roundabout is still under construction at the junction of Nethermains Road and Glasgow Road in Denny. This will form the access to the Mydub Farm development site.

4.1.6 New Roads Constructed or Proposed

The council has embarked on a series of infrastructure works. Junction improvements to the M9 at Junction 6 Earlsgate have been completed. These works are designed to reduce traffic congestion in the area at peak times and involves the signalisation of both the M9 off-ramp and Earlsgate interchange.

The next scheme due to get underway is improvement works to M9 Junction 5 Cadgers. This is phase 1 and will involve the signalisation of Cadgers interchange and duelling of a section of the A9 Laurieston Bypass. Phase 2 of the works will involve a new roundabout at the junction of the A9 Laurieston Bypass and Grandsable Road. Phase 2 is currently programmed for 2019/20.

4.1.7 Roads with significantly changed traffic flows

The current traffic growth trends indicate almost flat traffic growth throughout the Council area. Some links exhibit higher traffic flows from time to time depending on what has been happening on the surrounding road network. For example as part of Network Rail's EGIP electrification project various road over rail bridges were closed and diversion routes implemented. This would distort the normal level of traffic that you would expect on the surrounding routes during these works.

4.1.8 Bus or coach stations

There has been no new bus or coach stations constructed or planned for the foreseeable future.

4.2 Other Transport Sources

4.2.1 Airports

The number of airport passenger movements at Edinburgh between 2014 and 2015 has increased by 9.4% from 10.1 million to 11.3 million [Ref 2] .The airport does not need considering further as it is greater than 1 km from the Falkirk Council boundary.

Falkirk Council is not aware of any significant changes to Cumbernauld airport. This is a small airport just outside the Falkirk Council area boundary. There are no new airports either.

4.2.2 Stationary trains

Falkirk Council is not aware of any new locations where locomotives or trains are stationary for more than 15-minutes that would not have been assessed in previous reports.

4.2.3 Railways (diesel and steam trains)

Falkirk Council confirms that there are no new locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30 m

4.2.4 Ports for Shipping

Falkirk Council confirms that there are no ports or shipping that requires further consideration.

4.3 Industrial Sources

4.3.1 Industrial Installations – New Installations

There has been little change since the 2015 Updating and Screening Assessment with regards to new industrial installations. However, there is a new site at RHI, Bonnybridge PPC/B/1144889. Licence limits: NOx 500mg/m3 and SOx 500mg/m3.

In addition, Scottish Power PPC Permit PPC/A/1008873 for the operation of Longannet coal-fired power station is likely to be formally surrendered before the end of 2016 although this is still to be confirmed because the site needs to undertake a period of decommissioning and site investigation first to support their surrender application. However, emissions to air from the Power Station ceased on 24 March 2016 at 12:00 midday.

There are no new poultry farms, petrol stations or major fuel depots. The above information was supplied to Falkirk Council by SEPA, May 2016.

4.4 Commercial and Domestic Sources

4.4.1 Biomass Combustion Plants – Individual Installations

There are no new individual biomass combustion individual installations that require consideration.

4.4.2 Biomass Combustion Plants – Combined Sources

Falkirk Council has assessed domestic biomass or other fuel burning in previous reports. Falkirk Council has either received no significant numbers of complaints about particular areas in relation to or changes to the following:

- Complaints about nuisance dust or odour relating to burning,
- Visual signs of chimney smoke being emitted from several properties near to each other,
- Smell of burning biomass fuel,
- Known high levels of sales of biomass or other fuels via home delivery or local outlets,
- Areas known to have limited or no access to mains gas.

4.4.2 Domestic Solid Fuel Burning

Falkirk Council has assessed domestic solid fuel burning in previous reports and is not aware of any new areas that would need consideration.

A map of the smoke control areas in the Falkirk Council area is available to view on the Falkirk Council website at www.falkirk.gov.uk/airquality

4.4.1 Combined Heat and Power Plant

Falkirk Council have received an application to purify conditions on the consent under section 36 of The Electricity Act 1989 and deemed planning permission under section 57(2) of the Town and Country Planning (Scotland) Act 1997 in relation to the construction and operation of a gas fired combined heat and power plant (CHP) at BP Kinneil Terminal, Grangemouth.

The proposed CHP Plant Project is intended to replace the function of the neighbouring petrochemical plant by combusting dry gas in steam boilers and / or gas turbines in order to meet all of the Kinneil Terminal's process steam requirements.

4.5 New Developments with Fugitive or Uncontrolled Sources

Landfill sites are regulated by SEPA and no changes with respect to the pollutants covered by this report have been indicated by SEPA.

Falkirk Council is not aware of any other changes to unmade haulage roads on industrial sites, waste transfer stations or other potential sources of fugitive particulate emissions.

5. Planning Applications

5.1 Garngrew road development

S. Brown Builders propose to develop a site at Banknock, near Bonnybridge, for housing. The site has been allocated for housing development in Falkirk Council's Local Development Plan (site reference H74, Garngrew Road). The development site is partially located within the Falkirk Council Haggs Air Quality Management Area and the M80 motorway,

Prior to submitting a formal planning application, S. Brown Builders commissioned Energised Environment Ltd to prepare an air quality impact assessment. In brief the air quality impact assessment concluded that the primary emission sources will relate to traffic associated with the development. No traffic assessments were provided in support of the assessment, however, the study predicted that traffic flows on local roads associated with the development will be more than 100 AADT but significantly less than 500 AADT.

In addition, pollutant emissions were modelled using the advanced atmospheric dispersion modelling software ADMS-Roads 4. Predicted concentrations across all parts of the proposed development site were below NAQS objectives for both NO_2 and PM_{10} based on a minimum stand-off distance of 15 m from the motorway.

6. Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

Falkirk Council has examined its automatic and non-automatic monitoring results. No exceedances of Scottish Air Quality Objective, within or outside existing AQMAs were identified. Therefore no new Detailed Assessment of any pollutant is required.

The number of exceedances in the Grangemouth AQMA has significantly reduced compared to before the commissioning of the Tail Gas Unit. See Figure 8 in Appendix A showing the running annual total exceedances from 2011 – 2015. A decrease in exceedances is clearly shown after 2013.

In 2015, Grangemouth Municipal Chambers recorded the highest number of exceedances of the15-minute SO_2 objective concentration. Eight exceedances were recorded in total, a number well below the maximum permitted by the objective (35). However, in 2014 Grangemouth Municipal Chambers recorded thirty exceedances of the 15-minute objective concentration which could be considered to be close to the objective.

Local Air Quality Policy Guidance PG (S) 16 states that “There are no set criteria on which a revocation decision will be based, and the Scottish Government considers each request on a case by case basis. A minimum requirement however will normally be at least three consecutive years where the objectives of concern are being achieved”.

Although SO_2 objectives have been achieved within the Grangemouth AQMA for three consecutive years; Falkirk Council considers that the Grangemouth AQMA remains justified based upon the 2014 Grangemouth MC results. However, the strength of this justification has significantly weakened compared to when breaches of the objective were being recorded (between 2007 and 2012).

Monitoring data from the Grangemouth AQMA will continue to be reviewed and consultation will be sought from SEPA and other statutory consultees should the Grangemouth AQMA continue to achieve all SO_2 objectives in future reporting years.

The Falkirk Town Centre AQMA remains justified with a breach of the NO_2 objective along Falkirk West Bridge St. Although PM_{10} concentrations appear to be reducing at the Falkirk West Bridge St site.

The Haggs AQMA will be reviewed in the upcoming year as the monitoring results have again met the NO_2 objectives and the PM_{10} objectives in 2015.

The roadside and background monitoring in the Banknock AQMA is operating in the area. Any decision on the status of the AQMA will be made following assessment of the impact of emissions from the new Tomfyne quarry, once it begins operation.

6.2 Conclusions relating to New Local Developments

Falkirk Council has assessed new and proposed local developments in the Falkirk area. An air quality impact assessment was received in relation to the proposed residential development at Garngrew Road.

The assessment was required to demonstrate that the development will not compromise compliance with air quality objectives as set out in the National Air Quality Strategy (NAQS) and to illustrate that the proposed development will not introduce new receptors into an area of existing poor air quality.

Considering the dispersion modelling results undertaken as part of the assessment, alongside the measured NO_2 and PM_{10} concentrations within the Haggs AQMA. The assessment demonstrated that the development will not introduce new receptors into an area of existing poor air quality, on the condition that a 20 m stand-off distance to the M80 is observed.

However, to ensure the site continues to meet NAQS objectives; a traffic assessment has been requested. This will assist Falkirk Council in considering the application further and any mitigation measures that may need to be implemented. No formal planning application has been submitted to the council at present.

The proposed CHP plant at BP Kinneil Terminal, Grangemouth has deemed consent and therefore does not require express consent from Falkirk Council, provided that certain criteria and conditions are met. Falkirk Council has received an application to purify conditions on the consent. The application was reviewed from an air quality prospective. Conclusions were that the best available technology was proposed and that emissions of $SO_{x,}$ NO_x and PM would be negligible.

There are no other new developments that have potential to introduce new exceedances of relevant objectives, or exacerbate existing ones.

6.3 Proposed Actions

Falkirk Council will continue to assess and monitor SO_2 concentrations in the Grangemouth AQMA and NO_2 and PM_{10} in the Haggs AQMA.

To ensure that SO_2 monitoring can continue the SO_2 analyser at Grangemouth Municipal Chambers will be replaced in 2016.

In addition, Falkirk Council will replace the PM_{10} monitor at Falkirk West Bridge Street and add $PM_{2.5}$ capability to this AQMA. This proposal will allow simultaneous PM_{10} and $PM_{2.5}$ monitoring. It will also enable Falkirk Council to begin establishing a $PM_{2.5}$ monitoring network following the Scottish Governments announcement that Local Authorities are now required to consider this pollutant. Falkirk West Bridge Street has been prioritised given that this site is an existing PM_{10} AQMA.

The automatic monitoring NO_x and PM_{10} on Main St Bainsford commenced in June 2015 in relation to the Detailed Assessment along this street. The automatic and non-automatic results will be considered after one-year of monitoring as part of the outstanding Detailed Assessment.

An Air Quality Progress Report as required by the Scottish Government shall be submitted in June 2017.

Appendix A

Table 4 – 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)
A3	Bo'ness	Urban background/ industrial	299815	681481	SO_2	N	SO_2, Horiba	Y (5 m)	22 m	1.2
A4	Falkirk Haggs	Roadside	278977	679271	NO_2, PM_{10}	Y (NO_2)	NO_x: ML, PM_{10}: TEOM.	Y (5 m)	2 m	1.2
A5	Falkirk Hope St	Roadside	288688	680218	NO_2, SO_2.	Y (NO_2 and PM_{10}.)	Horiba.	Y (1 m)	5 m	1.5
A7	Falkirk West Bridge St	Roadside	288457	680064	NO_2, PM_{10}	Y (NO_2 and PM_{10}.)	NO_x: ML, PM_{10}: TEOM.	Y (1 m)	2 m	1.2
A8	Grangemouth AURN	Urban background/ industrial	293830	681022	Benzene, NO_2, PM_{10}, $PM_{2.5}$, SO_2.	Y (SO_2)	Benzene (pumped tube), PM: FDMS. NO_x and SO_2: ML.	Y (5 m)	20 m	3.5
A9	Grangemouth Moray	Urban background/ industrial	293469	681321	NO_2, SO_2.	Y (SO_2)	NO_x: ML and SO_2: Horiba.	Y (1 m)	25 m	3.5
A10	Grangemouth Municipal Chambers	Urban background/ industrial	292816	682009	NO_2, SO_2, PM_{10}.	Y (SO_2)	NO_x and SO_2: Horiba, PM_{10}: TEOM.	Y (1 m)	40 m	3.5

A11	Grangemouth Zetland Park	Urban background/ industrial	292969	681106	SO_2	Y (SO_2)	SO_2: Horiba.	Y (1 m)	135 m	3.5
A12	Falkirk Grahams Rd	Roadside	288823	680242	PM_{10}	Y (NO_2 and PM_{10}.)	TEOM	Y (1m)	10 m	1.2
A13	Banknock 2	Roadside	277247	679027	PM_{10}	Y (PM_{10})	FIDAS	Y (7 m)	3 m	1.2
A14	Banknock 3	Urban background	277168	679254	PM_{10}	Y (PM_{10})	Osiris	Y (19 m)	17 m	1.3
A15	Main St Bainsford	Roadside	288566	681508	NO_2, PM_{10}	N	NO_x: ML, PM_{10}: TEOM.	Y (1 m)	2 m	1.2

(1) 0 if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property). N/A if not applicable

Table 5 – 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?
NA3	Tinto Drive, Grangemouth.	Urban background.	293427	680386	Benzene, NO_2.	N	Y (<5)	<10	N
NA5	Copper Top pub, Camelon.	Roadside.	287332	680333	NO_2.	N	Y (<2)	0.6 (traffic island)	N
NA7	Irving Parish Church, Camelon.	Urban background.	287324	680442	NO_2.	N	Y (<5)	<10	N
NA9	Bellsdyke Rd, Larbert.	Roadside.	286048	683542	NO_2.	N	Y (<2)	0.7	N
NA19	Kilsyth Rd, Banknock.	Roadside.	278779	679301	NO_2.	Y	Y (<2)	2.2	N
NA20	Garngrew Rd, Haggs.	Urban background.	278975	679172	NO_2.	N	Y (<5)	<10	Y
NA21	Grangemouth Rd, College.	Roadside.	290112	680500	Benzene, NO_2.	N	Y (<2)	1.8	N
NA24	Kerse Lane, Falkirk.	Roadside.	289187	680024	NO_2.	Y	Y (<2)	3	N
NA26	Weir St, Falkirk.	Urban background.	289207	680123	NO_2.	Y	Y (<5)	<10	N
NA27	West Bridge St, Falkirk.	Roadside.	288490	680055	Benzene, NO_2.	Y	Y (<2)	0.5	Y

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?
NA29	Wellside Place, Falkirk.	Urban background.	288465	680220	NO_2.	N	Y (<5)	<10	N
NA36	Kerr Crescent, Haggs.	Roadside.	278985	679273	NO_2.	Y	Y (<5)	2.1	N
NA37	Denny Town House.	Urban centre.	281226	682526	Benzene, NO_2.	N	Y (<5)	<5	N
NA38	Larbert Village Primary School.	Urban background.	285930	682318	Benzene, NO_2.	N	Y (<5)	<10	N
NA41	Seaview Place, Bo'ness.	Roadside.	299722	681594	Benzene, 1,3 Butadiene, NO_2.	N	Y (<2)	0.1	N
NA42	Municipal Chambers, Grangemouth.	Urban centre / industrial.	292817	682000	Benzene, NO_2*.	N	Y (<5)	<10	Y
NA44	Greenpark Drive, Polmont.	Urban background.	293436	678938	Benzene, NO_2.	N	Y (<5)	<10	N
NA47	Thistle Avenue, Grangemouth.	Roadside.	292000	680300	NO_2.	N	Y (<2)	1.3	N
NA48	Hayfield, Falkirk.	Urban background.	289200	681580	NO_2.	N	Y (<5)	<10	N
NA50	Upper Newmarket St, Falkirk.	Urban background.	288671	680047	NO_2.	Y	Y (<5)	<10	N
NA51	Mary St, Laurieston.	Roadside.	290965	679490	NO_2.	N	Y (1)	4.5	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?
NA52	Main St, Larbert.	Roadside.	285866	682356	NO_2.	N	Y (<2)	4.4	N
NA53	Denny Cross.	Roadside.	281211	682727	NO_2.	N	Y (<2)	0.8	N
NA55	Inchyra Station	Urban background / industrial.	293830	681022	Benzene, 1, 3-butadiene.	N	Y (<5)	<2	Y
NA57	Inchyra Road, Grangemouth.	Urban background / industrial.	294028	680829	Benzene, NO_2.	N	Y (<5)	<10	N
NA58	Callendar Rd, Falkirk.	Roadside.	289667	679724	NO_2.	N	Y (<2)	0.5	N
NA59	Carron Rd, Bainsford.	Roadside.	288392	681931	NO_2.	N	Y (<2)	1.2	N
NA60	Ronades Rd, Carron.	Roadside.	288133	681587	NO_2.	N	Y (<2)	1.6	N
NA61	Canal Rd, Falkirk.	Roadside.	287976	680656	NO_2.	Y	Y (<2)	1.5	N
NA62	Arnot St, Falkirk.	Roadside.	289125	679705	NO_2.	Y	Y (<2)	1.2	N
NA63	Camelon Rd, Falkirk.	Urban background.	288055	680134	NO_2.	On boundary NO_2.	Y (<5)	<10	N
NA64	New Hallglen Rd, Falkirk.	Roadside.	288807	678422	NO_2.	N	Y (<2)	1.7	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?
NA65	Redding Rd, Redding.	Roadside.	291356	678644	NO_2.	N	Y (<2)	0.6	N
NA67	Queen St, Falkirk.	Urban background.	289430	680433	NO_2.	Y	Y (<5)	<10	N
NA68	Bellevue St, Falkirk.	Roadside.	289234	679945	NO_2.	Y	Y (<2)	1.7	N
NA69	Kerse Lane, Falkirk.	Roadside.	289025	679991	NO_2.	Y	Y (<2)	2.3	N
NA70	Park St AQ station, Falkirk.	Roadside.	288892	680070	NO_2.*	Y	Y (<2)	4.7	N
NA71	Park St, Falkirk.	Roadside.	288910	680112	NO_2.	Y	Y (<2)	1.5	N
NA72	Vicar St, Falkirk.	Roadside.	288824	680120	NO_2.	Y	Y (<2)	1.5	N
NA73	West Bridge St RHS, Falkirk.	Roadside.	288467	680048	NO_2.	Y	Y (<2)	0.3	N
NA76	Tyrst Road, Stenhousemuir.	Roadside.	286851	683229	NO_2.	N	Y (<2)	<2	N
NA77	Kinnaird Village.	Roadside.	286490	683775	Benzene, NO_2.	N	Y (<2)	3.9	N
NA78	Glen Brae, Falkirk.	Roadside.	288525	678991	NO_2.	N	Y (<2)	2.6	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?
NA80	Cow Wynd, Falkirk.	Roadside.	288765	679456	Benzene, NO_2.	N	Y (<2)	1.8	N
NA81	Grahams Rd, Falkirk.	Roadside.	288834	680898	Benzene, NO_2.	N	Y (<2)	0.5	N
NA82	Castings Ave, Falkirk.	Roadside.	288858	681036	NO_2.	N	Y (<2)	<2	N
NA83	Main St, Bainsford.	Roadside.	288614	681415	NO_2.	Y	Y (<2)	0.5	N
NA85	Auchinloch Dr, Banknock.	Roadside.	278752	679049	NO_2.	Y	Y (<2)	<2	N
NA86	Wolfe Rd, Falkirk.	Urban background.	289667	679871	NO_2.	N	Y (<2)	2	N
NA87	M80 slip south, Haggs.	Roadside.	279017	679305	NO_2.	Y	Y (<2)	1.6	N
NA88	Ure Crescent, Bonnybridge.	Roadside.	282444	681074	NO_2.	N	Y (<2)	1.7 (16 to M876)	N
NA89	Grahams Rd/Meeks Rd, Falkirk.	Roadside.	288853	680328	NO_2.	Y	Y (<2)	2.2	N
NA90	Grahams Rd bridge east, Falkirk.	Roadside.	288855	680234	NO_2.	Y	Y (<2)	2.2	N
NA94	A905 (Glensburgh Rd), Grangemouth.	Roadside.	291213	681927	Benzene, NO_2.	N	Y (7 m)	5.4	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?
NA98	Arnothill, Falkirk	Urban background.	288095	680105	NO_2	Y	Y (23 m)	1.6	N
NA99	St Crispins Place, Falkirk	Roadside.	288924	679675	NO_2	Y	Y (7.6 m)	2.7	N
NA100	Oswald St, Falkirk	Urban background.	288977	679662	NO_2	N	Y (3.8 m)	1.5	N
NA101	Glensburgh Road (2), Grangemouth	Roadside.	291127	682007	NO_2	N	Y (7 m)	0.9	N
NA102	Easy Kearse Mains, Bo'ness	Urban background.	297968	680684	Benzene	N	N	23 m (main road)	N
NA104	Powdrake Road, Grangemouth	Urban background / industrial.	293788	682054	1,3-butadiene	N	Y (40 m)	1.8	N
NA105	West of Shieldhill	Rural.	288292	676889	Benzene, NO_2	N	N	1.7	N
NA106	Stirling Road, North Broomage	Roadside.	284975	683532	NO_2	N	Y (4 m)	19	N
NA107	Main Street (east), Bainsford	Roadside.	288640	681396	NO_2	N	Y (4 m)	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 6 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2011	2012	2013	2014	2015
A4	Falkirk Haggs	Automatic	90.4	90.4	34	35	34	32	30
A5	Falkirk Hope St	Automatic	99.7	99.7	24	25	23	23	21
A7	Falkirk West Bridge St	Automatic	69.9	69.9	35	**43**	39	**41**	37
A8	Grangemouth AURN	Automatic	95.2	95.2	15	16	14	16	14
A9	Grangemouth Moray	Automatic	93.6	93.6	17	19	16	15	15
A10	Grangemouth MC	Automatic	88.5	88.5	21	24	20	19	18
A15	Main St Bainsford	Automatic	27.1	50	n/m	n/m	n/m	n/m	15
NA3	Tinto Drive, Grangemouth.	Diffusion Tube	100	100	21	21	21	19	20
NA5	Copper Top pub, Camelon.	Diffusion Tube	100	100	31	31	28	27	27
NA7	Irving Parish Church, Camelon.	Diffusion Tube	100	100	21	19	19	18	17
NA9	Bellsdyke Rd, Larbert.	Diffusion Tube	100	100	28	25	26	29	26
NA19	Kilsyth Rd, Banknock.	Diffusion Tube	91.7	91.7	33	36	36	36	26

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2011	2012	2013	2014	2015
NA20	Garngrew Rd, Haggs.	Diffusion Tube	100	100	25	27	24	22	23
NA21	Grangemouth Rd, College.	Diffusion Tube	100	100	33	30	28	28	28
NA24	Kerse Lane, Falkirk.	Diffusion Tube	91.7	91.7	40	37	**42**	37	38
NA26	Weir St, Falkirk.	Diffusion Tube	91.7	91.7	22	22	21	18	17
NA27	West Bridge St, Falkirk.	Diffusion Tube	100	100	**51**	**61**	**53**	**45**	**47**
NA29	Wellside Place, Falkirk.	Diffusion Tube	100	100	21	20	18	17	15
NA36	Kerr Crescent, Haggs.	Diffusion Tube	100	100	**47**	**42**	**40**	38	37
NA37	Denny Town House.	Diffusion Tube	100	100	20	20	19	20	18
NA38	Larbert Village Primary School.	Diffusion Tube	91.7	91.7	21	20	19	18	16
NA41	Seaview Place, Bo'ness.	Diffusion Tube	100	100	25	24	22	21	21
NA42	Municipal Chambers, Grangemouth.	Diffusion Tube	100	100	22	21	20	19	20
NA44	Greenpark Drive,	Diffusion Tube	100	100	17	17	16	16	12

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2011	2012	2013	2014	2015
	Polmont.								
NA48	Hayfield, Falkirk.	Diffusion Tube	100	100	22	21	21	20	19
NA50	Upper Newmarket St, Falkirk.	Diffusion Tube	83.3	83.3	26	30	30	27	22
NA51	Mary St, Laurieston.	Diffusion Tube	100	100	30	27	24	25	19
NA52	Main St, Larbert.	Diffusion Tube	91.7	91.7	30	28	26	21	24
NA53	Denny Cross.	Diffusion Tube	83.3	83.3	33	34	33	31	28
NA57	Inchyra Road, Grangemouth.	Diffusion Tube	100	100	28	27	26	26	20
NA58	Callendar Rd, Falkirk.	Diffusion Tube	100	100	23	23	22	21	21
NA59	Carron Rd, Bainsford.	Diffusion Tube	83.3	83.3	32	31	28	26	29
NA60	Ronades Rd, Carron.	Diffusion Tube	91.7	91.7	31	29	29	27	24
NA61	Canal Rd, Falkirk.	Diffusion Tube	100	100	30	25	26	25	24
NA62	Arnot St, Falkirk.	Diffusion Tube	100	100	**43**	39	36	38	39
NA63	Camelon Rd, Falkirk.	Diffusion Tube	100	100	**42**	**41**	38	36	36
NA64	New Hallglen Rd, Falkirk.	Diffusion Tube	100	100	20	20	20	18	18
NA65	Redding Rd,	Diffusion Tube	100	100	24	25	24	18	27

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2011	2012	2013	2014	2015
	Redding.								
NA67	Queen St, Falkirk.	Diffusion Tube	91.7	91.7	33	31	31	28	25
NA68	Bellevue St, Falkirk.	Diffusion Tube	100	100	36	35	31	29	35
NA69	Kerse Lane, Falkirk.	Diffusion Tube	91.7	91.7	35	38	33	35	30
NA70	Park St AQ station, Falkirk.	Diffusion Tube	100	100	32	30	28	28	n/m
NA71	Park St, Falkirk.	Diffusion Tube	100	100	**41**	38	35	33	35
NA72	Vicar St, Falkirk.	Diffusion Tube	100	100	34	33	33	32	30
NA73	West Bridge St RHS, Falkirk.	Diffusion Tube	100	100	37	34	35	33	31
NA76	Tyrst Road, Stenhousemuir.	Diffusion Tube	100	100	24	24	20	23	23
NA77	Kinnaird Village.	Diffusion Tube	100	100	31	25	24	22	23
NA78	Glen Brae, Falkirk.	Diffusion Tube	100	100	32	31	30	30	32
NA80	Cow Wynd, Falkirk.	Diffusion Tube	100	100	33	31	29	30	32
NA81	Grahams Rd, Falkirk.	Diffusion Tube	91.7	91.7	34	32	32	29	26
NA82	Castings Ave, Falkirk.	Diffusion Tube	100	100	23	22	20	18	20

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2011	2012	2013	2014	2015
NA83	Main St, Bainsford.	Diffusion Tube	91.7	91.7	**44**	**41**	37	34	35
NA85	Auchinloch Dr, Banknock.	Diffusion Tube	100	100	25	25	23	21	20
NA86	Wolfe Rd, Falkirk.	Diffusion Tube	100	100	18	19	19	15	18
NA87	M80 slip south, Haggs.	Diffusion Tube	100	100	36	33	32	32	32
NA88	Ure Crescent, Bonnybridge.	Diffusion Tube	91.7	91.7	36	33	30	29	29
NA89	Grahams Rd/Meeks Rd, Falkirk.	Diffusion Tube	100	100	37	34	34	30	31
NA94	A905 (Glensburgh Rd), Grangemouth.	Diffusion Tube	75.0	75.0	37	38	36	31	24
NA98	Arnothill, Falkirk	Diffusion Tube	33.3	33.3	26	26	25	22	15
NA99	St Crispins Place, Falkirk	Diffusion Tube	83.3	83.3	34	29	26	25	22
NA100	Oswald St, Falkirk	Diffusion Tube	83.3	83.3	22	22	21	20	16
NA101	Glensburgh Road (2), Grangemouth	Diffusion Tube	83.3	83.3	28	26	24	24	17
NA105	West of Shieldhill	Diffusion Tube	91.7	91.7	11	10	10	9	10
NA107	Main Street (east),	Diffusion Tube	91.7	91.7	n/m	n/m	31	30	28

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2011	2012	2013	2014	2015
	Bainsford								
NA108	Main Street, Camelon	Diffusion Tube	83.3	83.3	n/m	n/m	n/m	23	18
NA109	Carmuirs Street, Camelon	Diffusion Tube	83.3	83.3	n/m	n/m	n/m	18	14
NA110	Banknock 2 AQ station	Diffusion Tube	91.7	91.7	n/m	n/m	n/m	18	19
NA111	Falkirk West Bridge St AQ station	Diffusion Tube	83.3	83.3	n/m	n/m	n/m	33	33
NA112	Philip Street, Bainsford	Diffusion Tube	100	100	n/m	n/m	n/m	16	16

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 exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

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

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

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

Table 7 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2011	2012	2013	2014	2015
A4 Falkirk Haggs	Roadside	Automatic	90.4	90.4	0	0	0	0	0
A5 Hope St	Urban Background	Automatic	99.7	99.7	0	0	0	0	0
A7 Falkirk West Bride St	Roadside.	Automatic	69.9	69.9	0 (113)	0 (124)	0	0	0 (115)
A8 Grangemouth AURN	Urban background / industrial.	Automatic	95.2	95.2	0	0	0	0	0
A9 Grangemouth Moray	Urban background / industrial.	Automatic	94	94	0	0	0	0	0
A10 Grangemouth MC	Urban background / industrial.	Automatic	88.5	88.5	0	0	0	0	0 (86)
A15 Main St Bainsford	Roadside	Automatic	27.1	50.0	n/m	n/m	n/m	n/m	0 (45)

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 90%, the 99.8th percentile of 1-hour means is provided in brackets.

n/m = Not monitored

Figure 1 – Grangemouth AURN long term NO_2 concentrations

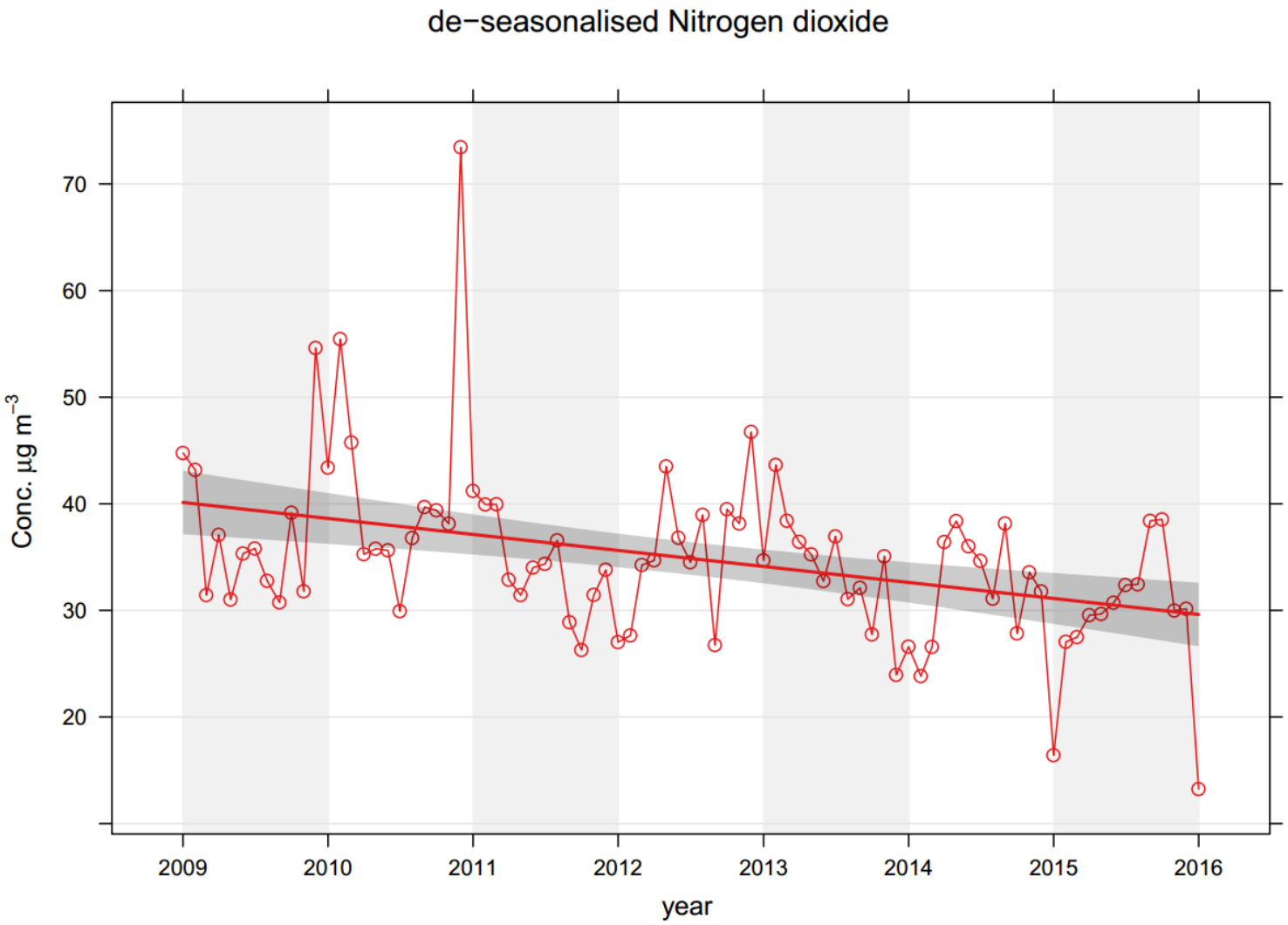


Figure 2 – Falkirk Haggs long term NO_2 concentrations

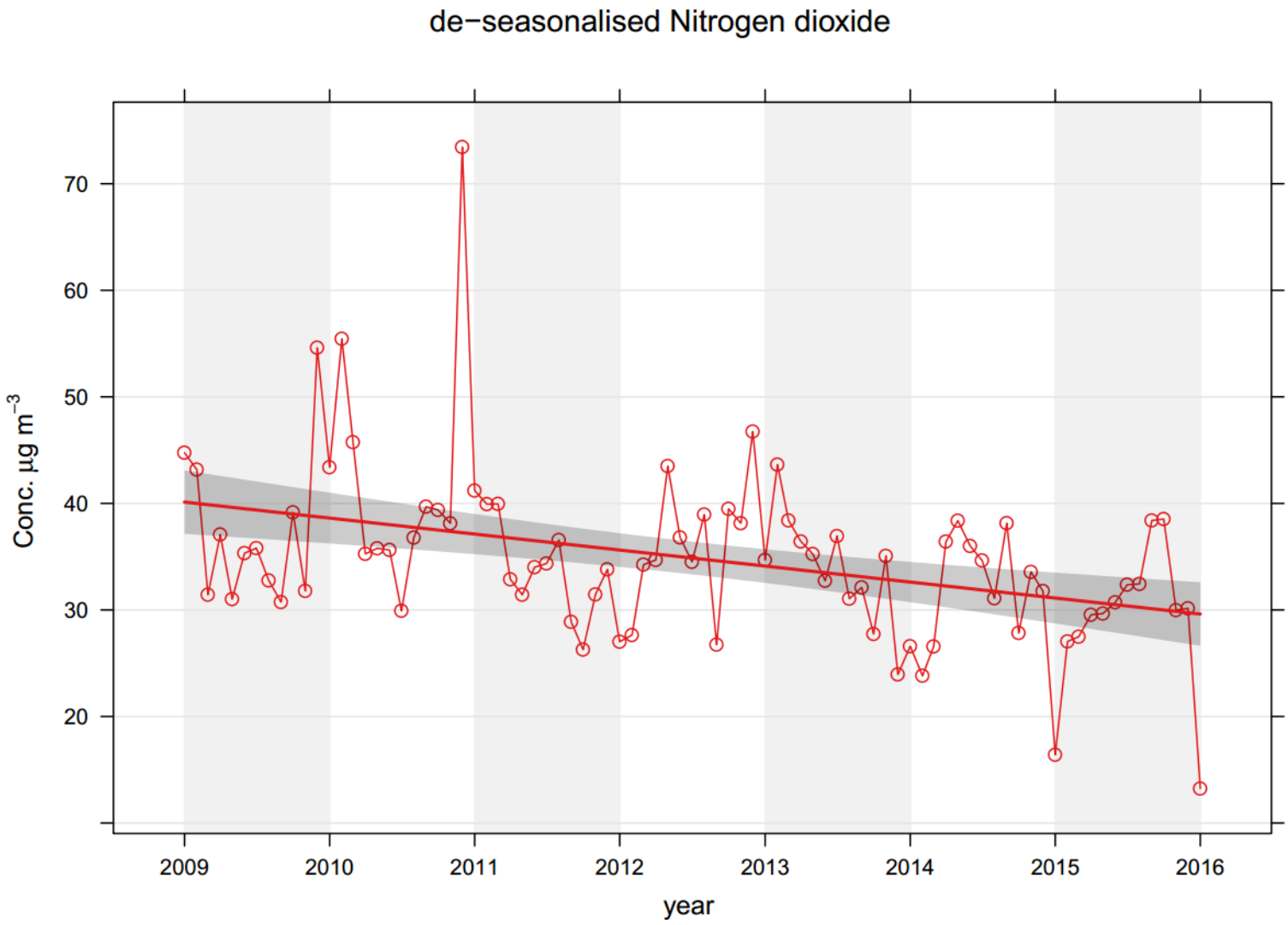


Figure 3 – Falkirk Hope St long term NO_2 concentrations

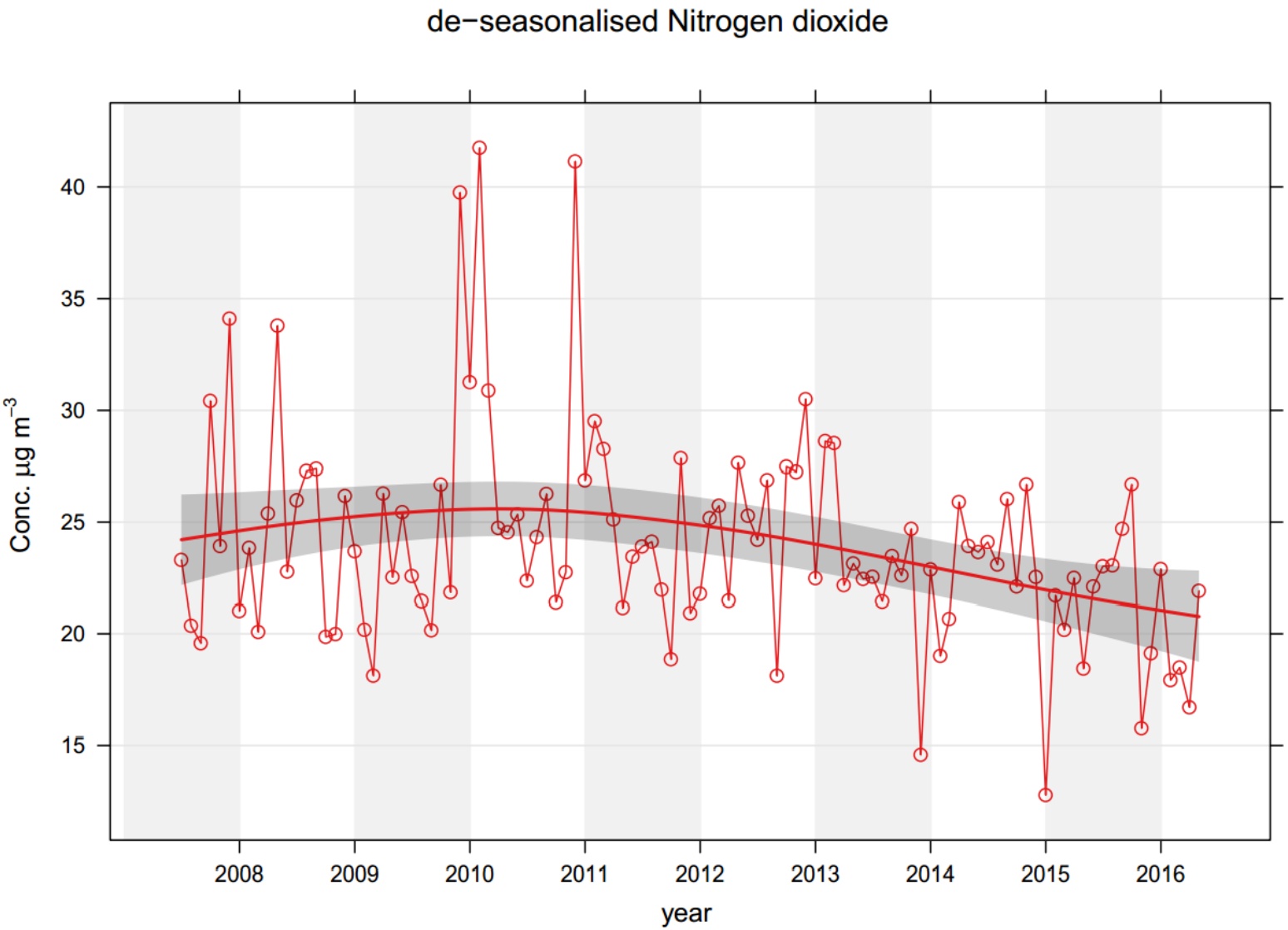


Figure 4 - Falkirk West Bridge St long term NO_2 concentrations

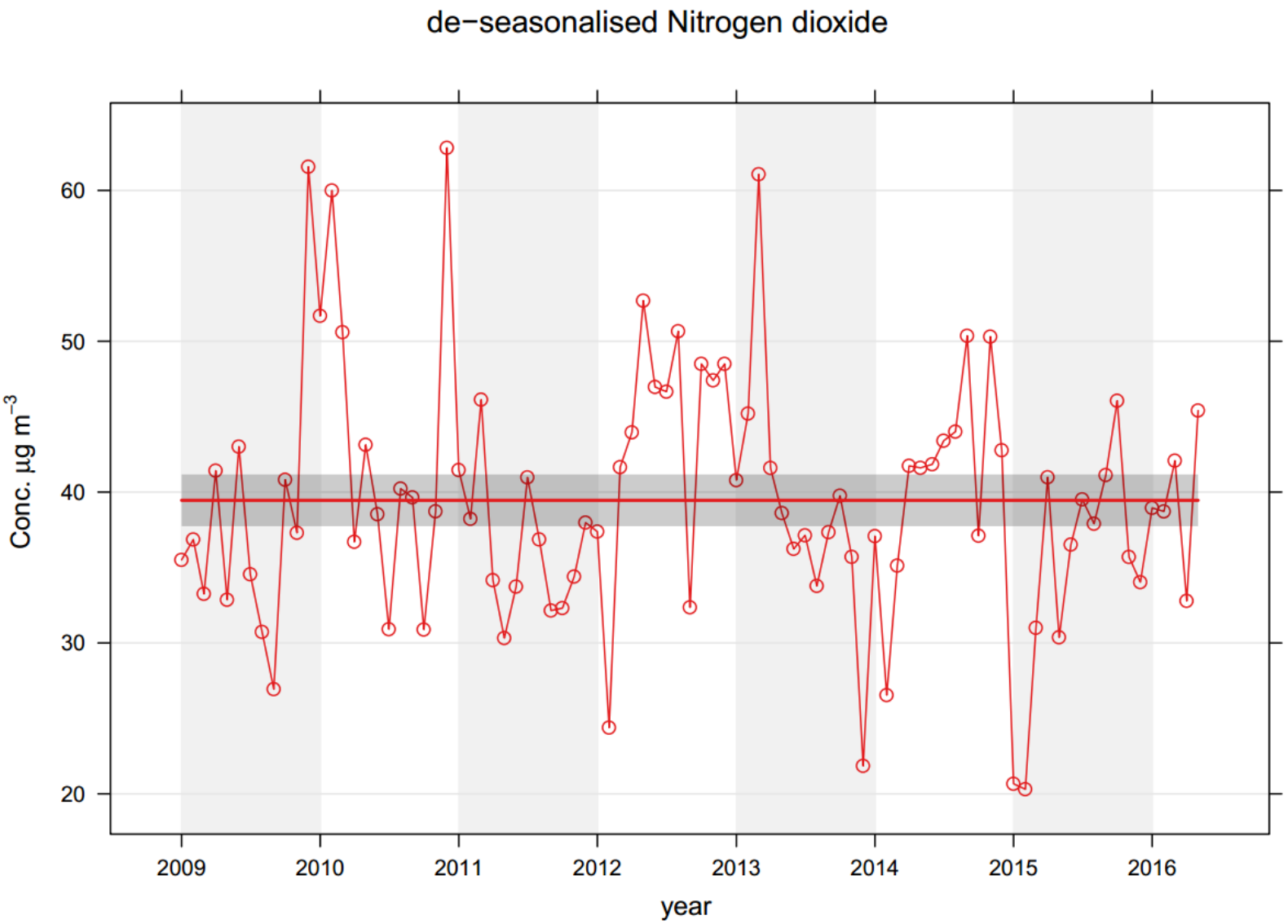


Table 8 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2011	2012	2013	2014	2015
A4	Falkirk Haggs	98	98	n/m	15.9	**18.3**	16.5	15
A7	Falkirk West Bridge St	80.3	80.3	**18.7**	17.8	**19.5**	17.7	15
A8	Grangemouth AURN	67	67	14.1	14.1	14	12.4	12.2
A10	Grangemouth Municipal Chambers	90	90	15.1	14.7	15	14.6	13
A12	Falkirk Graham's Road	78.9	78.9	n/m	16	16.3	13.2	11.8
A13	Banknock 2	95	95	n/m	16	16.3	13.2	11
A14	Banknock 3	100	100	n/m	12.7	14.6	15	8.2
A15	Main St Bainsford	27.6	50	n/m	n/m	n/m	n/m	12.8

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 9 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2011	2012	2013	2014	2015
A4	Falkirk Haggs	98	98	n/m	0 (45)	4	1	1
A7	Falkirk West Bridge St	80.3	80.3	5 (49)	6	4	2 (40)	2 (29)
A8	Grangemouth AURN	67	67	2	2	0 (34)	0	1 (21)
A10	Grangemouth Municipal Chambers	90	90	0	2 (41)	0 (32)	0	0
A12	Falkirk Graham's Road	78.9	78.9	n/m	4	3	0	0 (18)
A13	Banknock 2	95	95	n/m	0 (18)	0	3	4
A14	Banknock 3	100	100	n/m	n/m	0 (22)	0 (24)	1
A15	Main St Bainsford	27.6	50	n/m	n/m	n/m	n/m	0 (16)

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 90%, the 90.4th percentile of 24-hour means is provided in brackets.

Figure 5 – West Bridge St long term PM_{10} concentrations

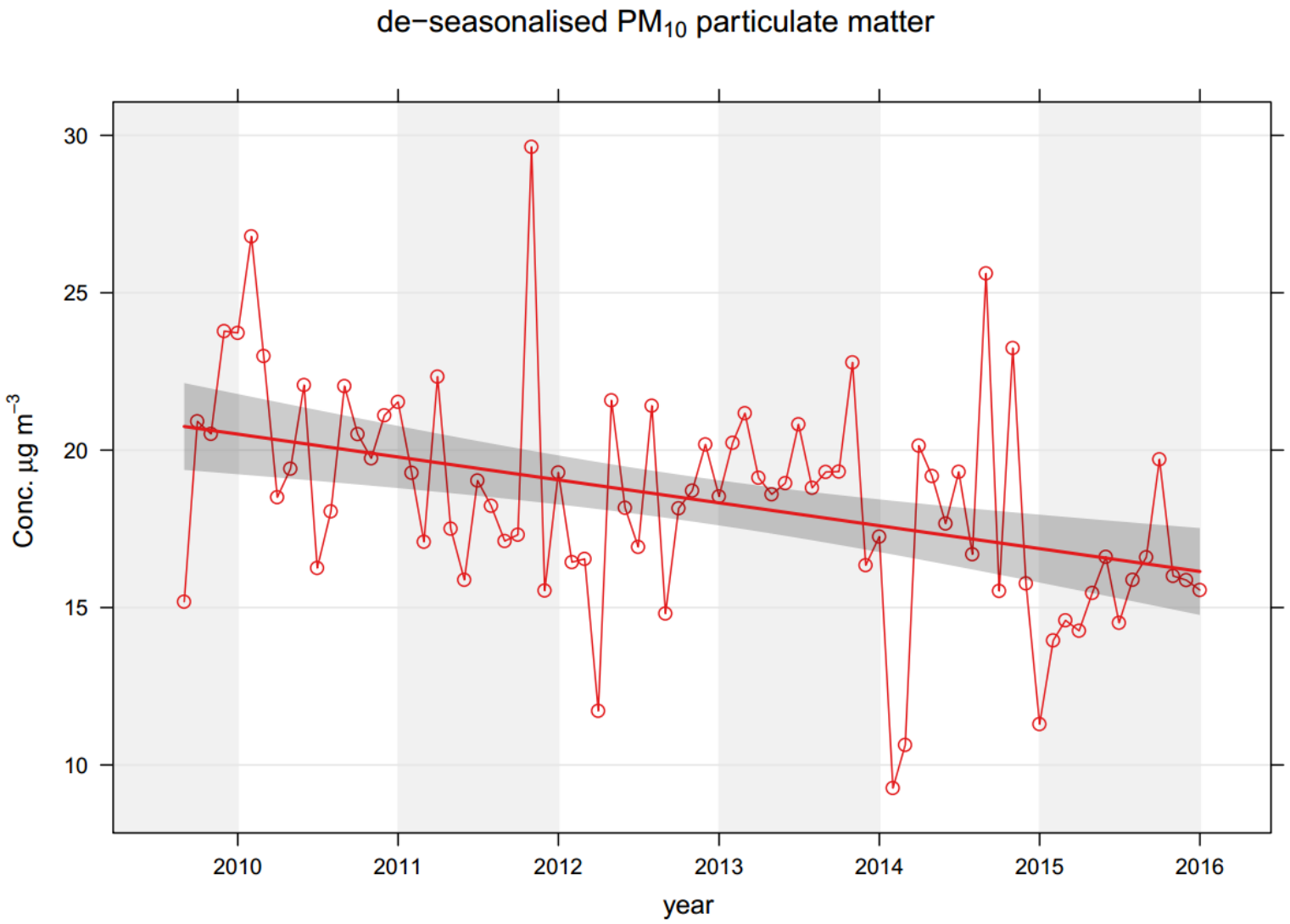


Figure 6 – Grangemouth AURN long term PM_{10} concentrations

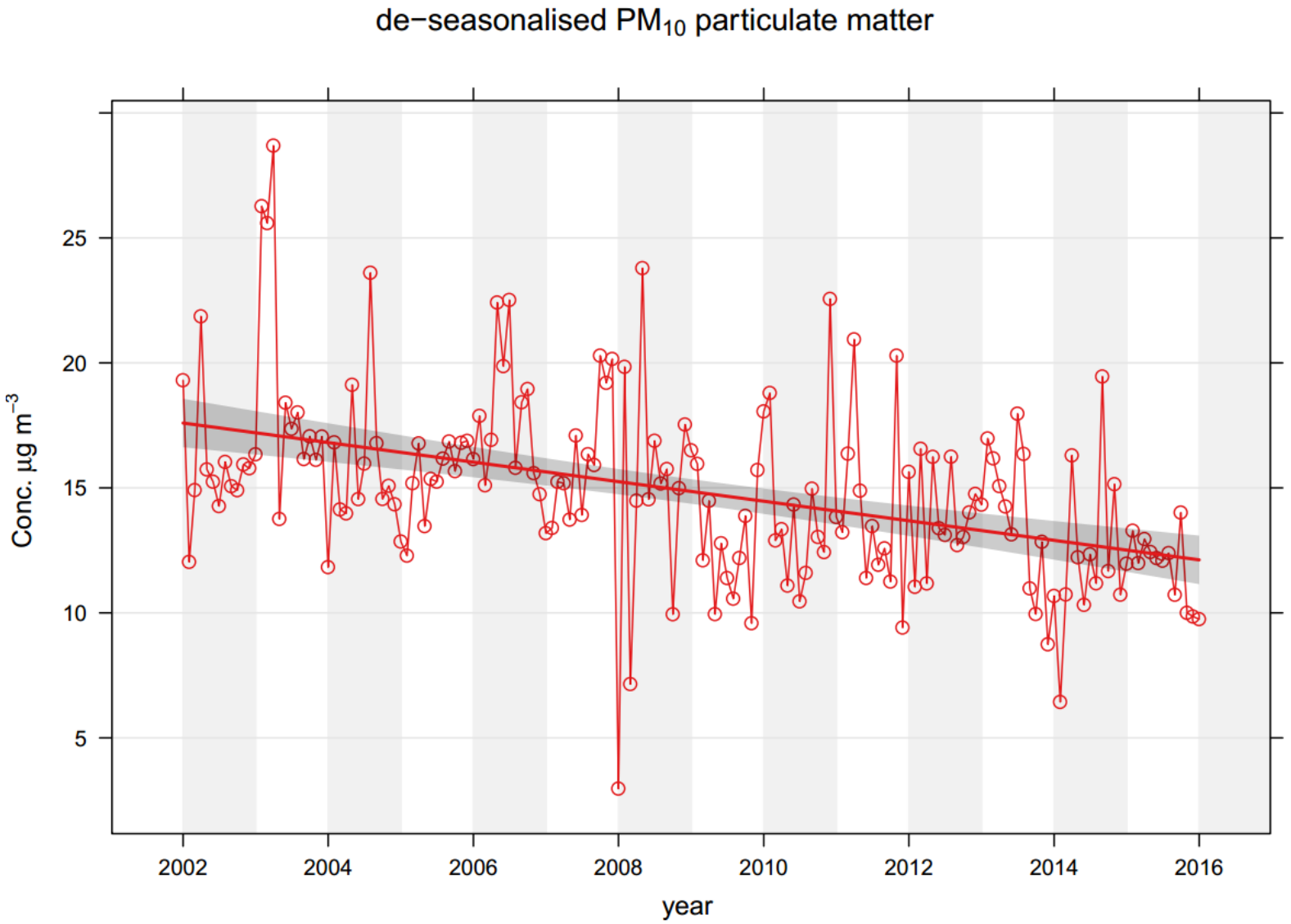


Table 10– Annual Mean $PM_{2.5}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
				2011	2012	2013	2014	2015
A8	Grangemouth AURN	n/a	99	**10.9**	**10.5**	9.2	8.0	9.2
A13	Banknock 2	n/a	87.7	n/m	n/m	n/m	n/m	6.0

Notes: Exceedences of the $PM_{2.5}$ annual mean objective of 10$\mu g/m^3$ are shown in **bold.**

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

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

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

Table 11– Estimated Annual Mean $PM_{2.5}$ Concentrations

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	Correction Factor	Estimated $PM_{2.5}$ Annual Mean Concentration (µg/m3) (3)				
					2011	2012	2013	2014	2015
A4 Falkirk Haggs	Roadside	98	98	0.54	n/m	9.88	8.91	8.91	8.10
A7 Falkirk West Bridge St	Roadside	80.3	80.3	0.54	**10.09**	9.61	**10.53**	9.55	8.10
A10 Grangemouth Municipal Chambers	Urban Background/ Industrial	90	90	0.75	**11.32**	**11.02**	**11.25**	**10.95**	9.75
A12 Falkirk Graham's Road	Roadside	78.9	78.9	0.54	n/m	8.64	8.80	7.12	6.37
A14 Banknock 3	Roadside	100	100	0.54	n/m	6.85	7.88	8.1	4.42
A15 Main St Bainsford	Roadside	27.6	50	0.54	n/m	n/m	n/m	n/m	6.91

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 estimated using a local correction factor as per LAQM.TG(16),See Appendix C for details.

Figure 7 – Grangemouth AURN long term $PM_{2.5}$ concentrations

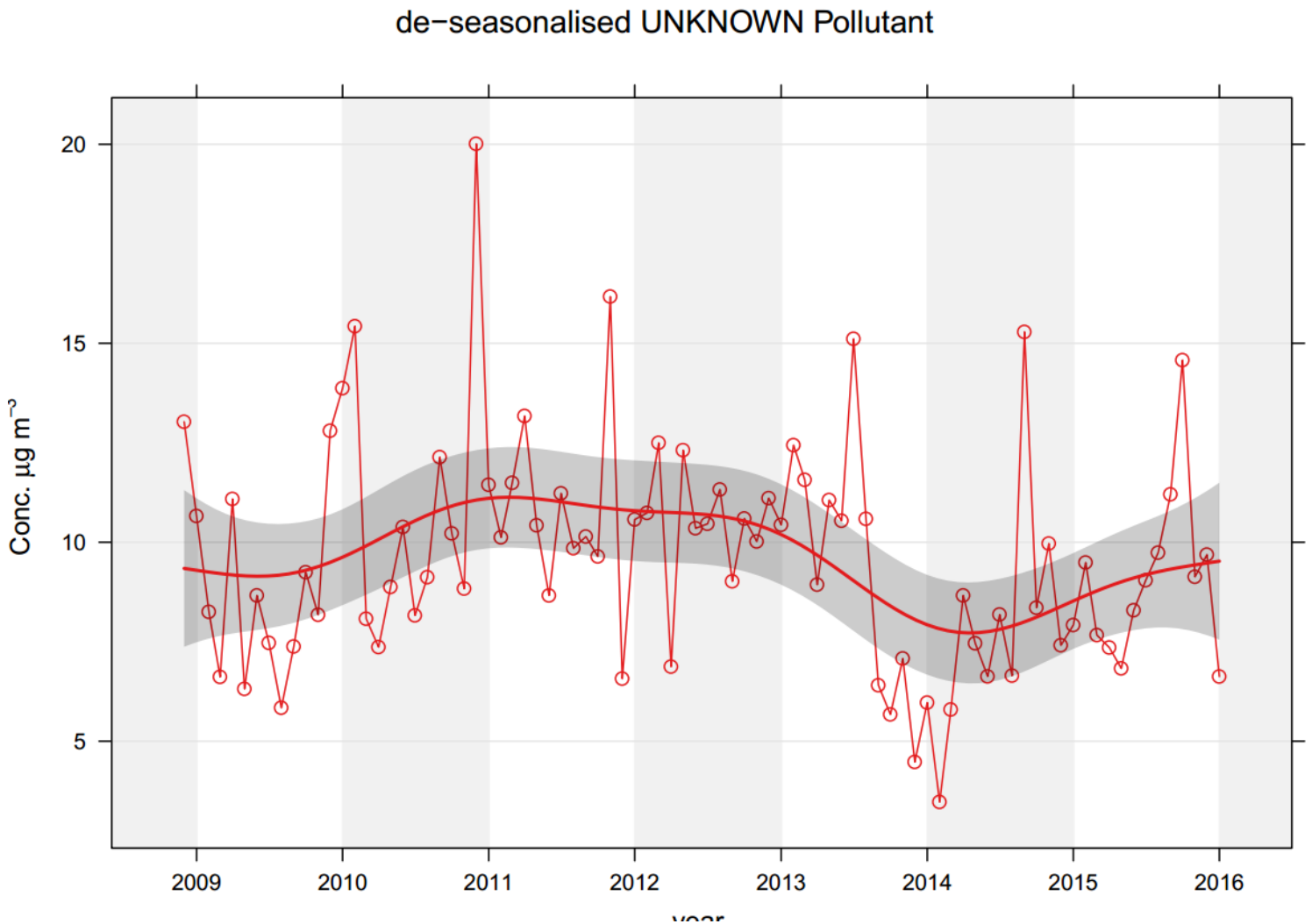


Table 12 – SO_2 Monitoring Results

Site ID	Site Type	Valid Data Capture for monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	Number of Exceedences (percentile in bracket) [3]		
				15-minute Objective (266 µg/m^3)	1-hour Objective (350 µg/m^3)	24-hour Objective (125 µg/m^3)
A3	Bo'ness	69.2	69.2	0 (44)	0 (70)	0 (15)
A5	Falkirk Hope St	100	100	0	0	0
A8	Grangemouth AURN	97	97	1	0	0
A9	Grangemouth Moray	94	94	2	0	0
A10	Grangemouth Municipal Chambers	99	99	8	0	0
A11	Grangemouth Zetland Park	71	58	0 (19)	0 (13)	0 (5)

Notes: Exceedences of the SO_2 objectives are shown in **bold** (15-min mean = 35 allowed a year, 1-hour mean = 24 allowed a year, 24-hour mean = 3 allowed a year)

(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 90%, the relevant percentiles are provided in brackets.

Figure 8 – Grangemouth 15-minute exceedance 2009 – 2015

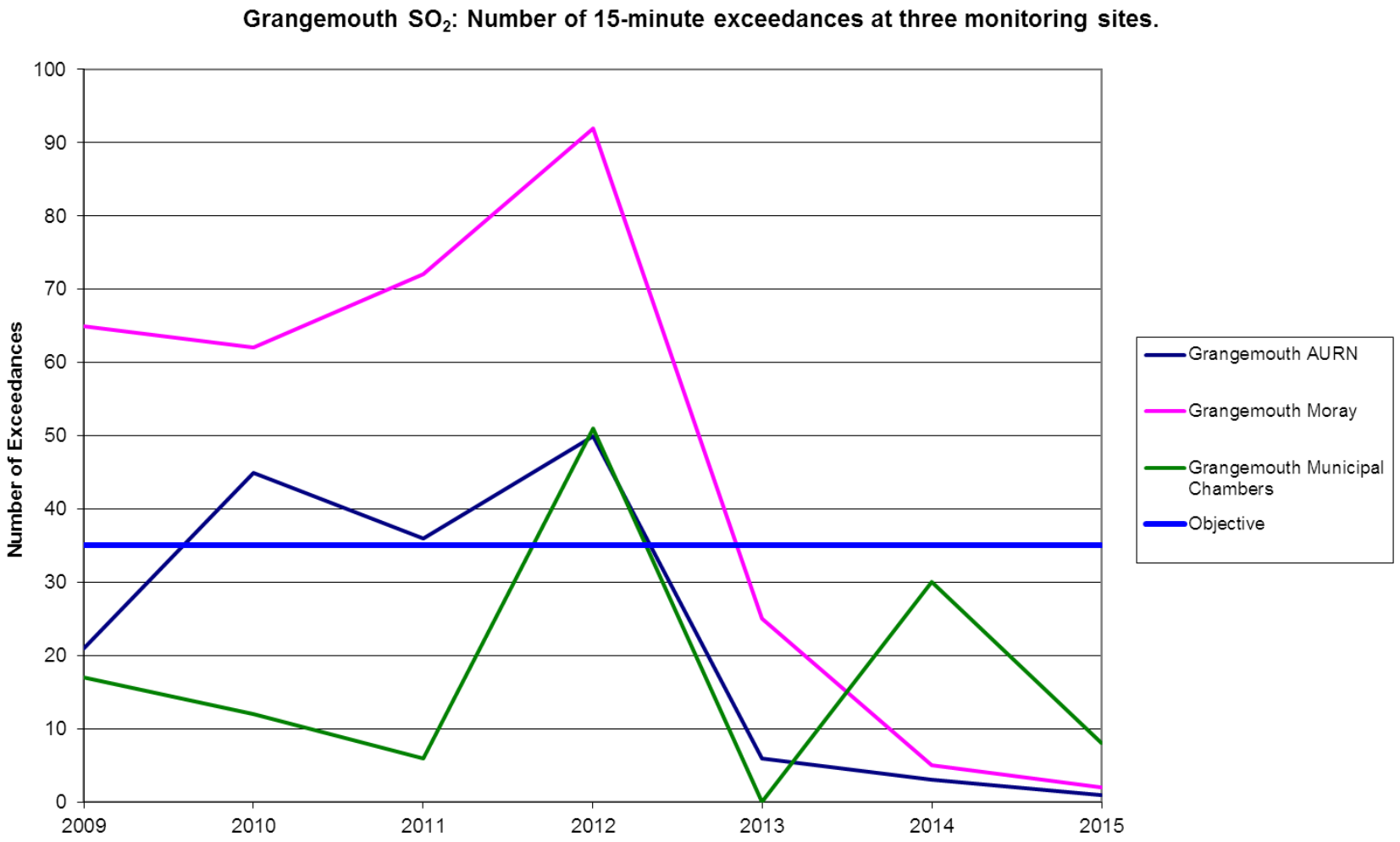
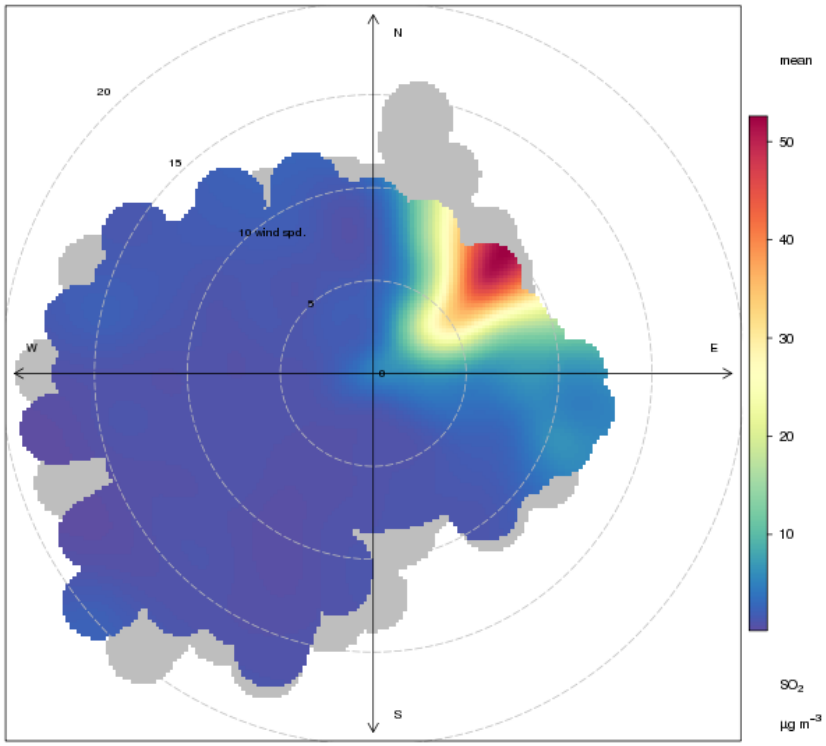
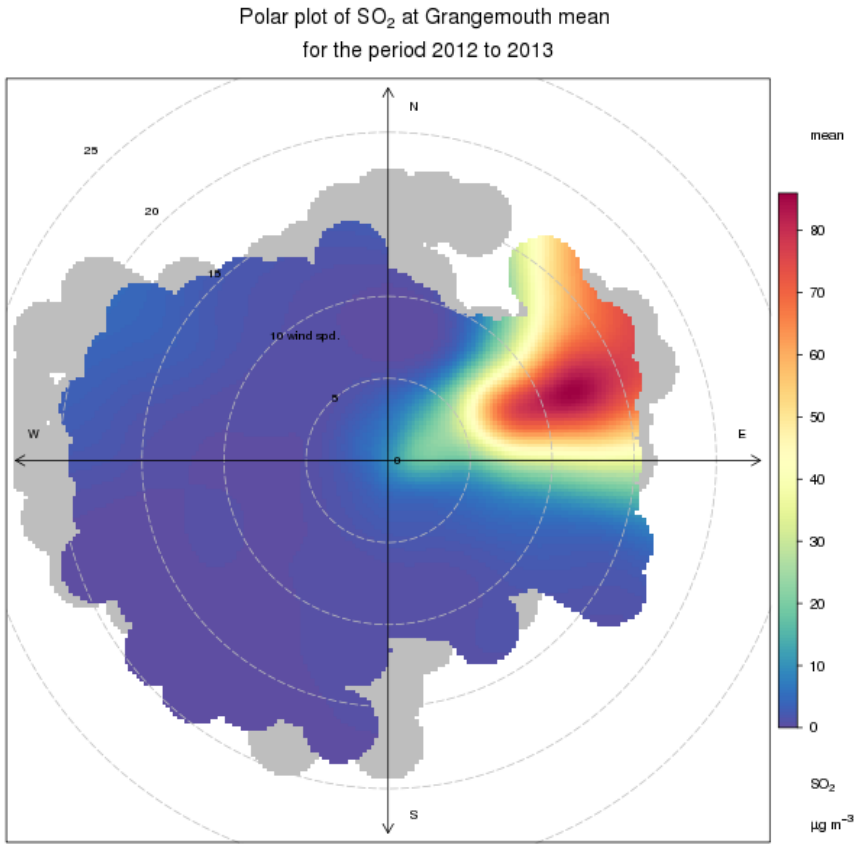


Figure 9 – Polar plots of average SO_2 concentrations Grangemouth sites

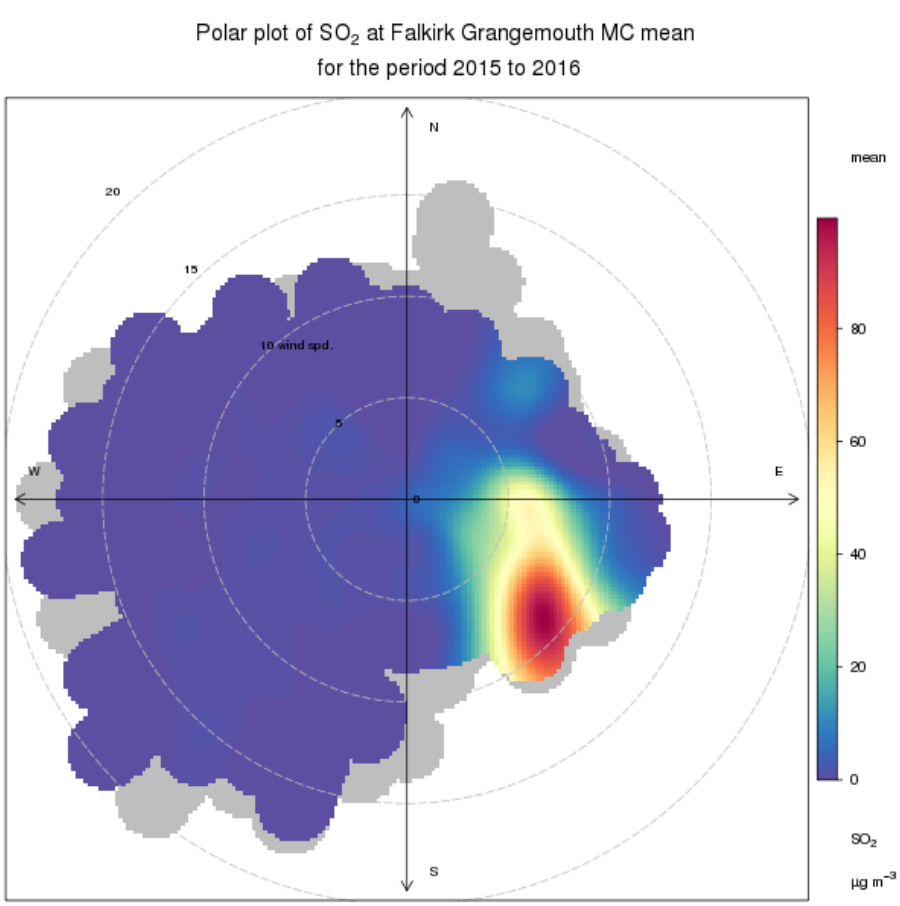
a) Grangemouth AURN 2015



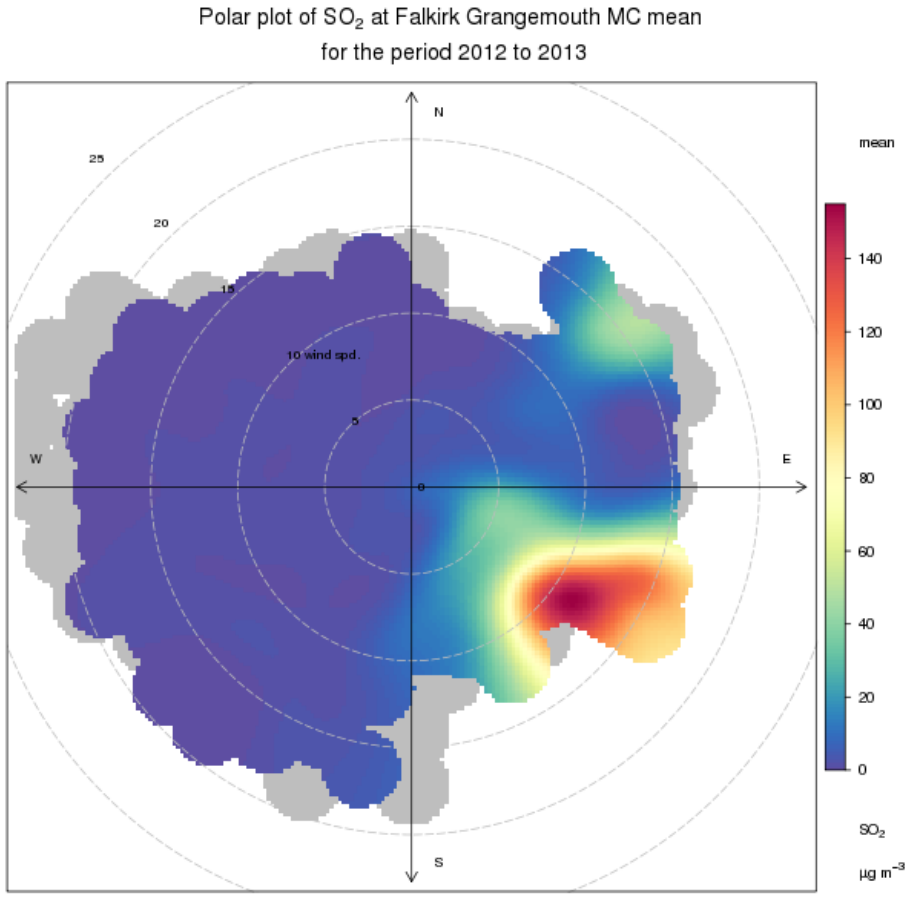
b) Grangemouth AURN 2012



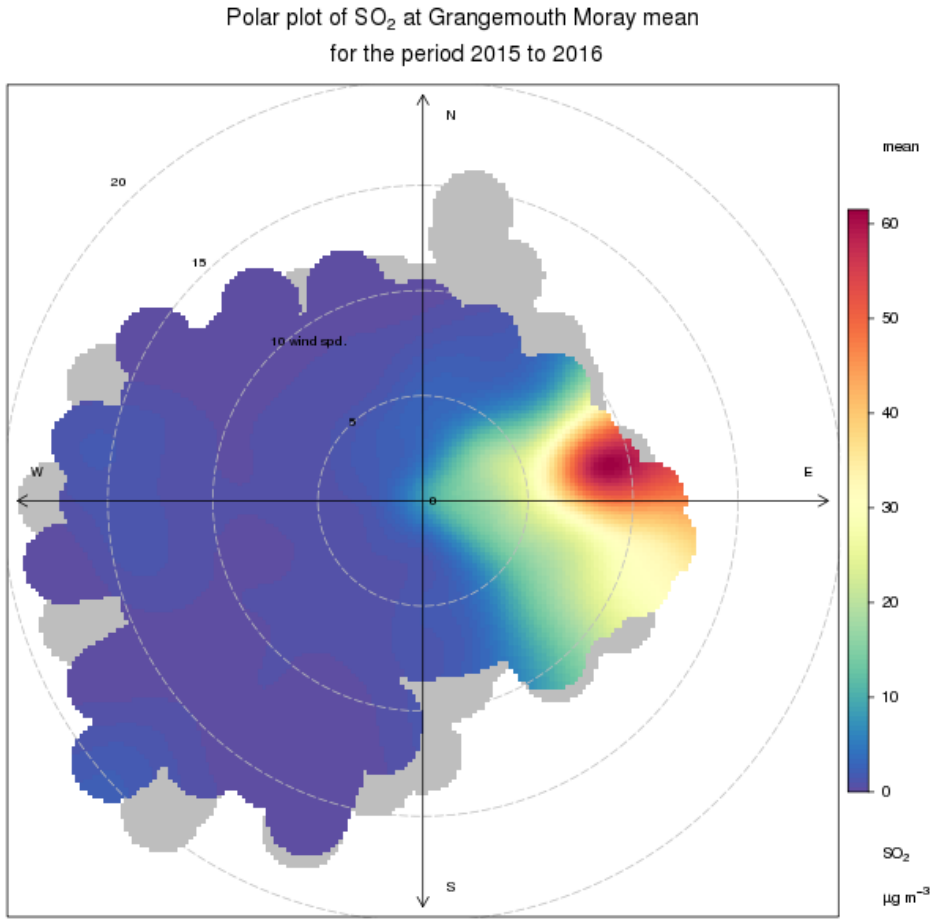
a) Grangemouth MC 2015



b) Grangemouth MC 2012



a) Grangemouth Moray 2015



b) Grangemouth Moray 2012

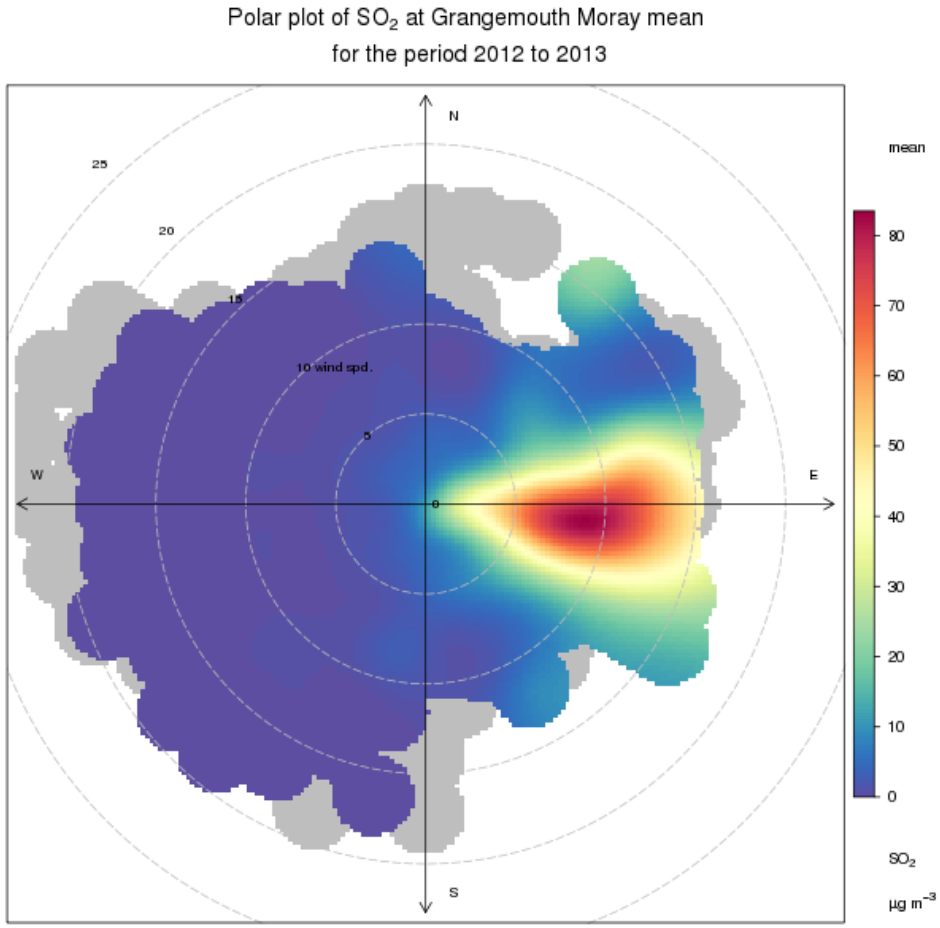


Figure 10 – Grangemouth AURN long term SO_2 concentrations

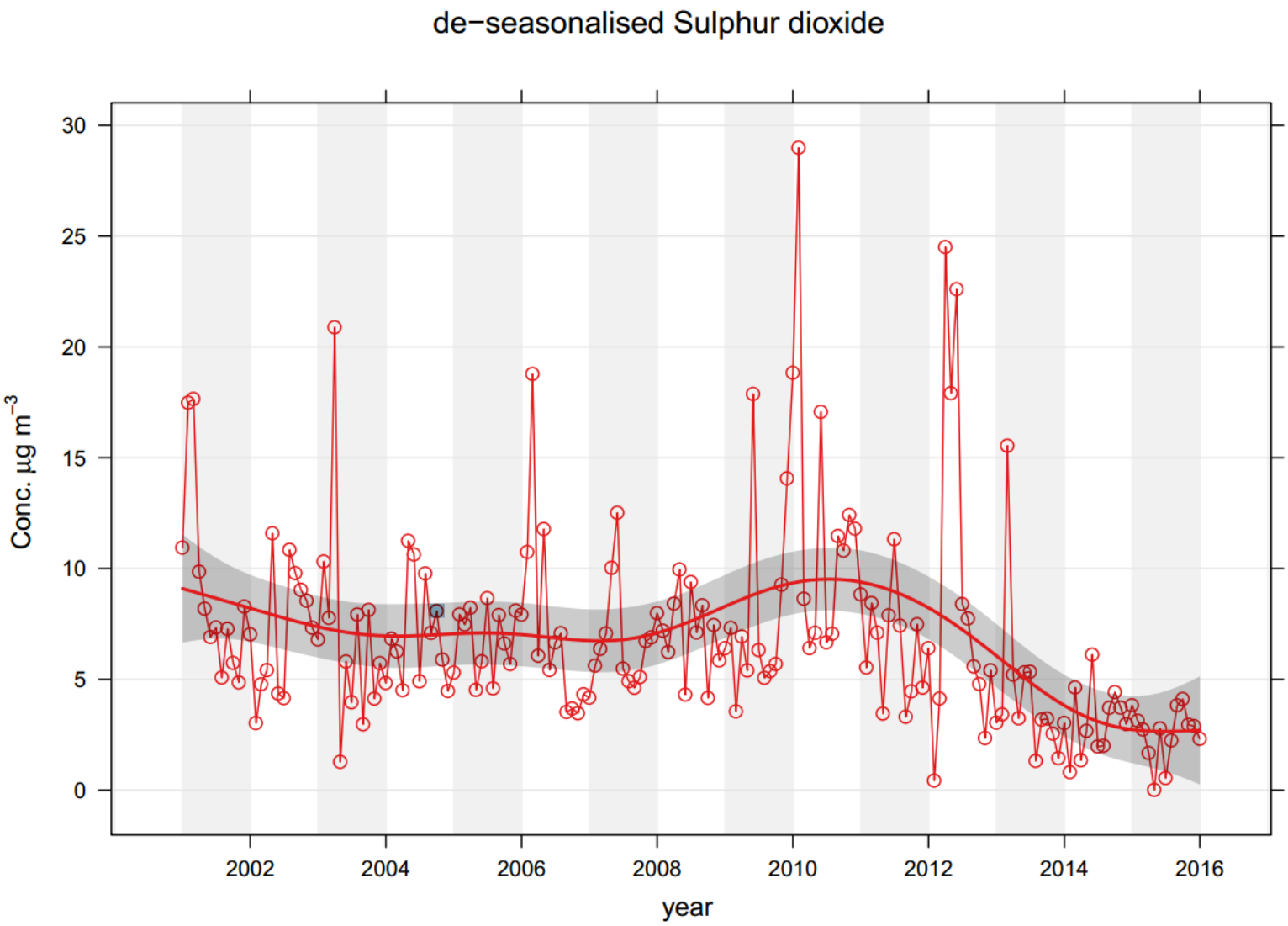


Table 13 – 1, 3-Butadiene Annual Mean Diffusion Tube Results for 2015

Site ID	Location	Within 1,3 butadiene AQMA?	Data capture in 2015, %.(1)	Annual mean concentrations (µg/m3)				
				2011	2012	2013	2014	2015
NA41	Seaview Place, Bo'ness	N	91.7	0.85	1.19	1.25	0.42	0.11
NA55	Inchyra Station, Grangemouth	N	100.0	0.85	1.19	1.25	0.48	0.09
NA104	Powdrake Road, Grangemouth	N	100.0	1.16	1.19	1.25	0.47	0.13

Notes: Exceedences of the 1, 3- butadiene running annual mean objective of 2.25µg/m^3 are shown in **bold.**

Table 14 –Benzene Annual Mean Diffusion Tube Results for 2015

Site	Location	Within benzene AQMA?	Data capture, 2015, %.	Annual mean concentration, µg/m^3					
				2011	2012	2012	2013	2014	2015
NA3	Tinto Drive,Grangemouth	N	100	1.22	1.23	n/a	1.39	1.30	1.16
NA21	Grangemouth Road, College	N	100	0.92	1.91	1.73	1.25	1.13	0.72
NA27	West Bridge Street, Falkirk	N	100	1.49	2.09	1.78	1.52	2.39	0.69
NA37	Denny Town House	N	100	0.87	1.38	n/a	1.16	1.09	0.59
NA38	Larbert Village Primary School	N	100	1.36	1.37	1.32	0.85	1.04	0.55
NA41	Seaview Place, Bo'ness	N	100	2.19	2.14	2.05	1.84	1.97	0.91
NA42	Municipal Chambers, Grangemouth	N	100	0.91	1.62	1.41	1.59	1.25	0.69
NA44	Greenpark Drive, Polmont	N	100	0.84	1.49	1.21	1.16	1.34	0.56
NA55	Inchyra Station	N	92	1.42	**3.29**	3.04	1.38	1.32	0.50
NA57	Inchyra Road, Grangemouth	N	100	1.31	2.39	n/a	1.33	1.96	0.69
NA77	Kinnaird Village	N	100	0.63	1.32	n/a	1.12	1.04	0.65
NA80	Cow Wynd, Falkirk	N	100	1.11	1.75	1.52	1.53	1.33	0.81
NA81	Grahams Road, Falkirk	N	100	1.04	1.37	n/a	1.47	1.25	0.88
NA94	A905 (Glensburgh Rd), Grangemouth	N	100	0.77	1.67	n/a	1.71	1.13	0.68
NA102	East Kerse Mains, Bo'ness	N	100	0.69	1.76	n/a	1.35	1.26	0.61
NA105	West of Shieldhill	N	100	0.91	1.26	1.1	0.69	0.74	0.34

Notes: Exceedences of the benzene running annual mean objective of 3.25µg/m^3 are shown in **bold**

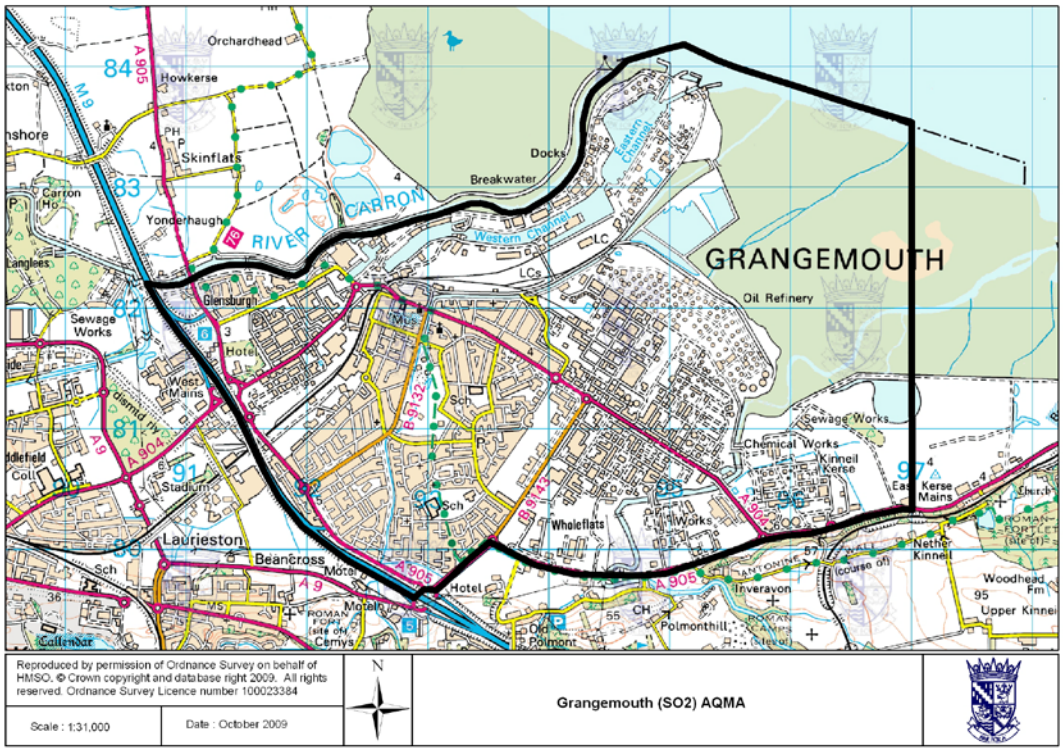
Table 15 – Pumped Benzene Annual Mean Results for 2015

Site	Location	Data capture, 2015, %.	Annual mean concentration, µg/m^3					
			2010	2011	2012	2013	2014	2015
A8	Grangemouth AURN	100	1.42	1.26	1.97	1.13	0.99	0.73

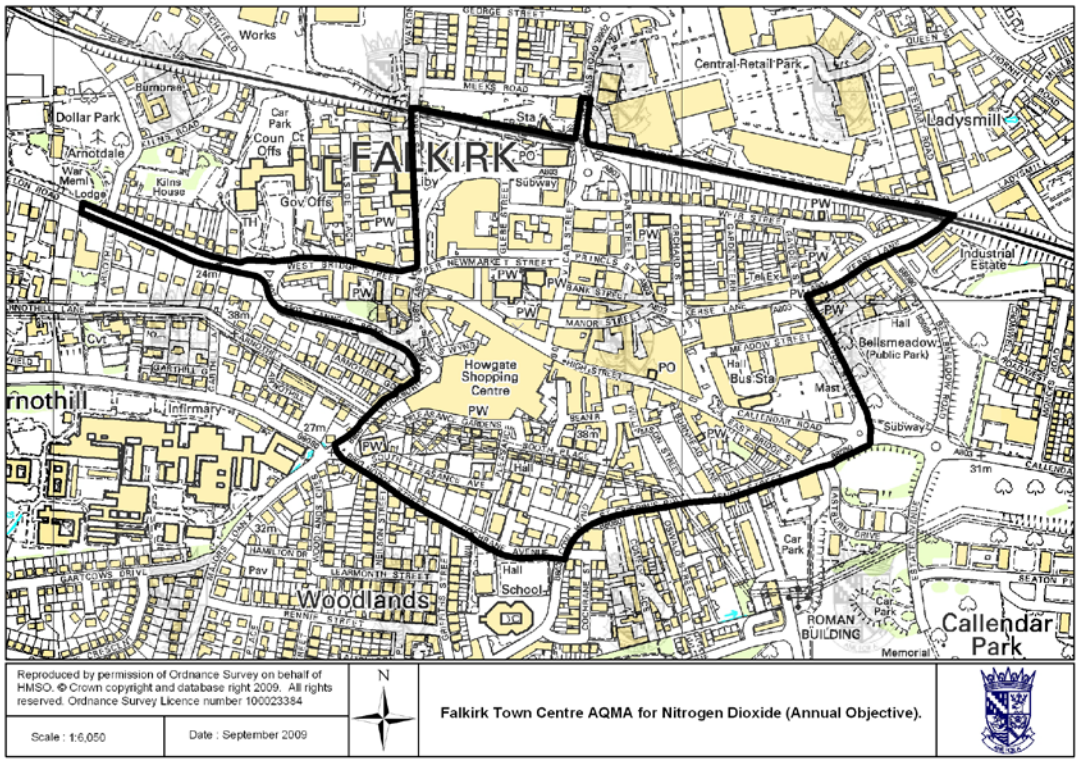
Notes: Exceedences of the benzene running annual mean objective of 3.25µg/m^3 are shown in **bold.**

Figure 11 – Maps of AQMA Boundaries in the Falkirk Council area.

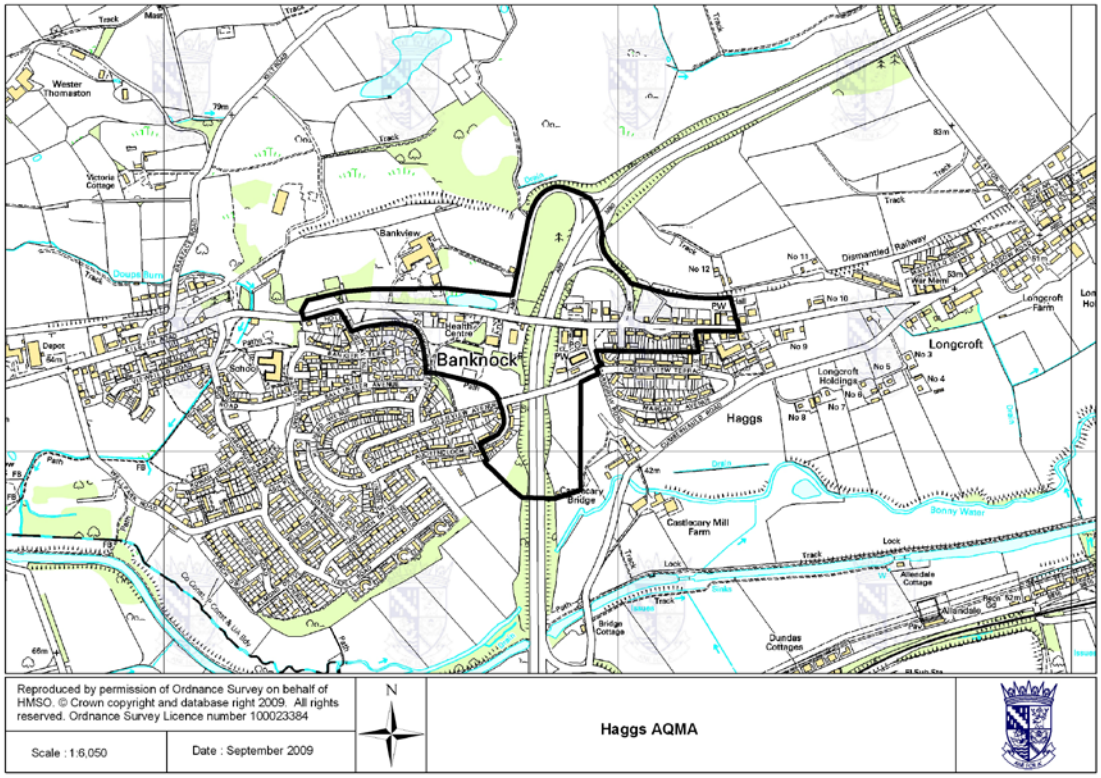
a) Grangemouth AQMA (15-minute SO_2), declared November 2005.



b) Falkirk Town Centre AQMA (annual NO_2), declared March 2010.



c) Haggs AQMA (annual NO_2), declared March 2010.



d) Banknock AQMA (PM_{10}), declared August 2011.

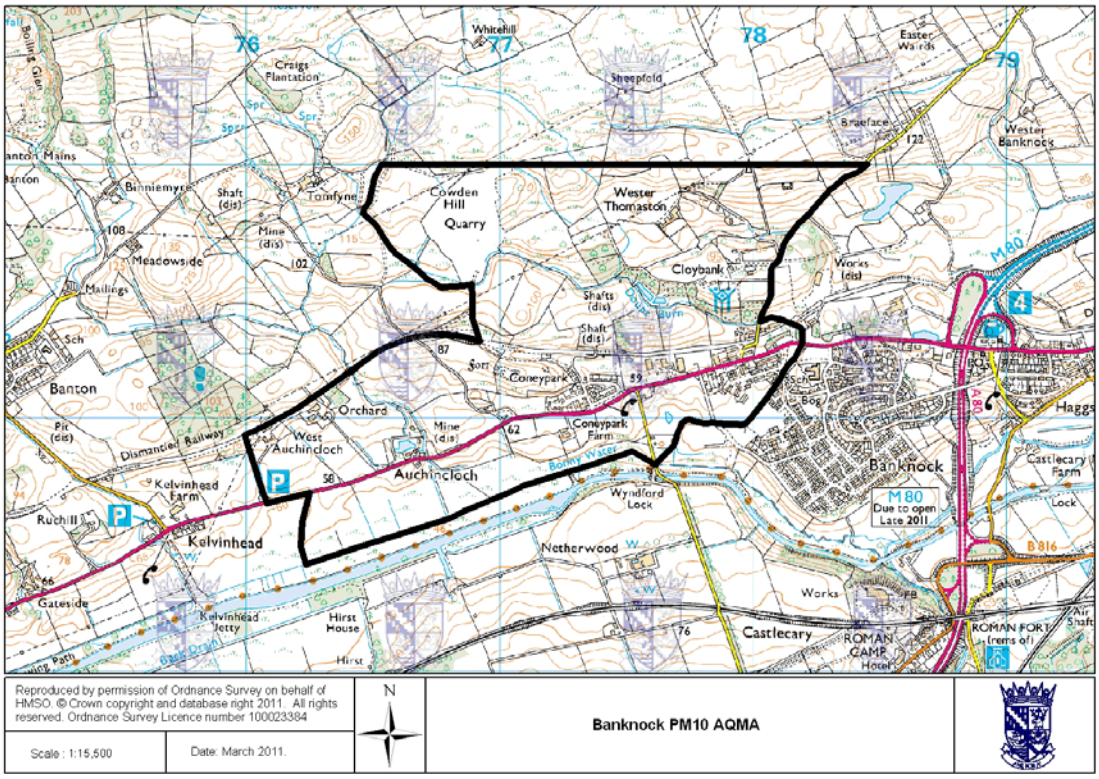
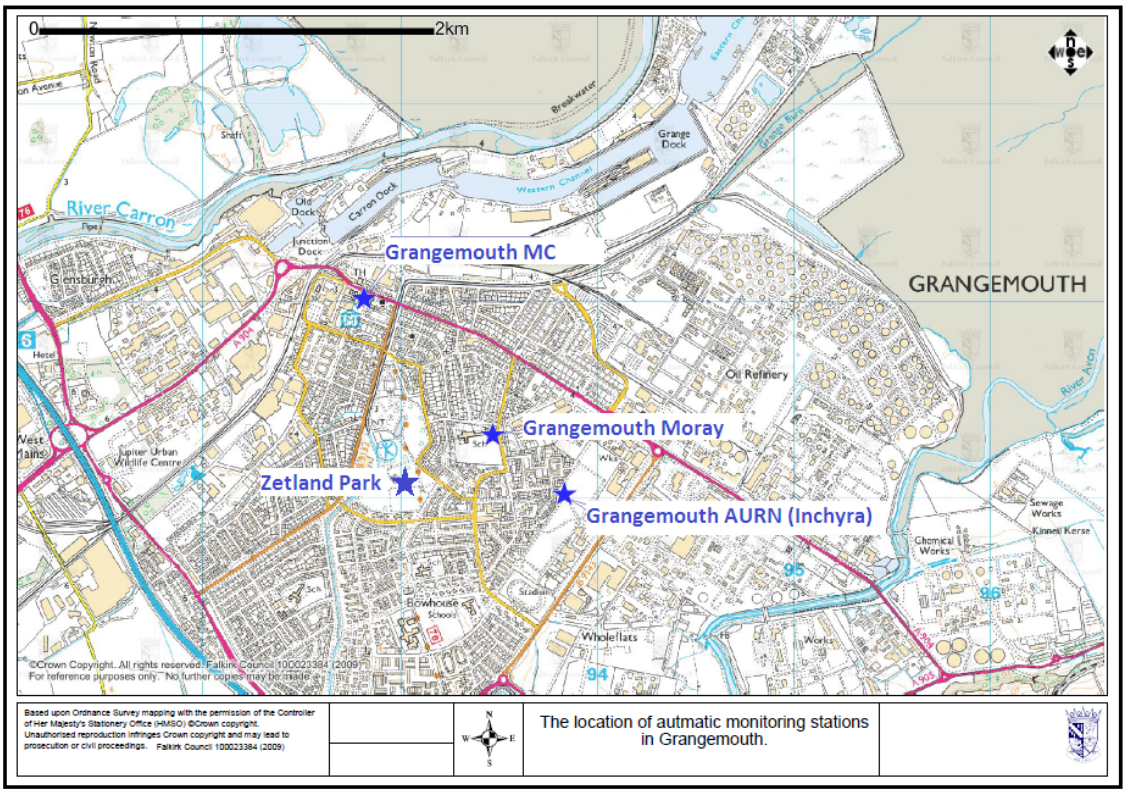
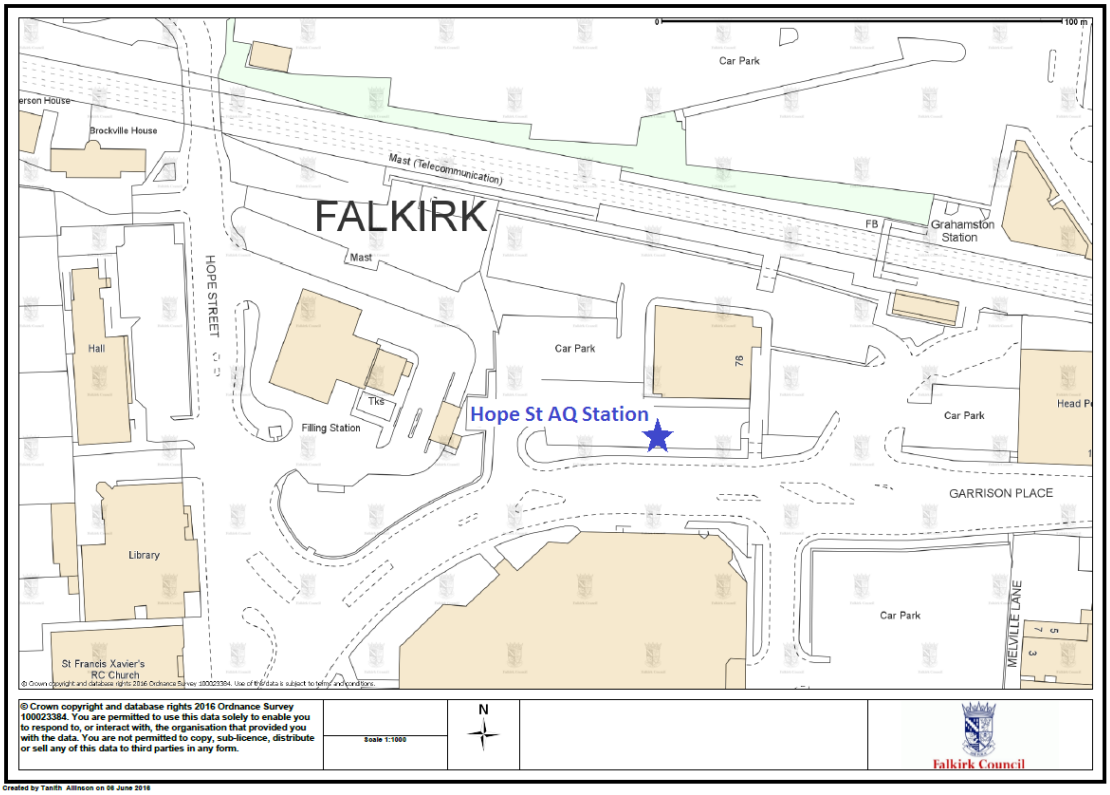


Figure 12 – Maps Showing Non-Automatic Monitoring Locations

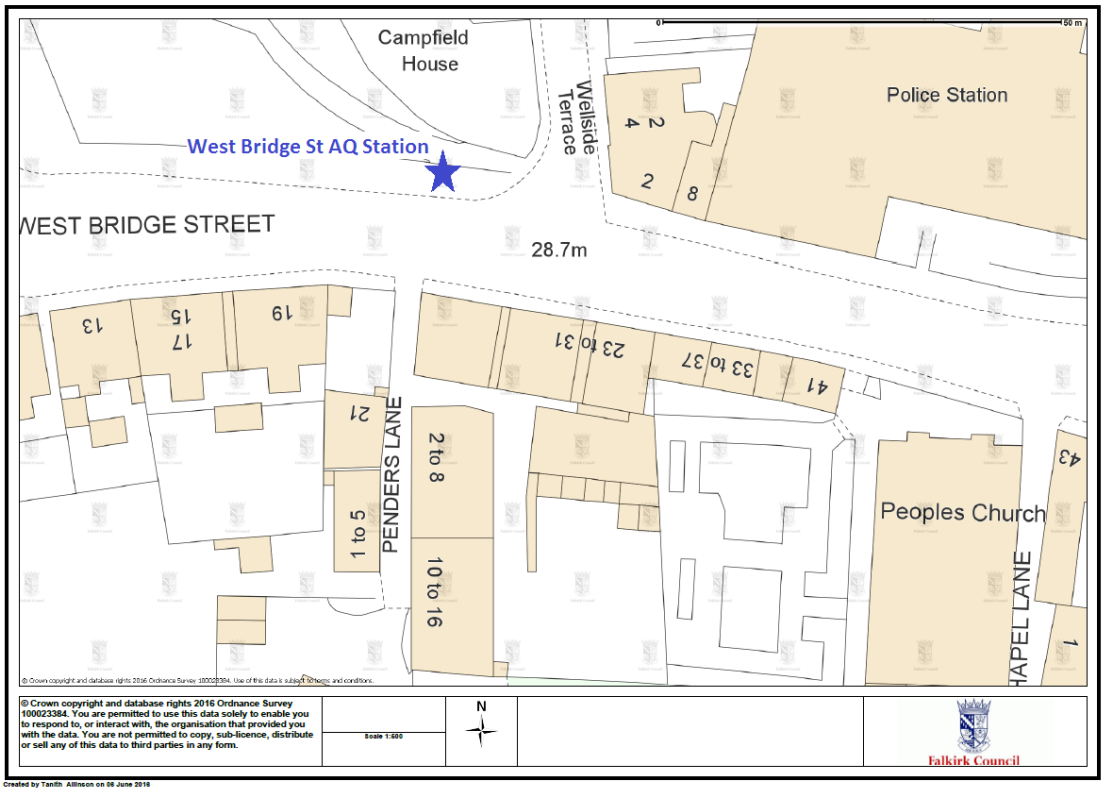
a) Grangemouth AQ Stations



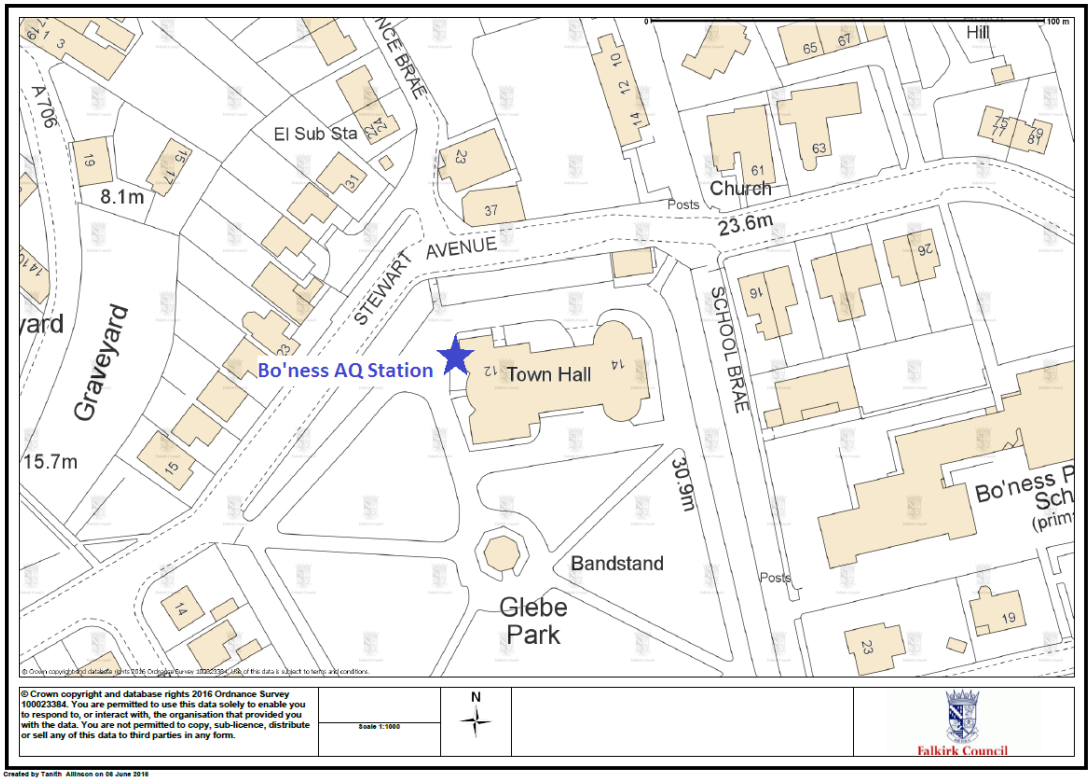
b) Falkirk Hope St AQ Station



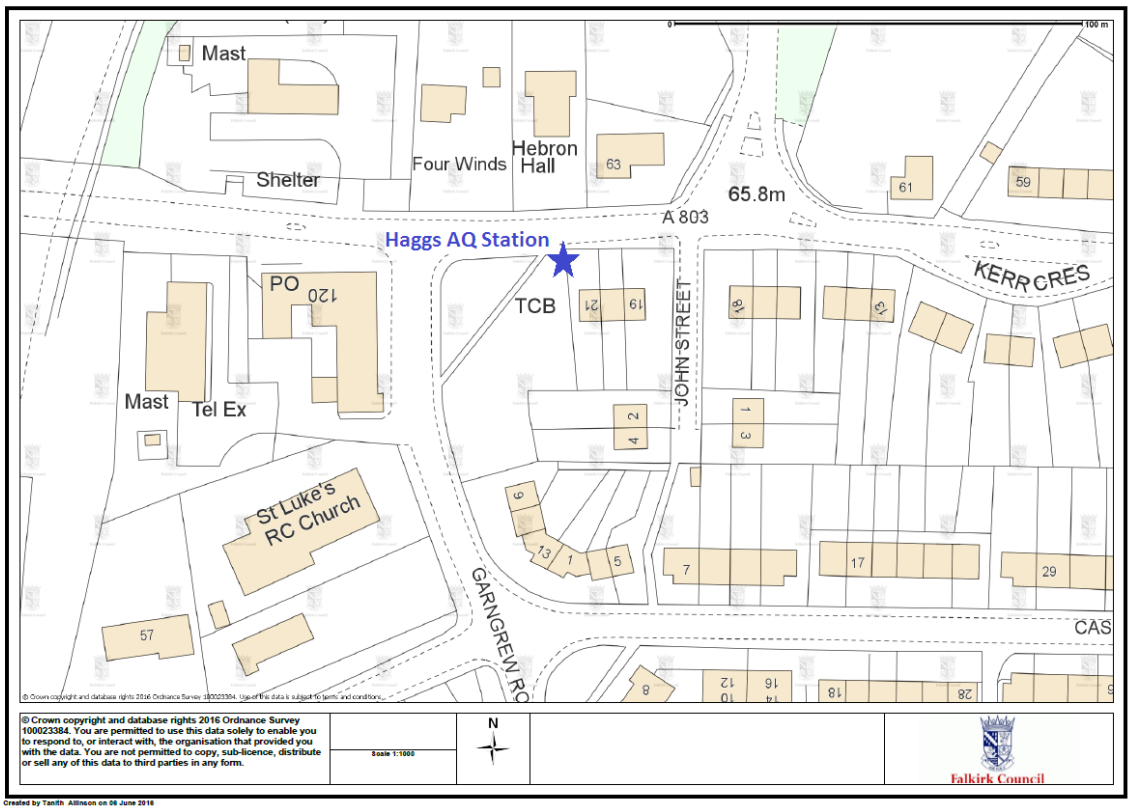
c) Falkirk West Bridge St AQ Station



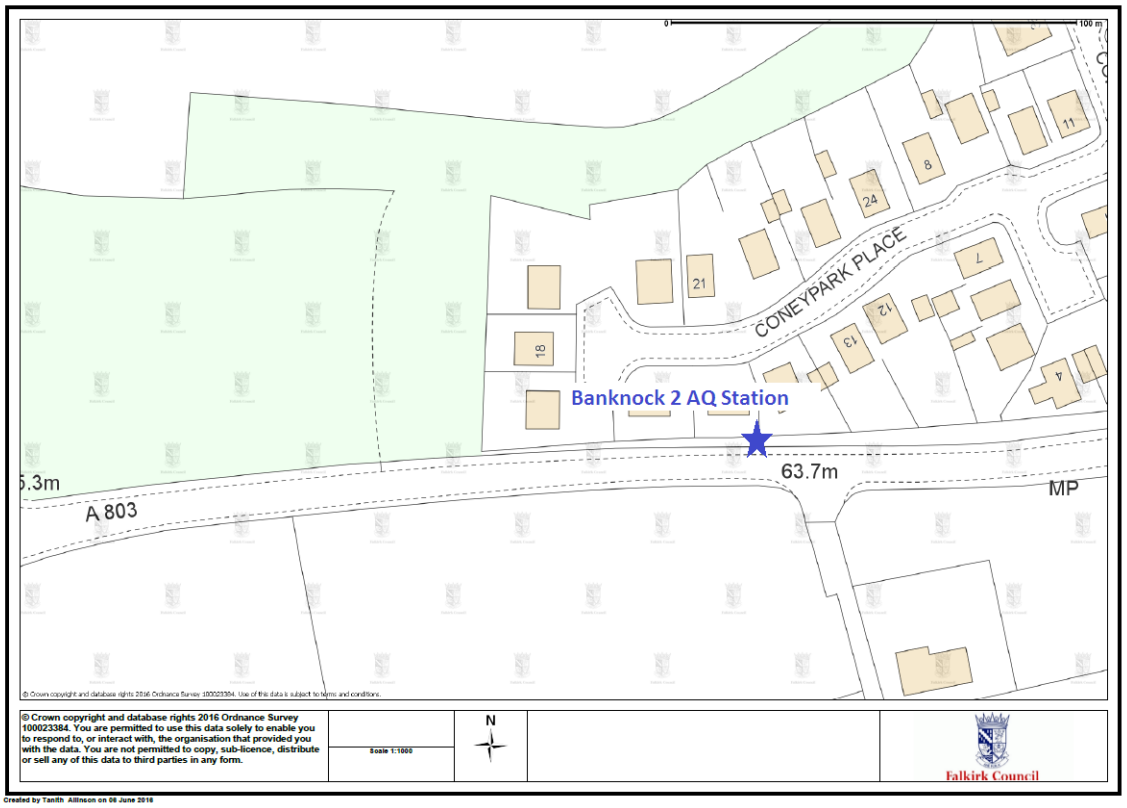
d) Bo'ness AQ Station



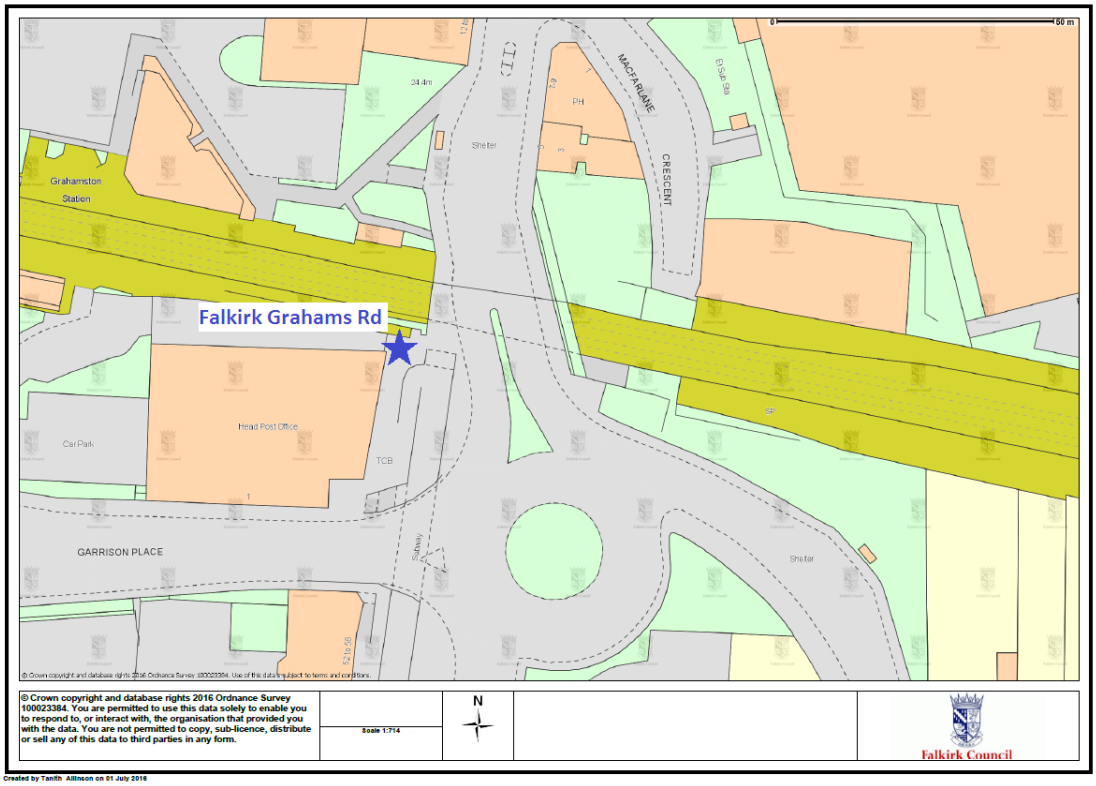
e) Falkirk Haggs AQ Station



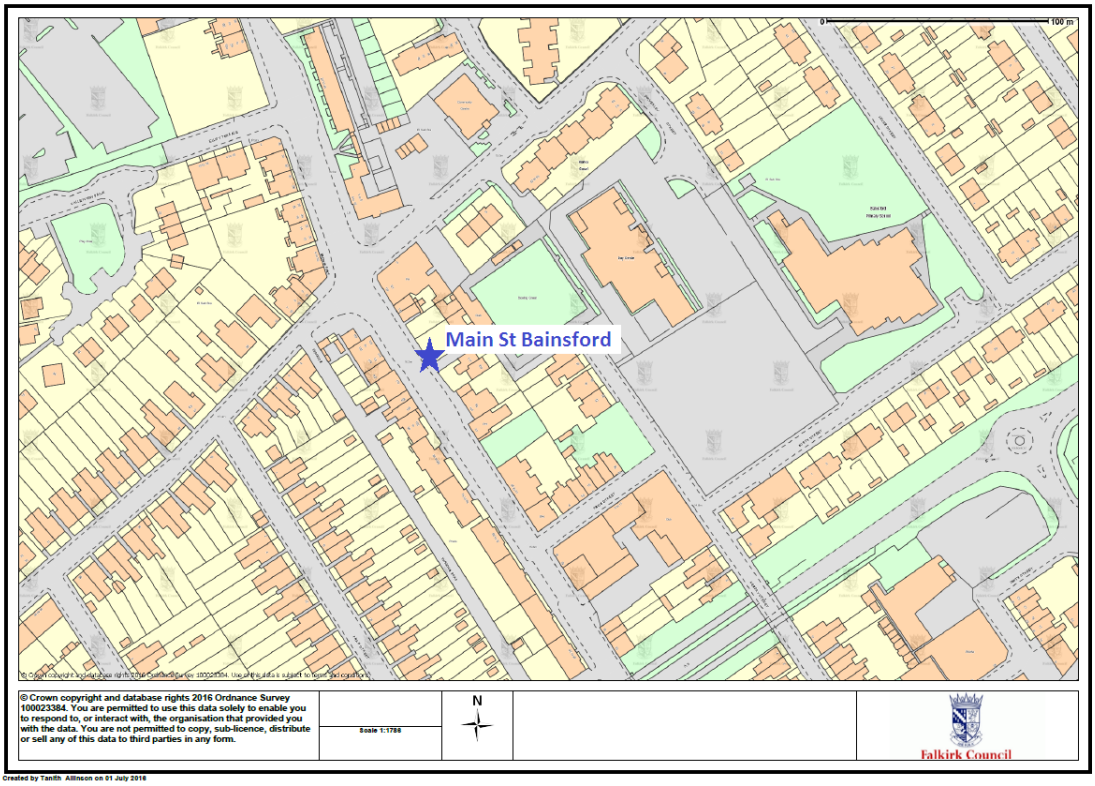
f) Banknock 2 AQ Station



g) Falkirk Grahams Rd AQ Station



h) Main St Bainsford



Appendix B

Table 16 – NO_2 Monthly Diffusion Tube Results for 2015

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
3	26.3	30.5	22.3	16.94	13.32	14.21	16.3	15.29	21.92	25.58	23.07	17.95	**20**	**20**
5	39.9	37.2	34.4	22.7	18.93	19.31	24.33	21.75	29.92	33.54	31.85	25.54	**28**	**27**
7	25	25	23.1	15.65	11.4	11.2	11.88	12.32	16.91	23.38	20.75	18.30	**18**	**17**
9	36	36.3	34.8	23.73	18.71	21.85	18.18	22.06	26.7	31.54	34.76	25.12	**27**	**26**
19	17.4	38.8	40.9	28.47	23.21	21.85	-	14.33	31.66	36.20	38.01	31.78	**29**	**26**
20	29.8	35.1	26.2	20.85	15.28	16.11	18.13	20.6	23.64	28.74	31.19	24.91	**24**	**23**
21	35.9	42.5	35.4	25.65	18.33	19.85	22.03	24.22	28.5	32.57	32.22	28.57	**29**	**28**
24	-	58.6	58	42.28	37.51	39.84	36.12	43.71	37.79	44.88	44.32	28.64	**43**	**38**
26	25.8	27.2	25.5	16.04	12.39	11.59	14.47	13.26	18.65	24.34	23.19	-	**19**	**17**
27	63.2	55.1	66.3	41.06	42.31	35.4	46.75	39.99	53.7	57.09	45.82	41.99	**49**	**47**
29	21.8	24	23.9	14.06	11.02	12.24	13.37	12.83	16.25	22.66	0.08	19.55	**16**	**15**
36	43.7	49	52.6	33.17	28.48	32	34.66	38.63	41.68	31.46	40.60	32.22	**38**	**37**
37	25.3	26.3	22.5	16.54	11.8	11.22	13.04	13.87	18.33	21.33	22.25	20.37	**19**	**18**
38	-	28.5	22.4	17.08	9.85	12.46	11.37	12.34	17.05	22.51	22.92	18.13	**18**	**16**
41	29.2	30.4	25.6	18.03	15.77	16.34	18.57	18.04	22.65	28.45	23.86	19.77	**22**	**21**
42	29.7	29.7	25	16.75	12.33	13.62	14.96	14.04	19.79	24.69	25.21	18.27	**20**	**20**
44	-	27.9	-	12.07	8.52	9.5	9.91	10.89	14.16	21.18	17.68	17.18	**15**	**12**
48	18.9	33	25.4	16.07	12.32	13.94	14.39	13.58	20.14	23.42	22.65	20.39	**20**	**19**
50	29.6	25.3	32.3	25.73	18.57	18.13	24.35	22.74	24.62	-	25.53	22.53	**24**	**22**
51	-	-	32.2	21.78	18.81	18.57	20.77	23.75	22.83	30.15	28.50	24.21	**24**	**19**
52	30.8	33.6	30.9	23.13	15.41	17.35	18.82	20.37	22.42	29.02	29.21	25.97	**25**	**24**
53	36.2	39.1	39.3	27.4	23.83	19.72	22.37	21.96	27.17	32.80	30.45	27.96	**29**	**28**
57	31.5	33.7	28.5	23.34	16.56	14.65	17.34	-	-	28.85	29.16	26.37	**25**	**20**
58	29	29.4	26.3	17.86	16.01	14.77	14.66	14.22	33.89	26.03	23.80	21.22	**22**	**21**
59	42.9	38.8	32.8	28.62	20.94	22.26	22.16	24	28.18	35.77	37.53	27.72	**30**	**29**
60	-	34.2	34.2	27.21	17.25	17.91	19.98	24.63	24.88	32.21	33.33	28.66	**27**	**24**

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)
61	36.7	37.5	30.1	24.62	15.83	17.12	17.55	16.74	37.45	31.60	16.89	22.92	**25**	**24**
62	55.2	58.7	46	38.37	25.41	27.99	35.02	36.55	37.18	42.81	43.18	38.88	**40**	**39**
63	53.2	52	41.1	40.59	35.59	29.65	30.93	22.21	16.98	43.54	45.28	35.68	**37**	**36**
64	21.9	22.2	23.3	14.27	13.04	11.26	14.08	12.21	25.79	22.65	18.65	18.56	**18**	**18**
65	38.3	30.3	32.9	24.33	21.22	23.06	21.5	24.61	28	34.22	29.66	21.92	**28**	**27**
67	-	33	31.4	26.24	23.53	20.95	23.82	23.06	35.8	33.74	30.43	28.39	**28**	**25**
68	53.8	49.3	44.5	30.92	24.17	28.41	30.97	30.32	36.52	35.27	40.24	31.53	**36**	**35**
69	-	37.8	39.4	34.22	30.47	28.99	30.37	32.32	36.08	39.11	36.72	30.97	**34**	**30**
71	54	41.7	43	32.94	26.38	29.38	28.51	32.59	29.98	41.62	45.71	30.04	**36**	**35**
72	37.2	42	38.8	25.25	25.78	23.9	28.19	27.58	32.48	36.20	32.93	29.18	**32**	**30**
73	37.6	41.9	41.7	26.35	26.43	24.16	28.59	26.95	23.67	36.65	35.07	33.41	**32**	**31**
76	37.2	35.5	26.4	19.4	15.72	17.01	14.04	17.9	24.75	27.69	30.71	22.34	**24**	**23**
77	34.5	38.3	26.2	17.83	13.2	15.61	15.59	17.66	32.34	27.24	29.71	21.36	**24**	**23**
78	42.5	39.6	36.3	29.67	26.76	27.86	24.44	34.2	31.93	37.14	34.37	28.77	**33**	**32**
80	40.8	43.6	38.2	29.87	22.23	23.46	24.57	26.77	30.68	38.23	42.03	34.37	**33**	**32**
81	-	40.3	38.8	24.13	21.58	19.03	25.52	29.7	18.75	35.30	36.85	30.29	**29**	**26**
82	20.5	25.1	22.7	19.19	11.21	13	16.28	14.97	40.89	24.36	25.27	19.47	**21**	**20**
83	52	55.5	49.8	38.48	32.29	-	35.73	32.78	20.46	44.03	43.32	37.20	**40**	**35**
85	25.7	26.7	24.4	16.32	12.08	11.35	17.88	16.61	22.5	26.88	23.87	22.17	**21**	**20**
86	25.7	24.5	21.5	14.23	10.26	10.67	9.82	11.17	34.11	20.65	20.77	16.97	**18**	**18**
87	38.2	38.6	36.4	27.67	23.54	28.71	30.42	36.18	30.65	37.72	36.86	27.63	**33**	**32**
88	44.9	48	41.4	32.33	25.58	24.41	24.11	23.85	34.13	34.04	32.53	-	**33**	**29**
89	34.9	39.3	34	29.68	23.06	25.31	27.55	30.48	36.76	36.79	36.62	25.14	**32**	**31**
94	-	41.8	-	37.46	26.28	27.08	30.65	31.45	27.73	41.14	-	31.24	**33**	**24**
98	29.9	-	-	19.75	15.77	-	0.11	-	-	-	-	-	**16**	**15**
99	34.7	38	38.1	22.01	22.72	18.31	20.69	-	18.89	32.57	30.48	26.85	**28**	**22**
100	22.2	27.6	27.1	19.93	13.94	17.07	2.29	23.57	24.04	24.92	-	27.28	**20**	**16**
101	-	33.2	29.3	22.66	13.94	16.09	16.74	15.56	7.58	29.28	28.55	-	**21**	**17**
105	12.2	13.7	9.7	6.43	3.69	5.62	5.76	7.18	36.72	10.29	13.83	9.46	**11**	**10**
107	41.1	38.2	38.4	26.28	23.01	24.41	28.92	29.3	24.21	38.14	34.49	29.62	**31**	**28**

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)
108	26.9	24.6	25.8	21.39	-	16.8	18.86	19.71	19.42	27.62	22.90	23.58	**22**	**18**
109	22.7	22	20.4	15.87	11.89	10.13	12.09	12.97	-	30.42	19.95	17.50	**18**	**14**
110	28.2	26.8	27.4	15.81	12.04	14.28	14.48	15.85	40.93	24.01	22.80	17.20	**22**	**19**
111	-	54	48.2	41.71	34.95	34.21	34.25	34.6	40.93	46.76	42.41	35.30	**41**	**33**
112	15.7	24.2	16.6	14.95	9.55	9.92	11.36	11.36	16.64	22.38	22.32	19.69	**16**	**16**

(1) See Appendix C for details on bias adjustment

Table 17 – 1, 3-Butadiene Monthly Diffusion Tube Results for 2015

Site ID	1,3-Butadiene Mean Concentrations													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean Raw Data	Annual Mean Raw Data
	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	µg/m^3
41	0.07	0.09	-	0.09	0.04	0.04	0.03	0.03	0.04	0.07	0.02	0.02	0.05	0.11
55	0.03	0.05	0.03	0.06	0.02	0.03	0.03	0.05	0.09	0.02	0.04	0.02	0.04	0.09
104	0.05	0.07	0.05	0.21	0.02	0.04	0.05	0.05	0.04	0.06	0.02	0.04	0.06	0.13

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

Diffusion Tube Monitoring QA/QC

From January to March 2015 the nitrogen dioxide, benzene and 1, 3-butadiene tubes used by Falkirk Council were supplied and analysed by Environmental Scientifics Group (EG). In April 2015, Falkirk Council changed supplier to Gradko International, who have since supplied and analysed Falkirk Councils diffusion tubes. The method used by both contractors for the NO_2 tubes is 50% acetone and 50% tri-ethanolamine. The tubes used for benzene are Chromosorb ATD (atomic thermal desorption) tubes and for 1, 3-butadiene are molecular sieve ATD tubes.

Nitrogen Dioxide Diffusion Tubes

ESG analysed the NO_2 diffusion tube samples from January to March 2015. ESG has satisfactorily passed all the WASP (Workplace Analysis Scheme for Proficiency) scheme tests since 2009. They follow their internal standard operating procedure that meets the guidelines set out in Defra's 'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance.'

ESG recorded 'good' precision throughout the first half of 2014 but poor in the second half. In April 2015 the NO_2 diffusion tube analysis contract was awarded to Gradko. International Ltd. Gradko follows the DEFRA guidance for the preparation and analysis of the NO_2 diffusion tubes. All the results for the amount of nitrogen dioxide present on the tube are within the scope of their UKAS accreditation

The full set of monthly NO_2 diffusion tube results are shown in Table 15 in Appendix B.

1, 3-Butadiene Diffusion Tubes

Gradko International Ltd performed the quantitative analysis of 1, 3-butadiene on diffusion tubes by TD-GCMS. Analysis has been carried out in accordance with in-house method GLM 13 under UKAS fixed scope accreditation.

The full set of monthly 1, 3-butadiene diffusion tube results are shown in Table 16 in Appendix B.

Benzene Diffusion Tubes

ESG analysed Falkirk Council's benzene diffusion tubes between January and March 2015 by ATD-GC-MS. All results are within the scope of their UKAS accreditation.

In April 2015 the benzene diffusion tube analysis contract was awarded to Gradko. International Ltd. All the results are within the scope of their UKAS accreditation

Diffusion Tube Bias Adjustment Factor

The national diffusion tube bias adjustment factor spread sheet as shown in Figure 13 was used to calculate the bias adjustment factor applied to the Falkirk NO_2 diffusion tube data. Falkirk Council has applied the R&A helpdesk factor to the 2015 results because there are a mixture of roadside and background sites. The R&A bias factor for the ESG Didcot tubes in 2015 was 0.95.

Figure 13 – National Diffusion Tube Bias Factor Spread sheet 2015

National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 03/16

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 2016

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 make your selection, choose [All] from the pop-up list	Year[5] To make 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)
Gradko	50% TEA in acetone	2015	R	Bedford Borough Council	12	35	33	6.4%	G	**0.94**
Gradko	50% TEA in acetone	2015	UB	Norwich City Council	9	12	12	-3.3%	G	**1.03**
Gradko	50% TEA in acetone	2015	R	West Berkshire Council	11	38	35	10.7%	G	**0.90**
Gradko	50% TEA in acetone	2015	R	East Hampshire District Council	11	22	20	9.5%	G	**0.91**
Gradko	50% TEA in acetone	2015	R	LB Haringey	12	37	40	-9.1%	S	**1.10**
Gradko	50% TEA in acetone	2015	KS	London Borough of Croydon	12	54	52	4.7%	G	**0.96**
Gradko	50% TEA in acetone	2015	B	London Borough of Richmond upon Thames	12	21	21	-0.2%	G	**1.00**
Gradko	50% TEA in acetone	2015	R	London Borough of Richmond upon Thames	12	36	33	8.9%	G	**0.92**
Gradko	50% TEA in acetone	2015	KS	Marylebone Road Intercomparison	12	86	81	6.4%	G	**0.94**
Gradko	50% TEA in acetone	2015	UI	Middlesbrough	11	16	14	11.7%	G	**0.90**
Gradko	50% TEA in acetone	2015	SI	Redcar & Cleveland	12	12	12	0.1%	G	**1.00**
Gradko	50% TEA in acetone	2015	R	West Dorset District Council	12	12	11	15.5%	G	**0.87**
Gradko	50% TEA in acetone	2015	R	Worthing Borough Council	11	42	37	14.5%	G	**0.87**
Gradko	50% TEA in acetone	2015	R	Royal Borough of Windsor and Maidenhead	12	34	37	-8.4%	G	**1.09**
Gradko	50% TEA in acetone	2015	R	Royal Borough of Windsor and Maidenhead	12	40	38	4.2%	G	**0.96**
Gradko	50% TEA in acetone	2015		**Overall Factor[3] (15 studies)**				**Use**		**0.95**

PM_{10} Monitoring Adjustment

All TEOM data from 2008 onwards has been adjusted using the King's College London Volatile Correction Method (VCM). This was carried out by Ricardo-AEA for the sites affiliated to the Scottish Air Quality Network in 2015 as part of the Scottish Government's contract.

The PM_{10} monitor at the Grangemouth AURN site has been a FDMS since April 2009 and so no correction factor has been applied to the data after this date. The VCM has been applied to the 2008 and 2009 AURN TEOM data by King's College under contract to Defra.

The PM_{10} monitor at the Banknock 2 site has been a FIDAS since February 2015 so no correction factor has been applied to the data after this date.

The Banknock 3 Osiris data has been adjusted by a factor of 1.14. The Osiris output is a 15-minute average, these have been converted to an hourly and daily average**.**

Estimating $PM_{2.5}$ from PM_{10} Measurements

LAQM TG (16) describes two methodologies for estimating $PM_{2.5}$ from PM_{10} measurements. Method one is to apply a locally derived correction ratio calculated from local sites measuring both PM_{10} and $PM_{2.5}$. The second is to apply a nationally derived correction ratio of 0.7. The national correction ratio should only be used where no appropriate local sites measuring both PM_{10} and $PM_{2.5}$ are available. The locally derived correction ratio should only be used at sites of the same classification.

Falkirk Council has two local sites monitoring both PM_{10} and $PM_{2.5}$ these being the Banknock 2 site and the Grangemouth AURN site. Using guidance in LAQM TG (16) the $PM_{2.5}$/ PM_{10} ratios were calculated for these two sites. The ratio derived from the Banknock 2 data was applied to sites classified as roadside and the ratio derived from the AURN data was applied to sites classified as urban background/industrial.

The local correction ratios were used to estimate $PM_{2.5}$ from PM_{10} measurements at the following sites; Falkirk Haggs, Falkirk West Bridge St, Grangemouth Municipal Chambers, Falkirk Graham's Road, Banknock 3 and Main St Bainsford. Results can be seen in Table 10 in Appendix A. Table 18 shows how the local ratios have been derived.

Table 18 – Locally Derived $PM_{2.5}$/ PM_{10} Correction Factors

Site	Site Type	Annual Average PM_{10} (µg/m3)	Annual Average $PM_{2.5}$ (µg/m3)	Ratio
A13 Banknock 2	Roadside	11	6	0.54
A8 AURN	Urban Background/ Industrial	12.2	9.2	0.75

Short term to long term adjustments

The annual average PM_{10} concentrations for the Grangemouth AURN and Main St Bainsford sites have been annualised. Both sites achieved a data capture below 75% for PM_{10} in 2015. Grangemouth Municipal Chambers and Auchencorth Moss were used as a background sites to calculate the adjustment ratio. Due to low data capture there were no other suitable AURN sites to use as a background site.

The annual average NO_2 concentrations recorded at the West Bridge St and Main St Bainsford automatic monitoring stations have been annualised. In addition the annual average NO_2 concentration recorded by the Arnot Hill diffusion tube has been annualised. All three sites achieved a data capture below 75% for NO_2 in 2015.

The Grangemouth Moray and Grangemouth AURN sites were used as background sites to calculate the adjustment ratio. Due to low data capture there were no other suitable AURN sites.

PM_{10} and NO_2 annual average concentrations have been annualised following guidance set out in Box 7.9 of the LAQM TG (16). Details are shown in Table 19 and Table 20.

Table 19 – PM_{10} short term to long term adjustments

A15: Main St Bainsford	Site Type	Annual Mean (2015), µg/m^3	Data capture 2015, %	Period Mean, µg/m^3	Ratio
A9:Grangemouth MC	Urban background/ Industrial	13	90	11.79	1.10
Auchencorth Moss	Rural background	6.06	97	5.28	1.15
				Average	**1.13**

A8:Grangemouth AURN	Site Type	Annual Mean (2015), µg/m^3	Data capture 2015, %	Period Mean, µg/m^3	Ratio
A9: Grangemouth MC	Urban background/ Industrial	13	90	12.56	1.04
Auchencorth Moss	Rural background	6.06	97	6.3	0.96
				Average	**1.00**

Table 20 – NO_2 short term to long term adjustments

A15: Main St Bainsford	Site Type	Annual Mean (2015), µg/m^3	Data capture 2015, %	Period Mean, µg/m^3	Ratio
A8: Grangemouth AURN	Urban background/ Industrial	14.6	95.2	10.9	1.34
A9:Grangemouth Moray	Urban background/ Industrial	15	93.6	11.9	1.26
				Average	**1.30**

A17: West Bridge St	Site Type	Annual Mean (2015), µg/m^3	Data capture 2015, %	Period Mean, µg/m^3	Ratio
A8: Grangemouth AURN	Urban background/ Industrial	14.6	95.2	13.95	1.05
A9: Grangemouth Moray	Urban background/ Industrial	15	93.6	13.5	1.1
				Average	**1.07**

98: Arnothill Diffusion Tube	Site Type	Annual Mean (2015), µg/m^3	Data capture 2015, %	Period Mean, µg/m^3	Ratio
A8: Grangemouth AURN	Urban background/ Industrial	14.6	95.2	14.90	1.00
A9: Grangemouth Moray	Urban background/ Industrial	15	93.6	14.74	0.95
				Average	**0.98**

QA/QC Automatic Monitoring

Table 21 – Details of the QA/QC at the automatic monitoring stations in 2015

QA / QC in 2015		
Site	**Analyser**	**Network**
A3. Bo'ness	SO_2	Local *
A4. Falkirk Haggs	NO_x	SAQN
	PM10 (TEOM)	SAQN
A5. Falkirk Hope St	NO_x	SAQN
	SO_2	SAQN
A7. Falkirk West Bridge St	NO_x	SAQN
	PM_{10} (TEOM)	SAQN
A8. Grangemouth AURN (Inchyra)	NO_x	AURN
	PM_{10} (TEOM-FDMS)	AURN
	$PM_{2.5}$ (TEOM-FDMS)	AURN
	SO_2	AURN
A9. Grangemouth Moray	NO_x	AURN
	SO_2	SAQN
A10. Grangemouth Municipal Chambers	NO_x	SAQN
	PM_{10} (TEOM)	SAQN
	SO_2	SAQN
A11. Grangemouth Zetland Park	SO2	SAQN
A12. Falkirk Grahams Rd	PM_{10} (TEOM)	Local *
A13. Banknock 2	PM_{10} (FIDAS)	SAQN
A14. Banknock 3	PM_{10} (Osiris)	Local #
A15 Main St Bainsford	NO_x	Local *
	PM10 (TEOM)	Local *

Local sites (*):

- Suspicious data or data recorded when a fault is occurring is automatically marked invalid by software. Data is also manually checked and marked invalid if it is suspicious.
- All NO_x and SO_2 analysers receive fortnightly zero and span checks and filter changes.
- All LSO site visits are carried out by Falkirk Council staff that are audited to AURN standards.
- Analysers are covered by a contract for emergency callout and receive a service every six months.
- The 2015 data recorded by local sites was ratified by Ricardo AEA following 'national' standards for use in this report.

Local sites (#):

- Data is downloaded at site and a flow check is carried out on a fortnightly basis.
- A filter change is carried out on an approximate four weekly basis, although this is dependent on the weather and filter loading. The filters are retained for analysis.
- As with the other sites all LSO site visits are carried out by Falkirk Council staffs who are audited to AURN standards.
- The Osiris is serviced on an annual basis and covered by a service agreement for any breakdowns, both are completed off-site.

AURN and Scottish AQ network sites:

- All NO_x and SO_2 analysers receive fortnightly zero and span checks and filter changes.
- TEOM heads are cleaned and the filter changed on a four weekly basis or more frequently if the filter loading goes above 90%.
- TEOM-FDMS heads are cleaned and filters changed as directed by AURN CMCU (i.e. at 90% loading).
- All LSO site visits are carried out by Falkirk Council staff that are audited to AURN standard.
- Analysers are covered by a contract for emergency callout and receive a service every six months.
- QA/QC is to AURN / 'national' standards
- Falkirk Council also checks the data on its systems and is in communication with Ricardo-AEA to ensure the best data quality. Unscaled data is supplied by Falkirk

Council to Ricardo-AEA for the Scottish AQ Network sites on a six monthly basis to improve data capture.

Glossary of Terms

Abbreviation	Description
AADT	Annual Average Daily Traffic (flow)
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)
ATD	Atomic Thermal Desorption
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
FIDAS	Fine Dust Analysis System
LAQM	Local Air Quality Management
LSO	Local Site Operator
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
n/a	Not Applicable
n/m	Not Monitored
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
SAQN	Scottish Air Quality Network
SEPA	Scottish Environmental Protection Agency
TEOM	Tapered Element Oscillating Microbalance
VCM	Volatile Correction Model

References

1. Technical Guidance LAQM.TG (16), Defra and Devolved Administrations, April 2016.
2. Civil Aviation Authority, UK Airport Statistics http://www.caa.co.uk/default.aspx?catid=80&pagetype=88&pageid=3&sgliid=3#Data
3. Policy Guidance LAQM.PG (S) 16, Defra and Devolved Administrations, March 2016.

All websites were accessible in June 2016.