

Annual Progress Report (APR)



Falkirk Council

2023 Air Quality Annual Progress Report (APR) for Falkirk Council

In fulfilment of Part IV of the Environment Act 1995, as amended by the Environment Act 2021

Local Air Quality Management

June 2023

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Executive Summary: Air Quality in Our Area

Air Quality in Falkirk Council

In 2022, the air quality within the Falkirk Council area continued to be good.

There were no National Air Quality Strategy (NAQS) objective exceedances recorded throughout Falkirk Council's air quality monitoring network in 2022.

The Falkirk Council air quality monitoring results have shown a decrease in NAQS objective exceedances from 2019 for all pollutants measured.

Falkirk Council endeavour to help reduce vehicle emissions by completing agreed Air Quality Action Plan (AQAP) long-term key point measures, promotion of alternative / sustainable modes of transport and to educate / inform the public on relevant local air quality issues.

In 2022, Falkirk Council made significant progress in implementing these measures. To illustrate, there are now one-hundred and twenty-six charging bays providing various charging capacities (7, 22, 50, 150kW) with additional bays being planned to be installed in various locations throughout the Falkirk Council area in the upcoming year. This action helps to promote alternative / sustainable modes of travel and to achieve measures included in Falkirk Council's [Climate Change and Sustainability Policies](#).

On the 10th August 2020, the [Falkirk Stadium Vehicle Charging Hub](#) was opened and became operational accepting electric vehicles to park and charge-up. The £1.4m facility has charging capacity for twenty-six electric vehicles - 30% more than the second largest EV facility in Scotland which supports the Scottish Government's ambition to phase-out the need for new petrol and diesel vehicles by 2032 as outlined in the Scottish Government's [Renewable and Low Carbon Energy Policy](#). The Falkirk Stadium Vehicle Charging hub is an integral part of Transport Scotland's [Electric A9](#) project with the overall aim of improving the electric vehicle charging infrastructure throughout Scotland.

Falkirk Council's vehicle fleet was enhanced and expanded in 2022 which now includes one hundred fully electric vehicles (EV) including minibuses, vans and cars. Falkirk Council has taken delivery of twenty-six new electric vans, boosting its green fleet and ability to operate more sustainably into the future.

Part of a Council-wide [Green Fleet Initiative](#) to achieve a zero emission fleet, the newly added EVs in 2022 will replace ageing diesel counterparts currently used by Building Maintenance. Further information on the Council's new electric fleet can be found using the following Falkirk Council weblink:

<https://www.falkirk.gov.uk/employees/news/article.aspx?aid=7420>

Falkirk Council Fleet has trialled Hydrogenated Vegetable Oil (HVO) in seventeen heavy goods vehicles (HGV) since the start of 2022 – fourteen refuse collection vehicles and three road's vehicles now run on HVO. The fuel is made from cooking and vegetable oils and performs in exceptionally cold environments. HVO is a low carbon, low emission, fossil-free and sustainable alternative to conventional fossil diesel. It is fully interchangeable with conventional diesel and can be mixed at any percentage. Using HVO instead of using traditional fossil fuels such as diesel saves a huge 90% on Falkirk Council's carbon footprint and supports Scotland's Net Zero targets. To date in 2022, the refuse collection vehicles have used 166,000 litres of HVO, saving almost 400 tCO₂.

The Council also promoted a variety of active and sustainable travel measures in 2021/22 to help reduce overall local traffic emissions. Full details of the progress Falkirk Council are making towards these measures are outlined in **Section 2 'Actions to Improve Air Quality'**.

Summary of Monitoring Results

Nitrogen Dioxide (NO₂)

The 2022 air quality monitoring results (as displayed in Appendix A 'Tables A.3' and 'A.4') show that all seven automatic nitrogen dioxide (NO₂) analysers in Falkirk Council's air monitoring network achieved both NO₂ NAQS (1hr and annual mean) objectives.

Particulate Matter (PM₁₀)

Falkirk Council measured particulate matter (PM₁₀) concentrations at eight site locations during 2022 (as displayed in Appendix A 'Tables A.5' and 'A.6'). The relevant Scottish NAQS objectives for PM₁₀ (24-hr and annual mean) were achieved at all eight site locations. The PM₁₀ analyser, Palas Fidas 200, 'Mean Corrections' were applied and shown within the above tables. Further information on adjusted PM data can be found in section 'QA/QC of Automatic Monitoring', 'PM₁₀ and PM_{2.5} Monitoring Adjustment (Palas Fidas 200 Analyser)' on page 102.

The monitoring site with the highest recorded annual mean PM₁₀ concentration in 2022 (but within the Scottish NAQS PM₁₀ objective) was A15 Main Street, Bainsford (12.3µg/m³). Over a five-year period (from 2018 to 2022), six sites have recorded PM₁₀ (annual mean) concentration reductions, these were: A4 Falkirk Haggs, A5 Falkirk Hope Street, A7 Falkirk West Bridge Street, A8 Grangemouth AURN, A10 Grangemouth Municipal Chambers and A14 Banknock 3. The Grangemouth Zetland Park site recorded a slight concentration increase over a two year period (2021 - 2022) from 9.5 to 10.8µg/m³. There were no PM₁₀ 24-hour mean exceedances recorded in 2022.

Particulate Matter (PM_{2.5})

Falkirk Council measured particulate matter (PM_{2.5}) concentrations at eight site locations during 2022. The relevant Scottish NAQS (annual mean) objective for PM_{2.5} was achieved at all eight site locations. The PM_{2.5} analyser, Palas Fidas 200, 'Mean Corrections' were applied and shown within the above tables. Further information on adjusted PM data can be found in section 'QA/QC of Automatic Monitoring', 'PM₁₀ and PM_{2.5} Monitoring Adjustment (Palas Fidas 200 Analyser)' on page 102.

The monitoring site with the highest recorded annual mean PM_{2.5} concentration in 2022 (but within the Scottish NAQS PM_{2.5} objective) was Main Street, Bainsford (6.5µg/m³). Over a five-year period (from 2018 to 2022), two sites have recorded PM_{2.5} (annual mean) concentration reductions, these were: A7 Falkirk West Bridge Street and A14 Banknock 3. These PM_{2.5} reductions 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, SO₂ 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 SO₂ could also impact local PM_{2.5} concentrations.

Sulphur Dioxide (SO₂)

In 2022, Falkirk Council monitored SO₂ at six site locations. Four of the monitoring sites are located within the Grangemouth AQMA (declared for 15-minute SO₂ NAQS objective) and two of the sites are located outwith this AQMA.

There were no exceedances of the SO₂ NAQS objectives (15-minute, hourly or daily) recorded at any of the Falkirk Council monitoring site locations during 2022.

This is the eighth consecutive year that no exceedances of the SO₂ NAQS objectives (15-minute, hourly or daily) have been recorded at any site in the Grangemouth AQMA. It is anticipated that the the Grangemouth AQMA will revoked in 2023 if this trend continues.

Benzene and 1,3-Butadiene

The benzene and 1, 3-butadiene diffusion tube monitoring completed by Falkirk Council in 2022 met the NAQS (annual running mean) objectives for each pollutant respectively.

Actions to Improve Air Quality

Falkirk Council made significant improvements to its air quality monitoring network during 2022.

Grangemouth Moray - Weather Instruments (WS / WD)

New wind speed (WS) and direction (WD) equipment was installed at the Grangemouth Moray site to compliment the continuously monitored air quality data (SO₂ and NO_x) to assist in identifying pollution event sources in the local Grangemouth area. As this equipment was installed as a trial, it has proven successful in the quality and consistency of data produced. Three other sites (Bo'ness, Grangemouth AURN and Falkirk Hope Street) have been identified in 2023 to have similar equipment installed. A request to display Grangemouth Moray's live weather data on the Scottish Air Quality website has been sent to Ricardo consultants who manage this website.

Photo 1: Weather Instruments Roof Mounted at Grangemouth Moray



New Air Conditioning Units – Main Street, Bainsford and Bo'ness

New air conditioning systems were installed at the Main Street, Bainsford and Bo'ness air quality stations to replace the older, smaller capacity units that was unsuitable / insufficient for providing heating / cooling within the sites throughout the year.

Photo 3: New A/C at Main Street, Bainsford AQ Station



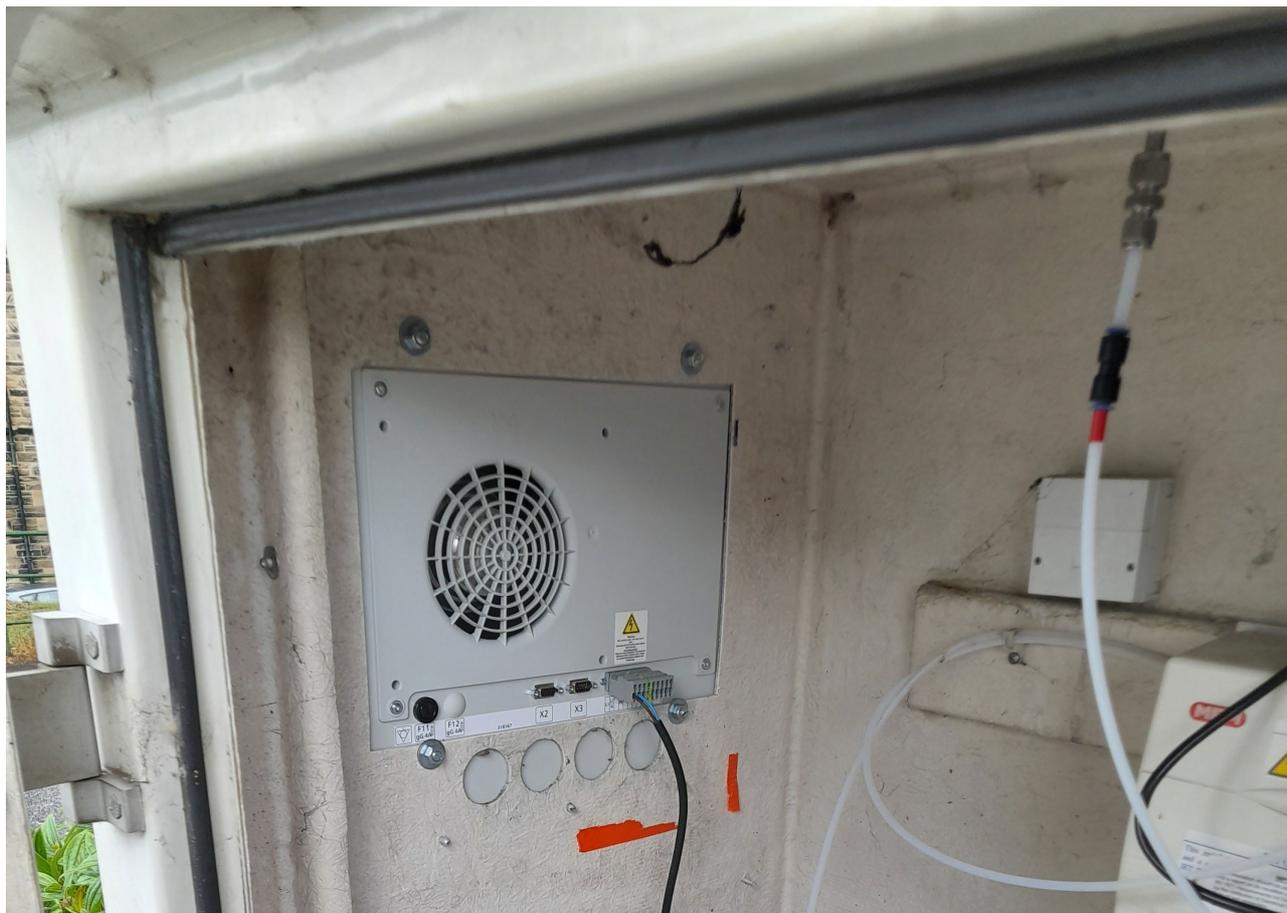
Photo 4: New A/C at Main Street, Bainsford AQ Station



Photo 5: New A/C at Bo'ness AQ Station



Photo 6: New A/C at Bo'ness AQ Station



Grangemouth AQMA Revocation – Consultancy Support

Scottish Government Local Air Quality Management (LAQM) funding was provided to undertake a critical assessment of the Grangemouth Air Quality Management Area (AQMA) in accordance with relevant legislation following years of compliance of NAQS for SO₂ (15min mean). This follows on from the initial Falkirk Council [Grangemouth Emissions Study](#) (GES) completed by consultants Sweco in 2020 and Phase 2 of the study being developed in 2023.

Falkirk Council requested that the consultancy supports the Grangemouth AQMA revocation process work by undertaking:

1. A critical assessment of Falkirk Council drafted reports prior to publication / consultation to ensure compliance with current, national technical air quality guidance.
2. Provision of air quality data modelling (to provide likely) future concentrations of significant, industrial point source emissions within the Grangemouth industrial area

using the latest, recognised modelling software such as ADMS or AERMOD, for inclusion in reports.

3. Assistance with any planned meetings including the presentation of provisional results with industrial operators, other organisations such as SEPA and the Scottish Government prior to the AQMA revocation publication / consultation.

4. Any further work or assistance in relation to the AQMA revocation process as required.

Environmental Health Electric Van

The Falkirk Council Environmental Health department own a fully electric van (Renault Kangoo ZE33), this van is used for all routine air quality site work.

Photo 7 Photo of Environmental Health Electric Van



ECOSTars Fleet Recognition Scheme

Throughout 2022 / 23 Falkirk Council's [ECOSTars](#) fleet recognition scheme has grown from two-hundred and sixty-three to two-hundred and ninety members. Falkirk Council's ECOSTars taxi scheme has a small but engaged membership of seven members. ECOSTars membership consists of vehicle fleet operators located within the Falkirk Council local authority area as well as those whose depots are located out with the Council boundary but operate vehicles within that area - all of these operators have an impact on local air quality. In addition, Falkirk Council has been working closely with fellow members of the East Central Scotland Vehicle Emissions Partnership (ECSVE, [Switch Off and Breathe](#)) to work to the objectives set out in the Scottish Government's Cleaner Air for Scotland ([CAFS](#), 2015 and [CAFS2](#), 2021) strategies. Air Quality Action Plan (AQAP) funding has been provided to continue the operation of the Falkirk ECOSTars scheme (for fleet operators and taxis) during 2022 / 23.

Falkirk Council also continues to work closely with its partner organisations to manage local air quality issues. The Council works regularly with organisations such as SEPA, Ineos and Petroineos to help reduce exceedances of the SO₂ NAQS objectives within the Grangemouth AQMA.

Local Priorities and Challenges

In 2023, Falkirk Council will be developing our engagement with local schools through promotion of air quality education resources such as the 'Learn About Air' teaching package, promoting the [Clean Air Day Scotland](#) and working closer with the Falkirk Council Transport Planning and Climate Change departments on promoting alternative, sustainable local transport and clean energy solutions.

Low Emission Zones

Low Emission Zones (LEZ) are currently being planned and operated in the four major Scottish cities: Glasgow, Edinburgh, Aberdeen and Dundee over the next few years. There are no current plans for any form of LEZ in the Falkirk Council area. Falkirk Council has undertaken the 'Stage 1 Screening Exercise (clause 2.2.25)' assessment in the [2020 APR](#) in accordance with the Scottish Government's [National Low Emissions Framework](#) to inform this process.

How to Get Involved

To obtain further information on air quality within the Falkirk Council area, please visit our air quality policy webpage:

<http://www.falkirk.gov.uk/services/environment/environmental-policy/air-quality/>

There are nine automatic air quality monitoring sites across the Falkirk Council area. The air quality data from all the monitoring sites (excluding Banknock 3) can be viewed on the Scottish Air Quality website at:

<http://www.scottishairquality.co.uk/latest/summary?view=la>

To learn more about the ECOSTars Fleet Recognition Scheme and for details of how to join if you are a commercial fleet operator please visit:

<https://www.ecostars-uk.com/eco-stars-schemes/>

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1 Local Air Quality Management

This report provides an overview of air quality in Falkirk Council during 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), 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) summarises the work being undertaken by Falkirk Council to improve air quality and any progress that has been made.

Table 1.1 – Summary of Air Quality Objectives in Scotland

Pollutant	Air Quality Objective Concentration	Air Quality Objective Measured as	Date to be Achieved by
Nitrogen dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
Nitrogen dioxide (NO ₂)	40 µg/m ³	Annual mean	31.12.2005
Particulate Matter (PM ₁₀)	50 µg/m ³ , not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
Particulate Matter (PM ₁₀)	18 µg/m ³	Annual mean	31.12.2010
Particulate Matter (PM _{2.5})	10 µg/m ³	Annual mean	31.12.2021
Sulphur dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
Sulphur dioxide (SO ₂)	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
Sulphur dioxide (SO ₂)	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005
Benzene	3.25 µg/m ³	Running annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m ³	Running annual mean	31.12.2003
Carbon Monoxide	10.0 mg/m ³	Running 8-Hour mean	31.12.2003

2 Actions to Improve Air Quality

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 publish and implement an Air Quality Action Plan (AQAP) within the shortest possible time and no later than 12 months of the date of AQMA Designation Order. The AQAP must set out measures the local authority intends to put in place in pursuit of the objectives within the shortest possible time. Measures should be provided with milestones and a final date for completion. The action plan itself should have a timescale for completion and for revocation of the AQMA. Where measures to reduce air pollution may require a longer timescale an action plan shall be reviewed and republished within five years of initial publication and then five-yearly thereafter.

The AQMAs that are currently active within the Falkirk Council area are:

1. Falkirk Town Centre AQMA - Declared on 31st January 2013 for NO₂ (annual mean)

The Falkirk town centre NO₂ (annual mean) AQMA remains justified as although there were no exceedances of the NAQS objective recorded in 2022, there have been consecutive diffusion tube exceedances (such as the NA27 Falkirk West Bridge Street location) in previous years which haven't been affected by Coronavirus (COVID-19) Scottish Government travel restrictions^{Ref1}.

It is anticipated that the Falkirk town centre AQMA (NO₂ annual mean) will be revoked by December 2023 if relevant (automatic and non-automatic) AQ monitoring results continue to comply with the NAQS objective.

2. Grangemouth AQMA - Declared on 1st November 2005 SO₂ (15min mean)

There have been over eight years where the SO₂ (annual mean) results at all Grangemouth AQMA automatic monitoring locations (Grangemouth AURN, Moray, Municipal Chambers and Zetland Park) have complied with the SO₂ NAQS (15min mean) objective of 266µg/m³, not to be exceeded more than thirty-five times a year (at each monitoring site).

In 2021/22, Scottish Government LAQM funding was provided to undertake a critical assessment of the Grangemouth AQMA in accordance with relevant LAQM guidance following years of compliance with NAQS for SO₂ (15min mean). This follows on from the initial Falkirk Council [Grangemouth Emissions Study](#) completed by consultants Sweco in 2020 and Phase 2 of the study being developed in 2023.

It is anticipated that the Grangemouth AQMA (SO₂ 15min mean) will be revoked in by October 2023 if relevant AQ results continue to comply with the NAQS objective.

The Falkirk Council AQMAs that have been revoked in recent years are:

1. Falkirk Town Centre AQMA - Declared on 25th January 2013 for PM₁₀ (24-hr and annual mean), Revoked on 23rd March 2023

There had been over five-years where PM₁₀ (24-hr and annual mean) results at both Falkirk Town Centre AQMA automatic monitoring locations (Falkirk Hope Street and Falkirk West Bridge Street) have complied with the PM₁₀ NAQS (Scottish annual mean) objective of 18µg/m³. Road traffic was identified as the main source of this pollutant. Falkirk Council undertook extensive public consultation in accordance with LAQM guidance and revoked the AQMA on 23rd March 2023. Please see the relevant report for details: [Proposal for the Revocation of the Falkirk Town Centre AQMA for Particulate Matter \(PM₁₀\)](#)

2. Hags - Declared on 18th March 2010 for NO₂ (annual mean), Revoked on 5th October 2021)

The Hags AQMA was declared on the 18th March 2010 following NAQS exceedances for NO₂ (annual mean) with road traffic being identified as the main source of this pollutant. Since the AQMA was declared, measured concentrations (using automatic and non-automatic monitoring methods) of NO₂ have complied with the NAQS objectives consistently since 2015. Falkirk Council undertook extensive public consultation in accordance with LAQM guidance and revoked the AQMA on 5th October 2021. Please see the relevant report for details: [Proposal for the Revocation of Hags AQMA](#).

3. Banknock - Declared on 18th August 2011 for PM₁₀ (24-hr and annual means), Revoked on 7th January 2021

The Banknock AQMA was declared on the 18th August 2011 following NAQS exceedances for PM₁₀ (24-hr and annual means) with local quarrying operations being identified as the main source of this pollutant. Since the AQMA was declared, measured concentrations (using automatic monitoring methods) of PM₁₀ in this area have complied with the relevant NAQS objectives. Falkirk Council undertook extensive public consultation in accordance with LAQM guidance and revoked the AQMA on 7th January 2021. Please see the relevant report for details: [Proposal for the Revocation of Banknock AQMA](#)

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 <https://uk-air.defra.gov.uk/aqma/list>.

A summary of AQMAs declared by Falkirk Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at [Falkirk Council Air Quality](#)

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	Description	Action Plan
Falkirk Town Centre	NO ₂ annual mean	Falkirk	An area encompassing an area of Falkirk Town Centre	AQAP (Falkirk Town Centre and Haggs) 2015 Air Quality Management Action Plan (Falkirk Town Centre and Haggs) June 2015
Grangemouth	SO ₂ 15-min mean	Grangemouth	An area encompassing the Grangemouth industry areas, shipping port and adjacent residential areas	Air Quality Action Plan Update (Grangemouth) 2009 Available on request

2.2 Cleaner Air for Scotland 2

[Cleaner Air for Scotland 2 – Towards a Better Place for Everyone \(CAFS2\)](#) is Scotland's second air quality strategy. CAFS2 sets out how the Scottish Government and its partner organisations propose to further reduce air pollution to protect human health and fulfil Scotland's legal responsibilities over the period 2021 – 2026. CAFS2 was published in July 2021 and replaces [Cleaner Air for Scotland – The Road to a Healthier Future \(CAFS\)](#), which was published in 2015. CAFS2 aims to achieve the ambitious vision for Scotland "to have the best air quality in Europe". A series of actions across a range of policy areas are outlined, a summary of which is available on the Scottish Government's website.

Progress by Falkirk Council against relevant actions for which local authorities are the lead delivery bodies within this strategy is demonstrated below.

2.1.1 Placemaking – Plans and Policies

Local authorities with support from the Scottish Government will assess how effectively air quality is embedded in plans, policies, City Deals and other initiatives, and more generally in cross-departmental working, identifying and addressing evidence, skills, awareness and operational gaps.

Falkirk Council has the following strategies, plans and policies currently in place which would help contribute to the principles of CAFS2:

[Falkirk Local Development Plan 2 \(LDP2\)](#)

The Falkirk Local Development Plan 2 (LDP2) is the statutory document which guides future development in the Council area for the period 2020-2040. It was adopted on the 7th of August 2020. LDP2 contains a vision for the area, an overall strategy, and detailed policies and proposals indicating where development should, or should not take place. It provides criteria which the Council uses in assessing planning applications. Air quality is considered throughout this plan and specifically within the following sections:

'Place and Environment' 'PE01 Placemaking' section 2 (p.30):

"Development should not exacerbate existing air quality issues or introduce new sources of pollution which impact on local air quality without appropriate mitigation".

‘Place and Environment’ ‘PE20 Natural Environment’ section 4.21 (p.39):

“Trees and woodlands have many benefits, including timber production, placemaking, landscape enhancement, screening, shelter, biodiversity value, carbon fixing, air quality improvement, natural flood management, recreation, and opportunities to interact with nature. Hedgerows similarly have important benefits for landscape enhancement, screening, biodiversity, and air quality improvement. Protection of existing trees and woodland will be a priority, and the principles of the Scottish Governments Policy on ‘Control of Woodland Removal’ will be followed where woodland is affected. In addition, a number of Tree Preservation Orders (TPOs) are in force across the Council area, as shown on the Proposals Map. New development will be expected to contribute to woodland and green network objectives through management and new planting as appropriate.”

‘Place and Environment’ ‘PE26 Air Quality’ (p.42):

“Development should not exacerbate existing air quality issues or introduce new sources of pollution which impact on local air quality without appropriate mitigation. Impacts on air quality will be taken into account in assessing development proposals, particularly within Air Quality Management Areas (AQMA). An Air Quality Assessment may be required for developments that are within an AQMA 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 overriding issues of national or local importance.”

‘Place and Environment’ ‘PE26 Air Quality’ Section 4.28 (p.42):

“Good air quality is an important element of sustainable place making which contributes towards health and well-being as set out in the Cleaner Air for Scotland Framework. Planning has an important part to play in improving air quality, which can be affected by new development, and air quality can be a material consideration in determining planning applications. In areas with significant potential for further industrial development such as Grangemouth proposals may require an air quality assessment even where no breach of air quality standards is anticipated. The Council has put in place a network of monitoring equipment to measure whether it is meeting National Air Quality Standards, and Air Quality Management Areas have been established at Banknock, Grangemouth, Falkirk

Town Centre and Haggs related to breaches in various air quality objectives. The Scottish Government has also committed to introducing Low Emission Zones (LEZ) to all AQMA areas by 2023.”

‘Infrastructures and Resources’ ‘IR05 Travel Hierarchy and Transport Assessment’ Section 2 (p.53):

“Transport assessments will be required for development proposals where the impact of the development on the transport network is likely to result in an increase in the number of trips, such that there will be significant impact on the operation of the transport network, requiring mitigation. Assessments will focus on the hierarchy of travel and should include, where appropriate:

- Travel plans
- Safety audits of proposed mitigation measures; and
- Air quality impact assessments.”

‘Infrastructures and Resources’ ‘IR12 Energy Generation Development’ Section 1 (p.55):

Energy infrastructure developments will be assessed in relation to the following factors:

- Impacts on communities, whether settlements or individual residential properties, including issues of noise, shadow flicker and air quality

[Falkirk Council Energy Policy Information](#)

Falkirk Council's energy consumption represents a significant part of both its carbon footprint and budget. Effective management of energy is therefore essential to controlling these costs and protecting the environment.

Energy efficiency measures are implemented to reduce the Council's energy use and cover:

- Street lighting
- Vehicle fuel consumption
- Electricity use in our buildings
- Energy use to heat our buildings.

To improve local air quality and increase our decarbonisation aims, a growing number of Electric Vehicle charging points will be installed throughout the Council area. We have expanded our District Heating System, providing an efficient and clean source of energy to more of the Callendar Park buildings.

[Falkirk Council Greenspace Strategy](#)

Through its delivery, the strategy will connect areas of natural, semi-natural and man-made open spaces within our towns and villages and create links into the wider countryside. The development of a high quality, multi-functional green network will provide a range of benefits for people, businesses and wildlife across our area. Air quality is considered throughout this strategy, specifically within Section 1.4 'Towards A New Greenspace Strategy':

"In particular the green network will provide:

- A framework for landscape and regeneration place-making initiatives.
- Urban open spaces including parks, play spaces, sports areas, green corridors, and natural and semi-natural open spaces for community, educational and visitor use.
- An important opportunity for facilitating climate change adaptation through sustainable flood management and woodland planting, and by enabling species migration.
- Spaces for recreation and active travel through creating safer, more pleasant walking and cycling routes.
- Habitat and biodiversity value by providing and enhancing areas where flora and fauna can thrive.
- Sustainable water and soil management and help reduce air and water pollution."

Falkirk Council also has published the following policies, strategies and initiatives which will aim to improve local air quality:

[Sustainable Procurement](#)

[Sustainable Transport Policies, Strategies and Measures](#)

[Sustainable Falkirk](#)

[Historic Environment Strategy](#)

[Contaminated Land Inspection Strategy](#)

[Falkirk Open Space Strategy](#)

2.2.2 Transport – Low Emission Zones

Local authorities working with Transport Scotland and SEPA will look at opportunities to promote zero-carbon city centres within the existing LEZs structure.

Falkirk Council has many sustainable transport options available which aims to improve local air quality in town centre locations throughout the Falkirk Council area including:

[Local Transport Strategy](#)

[Take the Right Route](#)

[Green Travel Map](#)

Low Emission Zones (LEZ) are currently being planned and operated in the four major Scottish cities: Glasgow, Edinburgh, Aberdeen and Dundee over the next few years. There are no current plans for any form of LEZ in the Falkirk Council area. Falkirk Council has undertaken the 'Stage 1 Screening Exercise (clause 2.2.25)' assessment in the [2020 APR](#) in accordance with the Scottish Government's [National Low Emissions Framework](#) to inform this process. Although Falkirk Council have completed this assessment, we are always willing to explore initiatives with partner organisations to help reduce transport sourced emissions to help improve local air quality in town centres.

2.3 Implementation of Air Quality Action Plan(s) and/or measures to address air quality

In order to ensure that local authorities implement the measures within an action plan by the timescales stated within that plan, the Scottish Government expects authorities to submit updates on progress through the APR process. Falkirk Council has taken forward a number of measures within the action plan during the current reporting year of 2022 in pursuit of improving local air quality and meeting the air quality objectives within the shortest possible time. Details of all measures completed, in progress or planned are set out in Table 2.1. More detail on these measures can be found in the air quality Action Plan relating to each AQMA.

Key completed measures in 2022 include:

- Measure 3 “AQ Monitoring Network Review”: In 2022, Grangemouth AURN has its communication systems upgraded to bring it in line with all the other FC AQ network sites. This improvement is expected to increase data capture rates (%) at all sites.
- Measure 4 “Electric Vehicles”: Falkirk Council’s vehicle fleet was enhanced and expanded in 2022 which now includes one hundred fully electric vehicles (EV) including minibuses, vans and cars. Falkirk Council has taken delivery of twenty-six new electric vans, boosting its green fleet and ability to operate more sustainably into the future. Part of a Council-wide “Green Fleet” initiative to achieve a zero-emission fleet, the newly added EVs in 2022 will replace ageing diesel counterparts.
- Measure 9 “Inclusion of Air Quality in Falkirk Development Plan”: See specific AQ related statements within the current FC Local Development Plan (LDP) in section 2.1.1 “Placemaking – Plans and Policy” within this APR.

Progress on the following measures has been slower than expected on the following measure:

- Review of the Grangemouth AQMA with potential revocation (reduction of Falkirk Council AQMAs from two to one). This has been slower due as the assessment has to consider the most up-to-date emissions data available from each Grangemouth Industrial Operator. This assessment hopes to build on the AQ modelling undertaken for the Phase 1 of the Grangemouth Emissions Study published in 2020. Each industrial operator has been asked to complete a proforma with all the

modelling emissions data required. Unfortunately, due to annual reporting commitments and ongoing industrial site improvements many of the operators have not been able to provide the data until May 2023. The data is still being refined between the operators and Sweco to ensure the most representative data are used. Interim analysis of the emissions inventory indicates that there are several industrial point sources no longer in operation which should result in an overall air quality improvement.

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

- Falkirk Town Centre AQMA (NO₂ – annual mean) and Grangemouth AQMA (SO₂ – 15min mean) revocations.
- Publication of the Grangemouth Emissions Study Phase 2.
- Development of a five-year Falkirk Council Air Quality Strategy in 2024 following AQMA revocations.

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
1	Improving SO ₂ Data Access	Public information	Ongoing monthly and then reviewed after the potential AQMA revocation in October 2023 (NAQS objective compliance dependant)	Completed monthly	Not LAQM or AQAP funding – reporting completed by Falkirk Council	The SO ₂ (annual mean) results at all Grangemouth AQMA automatic monitoring locations have complied with the SO ₂ NAQS (15min mean) objective for over eight consecutive years.	Monthly SO ₂ NAQS exceedances summary reports sent to many stakeholders / interested parties with ongoing totals and likely industrial (or otherwise) sources of exceedances.	None – monthly reporting to continue for the foreseeable future.
2	Text and Email Alerts for NAQS Exceedances	Public information	No end date identified – continuous service.	Completed within 1 hour of NAQS exceedance	Fully funded (Scot Gov LAQM Grant) for external AQ Data Collection system.	NAQS exceedances continue to be sent by SMS / email to FC staff and key stakeholders for immediate investigation into likely cause.	Funding allocated to continue the AQ Data Collection system to work in tandem with SAQ website alerts developed by Ricardo	None – service to continue for the foreseeable future (Scot Gov LAQM Grant funding dependant)
3	AQ Monitoring Network Review	Public information	Ongoing	Annual review of network completed as part of LAQM process. Improved AQ data accuracy and capture	Fully funded (Scot Gov LAQM Grant) for all AQ monitoring network equipment.	In 2022, Grangemouth AURN site had its communication systems upgraded to bring it in line with all the other FC AQ network sites.	All sites have had their communications equipment upgraded in recent years which has improved overall data accuracy and capture rates.	Future Scot Gov LAQM Grant funding could limit the expansion and improvement of network equipment.

4	Electric Vehicles	Promoting low emission transport	No end date identified – continuous service.	Annual increase in charging bays / facilities within Falkirk Council area	Scottish Government funded Falkirk Council Car Club (Scot Gov AQAP Grant Funded)	On the 10 th August 2020, the Falkirk Stadium Vehicle Charging Hub was opened and became operational accepting electric vehicles to park and charge-up. The Falkirk Stadium Vehicle Charging hub is an integral part of Transport Scotland's Electric A9 project with the overall aim of improving the electric vehicle charging infrastructure throughout Scotland. More charging bays are being planned by Falkirk Council into the future.	Falkirk Council's vehicle fleet was enhanced and expanded in 2022 which now includes one hundred fully electric vehicles (EV) including minibuses, vans and cars. Falkirk Council has taken delivery of twenty-six new electric vans, boosting its green fleet and ability to operate more sustainably into the future. Part of a Council-wide Green Fleet Initiative to achieve a zero-emission fleet, the newly added EVs in 2022 will replace ageing diesel counterparts.	Future external funding could limit the expansion and uptake of low emission transport.
5	Improvement of Traffic Light System at Bankside	Transport Planning and Infrastructure	Completed in 2014.	Reduction in NO ₂ and PM ₁₀ at the Bankside area in Falkirk	Local Authority funded	Traffic light system reduced overall road congestion in the Bankside area in 2014	Traffic light system reduced overall road congestion in the Bankside area in 2014	Similar traffic light improvements could be utilised at other traffic hotspots – dependant on public funding for FC Transport Planning
6	Falkirk Council Sustainable / Active Travel Scheme "Take the Right Route"	Promoting travel alternatives	Ongoing	Scheme uptake and participation statistics compiled by Sustainable Transport annually.	Scottish Government funded	TtRR continued success in 2022 with successful projects such as: Safer Street (Cycle / walking Infrastructure Improvements), Improved advertising / public awareness, workplace travel planning and	Improved public engagement statistics for 2022	If grant funding was reduced or not provided then the active travel scheme could not make sufficient progress to promote and provide travel alternatives.

						development of a Falkirk Council Employee Travel Plan.		
7	Forth Bike Hire Scheme	Promoting travel alternatives	Ongoing	Anticipated reduction in NO _x and PM emissions due to an increase in green travel alternatives / increased accessibility with improved cycle paths across the Forth Valley area	Scottish Government funded	Forth Bike (in conjunction with Forth Environment Link) operates an electric bike hire scheme within the Falkirk and Stirling area The Forth Bike system currently includes over one hundred electric pedal assist (Pedelec) bikes spread between their four local stations: the Falkirk Wheel, the Helix, Forth Valley Royal Hospital, and University of Stirling.	Completed. Forth Bike scheme established and running in 2021. Expansion of the scheme expected in future years.	If grant funding was reduced or not provided then the active travel scheme could not make sufficient progress to promote and provide travel alternatives.
8	Soft Measures e.g. travel planning (larger employers, schools), journey sharing, changes to mileage, home and mobile working.	Promoting travel alternatives	Ongoing	Anticipated reduction in NO _x and PM emissions due to an increase in green travel alternatives	Scottish Government funded	Development of LA Travel Plans, Flexible Work Pattern Plans and Sustainable Transport Alternatives / solutions	Formation of the following FC plans completed: Flexible Working Policy Local Transport Strategy Take the Right Route Green Travel Map	If grant funding was reduced or not provided then the aforementioned plans could not make sufficient progress to promote and provide travel alternatives.
9	Inclusion of Air Quality in the Falkirk Council Local Development Plan	Policy guidance and development control	Completed and ongoing	Inclusion of air quality policy statements in local development plan	LA funded	See specific AQ related statements within the current FC LDP in section 2.1.1 "Placemaking – Plans and Policy" in this APR	Inclusion of air quality policy statements in local development plan, addition of more air quality policies as they are developed in future.	LA funded however would require some annual LA funding to develop the FC LDP into the future.
10	Improved AQ Monitoring within FC AQMAs	Public information	Completed and ongoing	Consistent, good data capture (>90%) from all analysers	Fully funded (Scot Gov LAQM Grant) for all AQ monitoring network equipment.	Data capture has gradually improved in recent years due to better (future enabled) communication	Since the install of the Grangemouth AURN communication equipment in 2022 – all FC network sites have 4G routers, dataloggers, displays,	Scot Gov LAQM funding has enabled comms improvements – funding will require to be provided to enable this service

				in FC AQMAs		equipment such as 4G routers, dataloggers and improved data polling methods	keyboards to aid the increased improvements in data capture.	improvement continues into the future
11	Promotion of the EcoStars Fleet Recognition Scheme	Vehicle fleet efficiency	Completed and ongoing	The latest Falkirk Eco Stars report shows that recruitment in Falkirk has 290 members and is steadily increasing each year.	Fully funded (Scot Gov AQAP Grant)	Improved ratings achieved for the increased number of engaged EcoStars operators across the FC area. Full details on Fleet and Taxi operators and their ratings can be found here .	Continued annual increase in signed up operators. Regular liaison is achieved between TRL and FC on Fleet and Taxi operator progress.	Future Scot Gov AQAP Grant funding could limit the expansion and improvement of its EcoStars Fleet and Taxi operators.
12	Member of the East of Scotland Vehicle Emissions Partnership (EoSVEP)	Promoting low emission transport	Ongoing	Member of the partnership to help reduce vehicle idling, to report idling complaints, enforcing of fixed penalty notices, and provision of educational resources for the public	Scottish Government funded	Anticipated reduction in NO _x and PM emissions mainly in town centre areas through anti-idling enforcement. Provides the public with a service to report idling or smoky vehicles.	The EoSVEP continues to assist in promoting anti idling in the Falkirk Council area. Various idling complaints have been investigated by the partnership with road signs installed in a variety of FC areas. Improvements of the associated 'Switch Off and Breathe' website have taken place along with local advertising to raise awareness.	If Scot Gov funding was reduced or not provided then the EoSVEP scheme could not make sufficient progress to promote anti-vehicle idling help reduce pollution

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 nine sites during 2022. Table A.1 in Appendix A shows the details of these sites. National air quality monitoring results are available at the [Air Quality in Scotland](#) website.

Maps showing the location of the monitoring sites are provided in Appendix A, Figure 26 A) to F). Further details on how the monitors are calibrated and how the data has been adjusted for quality purposes (QA/QC) are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Falkirk Council undertook non-automatic (passive) monitoring of NO₂ at sixty-one sites during 2022. Table A.2 in Appendix A shows the details of the sites.

Falkirk Council also undertook non-automatic (passive) monitoring of 1, 3 butadiene at three sites during 2022. Table A.9 in Appendix A shows the details of the 1, 3 butadiene sites.

In addition, Falkirk Council also undertook non-automatic (passive) monitoring of benzene at sixteen sites during 2022. Table A.10 in Appendix A shows the details of the benzene sites.

3.1.3 Other Monitoring Activities

No other monitoring activities were undertaken by Falkirk Council in 2022.

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 (NO₂)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past five years with the air quality objective of 40 µg/m³.

For diffusion tubes, the full 2022 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO₂ hourly mean concentrations for the past five years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year.

NO₂ Automatic Analyser Results

The 2022 monitoring results (as displayed in Appendix A, Tables A.3 and A.4) show that all seven automatic NO₂ analysers in the Falkirk Council's air monitoring network met both NO₂ NAQS objectives (1hr and annual mean). The highest NO₂ annual mean result in 2022 was recorded at the A7 Falkirk West Bridge Street site (27µg/m³) - this result has decreased (by 4.4µg/m³) from 2021's result (31.4µg/m³). The lowest result was recorded at the A9 Grangemouth Moray (12µg/m³) site. The Grangemouth AURN NO₂ annual mean result has increased from 11µg/m³ in 2020.

Over a five year period (from 2018 to 2022), six (of seven) monitoring sites have recorded annual mean NO₂ concentration reductions. There have been minor fluctuations in results during this period but all remain within the NO₂ NAQS (1hr and annual mean) objectives. The A8 Grangemouth AURN annual mean NO₂ results have remained the same (14µg/m³) during this 5 year period.

Long term NO₂ trend graphs are shown in Appendix A, Figures 1 to 7. There is an overall downward trend in NO₂ (annual mean) concentrations at all monitoring sites which is a positive trend.

Likely contributing factors to the reduction in NO₂ concentrations at the above sites include the Coronavirus (COVID-19) pandemic^{Ref 1} in March 2020 to 2021 (resulting in less road traffic), traffic-light timing amendments (on Falkirk West Bridge Street) to minimise congestion and prevent excessive idling (within the Falkirk town centre area), road

upgrades (M80 at Haggs) and speed limit enforcement measures (30mph on the A803). Increased ownership of hybrid and electric vehicles may also have contributed to the overall NO₂ reduction.

Annual NO₂ Diffusion Tube Results

The 2022 annual NO₂ diffusion tube monitoring results (as displayed in Appendix A, Table A.3) shows that no (non-automatic) NO₂ tubes exceeded the NAQS (annual mean) NAQS objective limit of 40µg/m³. All sixty-one sites in Falkirk Council's network met the NO₂ NAQS (annual mean) objective.

The highest NO₂ annual mean diffusion tube concentration in 2022 was recorded at the NA27 Falkirk West Bridge Street roadside location (30µg/m³).

The lowest NO₂ annual mean diffusion tube concentrations in 2022 were recorded at the following locations: NA105 West of Shieldhill (Rural, 5µg/m³), NA64 New Hallglen Road (Urban Background, 10µg/m³) and NA86 Wolfe Road (Urban Background, 10µg/m³),

In addition, diffusion tubes are affected by several sources of interference which can cause substantial under or overestimation (often referred to as "bias") compared to the automatic NO₂ (chemiluminescence) reference analyser (as defined within the EU as the reference method)^{Ref 2}. Due to this, NO₂ concentrations recorded using diffusion tubes are typically of lower accuracy than that recorded by the reference method using automatic (chemiluminescence) NO₂ analysers.

3.2.2 Particulate Matter (PM₁₀)

Table A.5 in Appendix A compares the ratified and adjusted monitored PM₁₀ annual mean concentrations for the past five years with the air quality objective of 18µg/m³.

Table A.6 in Appendix A compares the ratified continuous monitored PM₁₀ daily mean concentrations for the past five years with the air quality objective of 50µg/m³, not to be exceeded more than seven times per year.

Falkirk Council measured PM₁₀ concentrations at eight locations during 2022. The relevant Scottish NAQS objectives for PM₁₀ were met at all eight locations.

In accordance with the Scottish Government Guidance Note "Measurement of Ambient Particulate Matter (PM) and the LAQM Reporting of Measured Concentrations" May 2023^{Ref4}. Corrected and uncorrected results (greyed out) are displayed in "Table A.5 – Annual Mean PM₁₀ Monitoring Results (µg/m³)" and "Table A.7 – Annual Mean PM_{2.5}

Monitoring Results ($\mu\text{g}/\text{m}^3$)” for PM concentrations with Palas Fidas 200 analysers in operation.

The site with the highest recorded annual mean PM₁₀ concentrations in 2022 (but within the Scottish NAQS PM₁₀ objective) was A15 Main Street, Bainsford ($12.3\mu\text{g}/\text{m}^3$).

The site with the lowest PM₁₀ (annual mean) concentration was A14 Banknock 3 ($6.2\mu\text{g}/\text{m}^3$). Good overall data capture (>90%) was recorded at all eight sites in 2022.

Over a five year period (from 2018 to 2022), six sites have recorded PM₁₀ (annual mean) concentration reductions, these were: A4 Falkirk Haggs, A5 Falkirk Hope Street, A7 Falkirk West Bridge Street, A8 Grangemouth AURN, A10 Grangemouth Municipal Chambers, and A14 Banknock 3. There have been slight Pm₁₀ (annual mean) increases recorded at the A11 Grangemouth Zetland Park and A15 Main Street, Bainsford sites over a 2–5 year period but remain within the PM₁₀ NAQS (annual mean) objective.

There were no PM₁₀ daily exceedances recorded in 2022.

Over a five year period (from 2018 to 2022), one site (A14 Banknock 3) has recorded a PM₁₀ (24-hr mean) concentration reduction. The remaining seven sites have remained at the same number of PM₁₀ 24-hour mean exceedances (zero) over this period.

3.2.3 Particulate Matter (PM_{2.5})

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

PM_{2.5} is measured at eight locations within the Falkirk Council area, these are: A4 Haggs, A5 Falkirk Hope Street, A7 Falkirk West Bridge Street, A8 Grangemouth AURN, A10 Grangemouth Municipal Chambers, A11 Grangemouth Zetland Park, A14 Banknock 3 and A15 Main Street, Bainsford. Five sites: A4 Haggs, A5 Falkirk Hope Street, A10 Grangemouth Municipal Chambers, A11 Grangemouth Zetland Park and A15 Main Street, Bainsford have PM_{2.5} data available from 2020 onwards after the installation of Palas Fidas (measuring PM_{10+2.5}) analysers.

In accordance with the Scottish Government Guidance Note “Measurement of Ambient Particulate Matter (PM) and the LAQM Reporting of Measured Concentrations” May 2023^{Ref4}. Corrected and uncorrected results (greyed out) are displayed in “Table A.5 – Annual Mean PM₁₀ Monitoring Results ($\mu\text{g}/\text{m}^3$)” and “Table A.7 – Annual Mean PM_{2.5}

Monitoring Results ($\mu\text{g}/\text{m}^3$)” for PM concentrations with Palas Fidas 200 analysers in operation.

During 2022, there were no exceedances of the PM_{2.5} Scottish NAQS (annual mean) objective limit ($10\mu\text{g}/\text{m}^3$) at any of the monitoring sites.

The site with the highest recorded PM_{2.5} (annual mean) concentrations in 2022 (but within the Scottish NAQS PM_{2.5} annual mean objective) was A15 Main Street, Bainsford ($6.5\mu\text{g}/\text{m}^3$).

The site with the lowest PM_{2.5} (annual mean) concentration in 2022 was A14 Banknock 3 ($3.8\mu\text{g}/\text{m}^3$).

Over a five year period (from 2018 to 2022) two sites (A7 Falkirk West Bridge Street, A8 and A14 Banknock 3) have recorded PM_{2.5} (annual mean) concentration reductions. The A8 Grangemouth AURN has seen a slight increase (from 7 to 8 $\mu\text{g}/\text{m}^3$) over this period but remain within the PM_{2.5} NAQS (annual mean) objective. The other sites have collected between 2-3 years worth of data to date.

The PM_{2.5} concentrations at the Grangemouth AURN site have, in general, remained at the same level of approx. $7\mu\text{g}/\text{m}^3$. 2022 saw a marginal concentration increase to $8\mu\text{g}/\text{m}^3$ however, this concentration remains reasonably low and within the Scottish PM_{2.5} NAQS (annual mean) NAQS objective. 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, SO₂ 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 SO₂ could also impact local PM_{2.5} concentrations.

Long-term trend analysis has been completed on two sites for PM_{2.5} and can be shown in Appendix A, Figures 15 and 16. In general terms, there has been a long-term reduction in PM_{2.5} concentrations at the A7 Falkirk West Bridge Street and in general no change in concentrations recorded at the A8 Grangemouth AURN site since 2017.

3.2.4 Sulphur Dioxide (SO₂)

Table A.8 in Appendix A compares the ratified continuous monitored SO₂ concentrations for year 2022 with the air quality objectives for SO₂.

In 2022, Falkirk Council monitored SO₂ at six locations. Four of the sites are located within the Grangemouth AQMA (15-minute NAQS objective) and two of the sites are located outwith.

There were no exceedances of the SO₂ objectives (15-minute, hourly or daily) recorded at any of the Falkirk Council monitoring locations during 2022.

There have been over nine years where the SO₂ (annual mean) results at all Grangemouth AQMA automatic monitoring locations (Grangemouth AURN, Moray, Municipal Chambers and Zetland Park) have complied with the SO₂ NAQS (15min mean) objective of 266µg/m³, not to be exceeded more than thirty-five times a year (at each monitoring site).

Polar roses displaying average SO₂ concentrations for the Grangemouth sites are shown in Appendix A 'Figure 23, A) to H)'.

3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene

Carbon Monoxide

No monitoring undertaken.

Lead

No monitoring undertaken.

1, 3-Butadiene

In 2022, Falkirk Council monitored 1, 3-butadiene at three locations using passive diffusion tubes. All the results recorded were within the NAQS objective and are shown in Appendix A, 'Table A.9'. No changes have occurred since the submission of the previous APR.

Benzene

In 2022, Falkirk Council monitored benzene at sixteen locations using passive diffusion tubes. In addition, at the A8 Grangemouth AURN site, a pumped diffusion tube operates as

part of the AURN network. The results from the passive diffusion tubes are shown in Appendix A Table A.10 with the pumped diffusion tube results shown in Appendix A Table A.11.

All the benzene concentrations recorded by the passive diffusion tubes were within the NAQS objectives. Ten tubes achieved 100% data capture (NA3, NA37, NA38, NA41, NA44, NA55, NA77, NA80, NA94 and NA105). Five tubes achieved 91% annual data capture (NA21, NA42, NA81, NA116 and NA117). One tube achieved 83% annual data capture (NA27).

In 2022, the pumped diffusion tube at the A8 Grangemouth AURN site recorded an annual average concentration of $0.66\mu\text{g}/\text{m}^3$. The concentration recorded continues to be within the relevant annual mean NAQS objective (of $3.25\mu\text{g}/\text{m}^3$) and is a slight decrease (of $0.02\mu\text{g}/\text{m}^3$) compared to 2021's result ($0.68\mu\text{g}/\text{m}^3$).

4 New Local Developments

4.1 Road Traffic Sources

Narrow Congested Streets

There have been no significant changes from last year's APR. There are no new locations that are likely to be considered as congested residential streets that have not been assessed in previous APRs or are not already in AQMAs.

Busy Streets

Falkirk Council has not identified any streets where pedestrians may spend one hour or more in close proximity to road traffic.

For information: the Falkirk Council automatic air monitoring network recorded no exceedances of the NO₂ NAQS (1hr mean) and the NO₂ non-automatic diffusion tube NAQS objectives in 2022.

Roads with a High Flow of Buses and / or HGVs

Since the closure of the Falkirk town centre bus station in August 2018, additional buses are using Upper Newmarket Street. As this road has witnessed an increase in bus traffic, Falkirk Council have kept the additional NO₂ (diffusion tube) monitoring location on Glebe Street (NA118) and nearby Upper Newmarket Street (NA50) active.

HGVs may have been reduced as the restrictions impacted on non-essential retail and non-essential activities that would be dependent on delivery vehicles within the Upper Newmarket Street area.

Junctions

There were no new road junctions constructed during 2022 within the Falkirk Council area.

New Roads Constructed or Proposed

There were no new roads constructed or proposed during 2022 within the Falkirk Council area.

Roads with Significantly Changed Traffic Flows

There were no roads with significantly changed traffic flows in 2022 within the Falkirk Council area.

Bus or Coach Stations

The Falkirk town centre bus station was located adjacent to Meadow Street and closed in August 2018 after many years of operation. Bus routes have subsequently been diverted via the Upper Newmarket Street hub since the closure of the main town centre bus station. There are no new bus or coach stations constructed or planned for the foreseeable future within the Falkirk Council area.

4.2 Other Transport Sources

Airports

The nearest major airport to the Falkirk Council area is Edinburgh. The Airport's "Terminal and Transit Passengers" in 2022 were 11,250,211^{Ref 3} - this is an increase of 272% from 2021 (3,024,960). This airport does not need considering further as it is greater than 1km from the Falkirk Council boundary.

Falkirk Council is not aware of any significant changes to Cumbernauld airport. This is a small airport situated near to the Falkirk Council boundary.

No other new airports are constructed or planned for the foreseeable future.

Stationary trains

Falkirk Council has not identified any new locations where locomotives or trains are stationary for more than 15-minutes that would not have been assessed in previous APRs.

Railways (diesel and steam trains)

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

Ports for Shipping

Falkirk Council confirms that there are no ports or shipping that requires further consideration. The Grangemouth Port is the nearest major port within the Falkirk Council area and this has been operating for many years.

4.3 Industrial Sources

Industrial Installations – New / Proposed Installations

No applications were received for any new / proposed industrial installations in the Falkirk Council area in 2022.

4.4 Commercial and Domestic Sources

Biomass Combustion Plants

Falkirk Council did not receive any applications in 2022 for any proposed biomass combustion plants.

Biomass Combustion Plants – Combined Sources

Falkirk Council has received no significant number of:

- Complaints about nuisance dust or odour relating to burning from domestic biomass appliances.
- Visual signs of chimney smoke being emitted from several properties in close proximity to each other.
- Significant odours 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.

4.4.3 Domestic Solid Fuel Burning

In 2022, Falkirk Council had received a large volume of complaints in relation to smoke and odour from domestic biomass sources such as wood burning stoves, open garden bonfires and fire pits etc. These complaints were thoroughly investigated and advice was provided on smoke control area rules, Department for Environment Food and Rural Affairs (DEFRA) approval of stoves including using authorised fuels, guidance on efficient stove use and recommended regular maintenance / smoke minimisation measures. Relevant and current guidance is now provided by Falkirk Council Environmental Health within the initial planning phase of new residential and commercial developments in relation to installing new combustion appliances such as wood burning stoves. This guidance includes adhering to local smoke control area rules, DEFRA approval of stoves, using

authorised fuels and providing information on flue height and termination to allow effective smoke dispersal to minimise local smoke / odour nuisance.

A map of the smoke control areas in the Falkirk Council area is available to view via Falkirk Council website at: <http://www.falkirk.gov.uk/services/environment/environmental-policy/air-quality/smoke-control-areas.aspx>

A new Falkirk Council webpage was developed in 2022 to provide relevant guidance on solid fuel appliances (SFA) such as wood burning stoves to residents:

<https://www.falkirk.gov.uk/services/environment/environmental-policy/air-quality/solid-fuel.aspx>

Combined Heat and Power (CHP) Plant

Falkirk Council did not receive any planning applications in 2022 for any CHP plant.

4.5 New Developments with Fugitive or Uncontrolled Sources

New Waste Management Facility – Ironworks Business Centre, Falkirk

Falkirk Council received an application from MGR Industrial services in October 2022 seeking to develop a new waste management facility within the Ironworks Business Centre in Falkirk. Ground preparation works were proposed which included the sifting and movement of soils / ground materials.

ITP Energised were commissioned by MGR Industrial to undertake a Dust Risk Assessment to satisfy Falkirk Council air quality requirements. The assessment was undertaken in accordance with Institute of Air Quality Management (IAQM) guidance (IAQM, 2014). It is unlikely that air quality / dust issues should arise if the good practice mitigation measures outlined in Section 5 are fully implemented with regards to the construction phase of the development.

All stated guidance and policy documents appear to be current, applicable and correct.

The ITP Energised (Ref: 5838 v1) construction dust risk assessment for the proposed new waste management development at the Ironworks Business Centre, Falkirk was assessed as satisfactory.

New Waste Management Facility – Dalgrain Road, Grangemouth – SEPA Consultation

Falkirk Council received an application from Elis in November 2022 seeking to develop a small-scale waste transfer station on Dalgrain Road, Grangemouth. Falkirk Council were statutory consultees on the Waste Management License (WML) application process managed by SEPA.

The application for the waste permitted on site comprises of washroom waste, sharps, medicinal waste, and empty aerosol canisters from commercial and industrial premises. Waste is proposed to be collected by the operator and stored onsite before transferring it to a suitably licenced facility for disposal.

The following statements were considered for the management of dust and odour onsite when the facility becomes operational:

Dust Control

“It is regarded that the operations Elis UK Limited carry out would produce a negligible amount of dust due to the nature of the waste accepted considered highly unlikely to contain dust. Wastes are visually inspected before collection, if a waste appears to contain dusty materials it will be rejected in accordance with the Waste Rejection Procedure outlined in section 4 of the Environmental Management System (Ref: 21/012d).”

Odour Control

“Elis UK Limited plan to store washroom waste which, due to its nature, could cause some odour. Odour will be minimised in accordance with the waste acceptance procedure, waste will be double bagged before collection / arrival and will be stored in sealed bins triple, containing the waste. Minimising the risk of odour release: Good housekeeping measures are implemented to further reduce any risks of malodour escaping the Site. Waste storage bins are cleaned on a regular basis to minimise risk of odour developing.”

Odour and dust issues arising from site operation should be minimised and managed via the appropriate SEPA WML. During site operation, any complaints of dust, and odour attributable to the site will fall within the remit of SEPA for investigation.

5 Planning Applications

Proposed Residential Development at Drum Farm, Bo'ness

Falkirk Council received an application in December 2021 from Miller Homes seeking planning permission to build two-hundred and twenty-five residential dwellings on land at Drum Farm, Bo'ness.

Increased road traffic emissions (NO₂, PM₁₀ and PM_{2.5}) from the operational phase of the planned development and a construction dust management plan was requested by Falkirk Council Environmental Health to be assessed within the AQIA which was produced by The Airshed consultancy on 22nd December 2021 (Airshed Ref: AS 0877).

Increased road traffic from the planned development has been fully assessed in Section 5 'Model Results' with impacts at nearest human receptor plots being stated as "well below the statutory Limit Value" for nitrogen dioxide (NO₂) and "levels of PM₁₀ and PM_{2.5} are predicted to comply with the Scottish Government's annual mean NAQS Objectives" across the site.

It is unlikely that air quality / dust issues should arise if the mitigation measures outlined in Appendix 3 'Dust Control Measures During Construction' are fully implemented with regards to the construction phase of the development.

All legislation, policies, standards, methods and guidance referenced within the report were assessed as current, applicable and correct at the time of the report being drafted. The Airshed air quality impact assessment (Ref: AS 0877 Drum Farm) for the Drum Farm, Bo'ness proposed residential development was assessed by Falkirk Council Environmental Health as satisfactory.

Proposed Residential Development at Garngrew Road, Banknock

Falkirk Council received an application in April 2016 from S Brown Builders seeking planning permission to build nineteen residential dwellings on land at Garngrew Road, Banknock. The planning application was reviewed in February 2022.

Increased road traffic from the planned development has been fully assessed in section 5 'Baseline Model Results' with impacts at nearest human receptors being stated in Section

7 'Conclusions' as "predicted concentrations across all parts of the site are below NAQS objectives for both NO₂ and PM₁₀ based on a minimum stand-off distance of 15m from the motorway". All legislation, policies and guidance referenced within the report are current, applicable and correct at the time of the report being published. It was noted that the Banknock AQMA (declared for PM₁₀ annual mean) was revoked in January 2021.

The ITP Energised air quality assessment (Ref: 10546) for the Garngrew Road, Banknock proposed residential development was assessed as satisfactory by Falkirk Council Environmental Health.

Proposed Residential Development on Land at Rosebank North, Dunipace

Falkirk Council received an application in March 2022 from Ogilvie Homes seeking planning permission to build eighty-seven residential dwellings on land at Rosebank North, Dunipace.

Increased road traffic emissions (NO₂, PM₁₀ and PM_{2.5}) from the operational phase of the planned development and a construction dust management plan was requested by Falkirk Council Environmental Health to be assessed within the AQIA which was produced by En-Safe consultancy on 18th March 2022 (En-Safe Ref: AQ75328).

The report states with "An assessment was undertaken using the EPS and RTPPI screening criteria to determine the potential for vehicle trips generated by the Proposed Development to affect local air quality. The traffic data provided by Dougall Baillie Associates, indicated that Proposed Development is anticipated to generate a maximum AADT flow of 472 on the local road network. Anticipated development traffic flows are below the relevant EPS and RTPPI assessment thresholds and operational impacts could be screened out as not significant.."

The report continues "A further review of the DEFRA pollutant background maps indicated that the annual mean NO₂, PM₁₀ and PM_{2.5} concentrations are expected to be below the relevant AQOs across the Proposed Development. When assessing the existing background levels in the vicinity of the site and distance to specific monitoring locations, it is considered that future site users would not be exposed to unacceptable NO₂, PM₁₀ and PM_{2.5} concentrations.."

The AQIA states that it is unlikely that air quality / dust issues should arise if the mitigation measures outlined in 'Construction Phase Methodology' are fully implemented with regards to the construction phase of the development.

Falkirk Council found that the first version of the report required some information (AQMAs, APR etc.) to be updated to maintain accuracy. A second version of the En-Safe AQIA report (AQ75328r1) was issued and assessed as acceptable by Falkirk Council Environmental Health.

Proposed Residential Development at Bensfield Farm, Stenhousemuir

Falkirk Council received an application in March 2022 from Miller Homes seeking planning permission to build two-hundred and fifty residential dwellings on land at Bensfield Farm, Stenhousemuir.

Increased road traffic from the planned development has been fully assessed in section 5 with impacts at nearest human receptors being stated as "negligible". Traffic associated with the construction phase of the proposed development will be of relatively short duration and of smaller magnitude compared to the operational phase traffic. ITP have stated that construction traffic will not exceed the Environmental Protection United Kingdom (UPUK) & IAQM criteria and have scoped out the need for a Detailed Assessment of construction phase traffic.

All legislation, policies and guidance referenced within the report are current, applicable and correct at the time of the report being published. The ITP air quality impact assessment (Ref:4725) for the Bensfield Farm, Stenhousemuir proposed residential development was assessed by Falkirk Council Environmental Health as satisfactory.

Proposed Residential Development at Roughlands, Carronshore

Falkirk Council received an application in October 2022 from Taylor Wimpey Homes seeking planning permission to build one-hundred and fifty residential dwellings on land at Roughlands, Carronshore.

Increased road traffic from the planned development has been fully assessed in Section 3.4 'Modelled Roads' with impacts at nearest sensitive human receptors being stated as "negligible" for the pollutants: nitrogen dioxide (NO₂) and particulate matter (PM₁₀ + PM_{2.5}).

A construction dust impact assessment with mitigation measures was requested by Falkirk Council Environmental Health during the planning process for this development. In response to this, Section 1.1 “Scope of Report” states:

“A Construction Dust Assessment (CDA) and Construction Dust Management Plan (CDMP) in line with methodology set out in the IAQM guidance document ‘Guidance on the Assessment of Dust from Demolition and Construction’ (2016) will be carried out at a later stage in the planning process when sufficient information is available to determine the site-specific risk levels and appropriate mitigation measures.”

All legislation, policies, standards, methods and guidance referenced within the report were current, applicable and correct at the time of drafting. The Envirocentre air quality impact assessment (Ref: 13017) for the proposed residential development in Roughlands, Carronshore in Falkirk was assessed as satisfactory by Falkirk Council Environmental Health.

6 Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

In 2022, the air quality within the Falkirk Council area continued to be good from 2021.

There were no NAQS objective exceedances recorded throughout Falkirk Council's air quality monitoring network in 2022.

The Falkirk Council air quality monitoring results for all pollutants measured have shown a decrease in NAQS objective exceedances from 2019 for all pollutants measured.

Nitrogen Dioxide (NO₂)

The 2022 air quality monitoring results show that all seven automatic nitrogen dioxide (NO₂) analysers in Falkirk Council's air monitoring network achieved both NO₂ NAQS (1hr and annual mean) objectives.

Particulate Matter (PM₁₀)

Falkirk Council measured particulate matter (PM₁₀) concentrations at eight site locations during 2022. The relevant Scottish NAQS objectives for PM₁₀ were achieved at all eight site locations.

Particulate Matter (PM_{2.5})

Falkirk Council measured particulate matter (PM_{2.5}) concentrations at eight site locations during 2022. The relevant Scottish NAQS objectives for PM_{2.5} were achieved at all eight site locations.

Sulphur Dioxide (SO₂)

In 2022, Falkirk Council monitored SO₂ at six site locations. Four of the monitoring sites are located within the Grangemouth AQMA (declared for 15-minute SO₂ NAQS objective) and two of the sites are located outwith this AQMA.

There were no exceedances of the SO₂ NAQS objectives (15-minute, hourly or daily) recorded at any of the Falkirk Council monitoring site locations during 2022.

Benzene and 1,3-Butadiene

The benzene and 1, 3-butadiene diffusion tube monitoring completed by Falkirk Council in 2022 met the NAQS (annual running mean) objectives for each pollutant respectively.

The AQMAs that are currently active in the Falkirk Council area are:

1. Falkirk Town Centre AQMA - Declared on 31st January 2013 for NO₂ (annual mean)

The Falkirk town centre NO₂ (annual mean) AQMA remains justified as although there were no exceedances of the NAQS objective recorded in 2022, there have been consecutive diffusion tube exceedances (such as the NA27 Falkirk West Bridge Street location) in previous years which haven't been affected by Coronavirus (COVID-19) Scottish Government travel restrictions^{Ref1}.

It is anticipated that the Falkirk town centre AQMA (NO₂ annual mean) will be revoked by December 2023 if relevant (automatic and non-automatic) AQ monitoring results continue to comply with the NAQS objective.

2. Grangemouth AQMA - Declared on 1st November 2005 SO₂ (15min mean)

There have been over eight years where the SO₂ (annual mean) results at all Grangemouth AQMA automatic monitoring locations (Grangemouth AURN, Moray, Municipal Chambers and Zetland Park) have complied with the SO₂ NAQS (15min mean) objective of 266µg/m³, not to be exceeded more than thirty-five times a year (at each monitoring site).

In 2021/22, Scottish Government LAQM funding was provided to undertake a critical assessment of the Grangemouth AQMA in accordance with relevant LAQM guidance following years of compliance with NAQS for SO₂ (15min mean). This follows on from the initial Falkirk Council [Grangemouth Emissions Study](#) completed by consultants Sweco in 2020 and Phase 2 of the study being developed in 2023.

It is anticipated that the Grangemouth AQMA (SO₂ 15min mean) will be revoked in by October 2023 if relevant AQ results continue to comply with the NAQS objective.

6.2 Conclusions relating to New Local Developments

All new local developments that were deemed to be significant in terms of their impact on air quality have been summarised in the following previous sections within this APR: **4.3 Industrial Sources (p.25), 4.4 Commercial or Domestic Sources (p.25), 4.5 New Developments with Fugitive or Uncontrolled Sources (p.26) and 5. Planning Applications (p.28)**. All developments within these sections had AQIAs (or Dust and Odour Assessments) requested and assessed by Falkirk Council Environmental Health. All new local development AQIAs were assessed as satisfactory and no objections to these developments were submitted to the Planning department on the grounds of significant air quality concerns.

6.3 Proposed Actions

It is anticipated that the Falkirk town centre AQMA (NO₂ annual mean) will be revoked by December 2023 if relevant (automatic and non-automatic) AQ monitoring results continue to comply with the NAQS objective.

It is anticipated that the Grangemouth AQMA (SO₂ 15min mean) will be revoked in by October 2023 if relevant AQ results continue to comply with the NAQS objective.

A five-year Falkirk Council Air Quality Strategy will be drafted after the above revocation work is completed. This is expected in 2024 following AQMA revocations.

Falkirk Council will continue to have (automatic, reference method and non-automatic methods) air quality monitoring capabilities for many years to come. It is anticipated that annual Scottish Government LAQM funding will continue to be provided to ensure air quality monitoring continuity and improvements. This will provide a valuable resource for public health resources into the future.

The Air Quality Progress Report (APR) as required by the Scottish Government shall be submitted by Falkirk Council in June 2024.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Inlet Height (m)
A3	Bo'ness	Urban Background / Industrial	299815	681481	SO ₂	N	SO ₂ : Horiba, APSA 370, UV Fluorescence.	5	22	1.2
A4	Falkirk Haggs	Roadside	278977	679271	NO ₂ , PM ₁₀ , PM _{2.5}	Y (NO ₂)	NO ₂ : API Teledyne T200, Chemiluminescence. PM _{10+2.5} : Palas Fidas 200 (Optical).	5	2	1.2
A5	Falkirk Hope Street	Roadside	288688	680218	SO ₂ , NO ₂ , PM ₁₀ , PM _{2.5}	Y (NO ₂ and PM ₁₀)	SO ₂ : API Teledyne T100, UV Fluorescence. NO ₂ : API Teledyne T200,, Chemiluminescence. PM _{10+2.5} : Palas Fidas 200 (Optical).	1	5	1.5
A7	Falkirk West Bridge Street	Roadside	288457	680064	NO ₂ , PM ₁₀ , PM _{2.5}	Y (NO ₂ and PM ₁₀)	NO ₂ : API Teledyne T200, Chemiluminescence. PM _{10+2.5} : Palas Fidas 200 (Optical).	1	2	1.2

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)
A8	Grangemouth Automatic Urban and Rural Network (AURN)	Urban Background / Industrial	293830	681022	Benzene, SO ₂ , NO ₂ , PM ₁₀ and PM _{2.5}	Y (SO ₂)	Benzene: Pumped absorption tube. SO ₂ : API Teledyne T100, UV Fluorescence. NO ₂ : API Teledyne T200, Chemiluminescence. PM ₁₀ : Met One 1020 Beta Attenuation Monitor (BAM). PM _{2.5} : Met One 1020 Beta Attenuation Monitor (BAM).	5	20	3.5
A9	Grangemouth Moray	Urban Background / Industrial	293469	681321	SO ₂ , NO ₂	Y (SO ₂)	SO ₂ : Horiba APSA 370, UV Fluorescence. NO ₂ : API Teledyne T200, Chemiluminescence.	1	25	3.5
A10	Grangemouth Municipal Chambers	Urban Background / Industrial	292816	682009	SO ₂ , NO ₂ , PM ₁₀ , PM _{2.5}	Y (SO ₂)	SO ₂ : Horiba APSA 370, UV Fluorescence. NO ₂ : API Teledyne T200, Chemiluminescence. PM _{10+2.5} : Palas Fidas 200 (Optical).	1	40	3.5
A11	Grangemouth Zetland Park	Urban Background / Industrial	292969	681106	SO ₂ , PM ₁₀ , PM _{2.5}	Y (SO ₂)	SO ₂ : API Teledyne T100, UV Fluorescence. PM _{10+2.5} : Palas Fidas 200 (Optical).	1	135	3.5
A14	Banknock 3	Urban Background	277168	679254	PM ₁₀ , PM _{2.5}	N (PM ₁₀)	Turnkey Osiris (Optical)	19	17	1.3
A15	Main St, Bainsford	Roadside	288566	681508	NO ₂ , PM ₁₀	N	NO ₂ : API Teledyne T200, Chemiluminescence. PM _{10+2.5} : Palas Fidas 200 (Optical).	1	2	1.2

Notes:

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

(2) N/A if not applicable.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Tube Height (m)
NA3	Tinto Drive, Grangemouth	Urban Background	293427	680386	Benzene, NO ₂	N	<5	2.6	N	3
NA5	Copper Top pub, Camelon	Roadside	287332	680333	NO ₂	N	<2	0.6 (Traffic Island)	N	2.3
NA9	Bellsdyke Rd, Larbert	Roadside	286048	683542	NO ₂	N	<2	0.7	N	2.5
NA19	Kilsyth Rd, Banknock	Roadside	278779	679301	NO ₂	N	<2	2.2	N	1.9
NA20	Garnrew Rd, Haggs	Urban Background	278957	679172	NO ₂	N	<5	1.5	N	2.5
NA21	Grangemouth Rd, Falkirk College	Roadside	290112	680500	Benzene, NO ₂	N	<2	1.8	N	2.5
NA24	Kerse Lane, Falkirk	Roadside	289189	680018	NO ₂	Y, FTC AQMA	<2	3	N	2.5
NA26	Weir St, Falkirk	Urban Background	289207	680123	NO ₂	Y, FTC AQMA	<5	1.7	N	2.5
NA27	West Bridge St, Falkirk	Roadside	288490	680055	Benzene, NO ₂	Y, FTC AQMA	<2	0.5	Y	2.2
NA29	Wellside Place, Falkirk	Urban Background	288467	680220	NO ₂	N	<5	1.6	N	2.4
NA36	Kerr Crescent, Haggs	Roadside	278985	679273	NO ₂	N	<5	2.1	N	2.5
NA37	Denny Town House	Urban Centre	281226	682526	Benzene, NO ₂	N	<5	8.9	N	2.5
NA38	Larbert Village Primary School	Urban Background	285937	682309	Benzene, NO ₂	N	<5	2.3	N	2.4
NA41	Seaview Place, Bo'ness	Roadside	299722	681594	Benzene, 1,3 Butadiene, NO ₂	N	<2	0.1	N	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Tube Height (m)
NA42	Municipal Chambers, Grangemouth	Urban Centre / Industrial	292817	682000	Benzene, NO ₂	N	<5	37.5	Y	3
NA44	Harvey Avenue, Polmont	Urban Background	293720	678911	Benzene, NO ₂	N	<5	1.6	N	2.4
NA48	Hayfield, Falkirk	Urban Background	289197	681564	NO ₂	N	<5	3.1	N	2.5
NA50	Upper Newmarket St, Falkirk	Urban Background	288671	680047	NO ₂	Y, FTC AQMA	<5	9	N	2.3
NA51	Mary St, Laurieston	Roadside	290965	679490	NO ₂	N	1	4.5	N	2.4
NA52	Main St, Larbert	Roadside	285866	682356	NO ₂	N	<2	4.4	N	2.6
NA53	Denny Cross	Roadside	281211	682727	NO ₂	N	<2	0.8	N	2.9
NA58	Callendar Rd, Falkirk	Roadside	290194	679624	NO ₂	N	<2	0.5	N	2.5
NA59	Carron Rd, Bainsford	Roadside	288392	681931	NO ₂	N	<2	1.2	N	2.4
NA60	Ronades Rd, Carron	Roadside	288133	681587	NO ₂	N	<2	1.6	N	2.3
NA61	Canal Rd, Falkirk	Roadside	287976	680656	NO ₂	N	<2	1.5	N	2.3
NA62	Arnot St, Falkirk	Roadside	289125	679705	NO ₂	Y, FTC AQMA	<2	1.2	N	2.1
NA63	Camelon Rd, Falkirk	Urban Background	288055	680134	NO ₂	On FTC AQMA boundary	<5	1.4	N	2.3
NA64	New Hallglen Rd, Falkirk	Roadside	288807	678422	NO ₂	N	<2	1.7	N	2.7
NA65	Redding Rd, Redding	Roadside	291356	678644	NO ₂	N	<2	0.6	N	2.4
NA67	Queen St, Falkirk	Urban Background	289430	680433	NO ₂	N	<5	1.8	N	2.9

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Tube Height (m)
NA69	Kerse Lane, Falkirk	Roadside	289025	679991	NO ₂	Y, FTC AQMA	<2	2.3	N	2.7
NA71	Park St, Falkirk	Roadside	288910	680112	NO ₂	Y, FTC AQMA	<2	1.5	N	2.1
NA72	Vicar St, Falkirk	Roadside	288824	680120	NO ₂	Y, FTC AQMA	<2	1.5	N	2.5
NA73	West Bridge St RHS, Falkirk	Roadside	288467	680048	NO ₂	Y, FTC AQMA	<2	0.3	N	2.5
NA76	Tryst Rd, Stenhousemuir	Roadside	286851	683229	NO ₂	N	<2	1.8	N	2.4
NA77	Kinnaird Village	Roadside	286490	683775	Benzene, NO ₂	N	<2	3.9	N	2.5
NA78	Glen Brae, Falkirk	Roadside	288525	678991	NO ₂	N	<2	2.6	N	2.2
NA80	Cow Wynd, Falkirk	Roadside	288765	679456	Benzene, NO ₂	N	<2	1.8	N	2.5
NA81	Grahams Rd, Falkirk	Roadside	288817	680911	Benzene, NO ₂	N	<2	0.5	N	2.3
NA82	Castings Av, Falkirk	Roadside	288858	681036	NO ₂	N	<2	1	N	2.5
NA83	Main St, Bainsford	Roadside	288614	681415	NO ₂	N	<2	0.5	N	2.6
NA85	Auchincloch Dr, Banknock	Roadside	278752	679049	NO ₂	N	<2	0.8	N	2.5
NA86	Wolfe Rd, Falkirk	Urban Background	289667	679871	NO ₂	N	<2	2	N	2.5
NA87	M80 Slip South, Hags	Roadside	279017	679305	NO ₂	N	<2	1.6	N	1.8
NA88	Ure Crescent, Bonnybridge	Roadside	282444	681074	NO ₂	N	<2	1.7 (16 to M876)	N	2.5
NA89	Grahams Rd / Meeks Rd, Falkirk	Roadside	288856	680336	NO ₂	Y, FTC AQMA	<2	2.2	N	2.3
NA94	A905 (Glensburgh	Roadside	291213	681074	NO ₂	N	7	5.4	N	2.4

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Tube Height (m)
	Road), Grangemouth									
NA98	Arnothill, Falkirk	Urban Background	288080	680073	NO ₂	N	23	1.6	N	2.2
NA99	St Crispins Pl, Falkirk	Roadside	288924	679675	NO ₂	Y, FTC AQMA	7.6	2.7	N	2
NA101	Glensburgh Rd (2), Grangemouth	Roadside	291127	682007	NO ₂	N	7	0.9	N	2.2
NA105	West of Shieldhill	Rural	288279	676875	Benzene, NO ₂	N	Background Rural Site	1.7	N	1.6
NA107	Main St (East), Bainsford	Roadside	288640	681396	NO ₂	N	4	0.5	N	2.3
NA111	Falkirk West Bridge St, Air Quality Station	Urban Centre	288457	680064	NO ₂	Y, FTC AQMA	4.3	2.3	Y	1.8
NA114	Glasgow Rd, Camelon	Roadside	286624	680577	NO ₂	N	2	0.5	N	2.6
NA115	Brown St, Camelon	Urban Background	286761	680413	NO ₂	N	2	1.5	N	2.1
NA116	Kersiebank Avenue, Grangemouth	Urban Background / Industrial	293671	680347	Benzene, NO ₂	N	2	2.75	N	2.27
NA117	Oswald Avenue (East), Grangemouth	Urban Background / Industrial	294101	681532	Benzene, NO ₂	Y, GM AQMA	2.5	2.2	N	2.27
NA118	Glebe Street, Falkirk	Roadside	288726	680096	NO ₂	Y, FTC AQMA	2.5	1.6	N	2.27
NA119	Hendry Street, Falkirk	Urban Background	288728	681383	NO ₂	N	3	1.3	N	2.3
NA120	Powdrake Road, Grangemouth	Roadside / Industrial	294097	681488	Benzene, NO ₂ , 1,3 Butadiene	Y, GM AQMA	2.9	1.9	N	2.4
NA121	Beancross Roundabout, Grangemouth	Roadside	291956	680522	NO ₂	Y, GM AQMA	3	1.6	N	2.1

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO₂ Monitoring Results (µg/m³)

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2022 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2018	2019	2020	2021	2022
A4	Falkirk Haggs	Automatic	87	87	28	27	18	21	18
A5	Falkirk Hope St	Automatic	95	95	21	20	14	15.5	14
A7	Falkirk West Bridge St	Automatic	100	100	39	38	27	31.4	27
A8	Grangemouth AURN	Automatic	92	92	14	15	11	13.1	14
A9	Grangemouth Moray	Automatic	99	99	17	15	12	13.8	12
A10	Grangemouth Municipal Chambers	Automatic	86	86	18	17	12	13.4	14
A15	Main St, Bainsford	Automatic	89	89	22	25	20.3	19.7	19
NA3	Tinto Drive, Grangemouth	Diffusion Tube	100	100	18	19	15	14.9	13
NA5	Copper Top pub, Camelon	Diffusion Tube	100	100	24	27	19	19.3	18
NA9	Bellsdyke Rd, Larbert	Diffusion Tube	100	100	22	23	18	17	16
NA19	Kilsyth Rd, Banknock	Diffusion Tube	100	100	28	27	21	19.9	18
NA20	Garngrew Rd, Haggs	Diffusion Tube	100	100	22	22	18	16.6	17
NA21	Grangemouth Rd, Falkirk College	Diffusion Tube	100	100	28	26	21	19.7	18
NA24	Kerse Lane, Falkirk	Diffusion Tube	91.7	91.7	34	33	25	24	24
NA26	Weir St, Falkirk	Diffusion Tube	100	100	20	18	13	13.6	12
NA27	West Bridge St, Falkirk	Diffusion Tube	83.3	83.3	44	47	35	34.8	30
NA29	Wellside Pl, Falkirk	Diffusion Tube	100	100	18	17	13	12	12
NA36	Kerr Crescent, Haggs	Diffusion Tube	91.7	91.7	37	35	27	25.2	24
NA37	Denny Town House	Diffusion Tube	100	100	17	17	14	12.6	12
						16			
NA38	Larbert Village Primary School	Diffusion Tube	100	100	17		13	12.1	11
NA41	Seaview Pl, Bo'ness	Diffusion Tube	100	100	22	23	19	17.4	16
NA42	Municipal Chambers, Grangemouth	Diffusion Tube	100	100	19	19	15	14.1	13
NA44	Harvey Av, Polmont	Diffusion Tube	100	100	19	18	14	13.1	12
NA48	Hayfield, Falkirk	Diffusion Tube	100	100	18	19	15	15.7	13

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2022 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2018	2019	2020	2021	2022
NA50	Upper Newmarket St, Falkirk	Diffusion Tube	100	100	24	24	18	18.2	15
NA51	Mary St, Laurieston	Diffusion Tube	100	100	24	24	18	16.8	17
NA52	Main St, Larbert	Diffusion Tube	100	100	23	22	20	18	17
NA53	Denny Cross	Diffusion Tube	83.3	83.3	26	27	21	19.9	18
NA58	Callendar Rd, Falkirk	Diffusion Tube	100	100	23	21	16	14.5	14
NA59	Carron Rd, Bainsford	Diffusion Tube	100	100	28	29	23	21.8	21
NA60	Ronades Rd, Carron	Diffusion Tube	66.7	66.7	24	25	21	19.8	22
NA61	Canal Rd, Falkirk	Diffusion Tube	100	100	24	23	19	17.9	16
NA62	Arnot St, Falkirk	Diffusion Tube	91.7	91.7	34	34	27	23.6	25
NA63	Camelon Rd, Falkirk	Diffusion Tube	100	100	35	34	27	27	24
NA64	New Hallglen Rd, Falkirk	Diffusion Tube	100	100	16	17	11	11.4	10
NA65	Redding Rd, Redding	Diffusion Tube	100	100	24	24	19	18.1	15
NA67	Queen St, Falkirk	Diffusion Tube	83.3	83.3	27	26	22	21.7	20
NA69	Kerse Lane, Falkirk	Diffusion Tube	100	100	32	30	23	23.3	21
NA71	Park St, Falkirk	Diffusion Tube	100	100	31	30	25	24.4	22
NA72	Vicar St, Falkirk	Diffusion Tube	100	100	26	27	22	20.8	18
NA73	West Bridge St RHS, Falkirk	Diffusion Tube	91.7	91.7	31	31	24	23.4	21
NA76	Tryst Rd, Stenhousemuir	Diffusion Tube	100	100	20	20	16	15	14
NA77	Kinnaird Village	Diffusion Tube	100	100	22	23	18	17.3	16
NA78	Glen Brae, Falkirk	Diffusion Tube	100	100	30	28	21	19.7	19
NA80	Cow Wynd, Falkirk	Diffusion Tube	100	100	28	30	25	19.8	20
NA81	Grahams Rd, Falkirk	Diffusion Tube	100	100	30	32	24	22.1	21
NA82	Castings Av, Falkirk	Diffusion Tube	91.7	91.7	19	18	15	13.3	13
NA83	Main St, Bainsford	Diffusion Tube	75	75	34	34	25	25.1	24
NA85	Auchincloch Dr, Banknock	Diffusion Tube	100	100	19	20	14	13.9	14
NA86	Wolfe Rd, Falkirk	Diffusion Tube	100	100	16	16	12	11.3	10
NA87	M80 Slip South, Hags	Diffusion Tube	100	100	28	31	21	21	19
NA88	Ure Crescent, Bonnybridge	Diffusion Tube	100	100	27	27	20	20.1	19

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2022 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2018	2019	2020	2021	2022
NA89	Grahams Rd / Meeks Rd, Falkirk	Diffusion Tube	100	100	30	30	23	21.8	20
NA94	A905 (Glensburgh Rd), Grangemouth	Diffusion Tube	83.3	83.3	31	30	24	22.4	21
NA98	Arnohill, Falkirk	Diffusion Tube	100	100	18	13	16	15.4	14
NA99	St Crispins Pl, Falkirk	Diffusion Tube	100	100	25	25	20	18.2	18
NA101	Glensburgh Rd (2), Grangemouth	Diffusion Tube	91.7	91.7	23	23	17	16.3	15
NA105	West of Shieldhill	Diffusion Tube	100	100	8	8	6	5.8	5
NA107	Main St (East), Bainsford	Diffusion Tube	100	100	27	30	23	18.9	17
NA111	Falkirk West Bridge St, Air Quality Station	Diffusion Tube	100	100	37	38	31	29.4	27
NA114	Glasgow Rd, Camelon	Diffusion Tube	58.3	58.3	39	41	31	28.9	25
NA115	Brown St, Camelon	Urban Background	100	100	18	19	13	13.2	11
NA116	Kersiebank Avenue, Grangemouth	Urban Background / Industrial	100	100	New Location for 2019	20	15	15.1	14
NA117	Oswald Avenue (East), Grangemouth	Urban Background / Industrial	100	100	New Location for 2019	20	15	13.6	12
NA118	Glebe Street, Falkirk	Roadside	75	75	New Location for 2019	23	18	17.3	15
NA119	Hendry Street, Falkirk	Urban Background	91.7	91.7	New Location for 2019	22	18	17.4	15
NA120	Powdrake Road, Grangemouth	Roadside / Industrial	91.7	91.7	New Location for 2022				14
NA121	Beancross Roundabout, Grangemouth	Roadside	100	100	New Location for 2022				19

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in bold.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG(22) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

- (1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
- (2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Figure 1 – Long Term Annual Mean Diffusion Tube Concentrations

Long Term (5 Years) NO₂ Annual Mean Results:
DT Locations in 2022 with Highest NO₂ Annual Concentrations

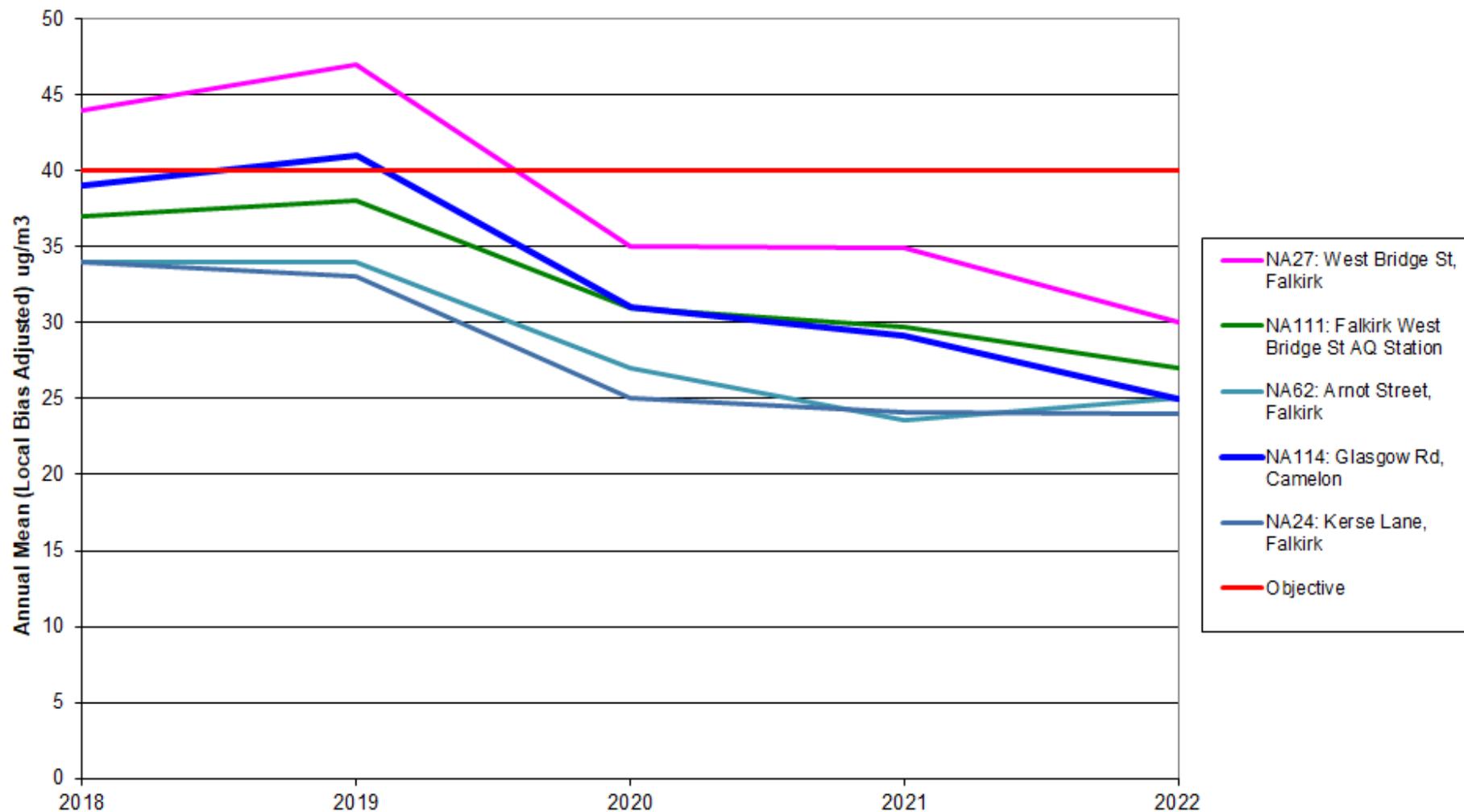


Table A.4 – 1-Hour Mean NO₂ Monitoring Results, Number of 1-Hour Means > 200µg/m³

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2022 (%) ⁽²⁾	2018	2019	2020	2021	2022
A4 Falkirk Hags	Roadside	Automatic	87	87	0	0	0	0	0
A5 Falkirk Hope St	Urban Background	Automatic	95	95	0	0	0 (81)	0	0
A7 Falkirk West Bridge St	Roadside	Automatic	100	100	0	0	0	0	0
A8 Grangemouth AURN	Urban Background / Industrial	Automatic	92	92	0	0	0	0 (71.7)	0
A9 Grangemouth Moray	Urban Background / Industrial	Automatic	99	99	0	0	0 (70)	0	0
A10 Grangemouth Municipal Chambers	Urban Background / Industrial	Automatic	86	86	0	0	0	0	0
A15 Main St, Bainsford	Roadside	Automatic	89	89	0	0	0 (88)	0	0

Notes:

Exceedances of the NO₂ 1-hour mean objective (200 µg/m³ not to be exceeded more than 18 times/year) are shown in bold.

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

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

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

Figure 3 – A5 Falkirk Hope St Long Term NO₂ Concentrations

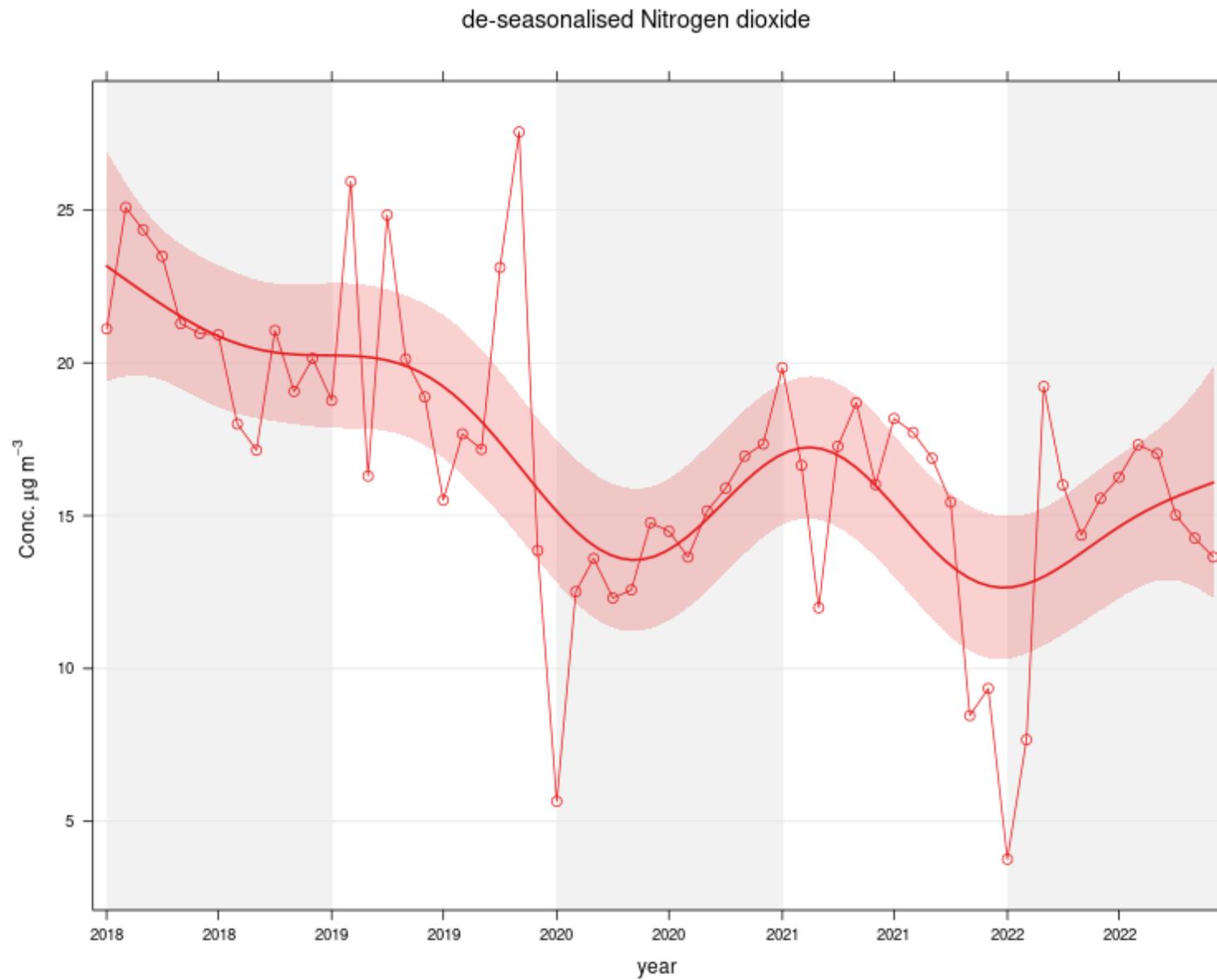


Figure 4 – A7 Falkirk West Bridge St Long Term NO₂ Concentrations

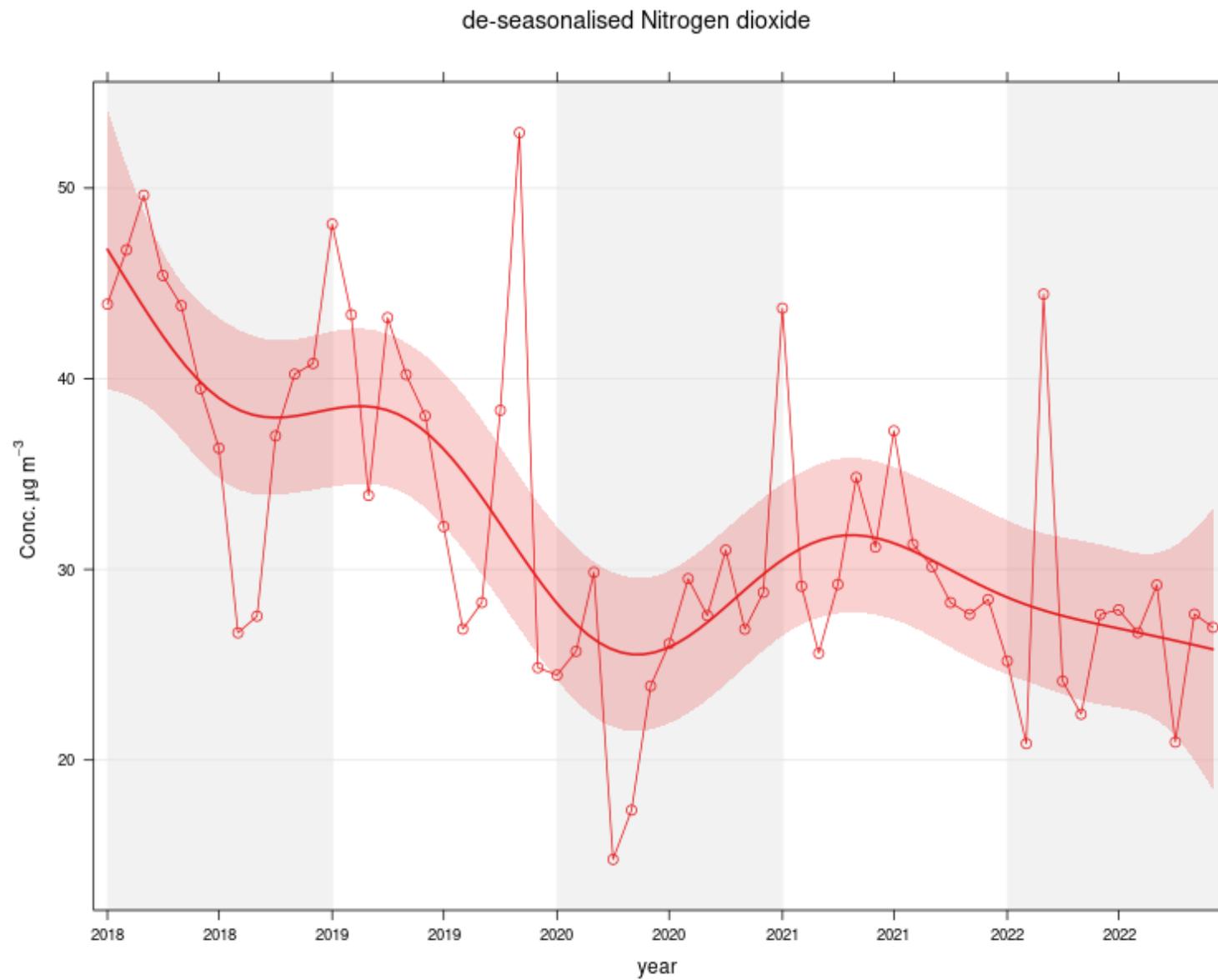


Figure 5 – A8 Grangemouth AURN Long Term NO₂ Concentrations

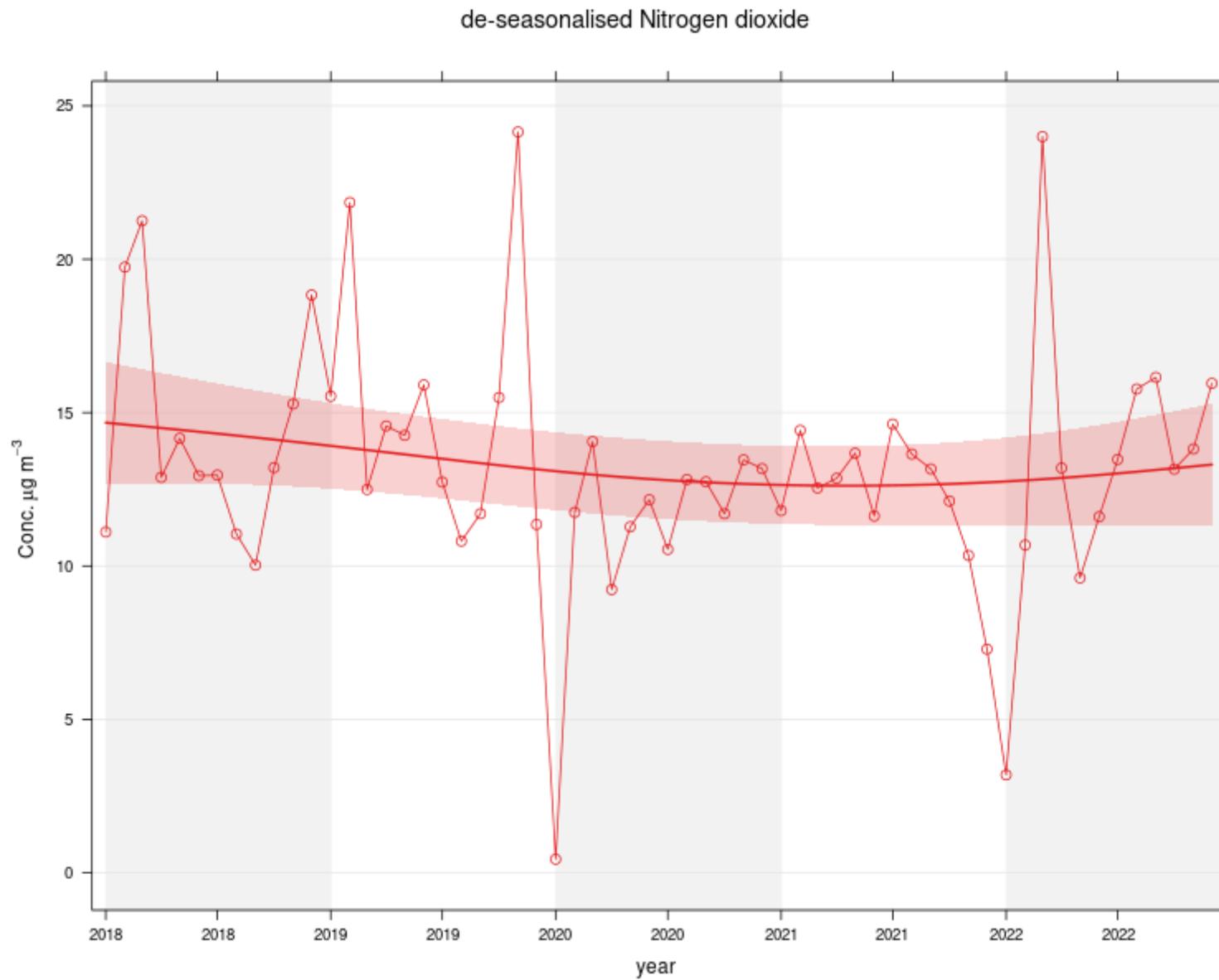


Figure 6 – A9 Grangemouth Moray Long Term NO₂ Concentrations

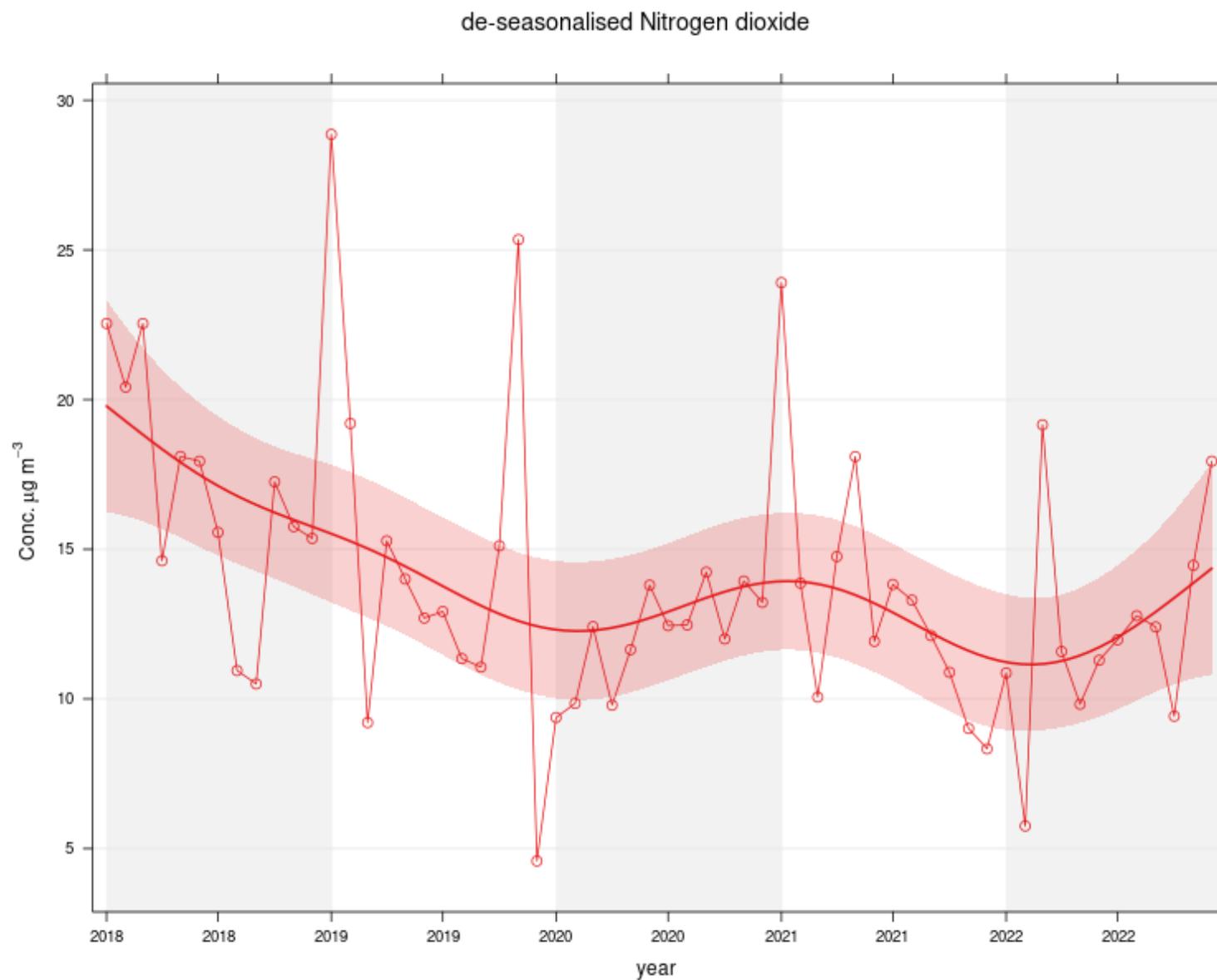


Figure 7 – A10 Grangemouth Municipal Chambers Long Term NO₂ Concentrations

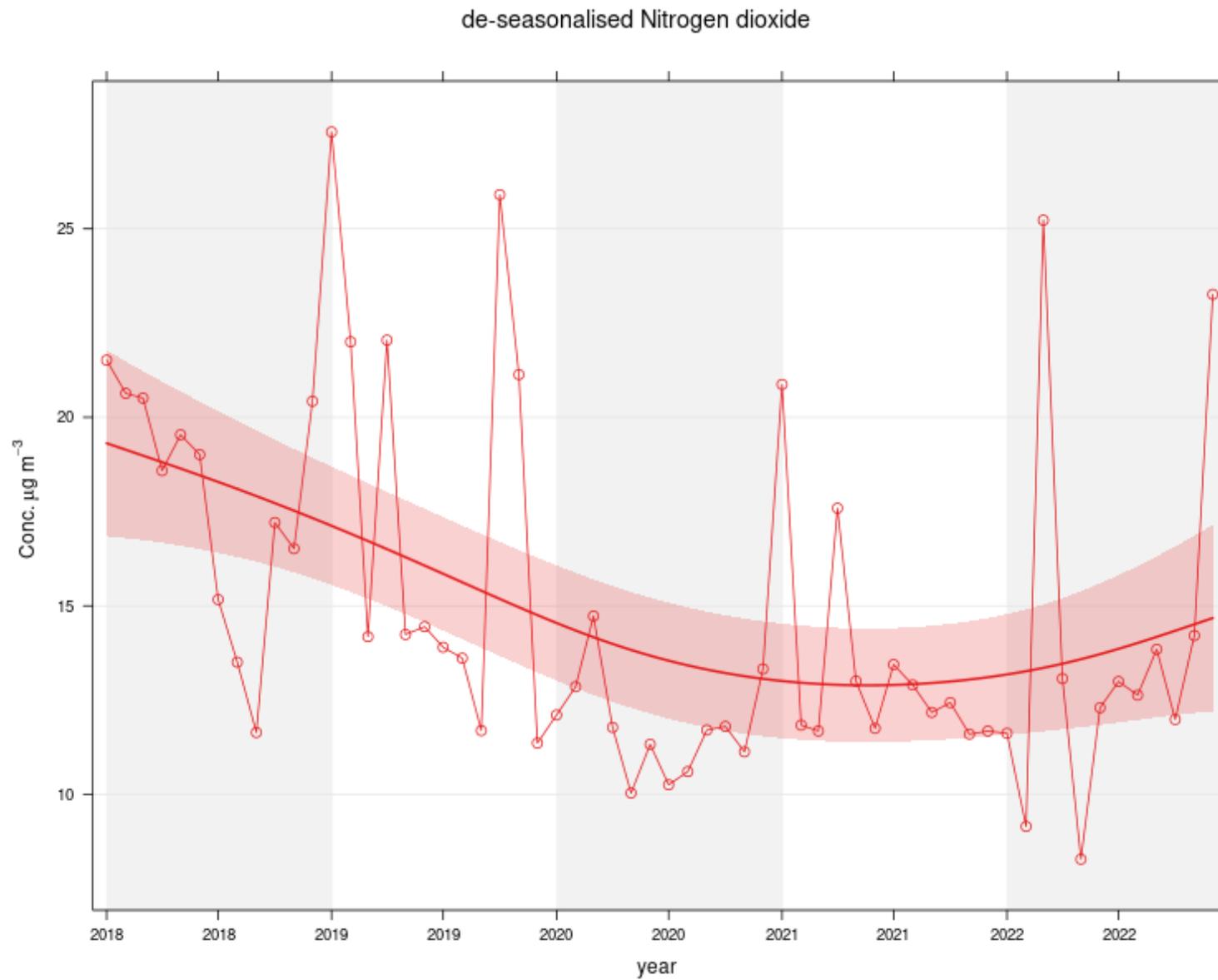


Figure 8 – A15 Main St, Bainsford Long Term NO₂ Concentrations

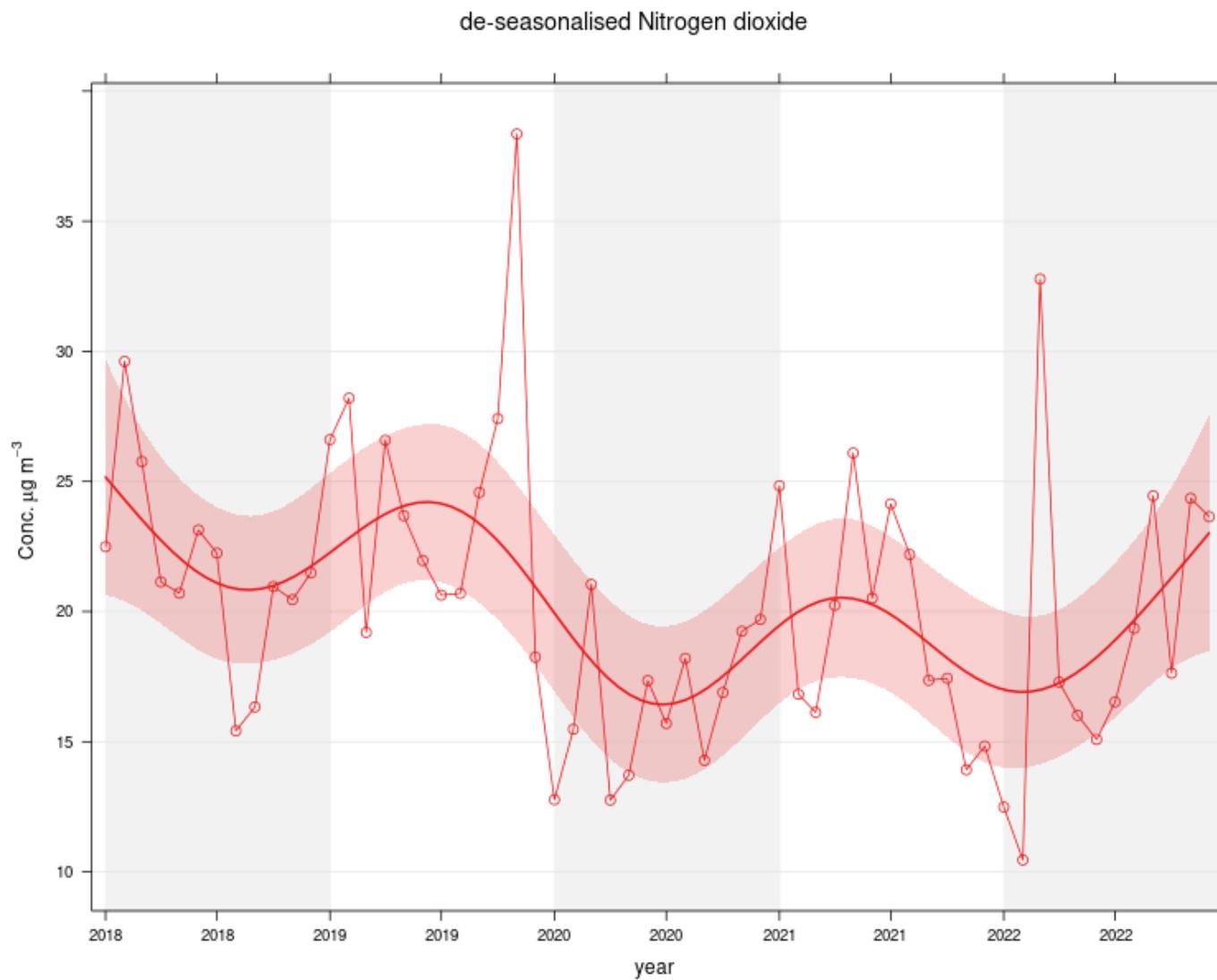


Table A.5 – Annual Mean PM₁₀ Monitoring Results (µg/m³)

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2022 (%) ⁽²⁾	2018	2019	2020	2021	2022
A4	Falkirk Haggs (Uncorrected)	97	97	14	14.1	10	10.4	11
	Falkirk Haggs (Mean Corrected – Fidas) ⁽³⁾					10.5	11.5	12.1
A5	Falkirk Hope St (Uncorrected)	98	98	11.1	13.4	9	9	9.3
	Falkirk Hope St (MC – Fidas) ⁽³⁾						9.9	10.2
A7	Falkirk West Bridge St (Uncorrected)	99	99	12.3	10.5	7.4	9.2	9.6
	Falkirk West Bridge Street (MC – Fidas) ⁽³⁾			13.5	11.5	8.1	10.1	10.6
A8	Grangemouth AURN	96	96	12	13	9	9.3	10
A10	Grangemouth Municipal Chambers (Uncorrected)	100	100	12.4	13.9	7.7	8.6	9.1
	Grangemouth Municipal Chambers (MC – Fidas) ⁽³⁾					8.5	9.5	10
A11	Grangemouth Zetland Park (Uncorrected)	97	97				8.6	9.8
	Grangemouth Zetland Park (MC - Fidas) ⁽³⁾						9.5	10.8
A14	Banknock 3	99	99	6.9	7.9	7.8	1.3	6.2
A15	Main St, Bainsford (Uncorrected)	92	92	11.6	14.4	10.6	11.1	11.2
	Main St, Bainsford (MC – Fidas) ⁽³⁾						12.2	12.3

Notes:

Exceedances of the PM₁₀ annual mean objective of 18 µg/m³ are shown in bold.

All means have been “annualised” as per LAQM.TG(22), valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

(3) In accordance with the Scottish Government Guidance Note “Measurement of Ambient Particulate Matter (PM) and the LAQM Reporting of Measured Concentrations” May 2023¹ - Corrected and uncorrected results (greyed out) are displayed for PM concentration with Fidas analysers in operation.

Table A.6 – 24-Hour Mean PM₁₀ Monitoring Results, Number of PM₁₀ 24-Hour Means > 50µg/m³

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
A4	Falkirk Haggs	97	97	0	4	0 (21)	0	0
A5	Falkirk Hope St	98	98	0 (30)	1	0	0	0
A7	Falkirk West Bridge St	99	99	0 (47)	1	0 (18)	0	0
A8	Grangemouth AURN	96	96	0	2	0	0	0
A10	Grangemouth Municipal Chambers	100	100	0	2	0 (17)	0	0
A11	Grangemouth Zetland Park	97	97				0	0
A14	Banknock 3	99	99	2 (10)	1	1 (15.6)	0 (7.4)	0
A15	Main St, Bainsford	92	92	0 (33)	5	0	0 (25)	0

Notes:

Exceedances of the PM₁₀ 24-hour mean objective (50 µg/m³ not to be exceeded more than seven times/year) are shown in bold.

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

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

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

Figure 9 – A4 Hags Long Term PM₁₀ (Hourly Measured) Concentrations

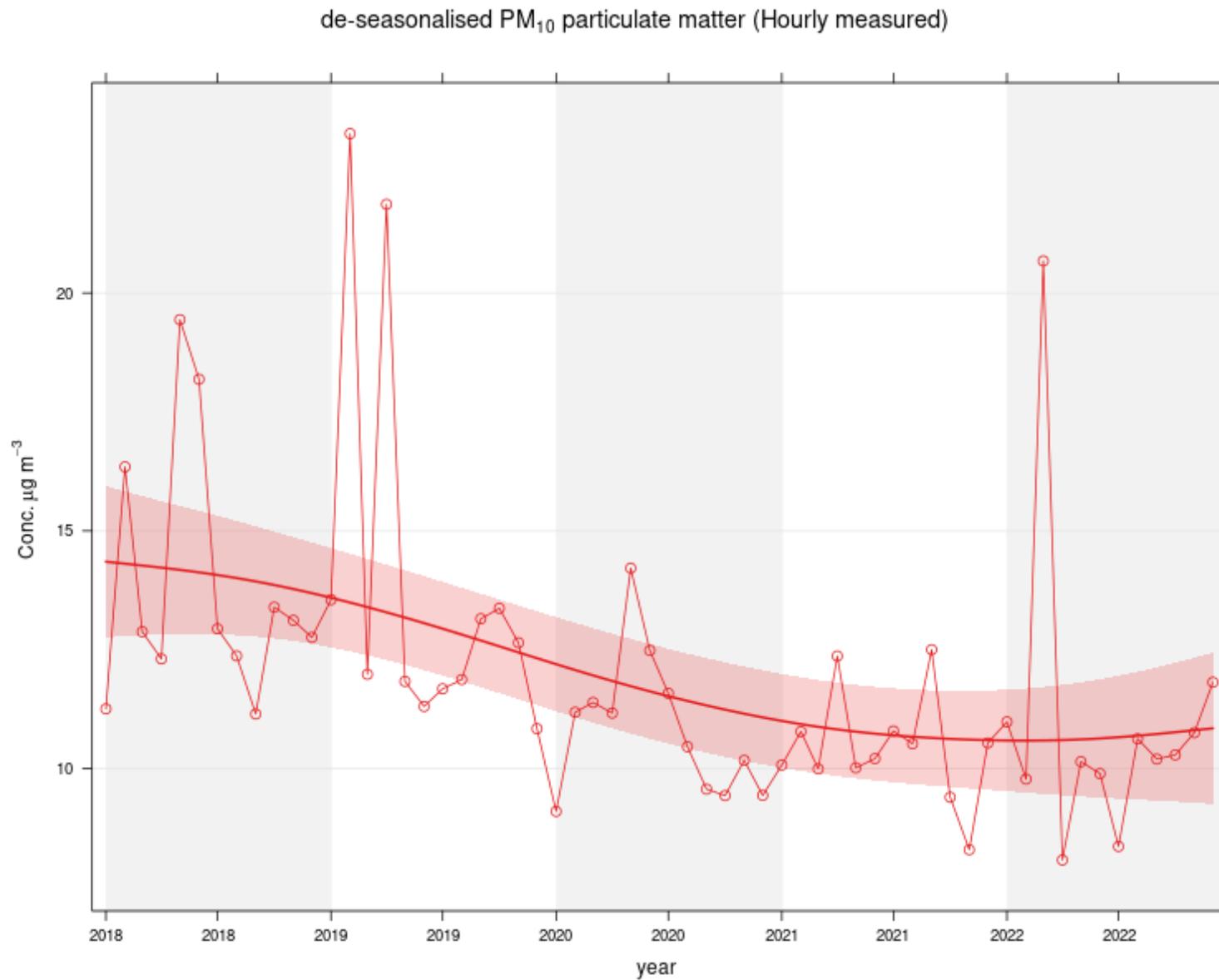


Figure 10 – A5 Falkirk Hope St Long Term PM₁₀ (Hourly Measured) Concentrations

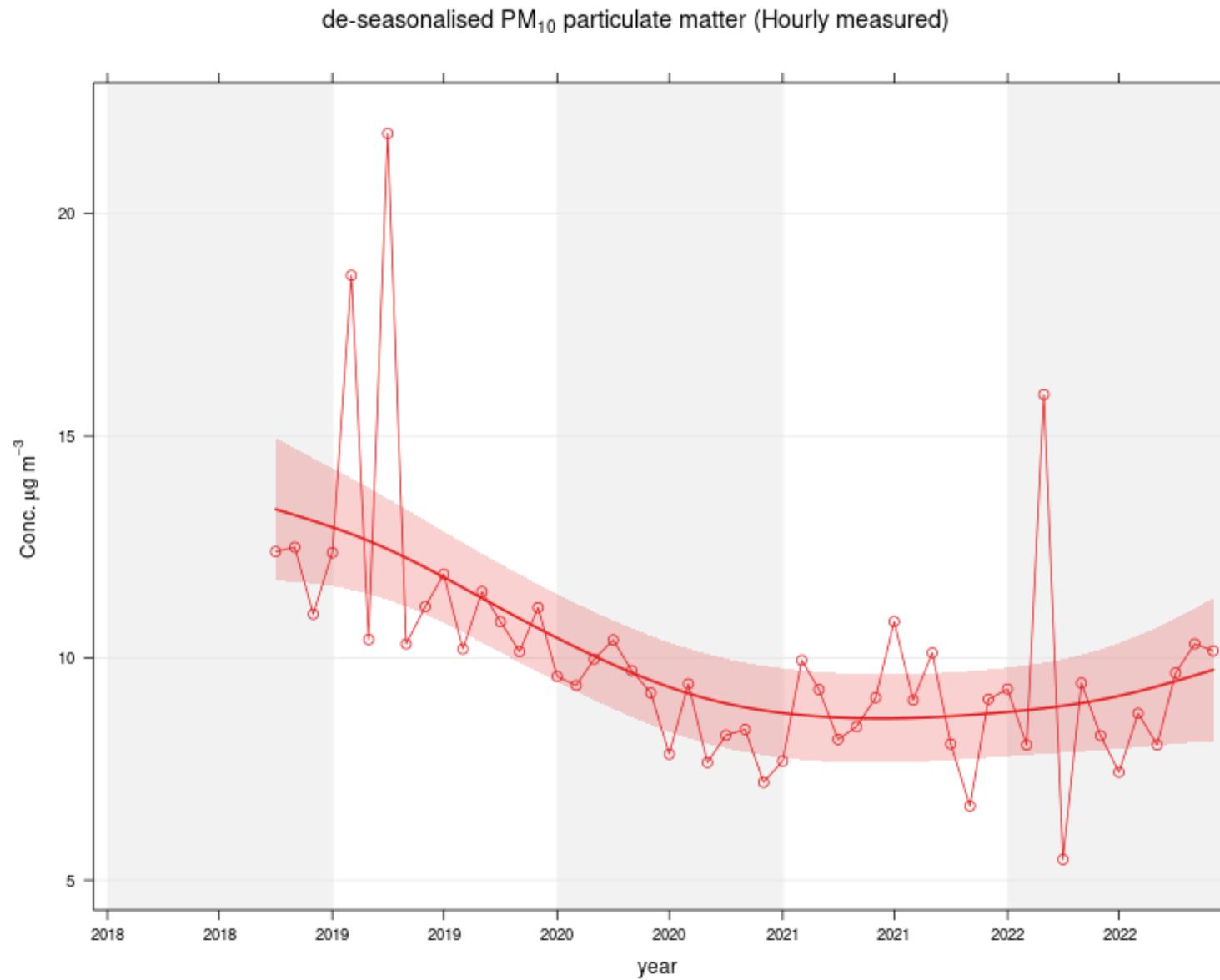


Figure 11 – A7 Falkirk West Bridge St Long Term PM₁₀ (Hourly Measured) Concentrations

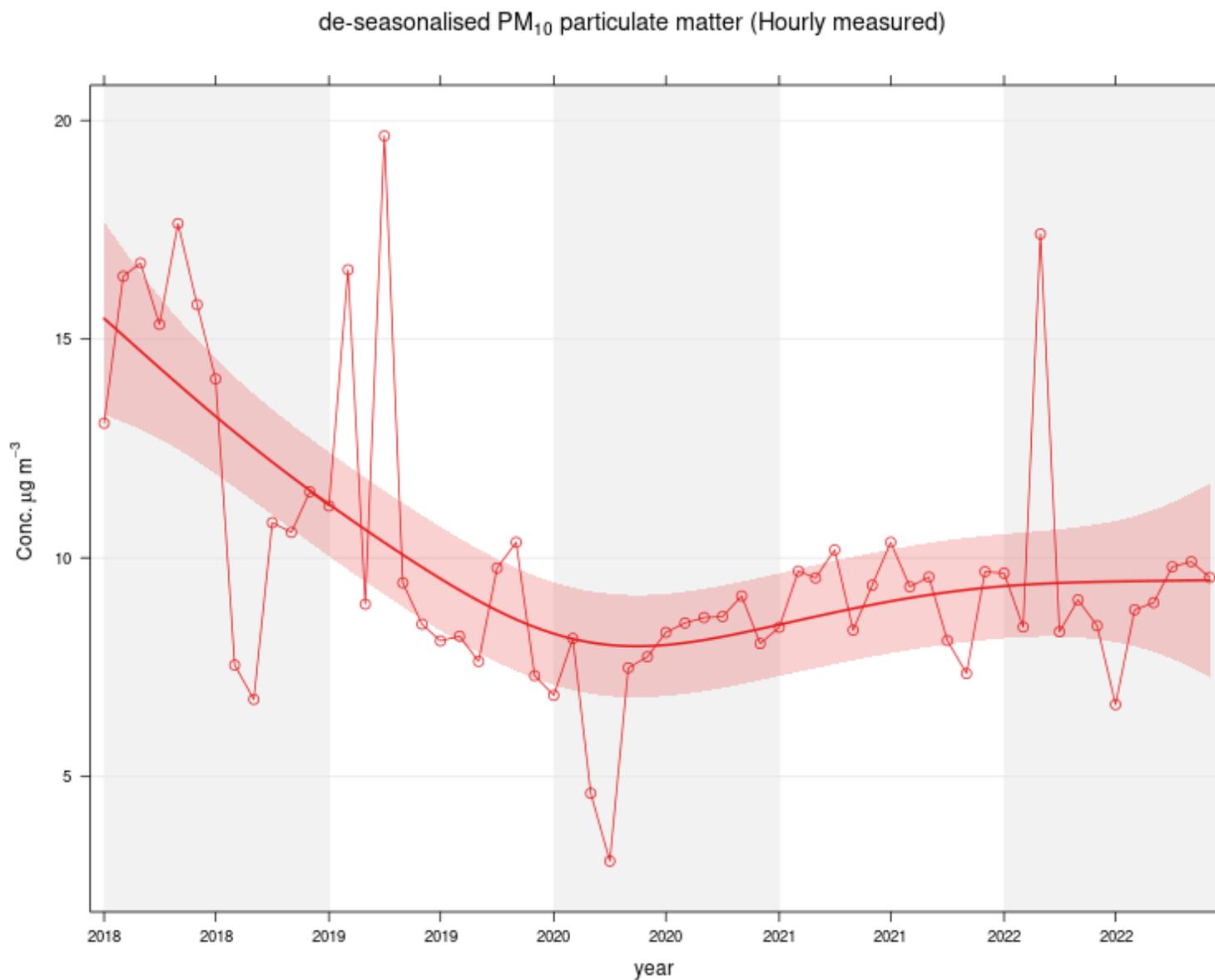


Figure 12 – A8 Grangemouth AURN Long Term PM₁₀ (Hourly Measured) Concentrations

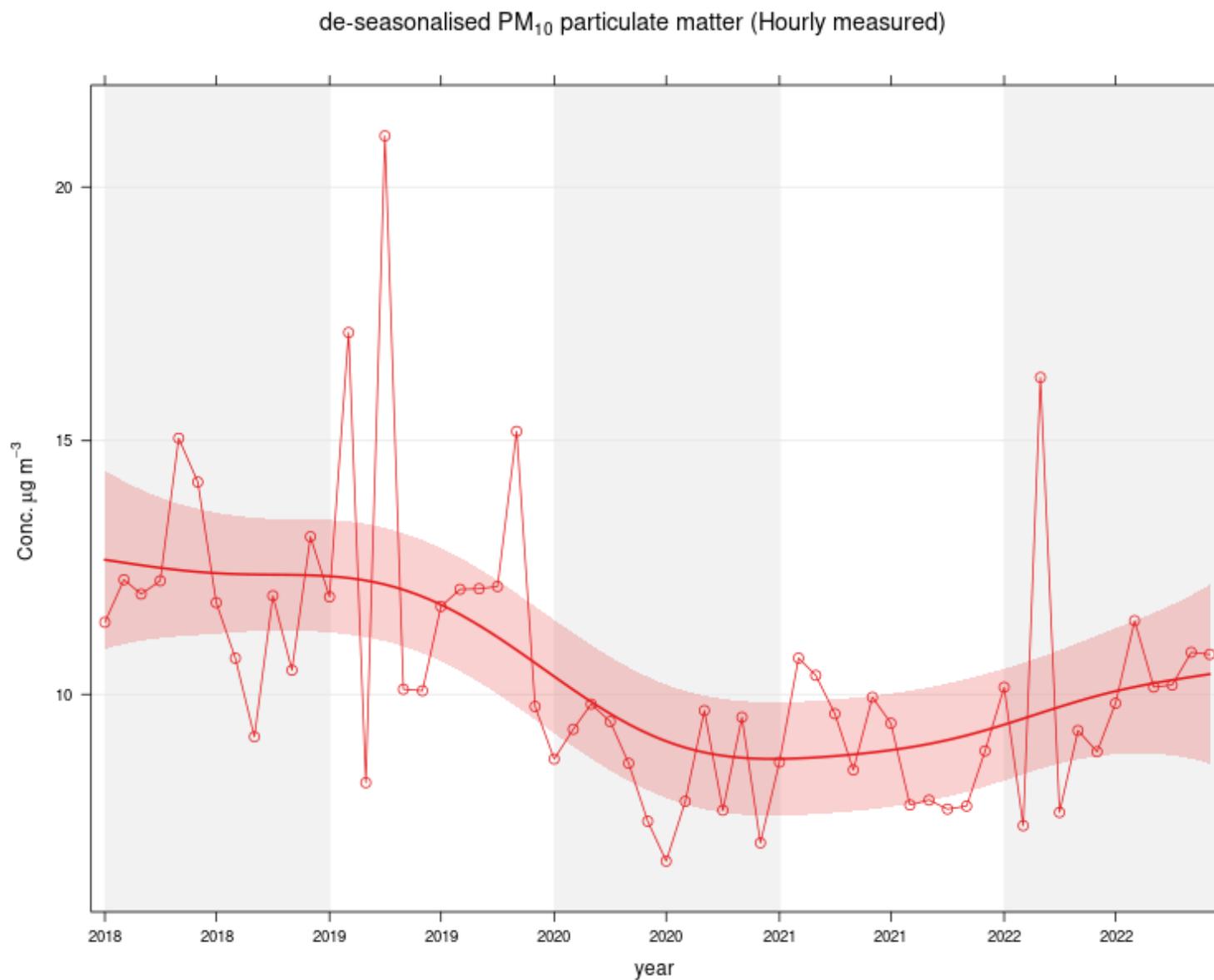


Figure 13 – A10 Grangemouth Municipal Chambers Long Term PM₁₀ (Hourly Measured) Concentrations

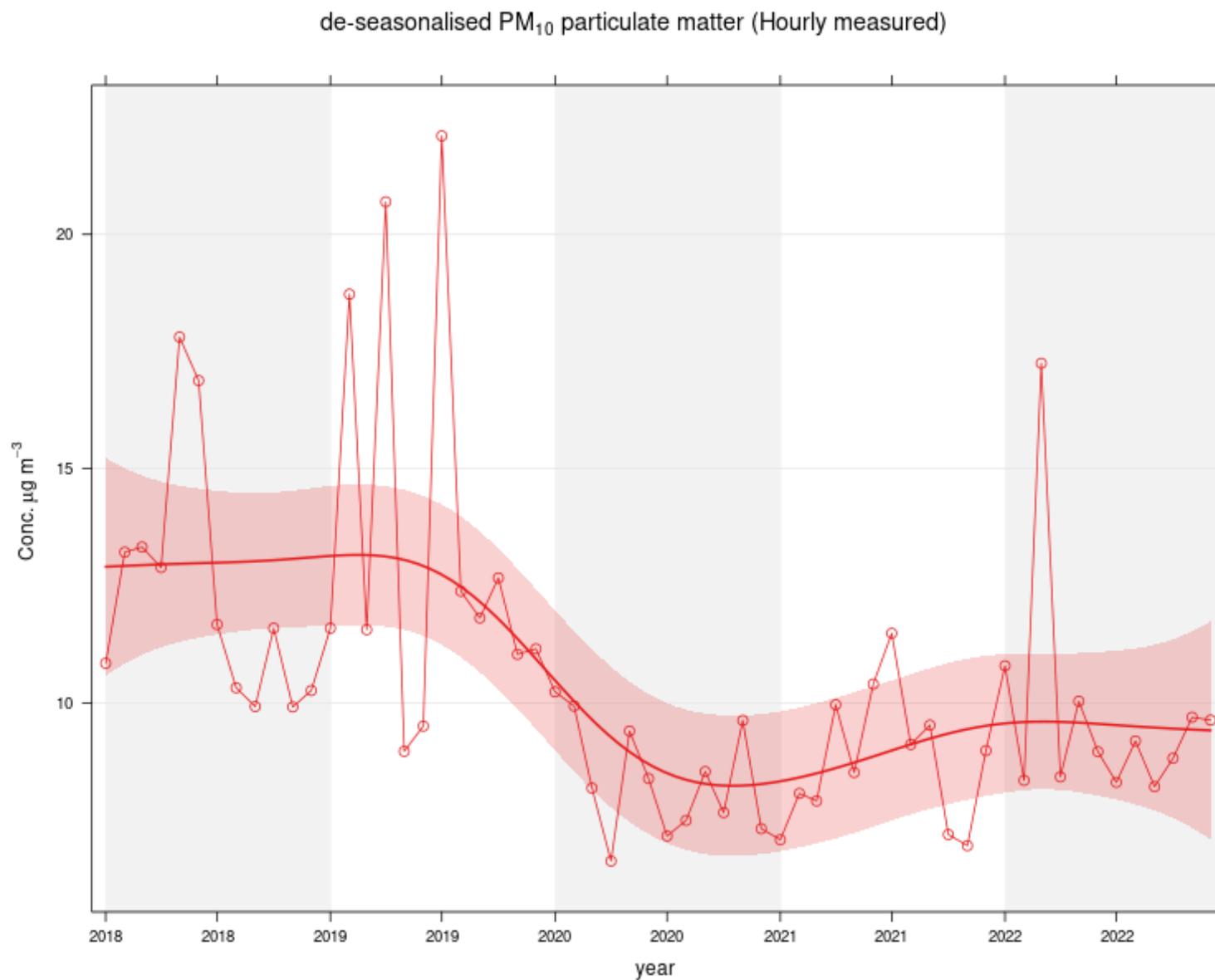


Figure 14 – A11 Grangemouth Zetland Park Long Term PM₁₀ (Hourly Measured) Concentrations

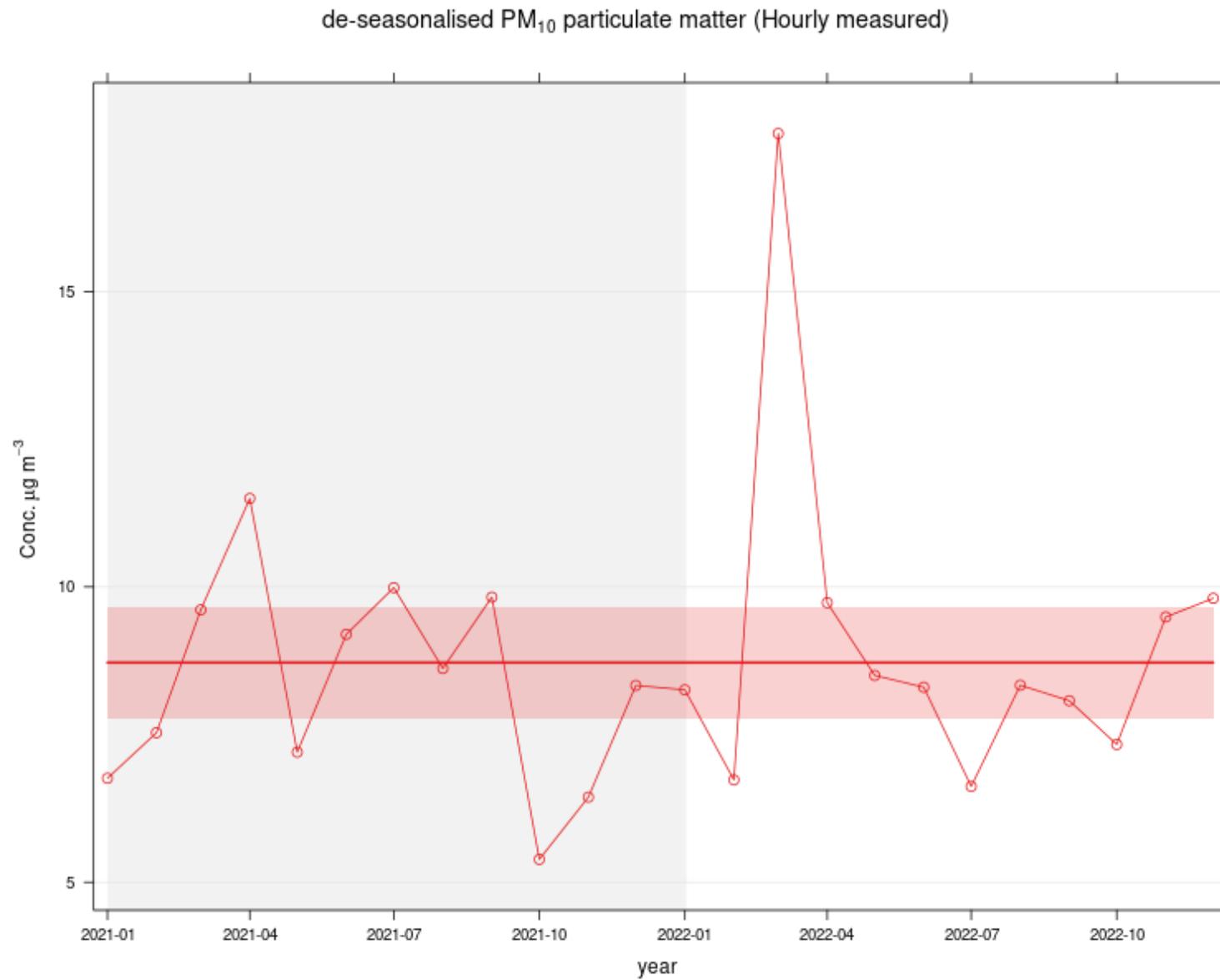


Figure 15 – A15 Main St, Bainsford Long Term PM₁₀ (Hourly Measured) Concentrations

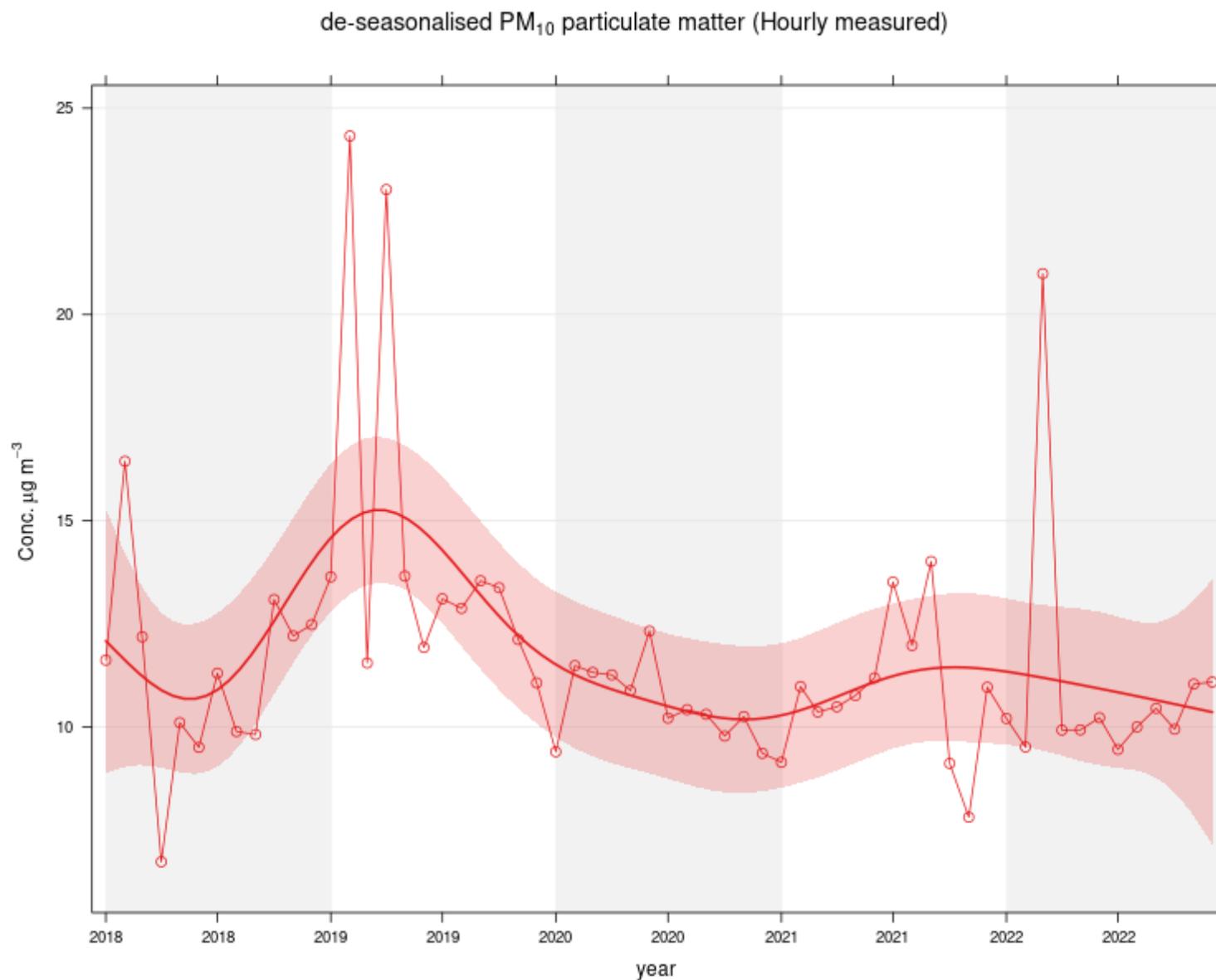


Table A.7 – Annual Mean PM_{2.5} Monitoring Results (µg/m³)

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2022 (%) ⁽²⁾	2018	2019	2020	2021	2022
A4	Falkirk Haggs (Uncorrected)	97	97			5.3	5.7	6.1
	Falkirk Haggs (Mean Corrected – Fidas) ⁽³⁾					5.6	6.1	6.4
A5	Falkirk Hope St (Uncorrected)	98	98			5.1	5	5.3
	Falkirk Hope St (MC – Fidas) ⁽³⁾						5.3	5.6
A7	Falkirk West Bridge St (Uncorrected)	99	99	6.4	5.9	4.4	4.9	5.2
	Falkirk West Bridge St (MC – Fidas) ⁽³⁾			6.8	6.2	4.7	5.2	5.5
A8	Grangemouth AURN	83	83	7	8	6	5.4	8
A10	Grangemouth Municipal Chambers (Uncorrected)	100	100			4.3	4.7	5.4
	Grangemouth Municipal Chambers (MC – Fidas) ⁽³⁾					4.5	5	5.8
A11	Grangemouth Zetland Park (Uncorrected)	97	97				5.2	5.5
	Grangemouth Zetland Park (MC – Fidas) ⁽³⁾						5.5	5.8
A14	Banknock 3	99	99	4	4.6	3.6	1	3.8
A15	Main St, Bainsford (Uncorrected)	92	92			6.2	6.1	6.2
	Main St, Bainsford (MC – Fidas) ⁽³⁾						6.4	6.5

Notes:

Exceedances of the PM_{2.5} annual mean objective of 10 µg/m³ are shown in bold.

All means have been “annualised” as per LAQM.TG(22), valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

- (2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).
- (3) In accordance with the Scottish Government Guidance Note “Measurement of Ambient Particulate Matter (PM) and the LAQM Reporting of Measured Concentrations” May 2023¹ - Corrected and uncorrected results (greyed out) are displayed for PM concentration with Fidas analysers in operation.

Figure 16 – A7 Falkirk West Bridge St Long Term PM_{2.5} Concentrations

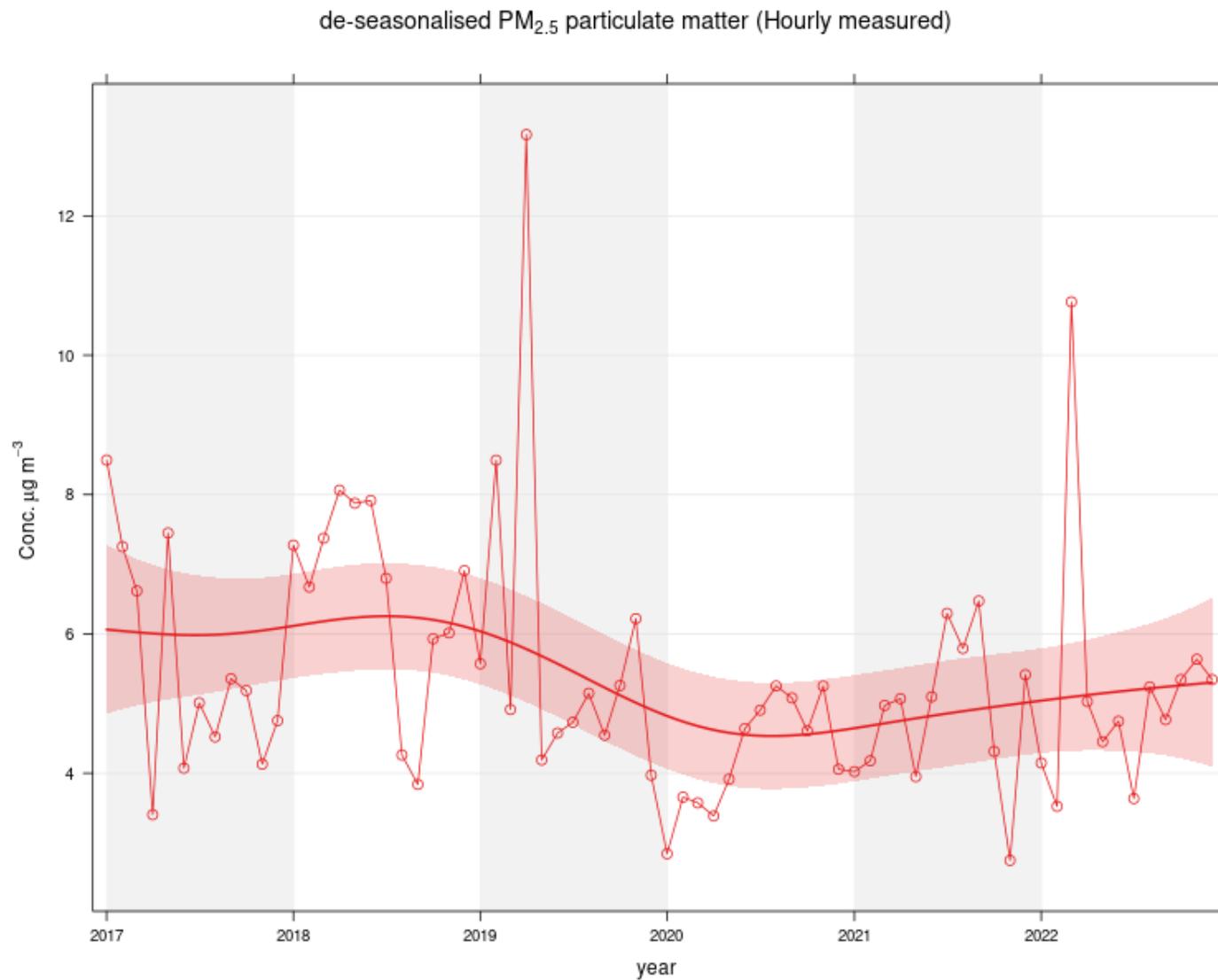


Figure 17 – A8 Grangemouth AURN Long Term PM_{2.5} Concentrations

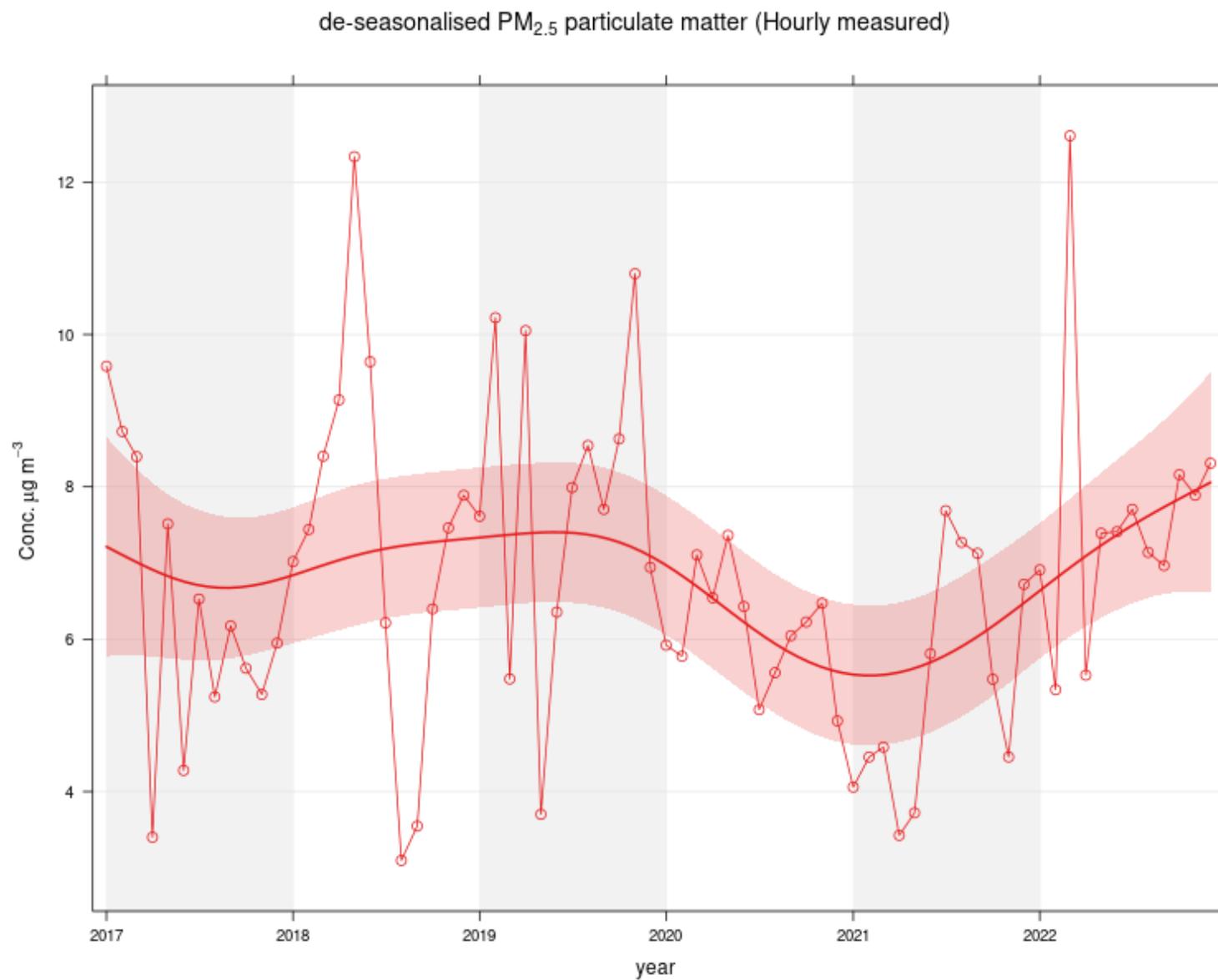


Table A.8 – SO₂ 2022 Monitoring Results, Number of Relevant Instances

Site ID	Site Type	Valid Data Capture for monitoring Period (%) ⁽¹⁾	Valid Data Capture 2022 (%) ⁽²⁾	Number of 15-minute Means > 266 µg/m	Number of 1-hour Means > 350 µg/m	Number of 24-hour Means > 125 µg/m
A3	Bo'ness	99	99	0	0	0
A5	Falkirk Hope St	96	96	0	0	0
A8	Grangemouth AURN	90	90	0	0	0
A9	Grangemouth Moray	86	86	0	0	0
A10	Grangemouth Municipal Chambers	97	97	0	0	0
A11	Grangemouth Zetland Park	91	91	0	0	0

Notes:

Exceedances of the SO₂ 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)

If the period of valid data is less than 85%, the relevant percentiles are provided in brackets (15-Minute means: 99.9th percentile, 1-hour means: 99.7th percentile, 24-hour means: 99.2nd percentile).

(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%).

Figure 18 – A3 Bo’ness Long Term SO₂ Concentrations

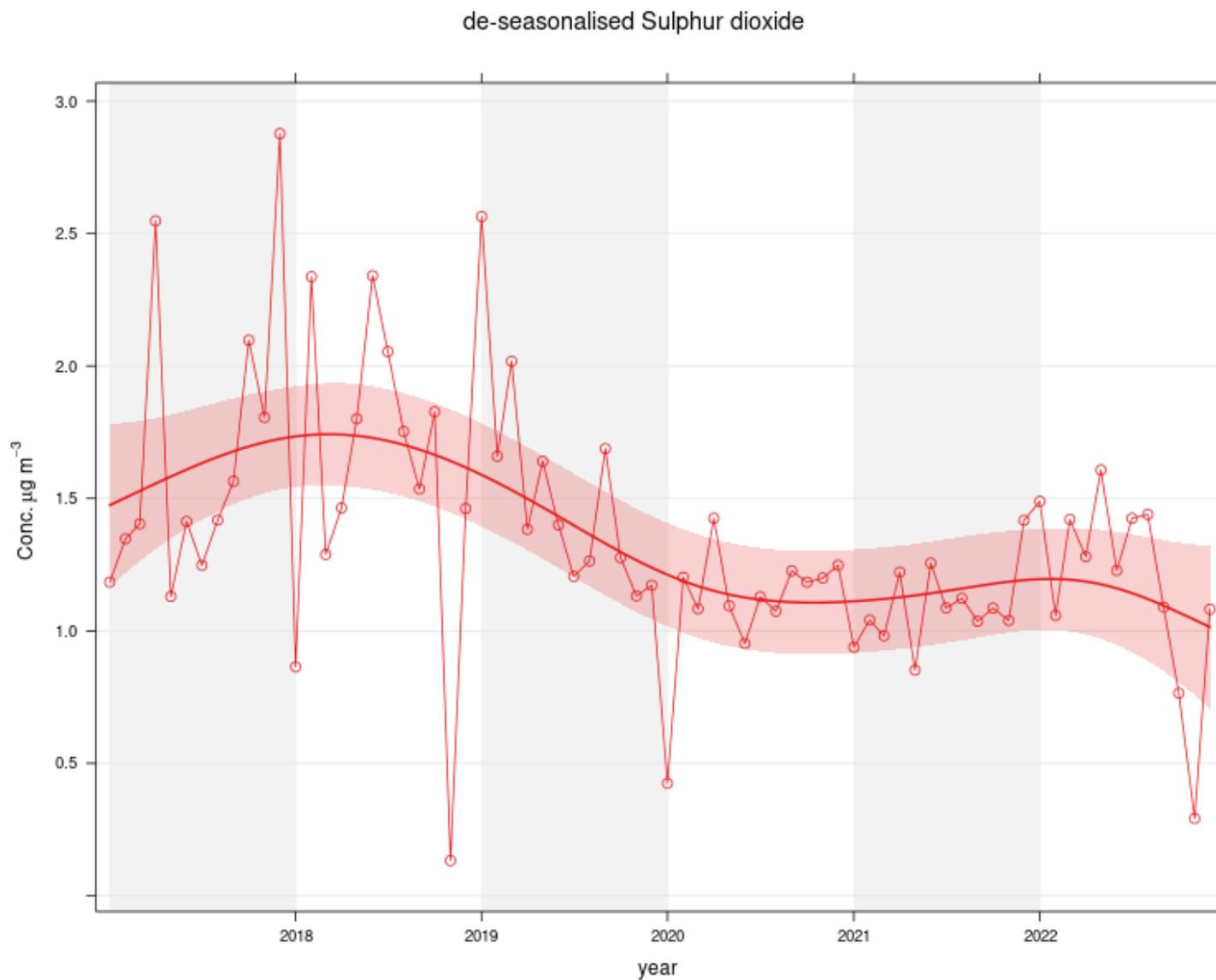


Figure 19 – A5 Falkirk Hope St Long Term SO₂ Concentrations

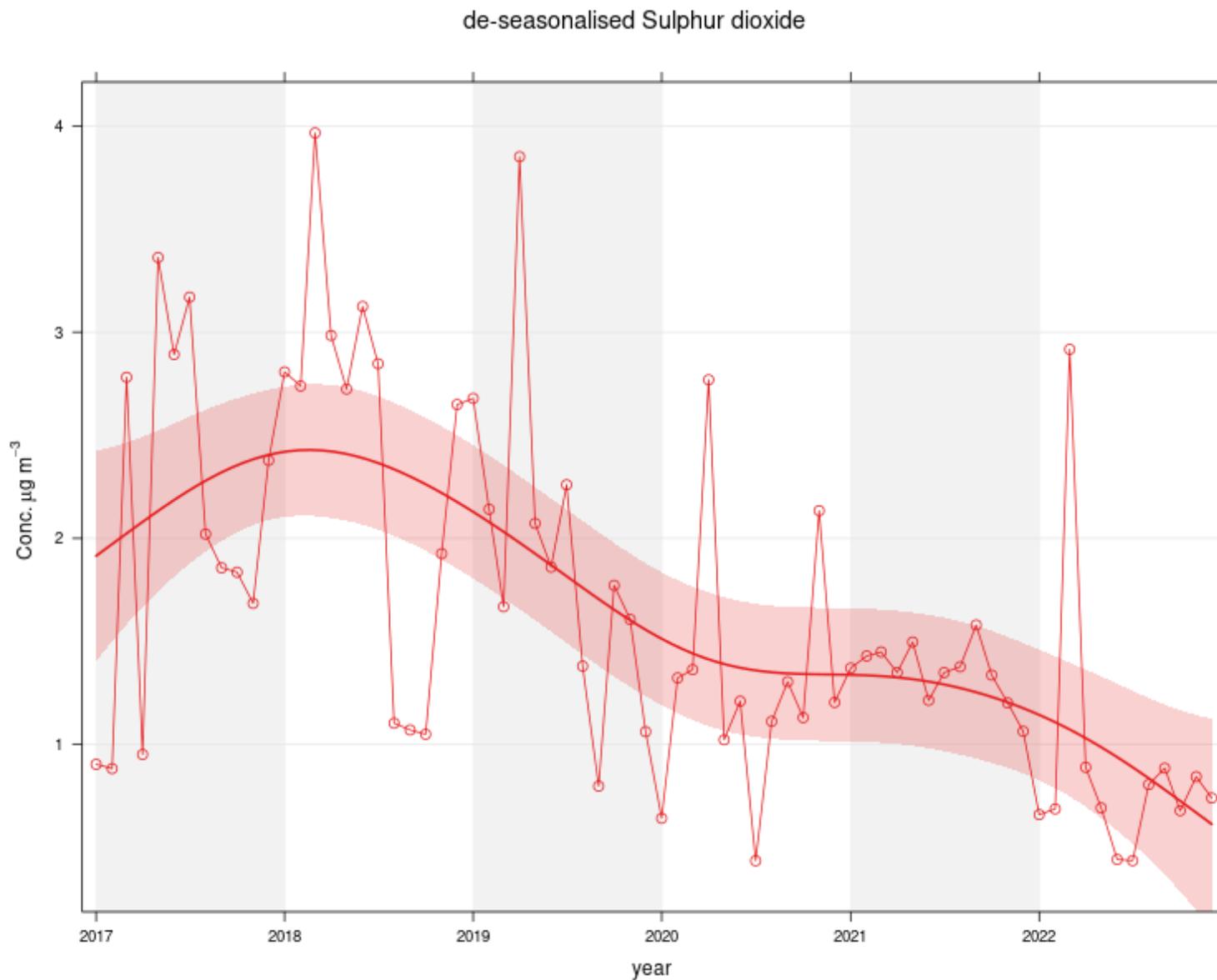


Figure 20 – A8 Grangemouth AURN Long Term SO₂ Concentrations

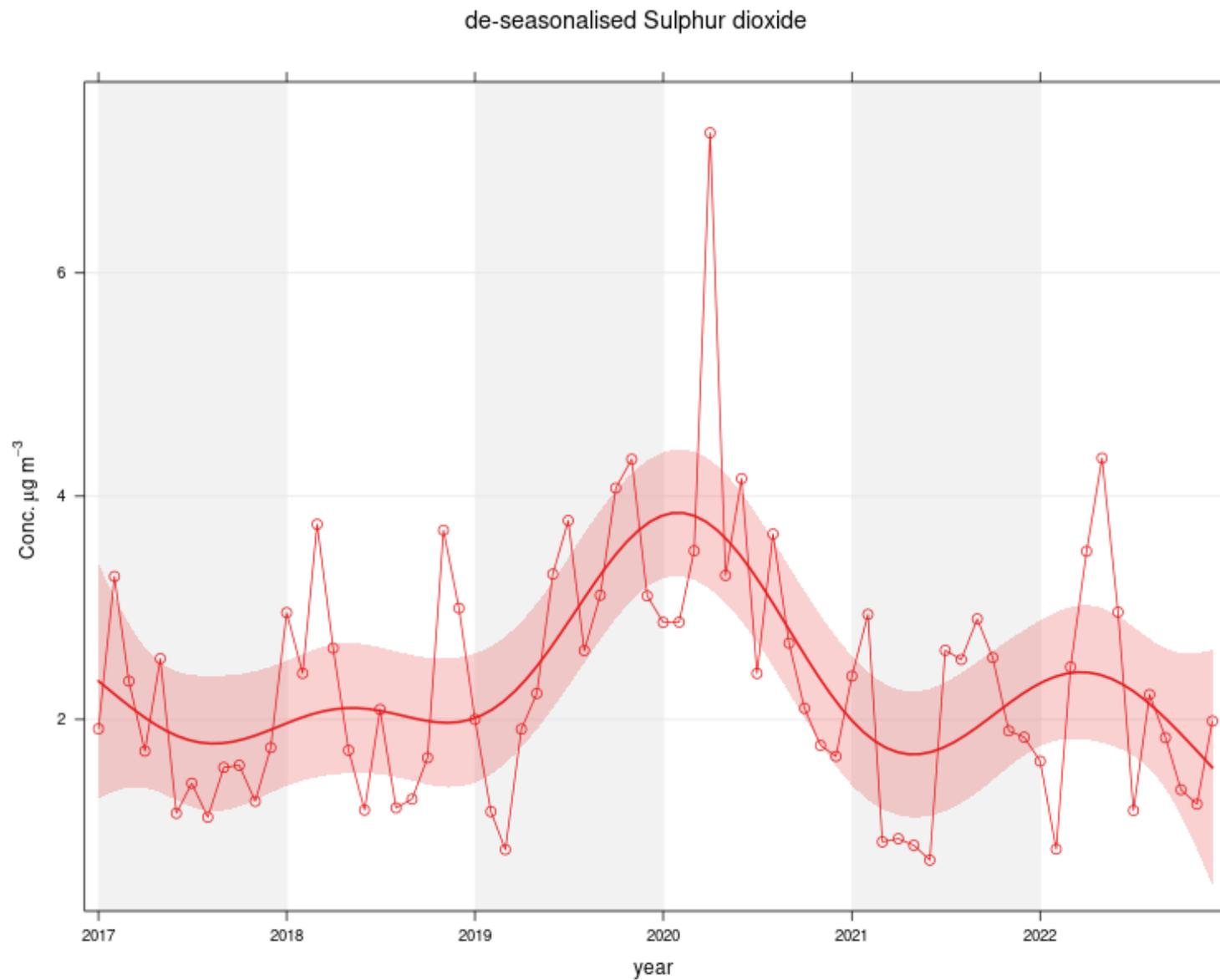


Figure 21 – A9 Grangemouth Moray Long Term SO₂ Concentrations

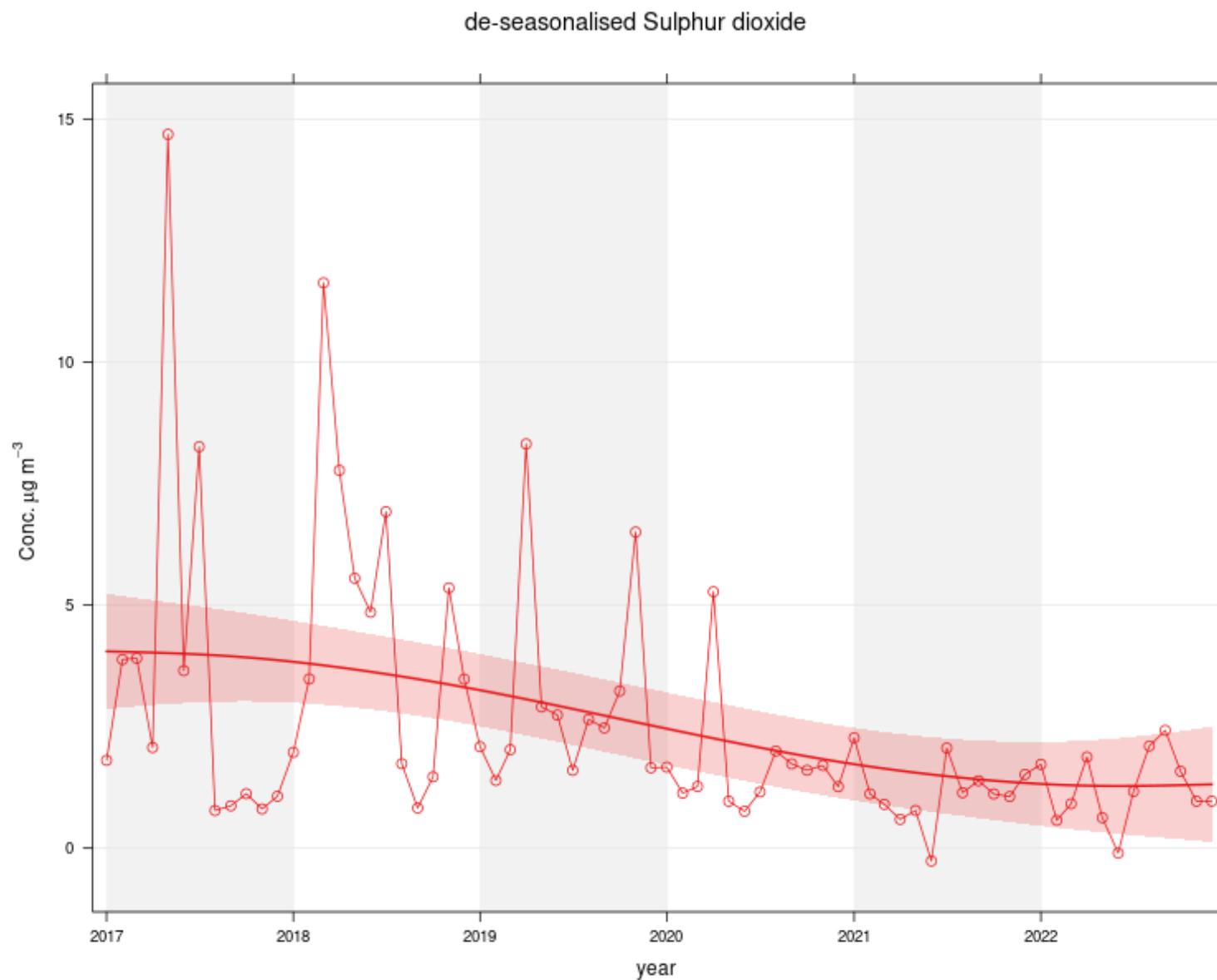


Figure 22 – A10 Grangemouth Municipal Chambers Long Term SO₂ Concentrations

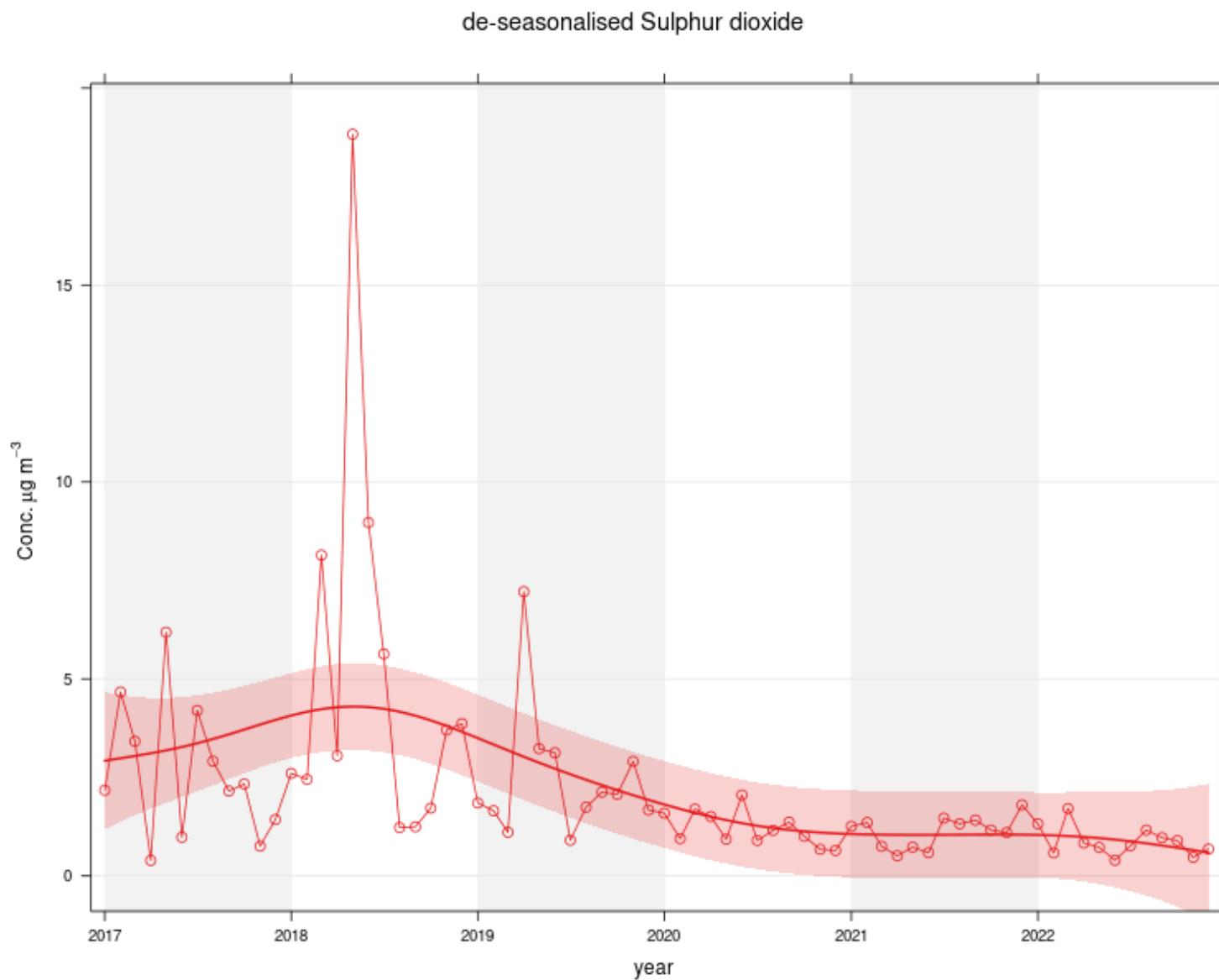


Figure 23 – A11 Grangemouth Zetland Park Long Term SO₂ Concentrations

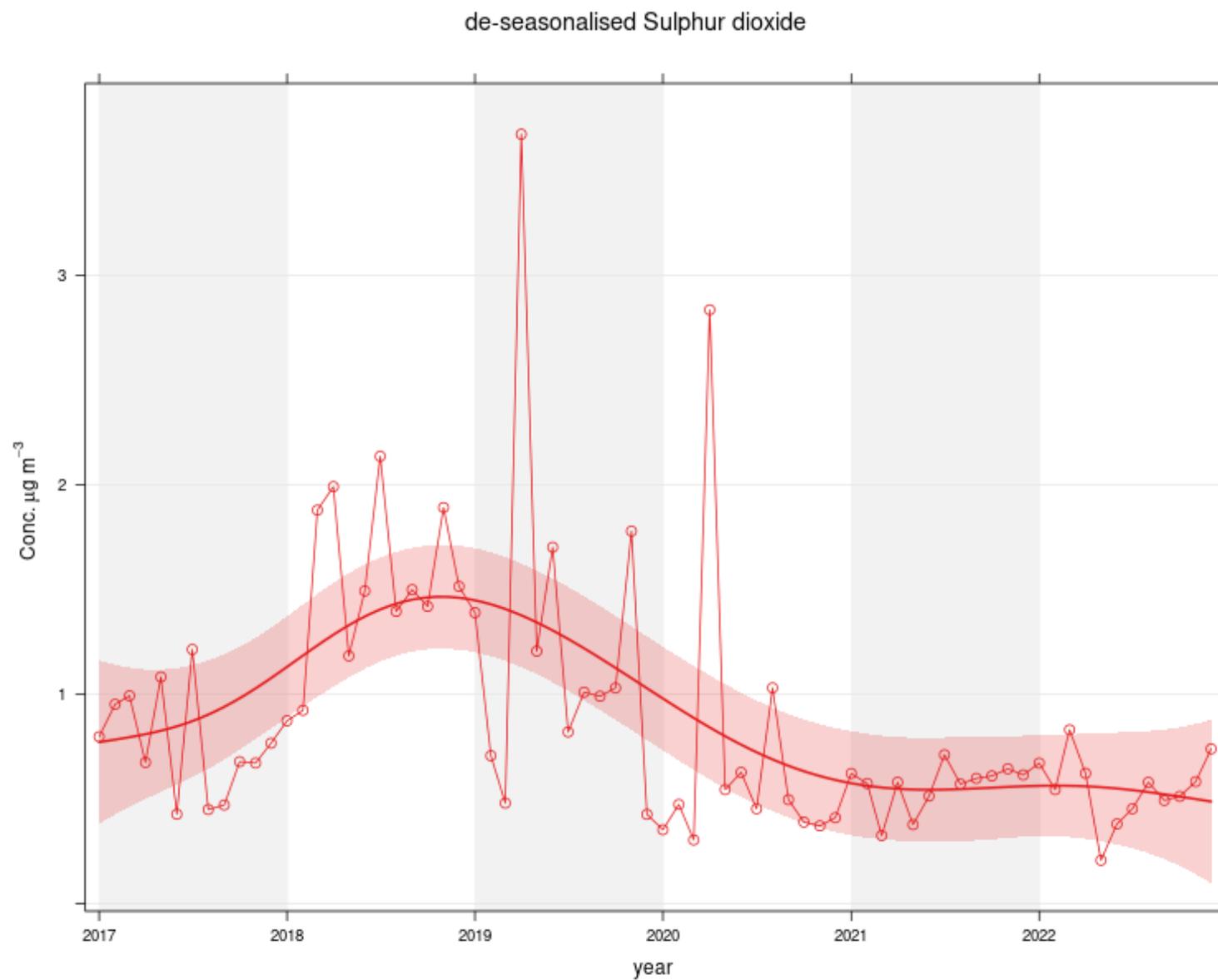
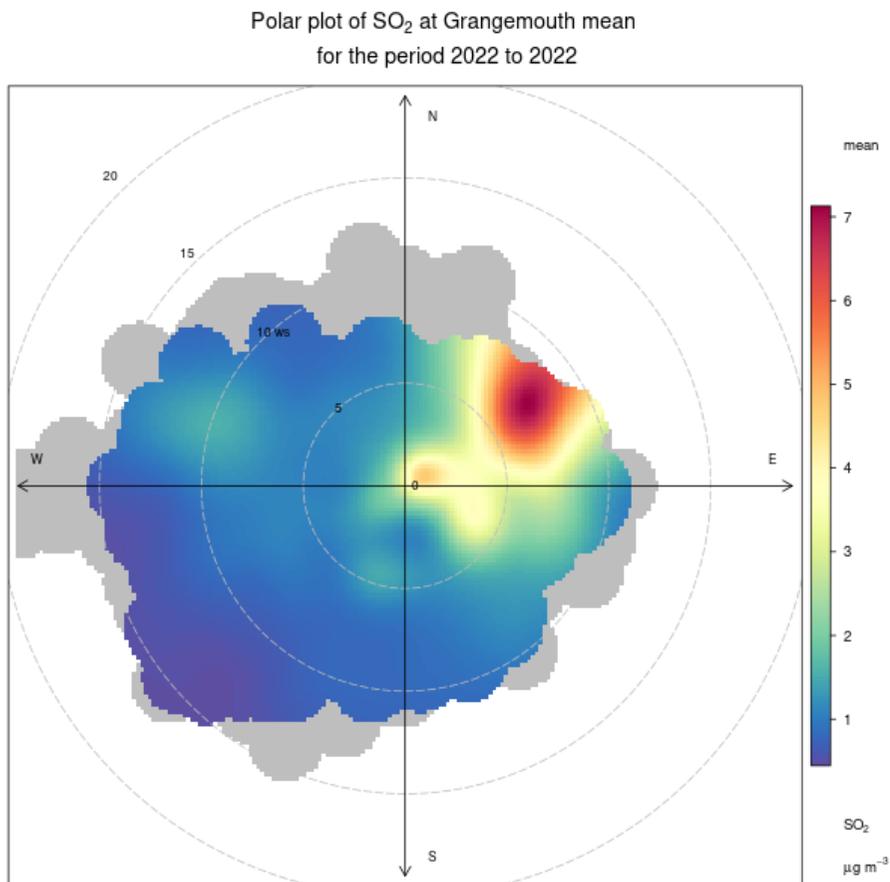
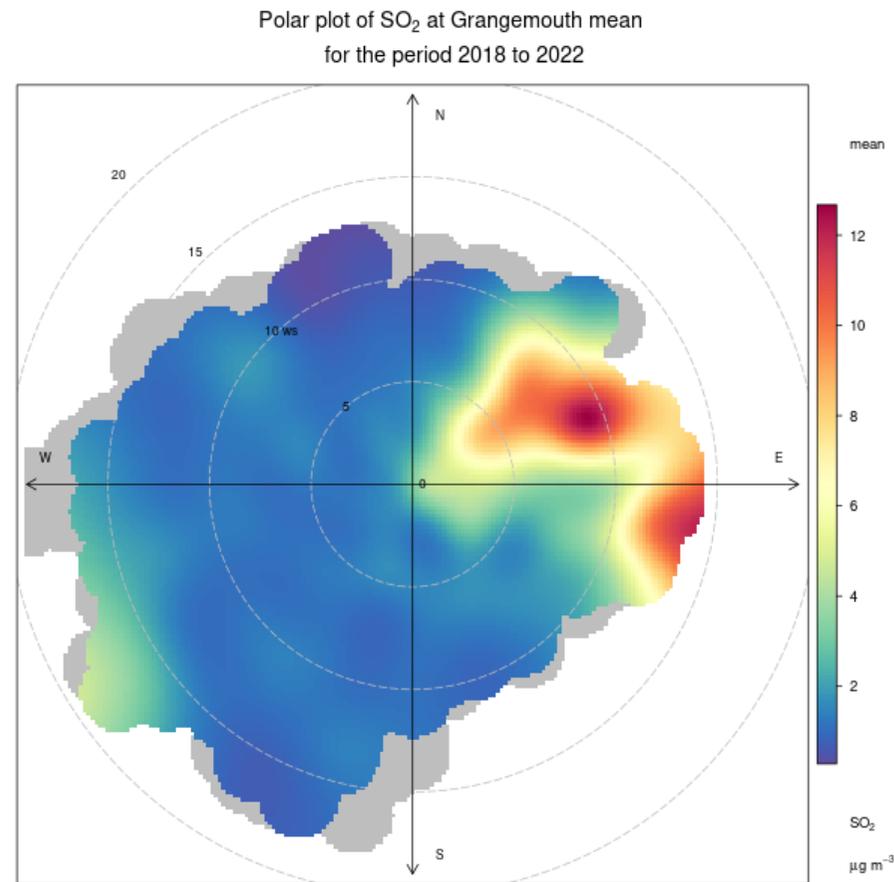


Figure 24 – Polar Plots of Average SO₂ Concentrations Recorded at the Grangemouth Sites

A) Grangemouth AURN: 2022

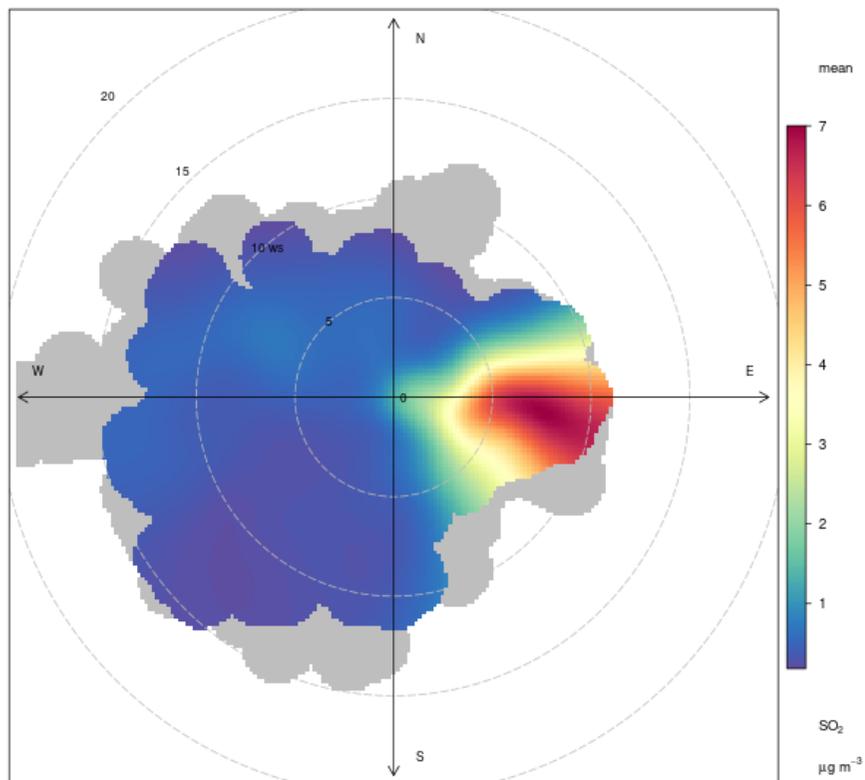


B) Grangemouth AURN: 2018 – 2022



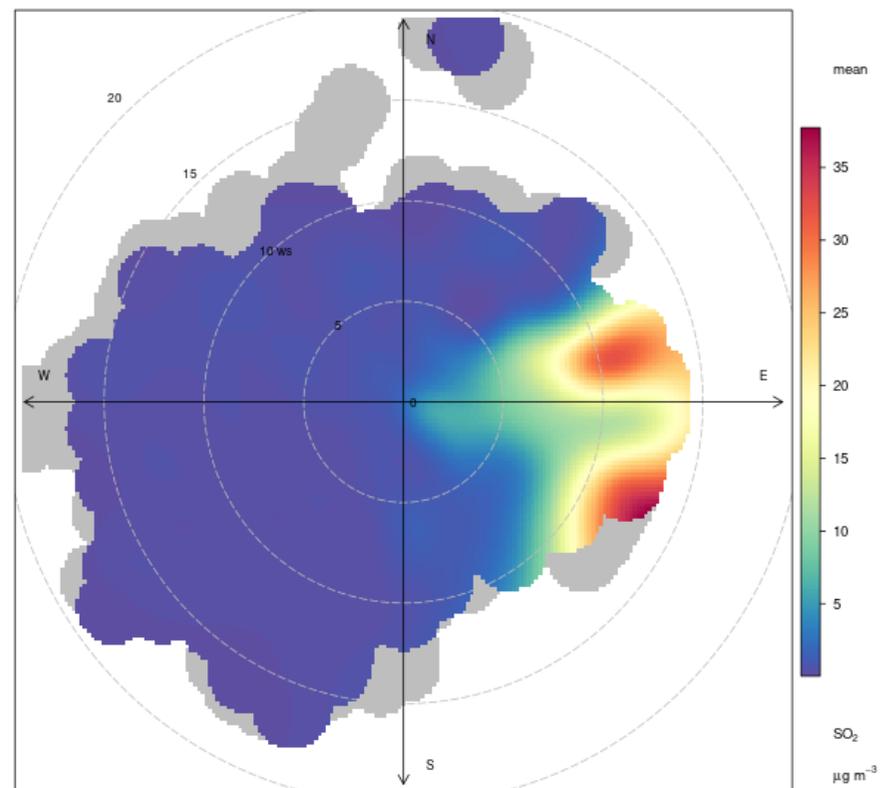
C) Grangemouth Moray: 2022

Polar plot of SO₂ at Grangemouth Moray mean for the period 2022 to 2022



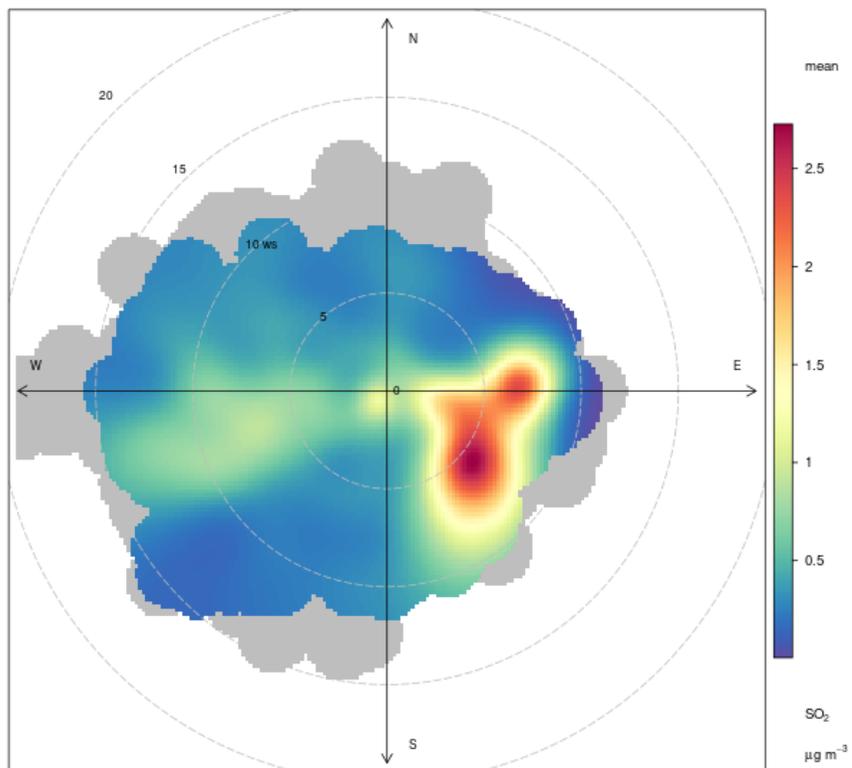
D) Grangemouth Moray 2018 – 2022

Polar plot of SO₂ at Grangemouth Moray mean for the period 2018 to 2022



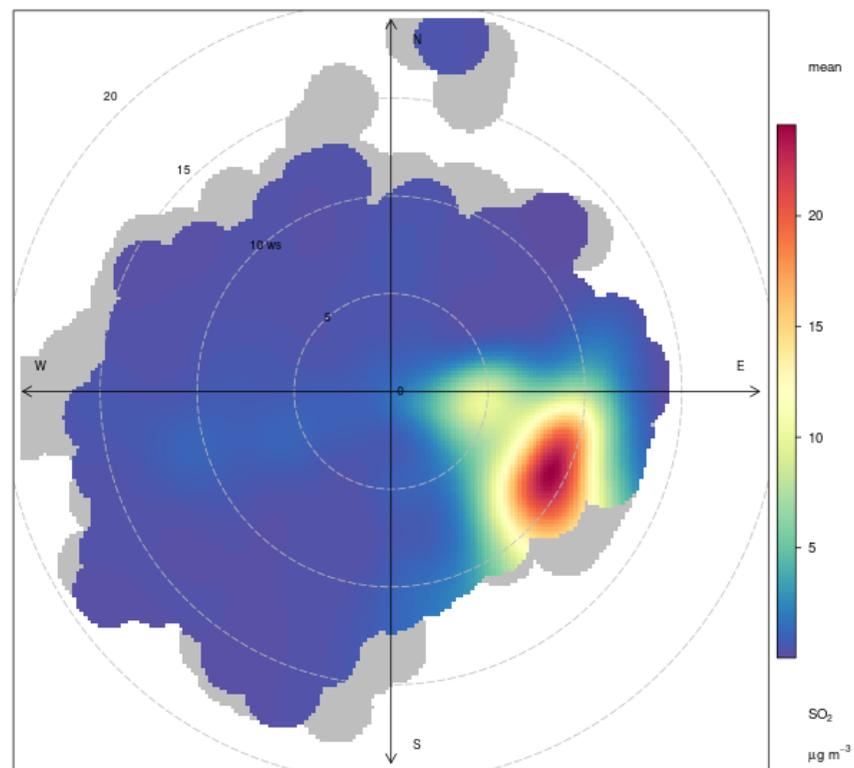
E) Grangemouth Municipal Chambers: 2022

Polar plot of SO₂ at Falkirk Grangemouth MC mean for the period 2022 to 2022



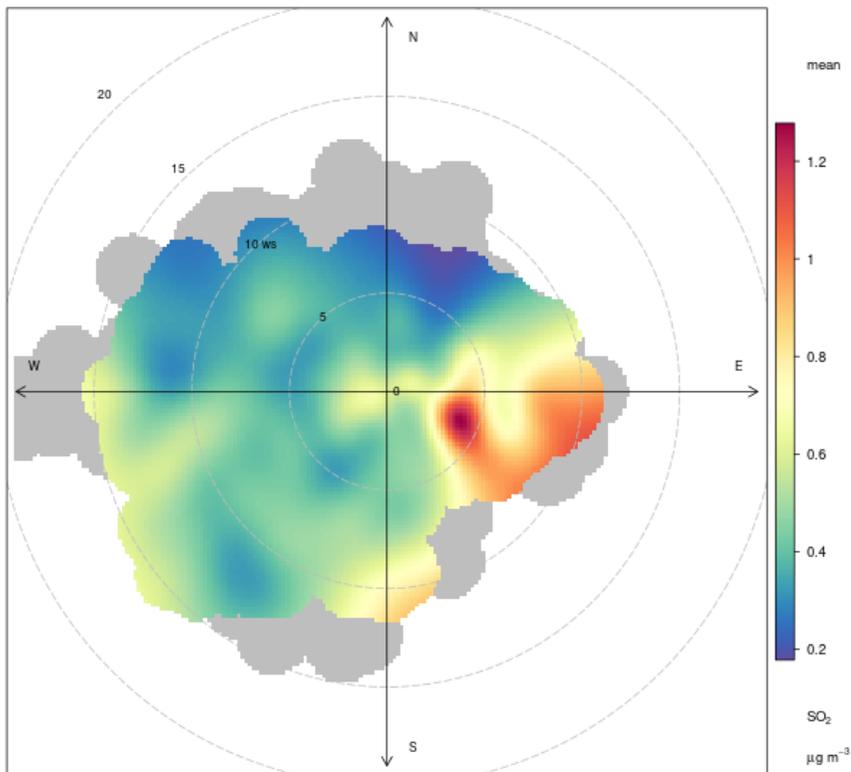
F) Grangemouth Municipal Chambers: 2018 – 2022

Polar plot of SO₂ at Falkirk Grangemouth MC mean for the period 2018 to 2022



G) Grangemouth Zetland Park: 2022

Polar plot of SO₂ at Falkirk Grangemouth Zetland Park mean for the period 2022 to 2022



H) Grangemouth Zetland Park: 2018 – 2022

Polar plot of SO₂ at Falkirk Grangemouth Zetland Park mean for the period 2018 to 2022

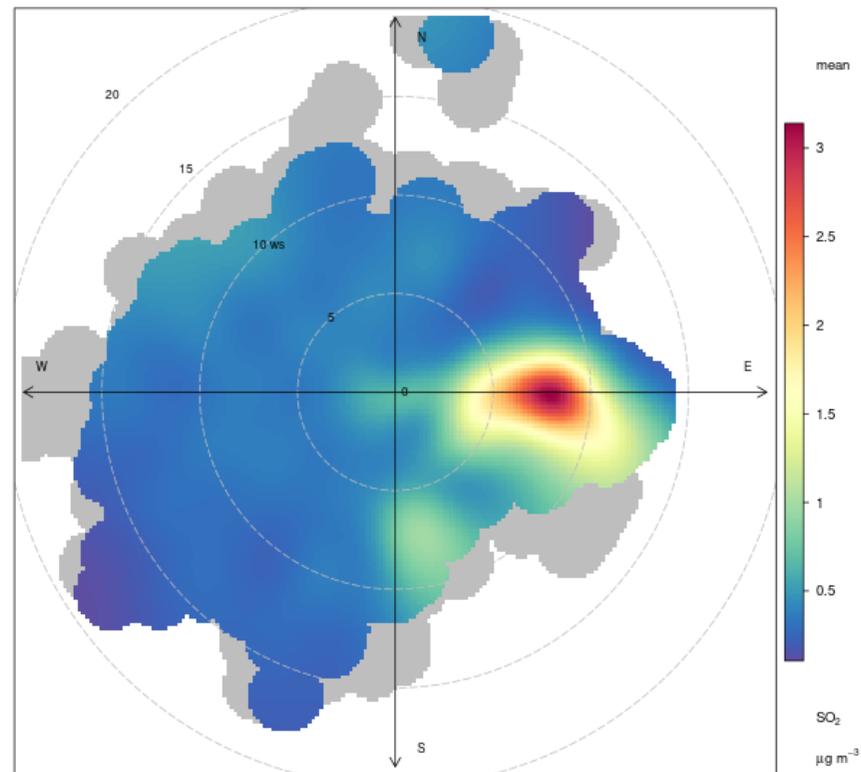


Figure 25 – Exceedances of the 15 Minute SO₂ NAQS Objective Concentration at the Grangemouth Sites 2012 – 2022

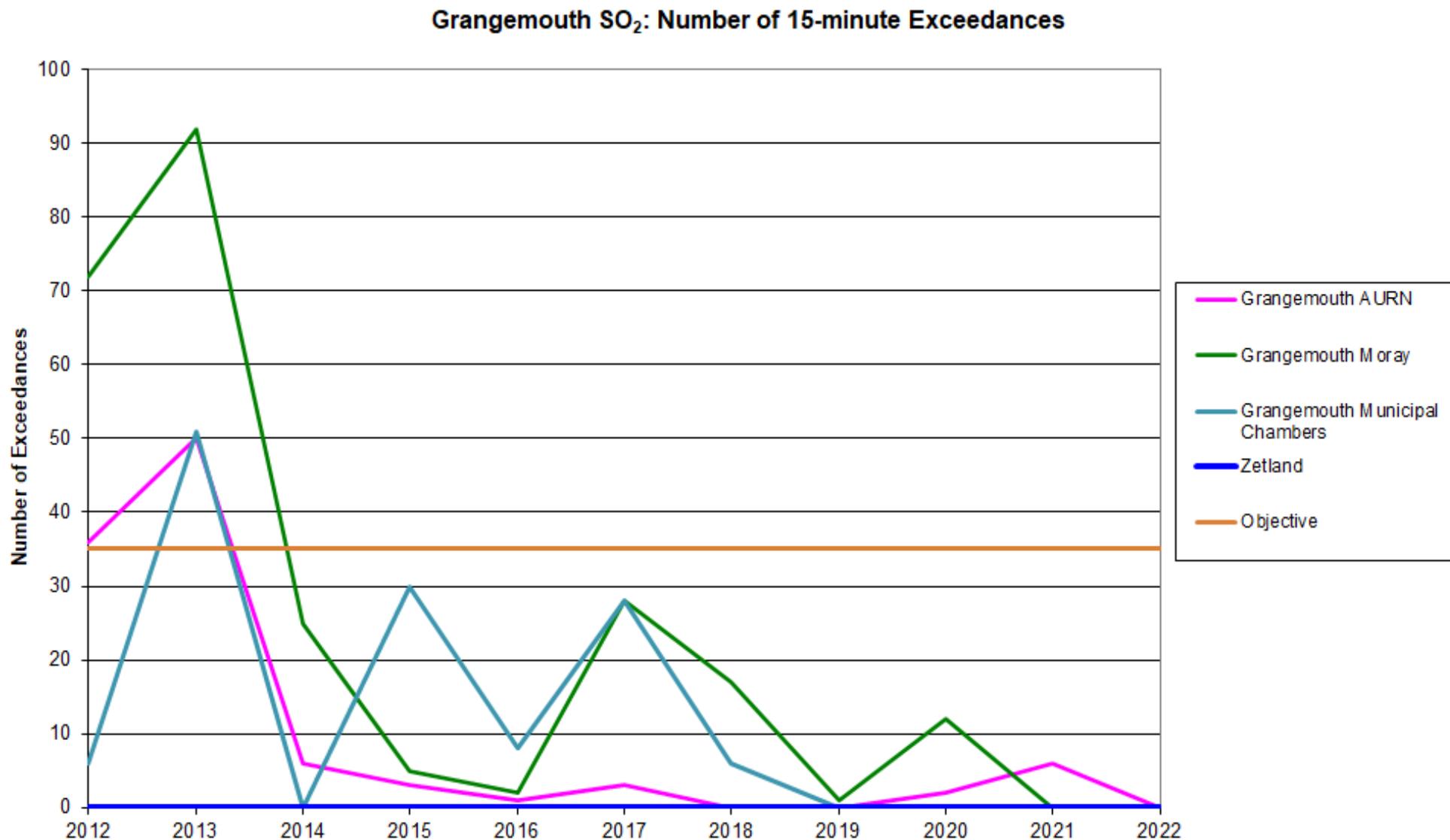


Table A.9 – 1, 3 Butadiene Annual Mean Diffusion Tube Results for 2022

Site ID	Location	Within 1, 3 Butadiene AQMA?	Data Capture in 2022, %. (1)	Annual Mean Concentrations ($\mu\text{g}/\text{m}^3$)				
				2018	2019	2020	2021	2022
NA41	Seaview Place, Bo'ness	N	100	0.06	0.05	0.05	0.05	0.05
NA55	Inchyra Station, Grangemouth	N	100	0.07	0.05	0.06	0.05	0.06
NA104	Powdrake Road, Grangemouth	N	91	0.11	0.05	0.05	0.05	0.05

Note: Exceedances of the 1,3 Butadiene running annual mean objective of $2.25\mu\text{g}/\text{m}^3$ are shown in bold.

Table A.10 – Benzene Annual Mean Diffusion Tube Results for 2022

Site ID	Location	Within AQMA?	Data Capture in 2022, %. (1)	Annual Mean Concentrations ($\mu\text{g}/\text{m}^3$)				
				2018	2019	2020	2021	2022
NA3	Tinto Drive, Grangemouth	N	100	0.66	0.8	0.48	0.51	0.58
NA21	Grangemouth Road, Falkirk College	N	91	0.6	0.65	0.43	0.37	0.57
NA27	West Bridge Street, Falkirk	N	83	0.7	1.07	0.61	0.54	0.60
NA37	Denny Town House	N	100	0.49	0.77	0.43	0.39	0.51
NA38	Larbert Village Primary School	N	100	0.5	0.51	0.45	0.39	0.45
NA41	Seaview Place, Bo'ness	N	100	0.91	0.96	0.63	0.61	0.74
NA42	Municipal Chambers, Grangemouth	N	91	0.63	0.78	0.45	0.51	0.57
NA44	Harvey Avenue, Polmont	N	100	0.52	0.67	0.38	0.41	0.42
NA55	Inchyra AQ Station, Grangemouth	N	100	0.52	0.73	0.49	0.52	0.58
NA77	Kinnaird Village	N	100	0.44	0.59	0.41	0.38	0.44
NA80	Cow Wynd, Falkirk	N	100	0.52	0.66	0.46	0.45	0.49
NA81	Grahams Road, Falkirk	N	91	0.81	0.97	0.62	0.61	0.74
NA94	A905 (Glensburgh Rd), Grangemouth	N	100	0.68	0.77	0.46	0.49	0.66
NA105	West of Shieldhill	N	100	0.3	0.4	0.25	0.28	0.33
NA116	Kersiebank Avenue, Grangemouth	Y	91	New site for 2019	0.76	0.46	0.45	0.52
NA117	Oswald Avenue (East), Grangemouth	Y	91	New site for 2019	0.99	0.53	0.55	0.64

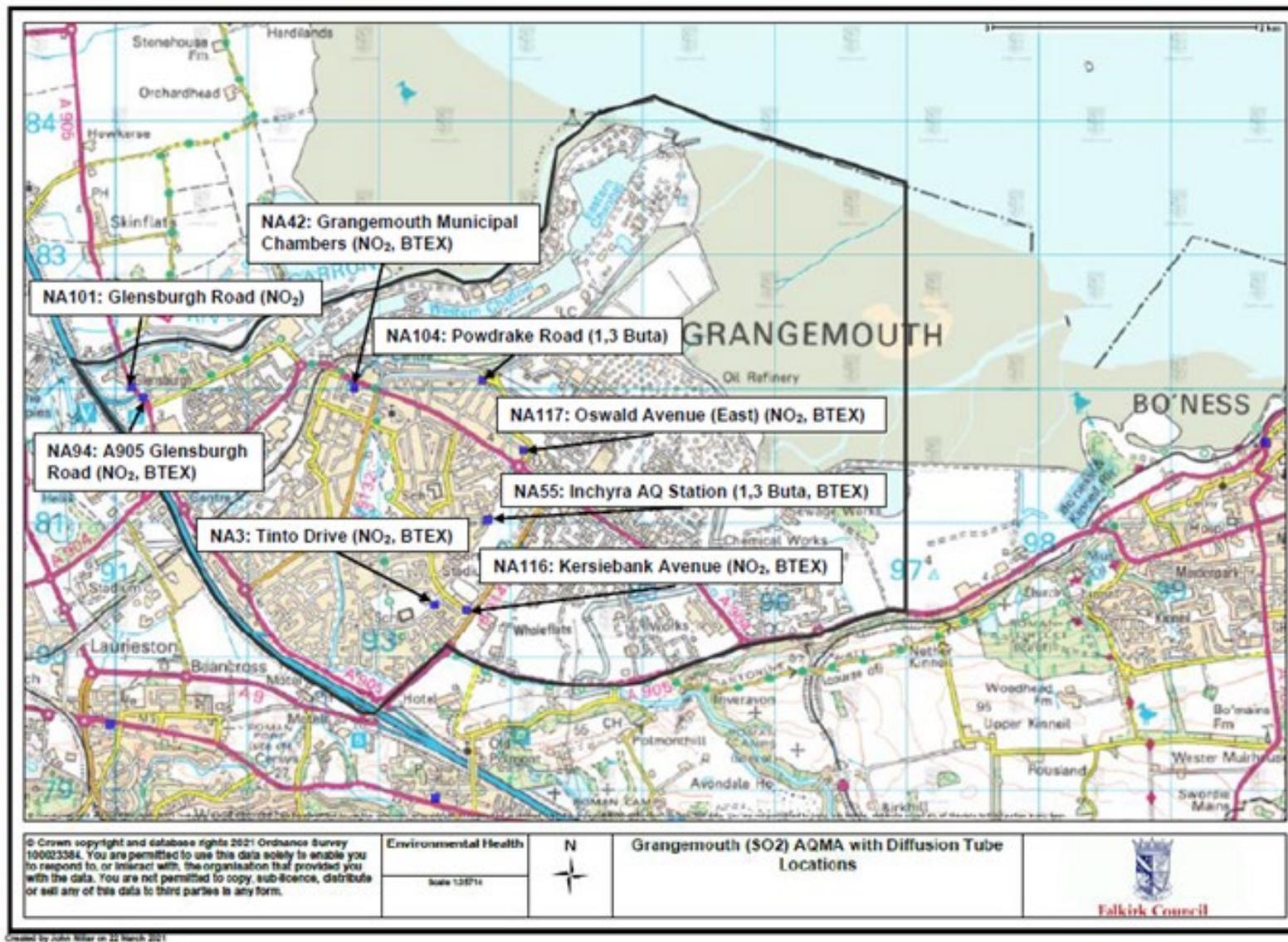
Table A.11 – Pumped Benzene Annual Mean Results for 2022

Site ID	Location	Within AQMA?	Data Capture in 2022, % (1)	Annual Mean Concentrations ($\mu\text{g}/\text{m}^3$)				
				2018	2019	2020	2021	2022
A8	Grangemouth AURN	Y	100	0.74	0.78	0.53	0.68	0.66

Note: Exceedances of the Benzene running annual mean objective of $3.25\mu\text{g}/\text{m}^3$ are shown in bold.

Figure 26 – Maps of the AQMA Boundaries in the Falkirk Council Area

A) Grangemouth AQMA (SO₂, 15min mean) with relevant diffusion tube locations, declared November 2005



B) Falkirk Town Centre AQMA (NO₂ Annual Mean, PM₁₀ annual and 24-hour mean) with relevant diffusion tube locations, declared March 2010

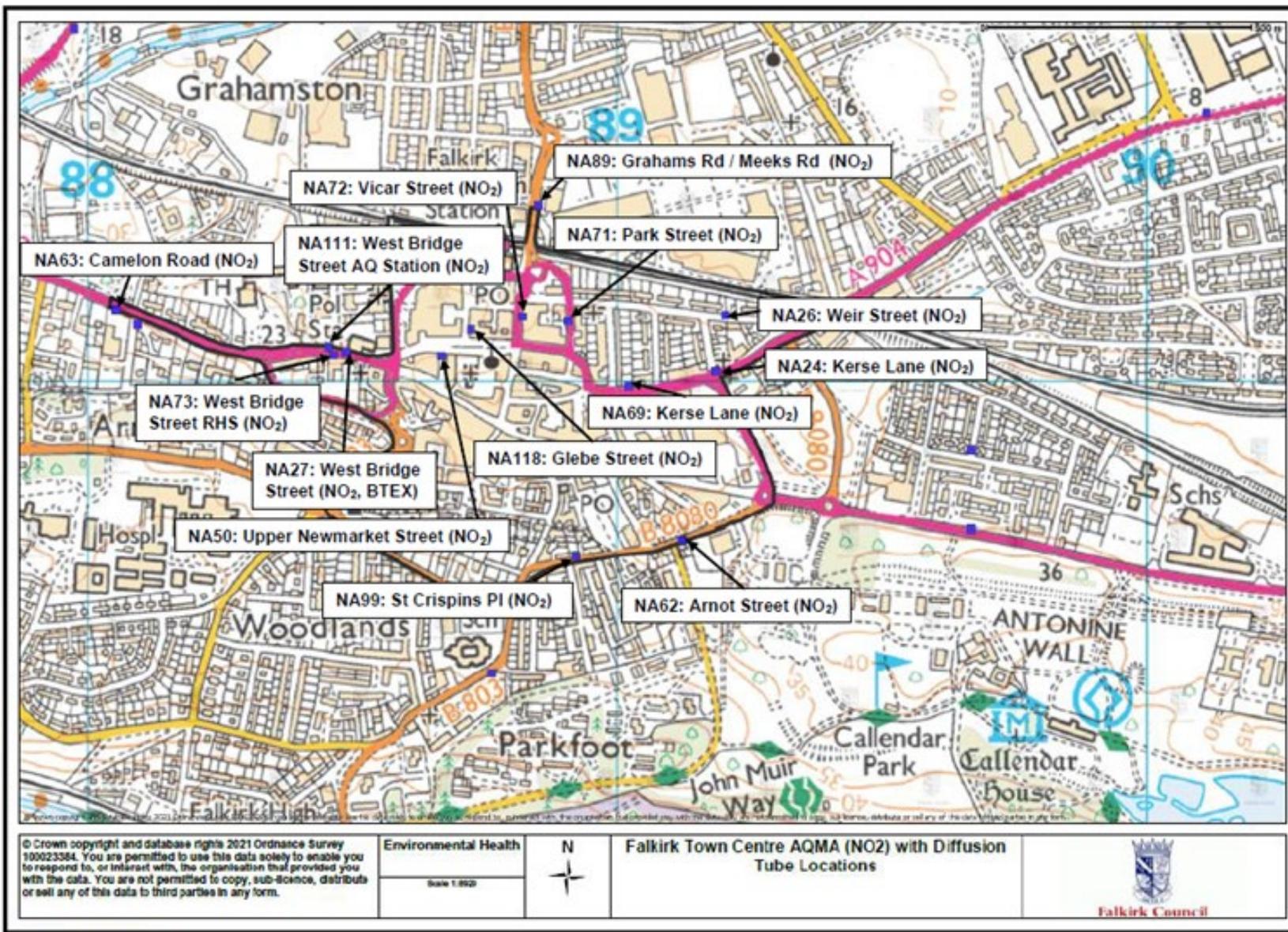
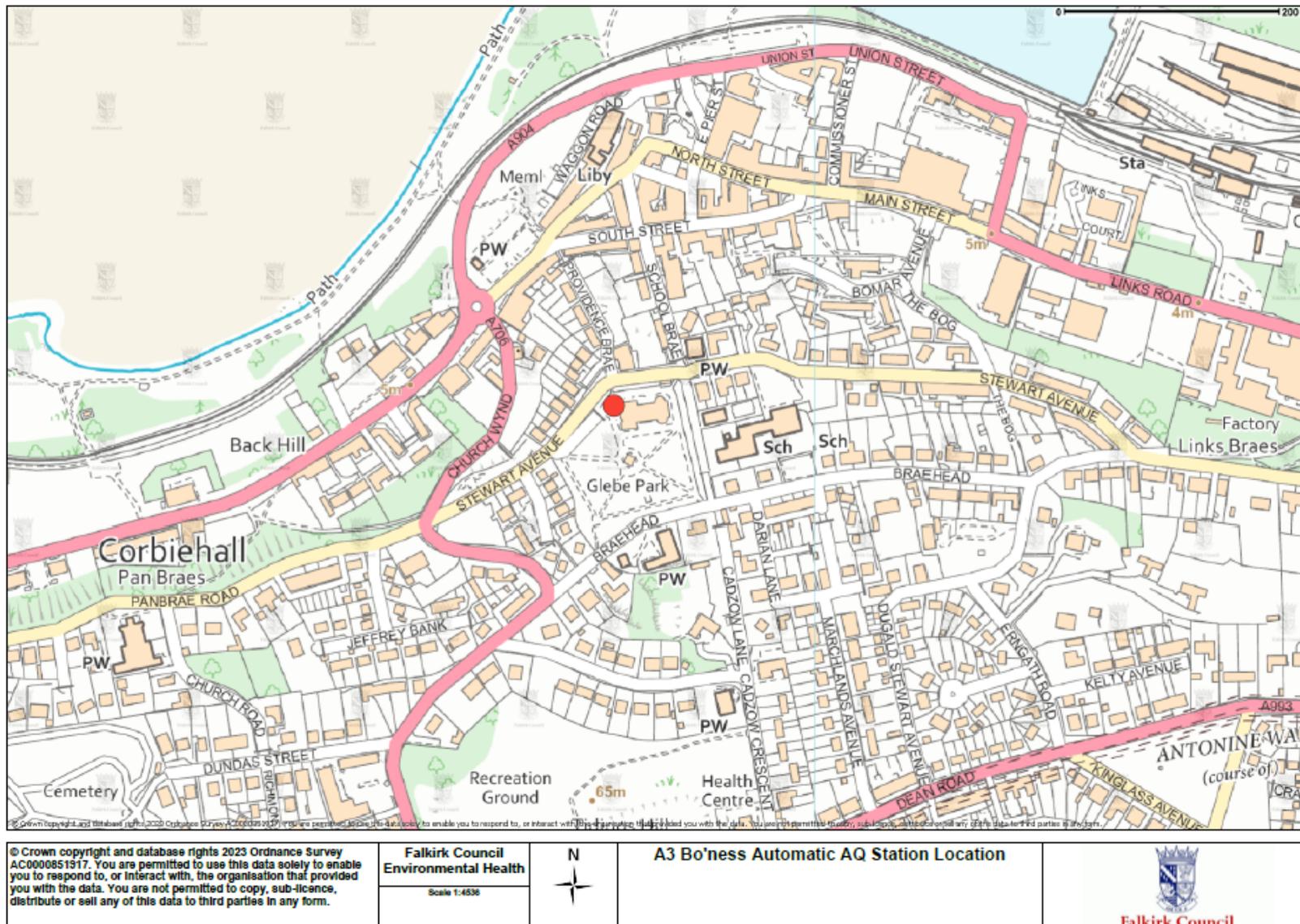
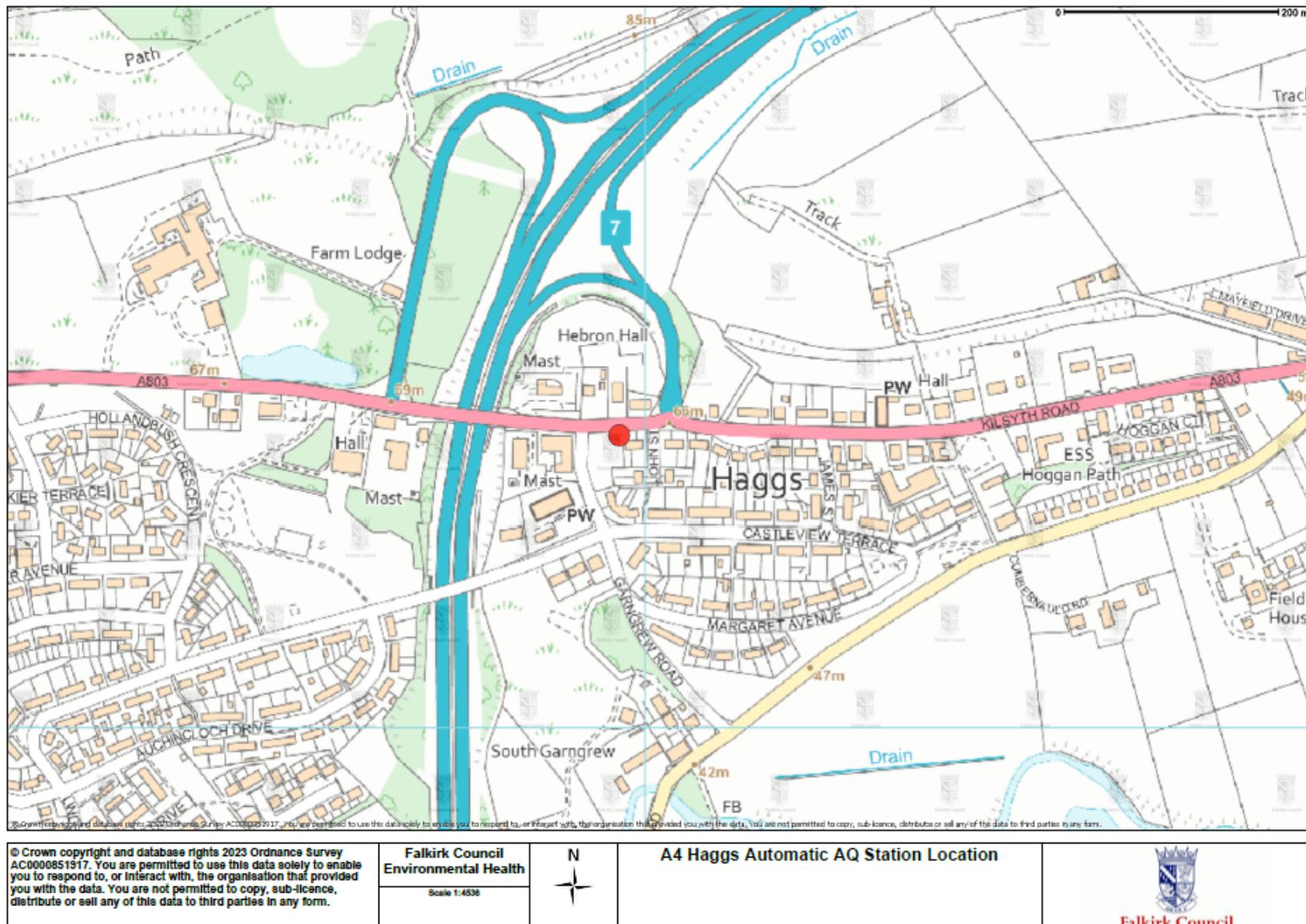


Figure 27 – Maps Showing Automatic Monitoring Locations

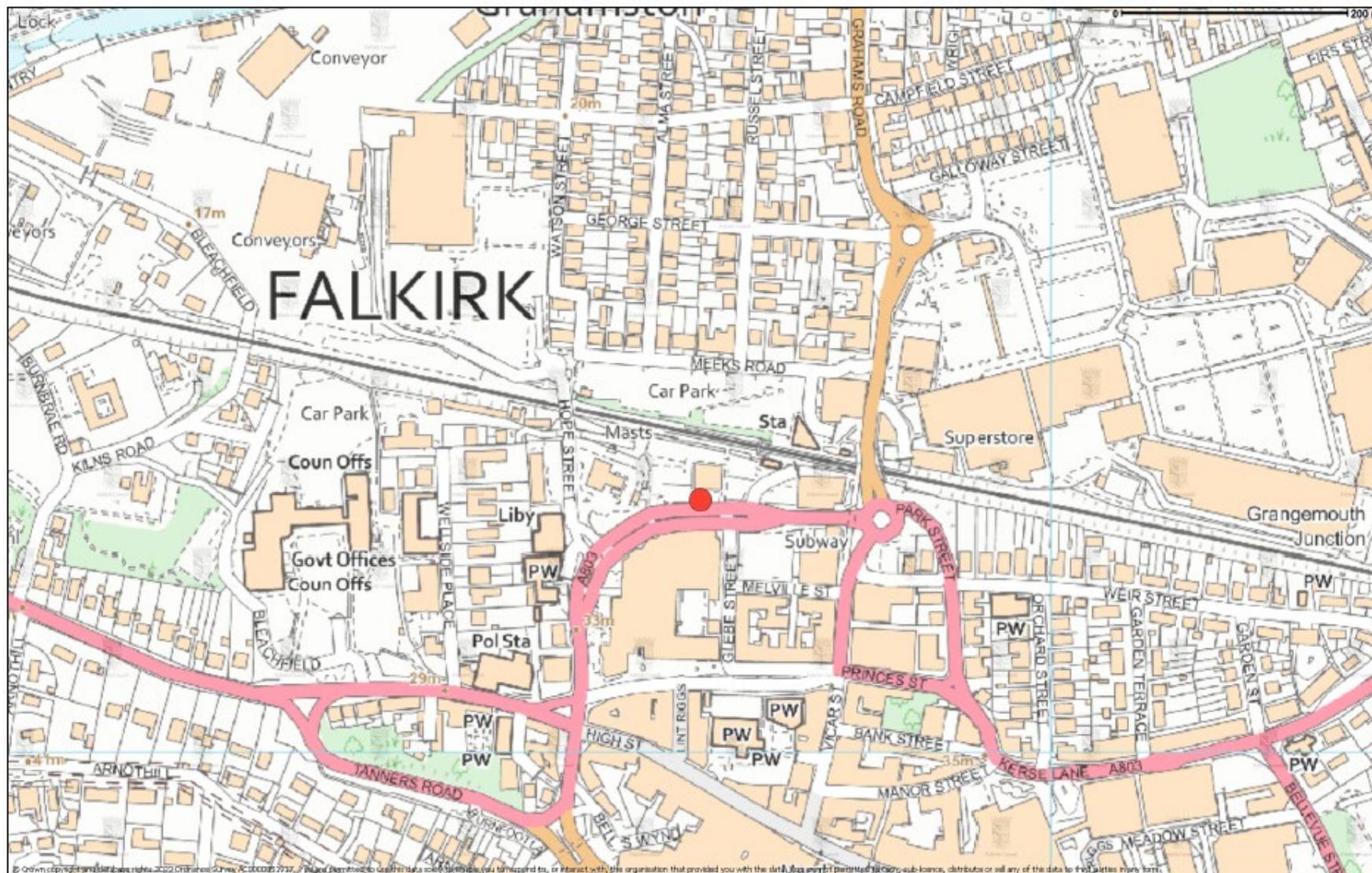
A) A3 Bo'ness



B) A4 Hags

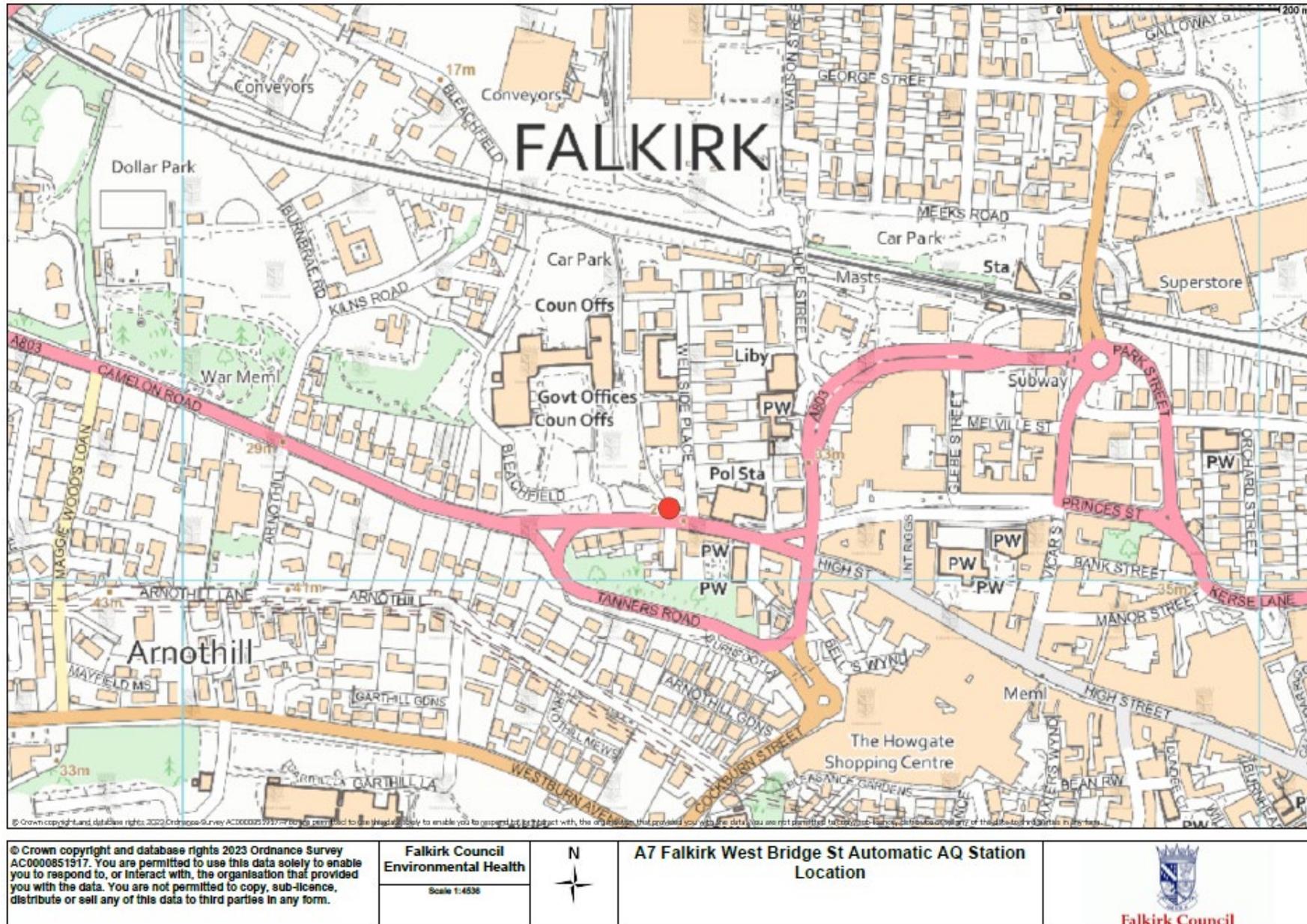


C) A5 Falkirk Hope Street

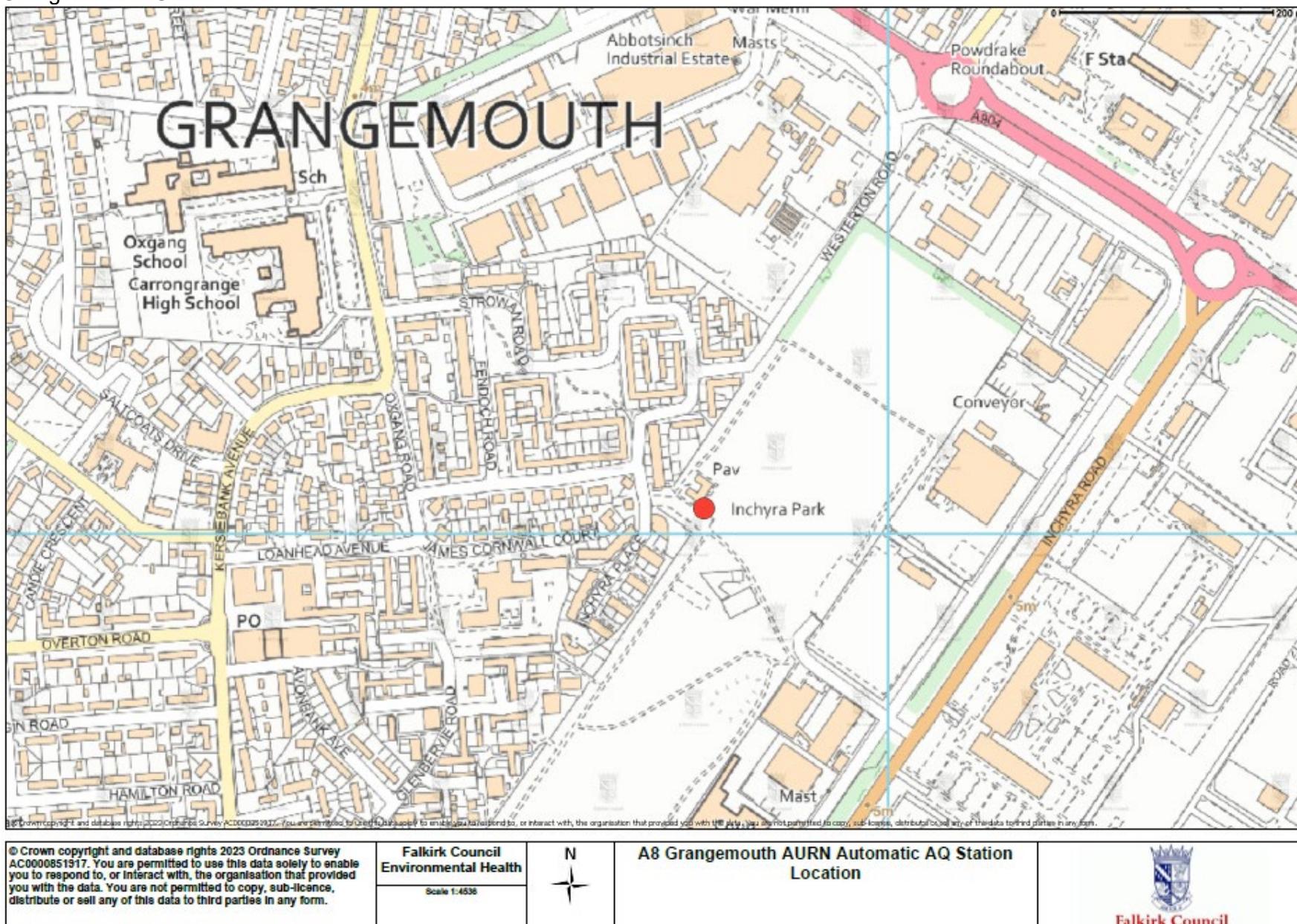


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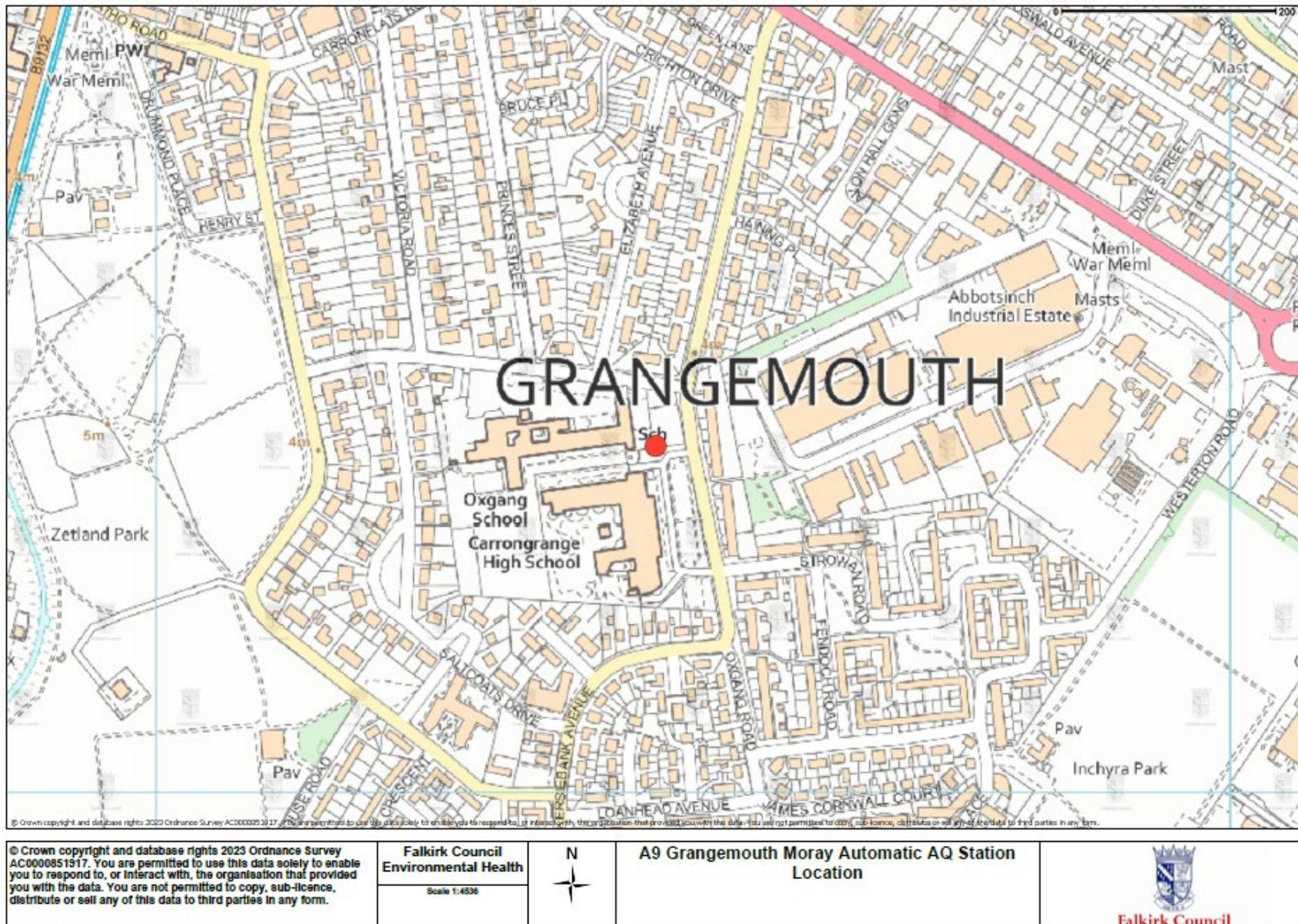
D) A7 Falkirk West Bridge Street



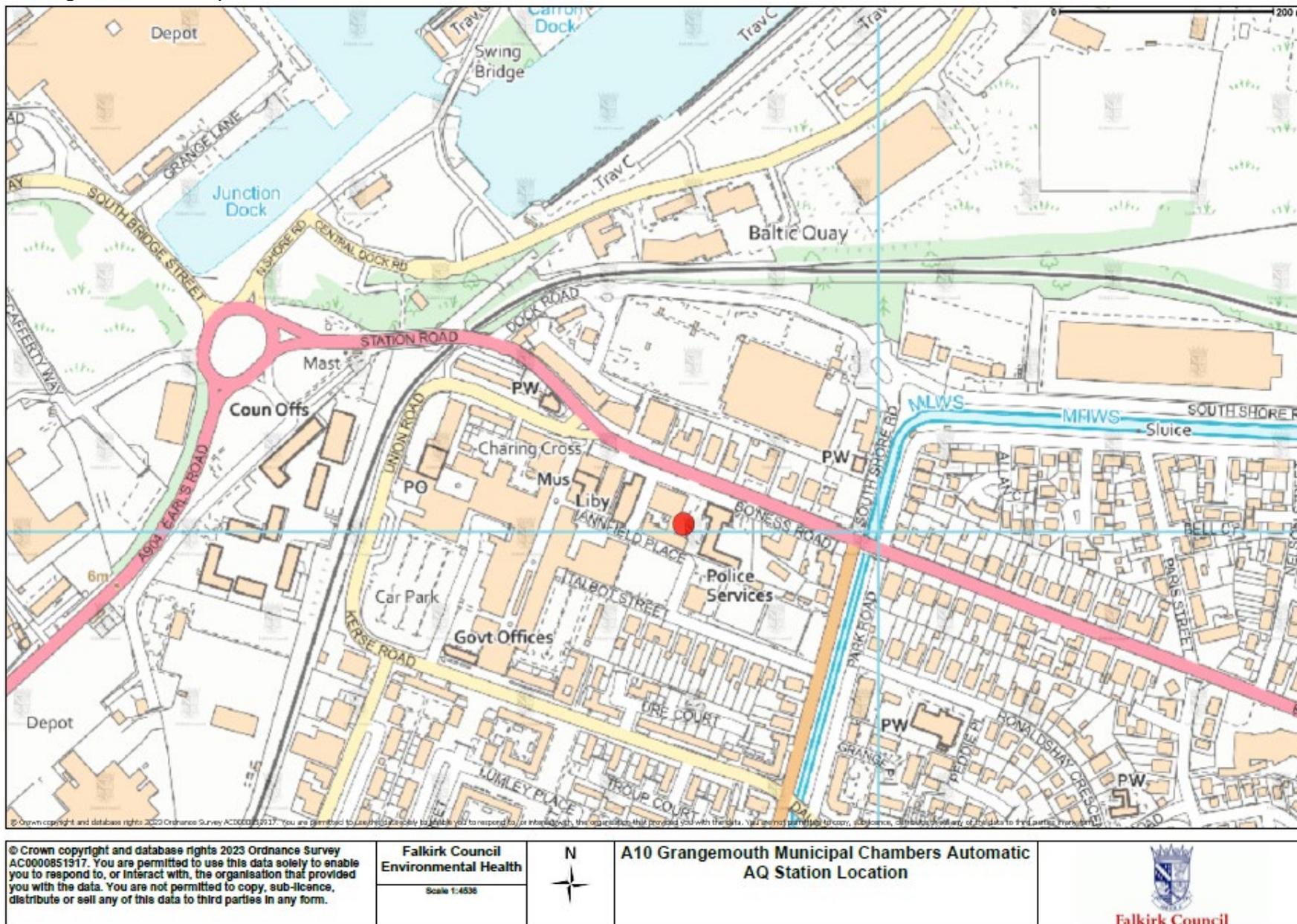
E) A8 Grangemouth AURN



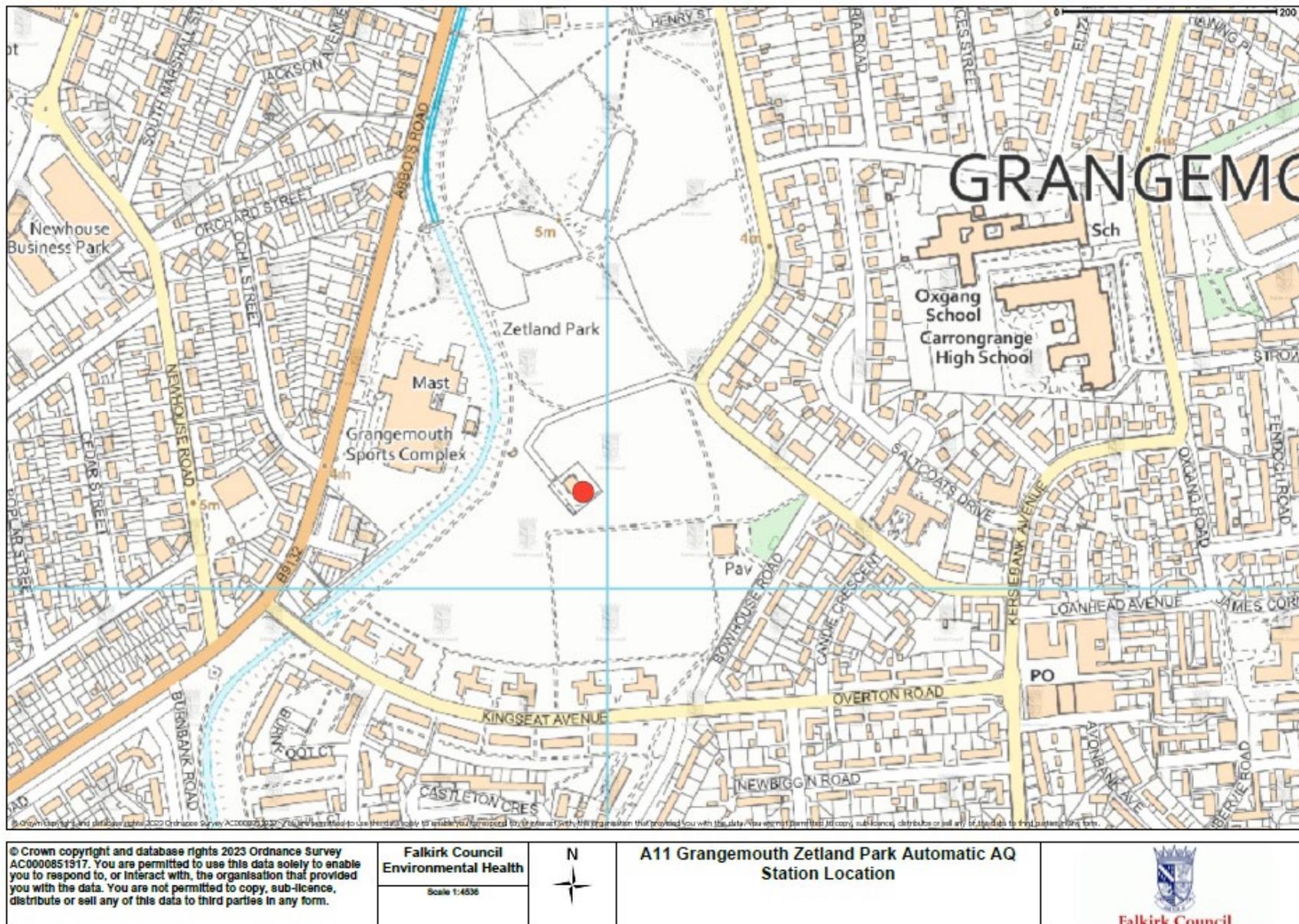
F) A9 Grangemouth Moray



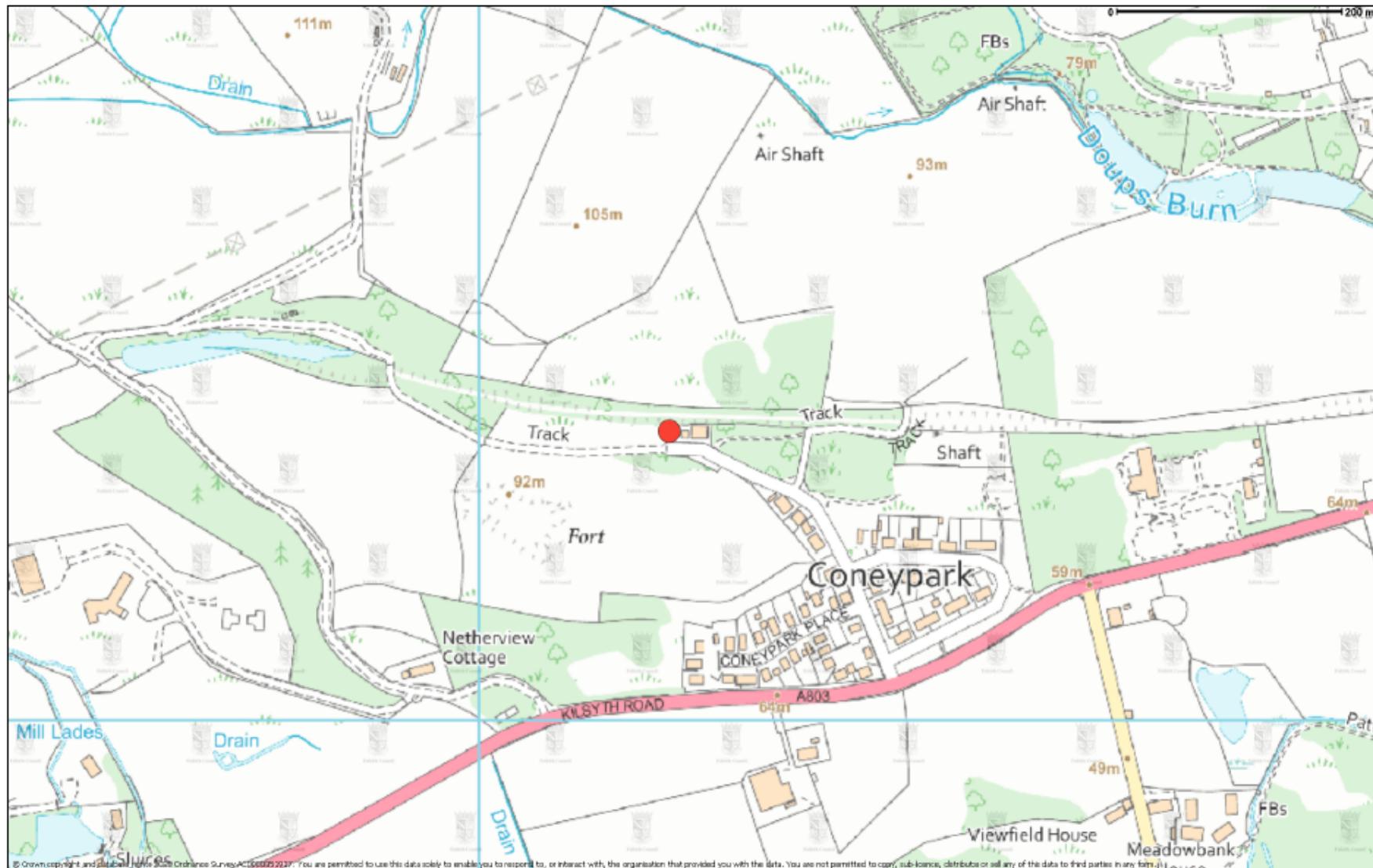
G) A10 Grangemouth Municipal Chambers



H) A11 Grangemouth Zetland Park

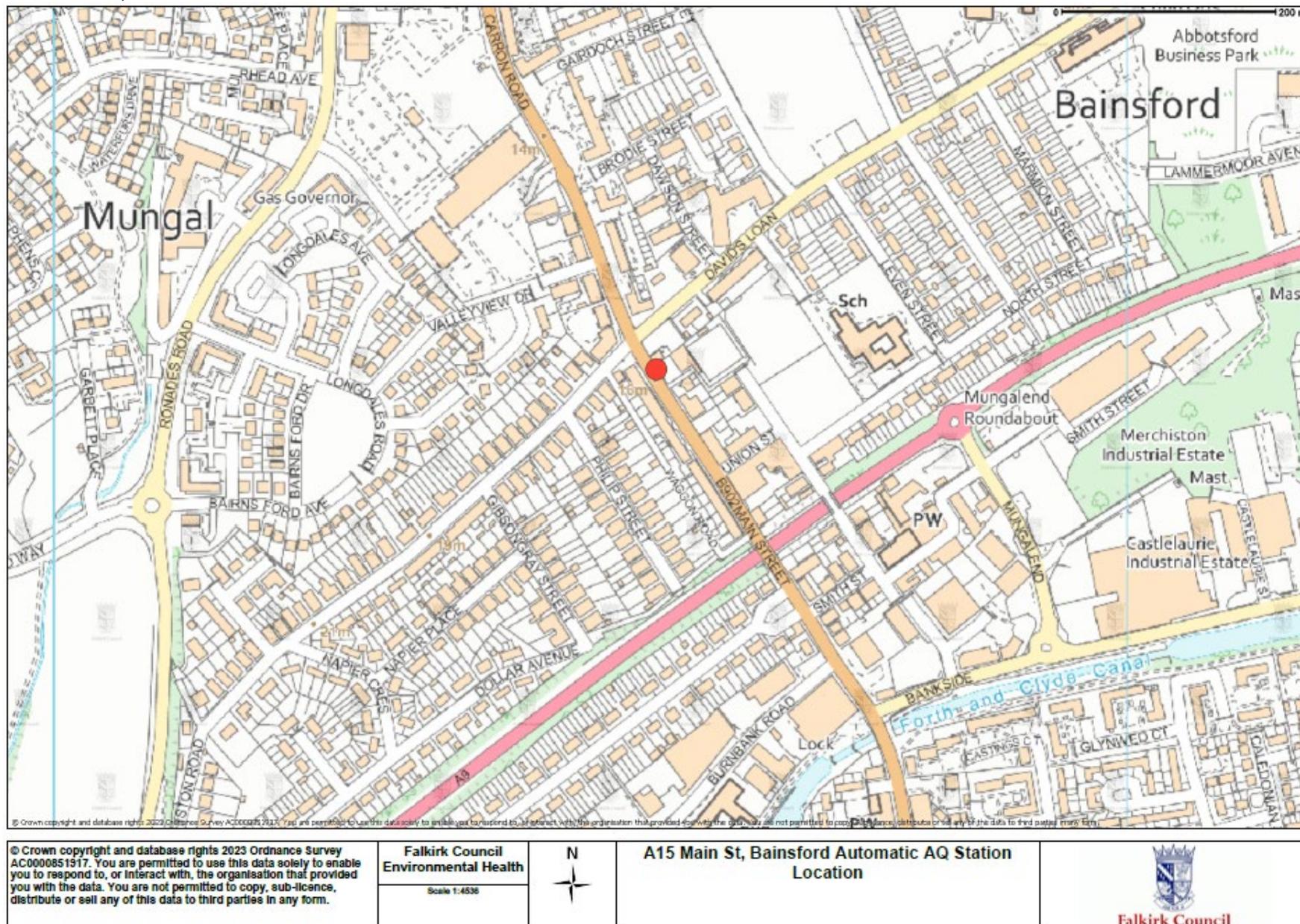


I) A14 Banknock 3



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J) A15 Main Street, Bainsford



Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 – NO₂ 2022 Monthly Diffusion Tube Results (µg/m³)

Site ID	Jan	Feb	Mar	Apr ⁽²⁾	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted ⁽¹⁾
NA3	18.20	13.51	23.75	11.94	9.69	7.85	8.01	12.56	16.16	13.19	19.47	24.60	15	13
NA5	22.30	18.65	27.79	21.43	14.51	12.12	15.27	20.14	23.26	19.07	28.73	33.99	21	18
NA9	22.20	19.18	22.74	16.88	13.80	11.47	12.24	17.55	20.66	16.72	26.70	30.89	19	16
NA19	23.75	20.65	29.92	22.45	15.87	10.71	13.16	18.63	23.36	18.87	30.51	29.91	21	18
NA20	23.73	20.43	25.70	16.58	12.73	11.39	12.85	16.25	18.81	18.57	27.06	31.68	20	17
NA21	22.66	15.17	24.62	20.91	17.83	13.26	14.03	16.67	23.28	20.85	29.29	31.75	21	18
NA24	31.80	30.11	24.62	26.45	-	20.40	22.05	25.64	29.37	25.70	34.77	37.55	28	24
NA26	14.06	9.66	18.73	13.82	10.23	6.58	8.23	11.45	15.12	12.66	21.08	25.69	14	12
NA27	27.86	-	52.13	36.40	31.09	21.36	25.51	34.76	44.06	31.60	-	47.63	35	30
NA29	13.56	10.60	18.32	14.31	10.11	6.75	8.48	12.31	15.98	13.76	22.15	26.32	14	12
NA36	34.39	30.11	33.18	-	22.47	20.09	19.00	26.89	28.18	25.06	37.51	37.20	29	24
NA37	15.19	11.07	19.27	14.16	9.61	6.95	7.90	11.20	12.41	13.49	21.34	24.21	14	12
NA38	12.32	12.20	17.66	11.99	6.68	6.72	8.00	12.00	13.41	13.25	19.08	25.30	13	11
NA41	22.61	16.69	23.89	19.82	15.32	12.70	13.55	16.39	18.50	17.54	24.38	28.37	19	16
NA42 (3 Tubes)	20.11	16.24	22.31	12.69	9.59	7.05	8.81	12.48	14.87	12.56	17.64	23.02	15	13
	16.98	13.44	22.76	15.15	9.51	7.87	8.88	12.71	15.28	11.74	20.31	24.77		
	19.32	15.86	18.32	14.03	9.56	7.81	9.14	12.42	15.24	13.00	20.36	25.63		
NA44	14.44	11.48	19.51	13.15	9.97	7.69	9.73	12.66	15.67	11.76	18.18	22.44	14	12
NA48	17.82	11.48	22.45	15.56	10.73	7.44	9.05	14.24	17.84	14.82	20.74	27.45	16	13
NA50	14.19	12.10	23.69	20.28	15.34	8.66	12.63	17.80	24.24	17.97	23.74	29.28	18	15
NA51	21.97	17.29	24.51	18.95	16.20	13.96	15.15	19.04	21.56	19.54	27.05	31.62	21	17
NA52	22.58	18.50	23.39	17.60	14.16	13.26	13.34	16.92	18.95	20.33	29.57	30.40	20	17
NA53	28.02	25.95	26.32	-	15.08	9.35	12.14	-	18.30	16.19	25.03	32.37	21	18
NA58	18.64	15.58	21.36	16.75	11.92	8.93	10.38	13.83	17.20	13.74	23.01	24.12	16	14
NA59	30.71	23.58	28.92	24.37	18.33	16.61	17.25	20.74	21.88	21.10	32.94	39.98	25	21
NA60	29.74	21.92	29.22	19.66	-	-	-	-	20.48	21.42	29.97	36.19	26	22
NA61	22.45	14.37	28.01	15.68	14.20	10.83	13.49	17.34	21.06	18.12	25.12	32.25	19	16
NA62	35.26	30.66	33.53	28.36	25.93	19.52	18.93	26.06	29.25	-	41.36	40.64	30	25
NA63	31.86	29.37	30.92	29.37	22.75	19.93	21.54	29.33	29.68	27.85	31.23	39.72	29	24

Site ID	Jan	Feb	Mar	Apr ⁽²⁾	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted ⁽¹⁾
NA64	12.53	10.56	16.92	13.57	9.10	6.08	6.92	11.14	13.05	9.07	14.19	19.21	12	10
NA65	17.85	15.57	24.93	19.11	13.42	10.86	13.41	16.68	21.27	14.85	24.36	27.07	18	15
NA67	23.08	22.81	33.48	23.24	19.34	14.85	19.41	24.37	30.13	23.25	-	-	23	20
NA69	22.64	21.16	36.47	23.77	21.72	14.06	18.92	23.18	30.15	22.97	28.18	36.13	25	21
NA71	26.32	27.36	32.92	25.68	20.01	17.87	18.28	24.51	27.00	24.66	32.15	37.51	26	22
NA72	21.73	15.72	30.18	23.06	15.99	12.46	14.00	19.84	23.08	19.61	27.02	32.97	21	18
NA73	25.07	18.24	30.59	26.67	21.46	16.72	16.99	23.50	-	26.01	34.47	35.75	25	21
NA76	21.59	16.56	22.51	14.89	10.57	7.05	9.64	12.75	14.26	16.10	24.55	28.70	17	14
NA77	23.58	19.71	24.06	17.62	12.76	11.45	12.59	17.27	18.28	18.34	24.60	27.21	19	16
NA78	22.27	19.76	29.76	22.99	19.48	14.69	18.12	22.70	24.23	20.08	27.52	31.29	23	19
NA80	28.62	24.26	31.17	20.78	16.03	15.20	17.73	20.64	21.37	20.36	32.35	32.77	23	20
NA81	22.25	19.26	36.25	24.12	19.75	15.26	15.25	21.68	28.29	25.83	33.91	36.11	25	21
NA82	17.72	13.65	21.10	12.13	-	8.12	9.09	12.84	15.49	14.87	22.82	26.59	16	13
NA83	35.22	-	-	26.60	21.32	18.62	-	24.37	27.54	27.28	36.98	41.27	29	24
NA85	14.40	10.60	20.29	16.64	10.86	6.99	6.75	18.58	20.22	18.11	26.11	29.89	17	14
NA86	14.70	11.30	18.96	11.51	8.30	5.03	7.72	10.56	11.37	11.17	16.79	21.23	12	10
NA87	23.26	18.67	26.59	24.89	19.74	15.26	15.99	22.46	22.56	22.64	31.37	34.01	23	19
NA88	28.55	22.66	26.59	20.47	18.24	15.52	17.29	21.52	25.01	18.69	22.97	31.24	22	19
NA89	26.74	20.16	27.54	23.87	20.13	16.23	17.30	22.20	23.90	23.82	31.52	34.28	24	20
NA94	31.76	-	31.49	18.59	18.51	17.17	-	22.06	24.66	22.13	34.04	34.57	25	21
NA98	18.29	14.39	24.32	18.62	12.84	7.21	9.95	16.57	17.69	14.48	19.61	25.33	17	14
NA99	24.87	20.55	28.88	21.89	16.23	9.79	13.98	17.28	21.72	19.18	26.55	31.67	21	18
NA101	-	13.26	24.92	19.49	11.79	9.79	9.56	16.04	17.85	17.10	24.50	30.19	18	15
NA105	7.41	5.26	7.74	4.73	4.51	2.77	4.05	5.19	5.86	4.42	7.13	9.33	6	5
NA107	21.01	16.29	27.78	18.89	14.00	11.51	12.75	16.93	20.36	16.85	27.50	32.46	20	17
NA111 (3 tubes)	35.26	30.66	33.53	28.36	25.93	19.52	18.93	26.06	29.25	-	41.36	40.64	32	27
	31.86	29.37	30.92	29.37	22.75	19.93	21.54	29.33	29.68	27.85	31.23	39.72		
	12.53	10.56	16.92	13.57	9.10	6.08	6.92	11.14	13.05	9.07	14.19	19.21		
NA114	34.75	30.07	-	36.66	28.35	21.71	23.32	-	-	-	-	31.09	29	25
NA115	14.27	9.37	20.19	9.93	10.74	6.53	8.09	12.98	15.04	12.02	20.12	24.44	14	11
NA116	15.71	14.00	24.28	17.67	11.95	8.26	9.40	13.63	15.97	13.56	22.54	27.92	16	14
NA117	18.46	12.06	18.24	10.91	10.98	9.30	10.46	12.38	11.62	13.63	19.79	25.69	14	12
NA118	20.18	16.50	26.99	18.87	14.46	8.92	-	16.83	20.20	15.38	-	-	18	15
NA119	21.71	17.42	-	19.64	11.99	10.05	10.42	14.92	20.32	16.69	25.80	32.33	18	15
NA120	18.78	16.25	21.21	-	12.42	12.03	12.78	15.54	11.08	16.17	24.50	27.43	17	14

Site ID	Jan	Feb	Mar	Apr ⁽²⁾	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted ⁽¹⁾
NA121	19.30	16.80	32.43	25.63	17.83	10.56	14.27	20.35	27.32	18.12	31.04	33.43	22	19

Notes:

(1) See Appendix C for details on bias adjustment.

Table B.2 – 1,3 Butadiene Monthly Diffusion Tube Results for 2022

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data (ppb)	Annual Mean: Raw Data ($\mu\text{g}/\text{m}^3$)
41	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.02	0.05
55	0.03	0.02	0.05	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.03	0.06
104	0.03	0.02	0.02	-	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.05

Table B.3 – Benzene Monthly Diffusion Tube Results for 2022

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data (ppb)	Annual Mean: Raw Data ($\mu\text{g}/\text{m}^3$)
3	0.18	0.12	0.27	0.24	0.12	0.08	0.13	0.16	0.15	0.12	0.28	0.28	0.18	0.58
21	0.17	0.24	0.27	0.20	0.12	0.13	0.10	-	0.16	0.12	0.21	0.22	0.18	0.57
27	0.17	0.21	0.31	0.22	0.17	0.11	0.13	0.15	0.20	0.19	-	-	0.19	0.60
37	0.18	0.11	0.23	0.13	0.09	0.12	0.16	0.14	0.17	0.18	0.22	0.14	0.16	0.51
38	0.15	0.22	0.20	0.12	0.11	0.09	0.11	0.17	0.12	0.12	0.19	0.05	0.14	0.45
41	0.20	0.17	0.40	0.23	0.15	0.10	0.20	0.18	0.25	0.20	0.30	0.36	0.23	0.74
42	0.16	-	0.34	0.25	0.17	0.09	0.09	0.17	0.17	0.19	0.22	0.07	0.17	0.57
44	0.11	0.12	0.20	0.11	0.10	0.11	0.11	0.10	0.13	0.09	0.15	0.23	0.13	0.42
55	0.14	0.14	0.33	0.26	0.15	0.07	0.11	0.16	0.19	0.16	0.16	0.28	0.18	0.58
77	0.20	0.13	0.24	0.15	0.08	0.09	0.10	0.11	0.12	0.15	0.15	0.10	0.14	0.44
80	0.14	0.11	0.22	0.16	0.11	0.10	0.11	0.13	0.14	0.15	0.22	0.22	0.15	0.49
81	0.26	0.20	0.36	0.23	0.19	0.13	0.17	0.18	0.22	-	0.27	0.31	0.23	0.74
94	0.22	0.19	0.30	0.22	0.17	0.11	0.14	0.11	0.16	0.17	0.38	0.28	0.20	0.66
105	0.11	0.11	0.18	0.10	0.09	0.07	0.08	0.08	0.10	0.11	0.08	0.12	0.10	0.33
116	0.16	0.12	-	0.20	0.15	0.10	0.15	0.19	0.14	0.13	0.17	0.24	0.16	0.52
120	0.13	0.14	0.34	-	0.21	0.16	0.14	0.23	0.25	0.21	0.12	0.24	0.20	0.64

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

New or Changed Sources Identified Within Falkirk Council During 2022

Falkirk Council has not identified any new sources relating to air quality within the reporting year of 2022.

Additional Air Quality Works Undertaken by Falkirk Council During 2022

Falkirk Council completed the revocation of the Falkirk town centre (PM₁₀ annual mean only) AQMA in 2022. Please see Appendix D for the associated AQMA revocation report.

QA/QC of Diffusion Tube Monitoring

In 2022, the nitrogen dioxide (NO₂), benzene and 1, 3-butadiene ambient air diffusion tubes deployed by Falkirk Council were supplied and analysed by Gradko International Ltd. The analysis method used for the NO₂ tubes was 50% tri-ethanolamine (TEA) and 50% acetone. The benzene tube type was Carbograph 1TD (thermal desorption / gas chromatography) and for 1, 3-butadiene the tube type was Carbo-pack X (ATD) with analysis using TD-GCMS. The diffusion tube monitoring has been completed in adherence with the [DEFRA 2022 Diffusion Tube Calendar](#) and with all monitoring data and additional bias / annualisation information entered into the latest [DEFRA Diffusion Tube Data Processing Tool](#).

Nitrogen Dioxide Diffusion Tubes

In 2022, the NO₂ diffusion tube analysis was completed by Gradko International Ltd. Gradko adheres to the DEFRA guidance for the preparation and analysis of the NO₂ diffusion tubes. All the results relating to the concentration of NO₂ present on the diffusion tube are within the scope of Gradko's United Kingdom Accreditation Service (UKAS) accreditation.

The full set of monthly NO₂ diffusion tube results are shown in Table B.1 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 completed in accordance with in-house method 'GLM 13-6' under UKAS fixed scope accreditation.

The full set of monthly 1, 3-butadiene diffusion tube results are shown in Table B.2 in Appendix B.

Benzene Diffusion Tubes

Gradko International Ltd. analysed Falkirk Council's benzene diffusion tubes by ATD-GCMS. Analysis has been completed in accordance with Gradko's in-house method 'GLM 4' under UKAS fixed scope accreditation. The full set of monthly Benzene diffusion tube results are shown in Table B.3 in Appendix B.

Diffusion Tube Annualisation

Annualisation is required for any site with data capture less than 75% but greater than 25%. Two diffusion tube locations have recorded data capture less than 75% in 2022 – NA60 Ronades Road, Carron and NA114 Glasgow Road, Camelon. The calculation method undertaken and associated results are provided in Table C.2.

Diffusion Tube Bias Adjustment Factors

Falkirk Council have applied a local bias adjustment factor of **0.84** to the 2022 monitoring data. A summary of bias adjustment factors used by Falkirk Council over the past five years is presented in C.1.

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	Local	-	0.84
2021	Local	-	0.84
2020	Local	-	0.94
2019	Local	-	0.94
2018	Local	-	0.88

NO₂ Diffusion Tube Bias Adjustment Factor (Local and National)

In accordance with LAQM TG16^{Ref 2}, a locally derived Bias Adjustment Factor has been calculated for the 2022 NO₂ diffusion tube results based on the following two co-location sites: NA42 Grangemouth Municipal Chambers and NA111 Falkirk West Bridge Street. The local results have been submitted to the LAQM Helpdesk to contribute to the national bias factor.

The results of the locally derived bias adjustment factor spreadsheets are shown in Figure 27 A) and B).

The national diffusion tube bias adjustment factor spreadsheet is displayed in Figure 28 for comparison purposes. The overall national bias factor in 2022 was **0.82**.

A comparison in summary form of the local and national bias factor summary is shown in table C.2.

Table C.2 – Comparison of Local vs National Bias Factor Summary

Local NO₂ Bias Adjustment Factor	0.84
National NO₂ Bias Adjustment Factor	0.82
Difference	-0.02

In accordance with LAQM TG16^{Ref 2} Box 7.11 – data quality checks of the local bias adjustment spreadsheet have been assessed as ‘good’ for the Falkirk West Bridge Street site (Precision and Monitoring Data) and ‘good’ for Precision and ‘Poor’ (due to data capture rates) for Monitoring Data for the Grangemouth Municipal Chambers site. Falkirk Council have a full years’ worth of co-location data at the representative locations (A10 Grangemouth Municipal Chambers: Urban background / Industrial – typical off-street urban location that is likely to measure traffic and industrial emissions and A7 West Bridge Street: roadside – traffic related, elevated NO₂ levels at typical daytime peak traffic periods).

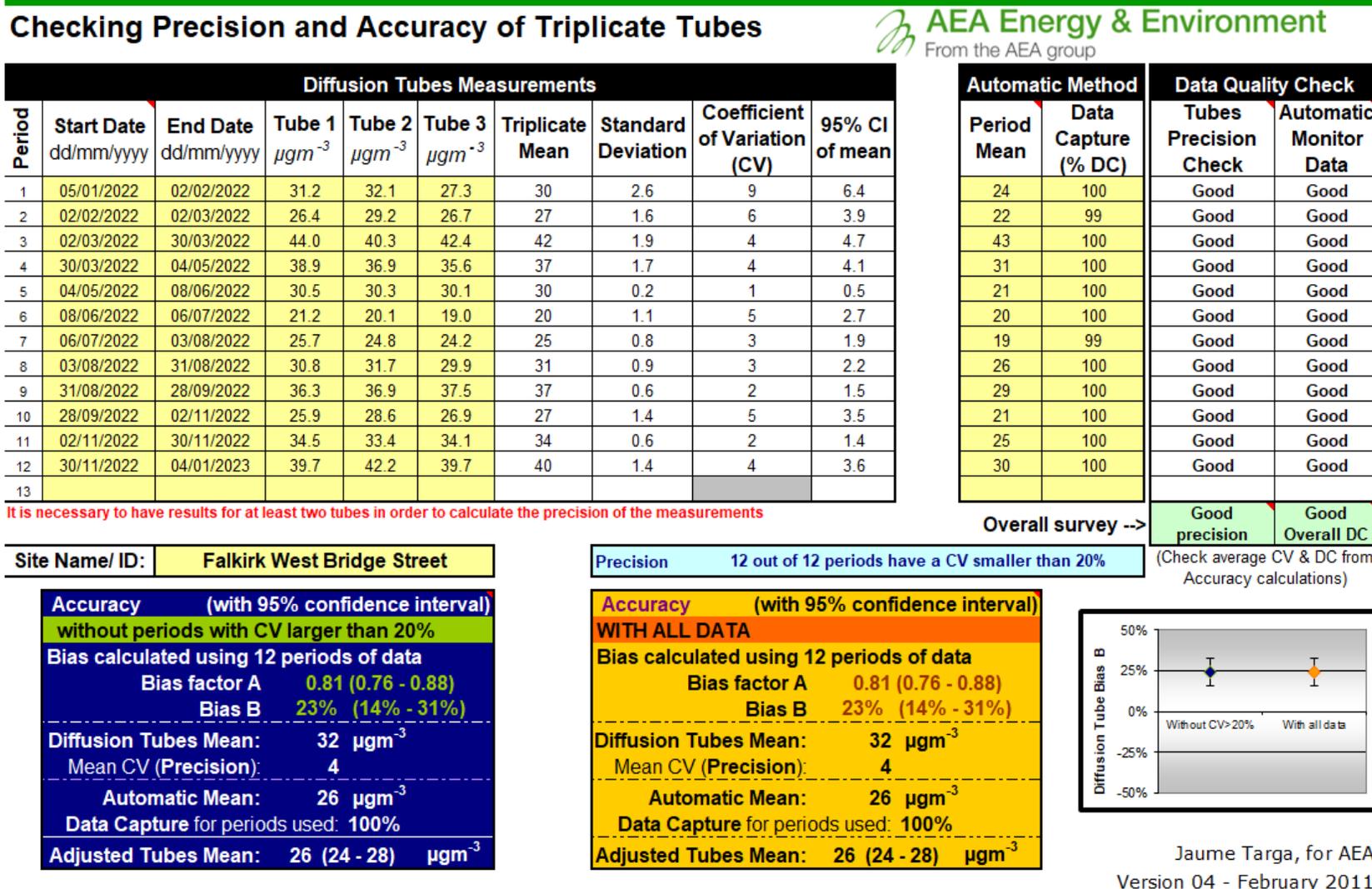
Using the above reasons, it has been decided to apply the locally derived bias adjustment factor for the NO₂ diffusion tube results.

NO₂ Fall-off with Distance from the Road

No diffusion tube NO₂ monitoring locations within Falkirk Council required distance corrections during 2022.

Figure 28 – NO₂ Locally Derived Bias Adjustment Factor Spreadsheets

A) A7 Falkirk West Bridge St



B) A10 Grangemouth Municipal Chambers

Checking Precision and Accuracy of Triplicate Tubes



Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm ⁻³	Tube 2 µgm ⁻³	Tube 3 µgm ⁻³	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	05/01/2022	02/02/2022	20.1	17.0	19.3	19	1.6	9	4.0
2	02/02/2022	02/03/2022	16.2	13.4	15.9	15	1.5	10	3.8
3	02/03/2022	30/03/2022	22.3	22.8	18.3	21	2.4	12	6.1
4	30/03/2022	04/05/2022	12.7	15.2	14.0	14	1.2	9	3.1
5	04/05/2022	08/06/2022	9.6	9.5	9.6	10	0.0	0	0.1
6	08/06/2022	06/07/2022	7.1	7.9	7.8	8	0.5	6	1.1
7	06/07/2022	03/08/2022	8.8	8.9	9.1	9	0.2	2	0.4
8	03/08/2022	31/08/2022	12.5	12.7	12.4	13	0.2	1	0.4
9	31/08/2022	28/09/2022	14.9	15.3	15.2	15	0.2	1	0.6
10	28/09/2022	02/11/2022	12.6	11.7	13.0	12	0.6	5	1.6
11	02/11/2022	30/11/2022	17.6	20.3	20.4	19	1.6	8	3.9
12	30/11/2022	04/01/2023	23.0	24.8	25.6	24	1.3	5	3.3
13									

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
15	99	Good	Good
11	97	Good	Good
25	51	Good	or Data Capt
10	65	Good	or Data Capt
6	92	Good	Good
8	100	Good	Good
8	99	Good	Good
9	53	Good	or Data Capt
13	78	Good	Good
11	100	Good	Good
16	100	Good	Good
25	100	Good	Good
Overall survey -->		Good precision	Poor Overall DC

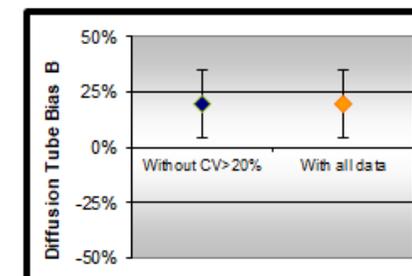
Site Name/ ID:	Grangemouth MC
----------------	----------------

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

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 9 periods of data	
Bias factor A	0.86 (0.76 - 0.99)
Bias B	16% (1% - 32%)
Diffusion Tubes Mean:	15 µgm ⁻³
Mean CV (Precision):	5
Automatic Mean:	13 µgm ⁻³
Data Capture for periods used:	96%
Adjusted Tubes Mean:	13 (11 - 14) µgm ⁻³

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 9 periods of data	
Bias factor A	0.86 (0.76 - 0.99)
Bias B	16% (1% - 32%)
Diffusion Tubes Mean:	15 µgm ⁻³
Mean CV (Precision):	5
Automatic Mean:	13 µgm ⁻³
Data Capture for periods used:	96%
Adjusted Tubes Mean:	13 (11 - 14) µgm ⁻³



Jaume Targa, for AEA
Version 04 - February 2011

C) Calculation of Two Colocation Results: A7 Falkirk West Bridge St and A10 Grangemouth Municipal Chambers

	Local Bias Adjustment Input 1 (Site: FWBS)	Local Bias Adjustment Input 2 (Site: GMC)
Periods used to calculate bias	12	12
Bias Factor A	0.81 (0.76 – 0.88)	0.86 (0.76 – 0.99)
Bias Factor B	23% (14% - 31%)	16% (1% - 32%)
Diffusion Tube Mean ($\mu\text{g}/\text{m}^3$)	32	15
Mean CV (Precision)	4%	5%
Automatic Mean ($\mu\text{g}/\text{m}^3$)	26	13
Data Capture	100%	96%
Adjusted Tube Mean ($\mu\text{g}/\text{m}^3$)	26 (24 – 28)	13 (11 – 14)

Notes: A combined local bias adjustment factor of **0.84** (0.81 – 0.86) has been used to bias adjust the 2022 diffusion tube results.

QA/QC of Automatic Monitoring

Table C. 3 – Details of the QA / QC at the Automatic Monitoring Stations in 2021

QA / QC in 2021		
Site	Analyser	Network
A3. Bo'ness	SO ₂	SAQN
A4. Falkirk Haggs	NO _x	SAQN
	PM _{10+2.5} (Fidas)	
A5. Falkirk Hope St	NO _x	SAQN
	SO ₂	
	PM _{10+2.5} (Fidas)	
A7. Falkirk West Bridge St	NO _x	SAQN
	PM _{10+2.5} (Fidas)	
A8. Grangemouth AURN (Inchyra)	NO _x	AURN
	PM ₁₀ (BAM)	
	PM _{2.5} (BAM)	
	SO ₂	
A9. Grangemouth Moray	NO _x	AURN
	SO ₂	SAQN

A10. Grangemouth Municipal Chambers	NO _x	SAQN
	PM _{10+2.5} (Fidas)	
	SO ₂	
A11. Grangemouth Zetland Park	SO ₂	SAQN
	PM _{10+2.5} (Fidas)	
A14. Banknock 3	PM _{10+2.5} (Osiris)	Local
A15 Main St Bainsford	NO _x	SAQN
	PM _{10+2.5} (Fidas)	SAQN

Local sites:

- Analyser data is downloaded, and a flow check is completed on a fortnightly basis.
- A filter change is completed 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 completed by Falkirk Council staffs that are audited to AURN standards.
- The Turnkey Osiris at Banknock 3 site 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 SO₂ analysers receive fortnightly zero and span checks and filter changes.
- BAM PM₁₀ and PM_{2.5} nozzles are cleaned and tapes are changed every eight weeks.
- All LSO site visits are carried out by Falkirk Council staffs that are audited to AURN standards.
- Analysers are covered by an emergency callout contract and receive a service every six months.
- QA / QC are conducted to AURN / 'national' standards.

- All air quality data presented within this APR are fully ratified. Ratified data is collected from the [Air Quality in Scotland](#) website. Full details of the data QA / QC ratification process are detailed here: <https://www.scottishairquality.scot/data/verification-ratification>
- Live air quality data from all Falkirk Council sites are presented on the [Air Quality in Scotland](#) website.
- Falkirk Council also checks the data on its internal systems and is in regular communication with Ricardo to ensure the best data quality is collected / presented. Unscaled data is supplied by Falkirk Council to Ricardo for the Scottish AQ Network sites on a six-monthly basis to improve data capture.

PM₁₀ and PM_{2.5} Monitoring Adjustment (Palas Fidas 200 Analyser)

In accordance with the Scottish Government Guidance Note “Measurement of Ambient Particulate Matter (PM) and the LAQM Reporting of Measured Concentrations” May 2023¹. Corrected and uncorrected results (greyed out) are displayed in “Table A.5 – Annual Mean PM₁₀ Monitoring Results (µg/m³)” and “Table A.7 – Annual Mean PM_{2.5} Monitoring Results (µg/m³)” for PM concentrations with Palas Fidas 200 analysers in operation.

Automatic Monitoring Annualisation

All automatic monitoring locations within Falkirk Council recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

NO₂ Fall-off with Distance from the Road

No automatic NO₂ monitoring locations within Falkirk Council required distance correction during 2022.

Appendix D - Additional Air Quality Works Undertaken by Falkirk Council During 2022

2022 Falkirk Town Centre PM10 AQMA Revocation Report



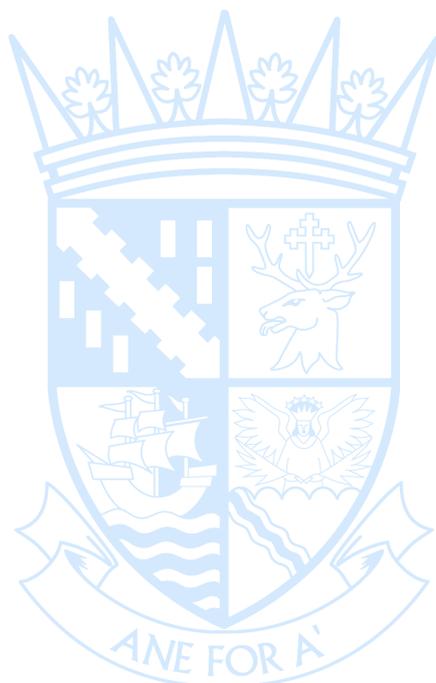
Falkirk Council

Proposal for the Revocation of the Falkirk Town Centre Air Quality Management Area (AQMA) for Particulate Matter (PM₁₀)

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

2022

Local Authority Officer:	Author: John Millar (Air Quality Specialist) Reviewed by: David Gray (Env. Protection Co-ordinator)
Department:	Environmental Health, Development Services
Address:	Abbotsford House, David's Loan, Falkirk, FK2 7YZ
Email:	pollution@falkirk.gov.uk
Report Ref:	Revocation Proposal, FTC (PM₁₀) AQMA
Status:	Final
Date:	12/10/2022



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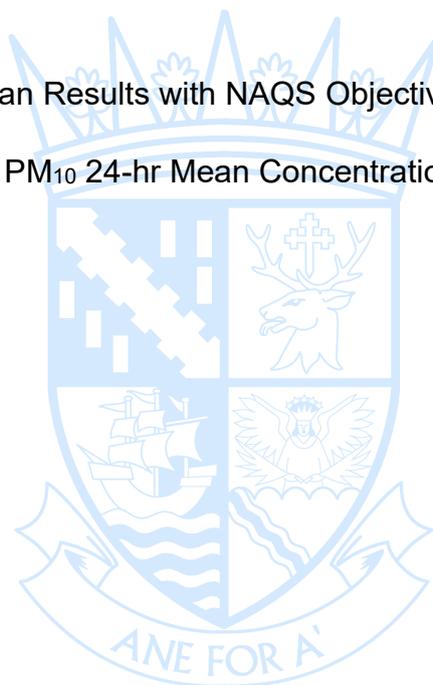
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Background

Falkirk Council has been working to improve air quality and public health for many years. The Council has a responsibility to comply with legislation and policy regulations when managing local air quality. The Council completes its Local Air Quality Management (LAQM) duties by managing an extensive air quality network, assessing monitoring data, and reporting on areas of existing or anticipated poor air quality - declared via Air Quality Management Areas (AQMA).

After many years of compliance with the relevant National Air Quality Strategy (NAQS) objectives, Falkirk Council is proposing to revoke the Falkirk Town Centre (FTC) AQMA for particulate matter (PM₁₀) annual mean and 24-hour mean elements only. The nitrogen dioxide (NO₂) annual mean element of the FTC AQMA is remaining in place and is unaffected by this AQMA revocation proposal.

Revoking an AQMA is an indication that there has been an improvement in air quality within that area over a certain period of time. This improvement has public health benefits through the achievement and the on-going work of the relevant Air Quality Action Plan (AQAP) measures.

Local Pollution Sources

The FTC 2015 AQAP¹ identified that the “principal source of PM₁₀ pollution in FTC is road traffic, with commercial and residential combustion as significant contributors.” The PM₁₀ source apportionment (as displayed in Figure 3.16 of the AQAP) identified that, at locations where the PM₁₀ concentrations are predicted to exceed NAQS objective the exceedances are “principally attributable to road traffic emissions.”

Legislation and Policy

European Legislation

The European Union (EU) has published a Directive on Ambient Air Quality Assessment and Management² which came into force in September 1996. This Directive was intended as a strategic framework for tackling air quality consistently, through setting European-wide air quality limit values in a series of daughter directives, superseding and extending European legislation. The first four daughter directives were placed into national legislation. A new EU air quality directive³ came into force in June 2008 and was transposed into “The Air Quality Standards Regulations”⁴ in England, Wales, Scotland, and Northern Ireland in June 2010.

National Legislation

The Environment Act 1995⁵ (UK Government) required the preparation of a National Air Quality Strategy (NAQS) setting Air Quality Objectives (AQOs) for specified pollutants and outlining measures to be adopted by local authorities through the system of LAQM and by others to work in pursuit of the achievement of these objectives. The NAQS was published in 1997 and subsequently reviewed and revised in 2000, and an addendum to the Strategy published in 2002. The current Strategy⁶ was published in July 2007.

The Air Quality Standards (AQS) are set for the purpose of protecting human health, vegetation, and ecosystems from certain harmful atmospheric pollutants. The Scottish air quality standards take account of the EU objective values and are either effectively identical, or more stringent. The standards applicable to the study are shown in Table 1.

Cleaner Air for Scotland

The Scottish Government's "Cleaner Air for Scotland (CAFS) Strategy - The Road to a Healthier Future"⁷ is a national strategy that sets out how the Scottish Government will deliver its commitment to further improving air quality to protect human health.

The CAFS strategy aims to help the Scottish Government achieve the ambitious goal "to have the best air quality in Europe". A National Modelling Framework (NMF) and National Low Emission Framework (NLEF) are being developed to provide the tools and mechanisms to improve national air quality.

"Cleaner Air for Scotland 2 (CAFS2) - Towards a Better Place for Everyone"⁸ is Scotland's second air quality strategy. CAFS2 sets out how the Scottish Government and its partner organisations propose to further reduce air pollution to protect human health and fulfil Scotland's legal responsibilities over the period from 2021 to 2026. A series of actions across a range of policy areas are outlined within the strategy.

Local Air Quality Management

The AQOs which are relevant to LAQM in Scotland and have been set into regulations, namely the Air Quality (Scotland) Regulations 2000⁹, the Air Quality (Scotland) Amendment Regulations 2002¹⁰ and the Air Quality (Scotland) Amendment Regulations 2016¹¹, the latter of which introduces an additional statutory obligation for Scottish local authorities to comply with an annual mean standard for PM_{2.5} to align with the World Health Organisation (WHO) guideline value¹².

LAQM Technical Guidance "TG16"¹³ requires that a decision to amend or revoke an AQMA should only be taken "following a detailed study, providing sufficient information to justify a decision. Supporting information for revocation should be equivalent to the detail required in declaring an AQMA. An AQMA can be revoked on the basis of robust monitoring evidence" as displayed in this report.

Local Air Quality Standards

The Air Quality Standards (AQSs) are set for the purpose of protecting human health, vegetation, and ecosystems from certain harmful atmospheric pollutants. The Scottish standards take account of the EU objective values and are either effectively identical, or more stringent. The standards applicable to the study are shown in Table 1.

Table 1 – AQS Relevant for This Study

Pollutant	Concentration	Measured As
Particulate Material (PM ₁₀)	50 µg/m ³ not to be exceeded more than 7 times per year	24-hour mean
	18 µg/m ³	Annual mean

LAQM Technical Guidance “TG16”¹³ provides advice on where the AQS for pollutants considered in this study apply. These are summarised in Table 2.

One of the areas identified which was subject to historic, poor air quality was FTC. This area is shown in Figure 1 – Map of Falkirk Town Centre AQMA. The AQMA was declared by Falkirk Council on 25th January 2013.

Figure 1 – Map of Falkirk Town Centre AQMA

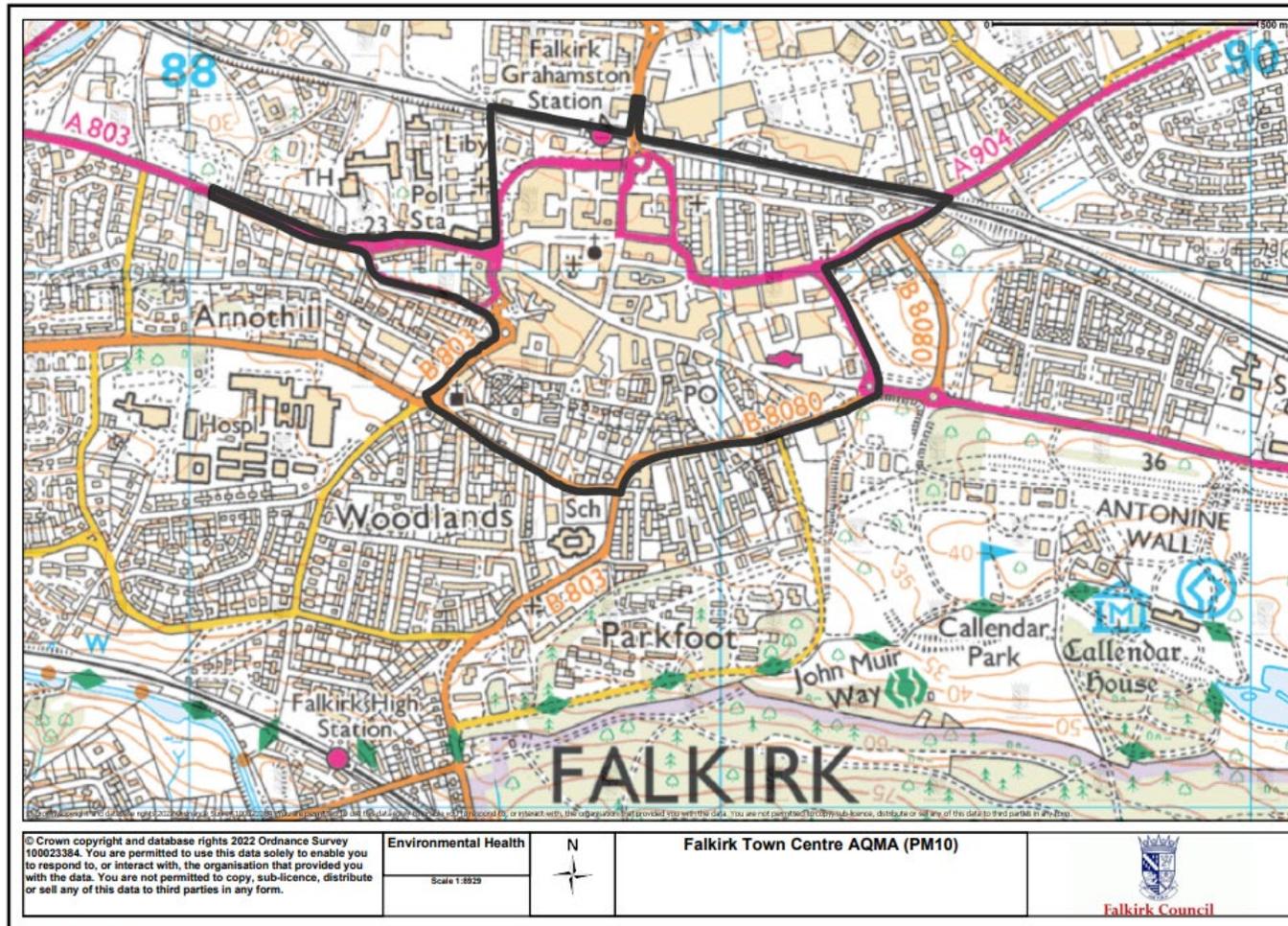


Table 2 – Examples of Where the AQS Apply

Averaging Period	Standards Should Apply to	Standards Should Generally Not Apply to
24-hour mean and 8-hour mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless used as a permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24-hour mean and 8-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be shorter than either the 24- or 8-hour relevant mean.
1-hour mean	<p>All locations where the annual mean and 24- and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more.</p> <p>Any outdoor locations where members of the public might reasonably expect to spend one hour or longer which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more.</p> <p>Any outdoor locations where members of the public might reasonably expect to spend one hour or longer.</p>	Kerbside sites where the public would not be expected to have regular access.

Scope of the Study

This report considers air quality monitoring (PM₁₀ specific) data within the FTC area from the last ten years (since 2011) to determine trends in measured concentrations and to provide a robust study for the proposed AQMA revocation (in accordance with LAQM Technical Guidance “TG16”¹³). Measured PM₁₀ concentrations are compared against NAQS objectives displaying overall compliance with the PM₁₀ (annual and 24-hr mean) NAQS objectives.

FTC AQAP Measures Achieved and On-going

The 2015 FTC AQAP¹ details the following grouped action measures which has led to an improvement of PM₁₀-related air quality within the FTC area:

- Reducing emissions from individual vehicles.
- Promotion of the Falkirk ECO Stars scheme for commercial vehicle operators.
- Planning and development measures.
- Reducing demand for travel and promoting alternative modes of transport; and
- Educating and informing the public regarding air quality.

Specific AQAP Measures completed in recent years which have led to a reduction in FTC PM₁₀ concentrations include:

Falkirk Council Fleet Management

Falkirk Council’s vehicle fleet (in 2022) includes seventy-seven fully electric vehicles (EV) including minibuses, vans and cars. The Council’s EV fleet has gradually increased over the years since the FTC AQMA was declared in 2013. This is due to increase to one hundred EVs in late 2022. Further information on the Council’s new electric fleet can be found using the following Falkirk Council weblink:

<https://www.falkirk.gov.uk/employees/news/article.aspx?aid=6735>

In 2022, there are ninety-six vehicle charging bays with various capacities (7, 22, 50, 150kW). An additional thirty-three chargers (with sixty-six vehicle bays) are being

planned to be installed in various locations throughout the Falkirk Council area in 2022. This action helps to promote alternative / sustainable modes of travel and to achieve measures included in Falkirk Council's [Climate Change & Sustainability Policies](#) .

ECO Stars

ECO Stars is a fleet recognition scheme designed to provide recognition and guidance on operational practices to companies operating goods vehicles, taxis, buses and coaches within the Falkirk Council area. The scheme aims to improve local air quality and reduce other environmental impacts as well as improving operational efficiency of vehicles.

The ECO Stars scheme has been in place with Falkirk Council since 2012. The scheme has since grown to two-hundred and sixty-three members in 2022.

Traffic Light System Improvements in Falkirk / Grangemouth

An improved traffic light system was installed at the junction of Main Street, Bainsford and Bankside in February 2012. With Microprocessor Optimised Vehicle Actuation (MOVA) in use, this has led to an improvement in traffic capacity and helped reduce delays at this junction (judged to be around 10%).

Traffic light signal improvements have also been completed at the high-capacity M9 junctions in Polmont and Grangemouth to help alleviate congestion, reduce vehicle idling and allowing free flowing traffic in the vicinity of local receptors.

Take the Right Route

Falkirk Council's "Take the Right Route" is a scheme which aims to tackle traffic congestion and reduce car dependency by promoting walking, cycling and the use of public transport for everyday short journeys. Take the Right Route covers a wide range of projects including:

- Personal travel planning;

- Marketing and promotion: and
- Infrastructure improvements

Further information on current and specific Take the Right Route projects can be found here:

<https://www.falkirk.gov.uk/services/roads-parking-transport/transport/take-the-right-route.aspx>

Other (non-AQAP specific) measures that Falkirk Council has implemented which has assisted with the improvement of FTC (PM₁₀) air quality include:

Electric A9

On the 10th August 2020, the [Falkirk Stadium Vehicle Charging Hub](#) was opened and became operational accepting electric vehicles to park and charge-up. The £1.4m facility has charging capacity for twenty-six electric vehicles - 30% more than the second largest EV facility in Scotland. This supports the Scottish Government's ambition to phase-out the need for new petrol and diesel vehicles by 2032 as outlined in the Scottish Government's Renewable and Low Carbon Energy Policy [Renewable and Low Carbon Energy Policy](#) . The Falkirk Stadium Vehicle Charging hub is an integral part of Transport Scotland's "Electric A9" project with the overall aim of improving the electric vehicle charging infrastructure throughout Scotland.

East Central Scotland Vehicle Emission Partnership "Switch Off and Breathe"

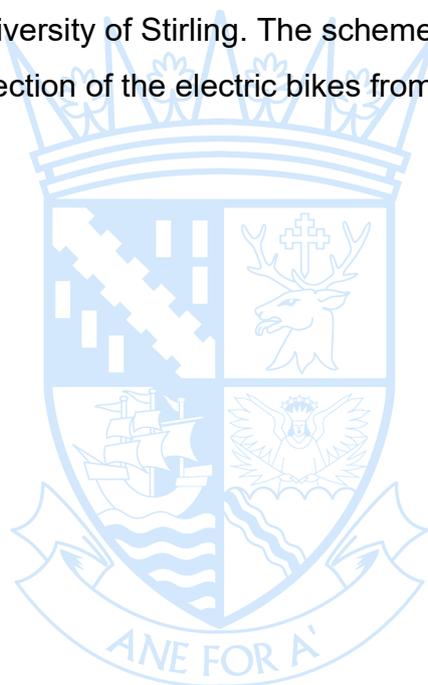
Falkirk Council has been working closely with fellow members of the East Central Scotland Vehicle Emissions Partnership (VEP, "[Switch Off and Breathe](#)") to work to the objectives set out in the Scottish Government's CAFS strategies.

The remit of the VEP is to help reduce vehicle emissions (and as a result, air pollution) by encouraging drivers to switch off their engine whenever possible. The

VEP also handle vehicle idling complaints and provide educational resources for schools and communities.

Forth Bike

[Forth Bike](#) (in conjunction with [Forth Environment Link](#)) operates an electric bike hire scheme within the Falkirk and Stirling areas utilising the local path network. The Forth Bike system currently includes over one-hundred electric pedal assist 'Pedelec' bikes distributed between their four local stations: the Falkirk Wheel, the Helix, Forth Valley Royal Hospital, and the University of Stirling. The scheme operates using a smart phone app to aid in the selection of the electric bikes from one of the local stations.



Monitoring Sites, Equipment and Data

Falkirk Council monitors PM₁₀ and other pollutants at several locations throughout the Council area using automatic and manual sampling methods. The automatic monitoring data displayed below has been fully checked and ratified in accordance with the Scottish Air Quality Database Quality Assurance / Quality Control (QA/QC) process¹⁴.

The Council currently operates two automatic monitoring stations located within the FTC AQMA (as detailed in Table 3). Previous monitoring stations / equipment are also shown in this table for reference. The locations of the Falkirk Hope Street and West Bridge Street automatic monitoring stations are displayed in Appendix A – Maps of Automatic Monitoring Locations.

The PM₁₀ (annual mean and 24-hr mean) monitoring results are shown in Tables 4 and 5. These results are also displayed in Graphs 1 and 2.

PM₁₀ Annual Mean Results (2011 – 2021)

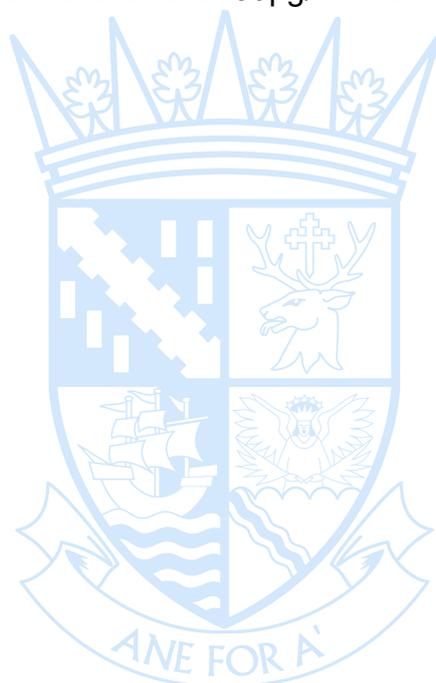
There were four PM₁₀ annual mean NAQS objective exceedances recorded at one site, A7 Falkirk West Bridge Street, over the displayed, last ten-year period. No further NAQS objective exceedances were recorded since 2015 at any of the monitoring sites in the FTC area with all results displaying a decreasing trend in annual mean concentration results. These results demonstrate that the annual mean PM₁₀ concentrations for the past seven years (since 2015) have complied with the NAQS objective. Falkirk Council expects the PM₁₀ annual mean concentrations to remain within the NAQS objective for many years in the future due to the ongoing AQAP work as detailed in the above section “FTC AQAP Measures Achieved and On-going”.

There was a lower-than-expected PM₁₀ annual mean concentration recorded in 2020 (7µg/m³) at the Falkirk West Bridge Street site, this is likely to be attributable to a reduction in normal traffic volumes and patterns due to the Covid-19 pandemic.

Number of Days PM₁₀ 24-hr Mean Concentrations Above 50µg/m³ (2011 – 2021)

There have been no NAQS objective exceedances of the “Number of Days PM₁₀ 24-hr Mean Concentrations Above 50µg/m³” at any of the FTC monitoring sites over the past ten years.

The site which recorded the highest number of days was A7 Falkirk West Bridge Street in 2016 (6). The general trend of mean concentrations has been decreasing at all sites since 2013 when the FTC AQMA was declared. These results demonstrate that the PM₁₀ 24-hr mean concentrations above 50µg/m³ have complied with the NAQS objective.



Monitoring Equipment

The FTC automatic, fixed air quality monitoring equipment are displayed in Table 3.

Table 3: FTC AQMA Air Quality Monitoring Stations and Equipment

AQ Monitoring Site ID:	A5 Falkirk Hope Street	A6 Falkirk Park Street (Closed)	A7 Falkirk West Bridge Street	A12 Falkirk Grahams Road (Closed)	
Site Type:	Roadside (Automatic)	Roadside (Automatic)	Roadside (Automatic)	Roadside (Automatic)	
Address:	Car Park at Garrison Place (West), Falkirk, FK1 1HU	Education Building, Park St, Falkirk, FK1 1RE	West Bridge St, Falkirk, FK1 5RQ	Grahams Rd, Falkirk, FK1 1HU	
Easting / Northing:	288688 / 680219	288892 / 680070	288457 / 680064	288823 / 680242	
Monitoring Equipment:	PM₁₀	R&P 1400 TEOM (PM ₁₀) (10/10/2018 - 15/12/2020) Palas FIDAS 200 (PM ₁₋₁₀) (15/12/2020 - Present)	R&P 1400 TEOM (PM ₁₀) (2005 - 23/04/2014)	R&P 1400 TEOM (PM ₁₀) (16/09/2009 - 09/11/2016) Palas FIDAS 200 (PM ₁₋₁₀) (09/11/2016 - Present)	R&P 1400 TEOM (PM ₁₀) (20/12/2011 - 10/10/2018)
	NO_x	Horiba 360 APNA (NO _x) (01/07/2007 - 09/03/2022) API Teledyne T200 (NO _x) (09/03/2022 - Present)	Horiba 360 APNA (NO _x) (2005 - 23/04/2014)	Monitor Labs ML9841B (NO _x) (07/11/2007 - 25/03/2015) API Teledyne T200 (NO _x) (25/03/2015 - Present)	Casella ML9841B (NO _x) (30/09/2010 - 30/09/2011)
	SO₂	Horiba 360 APSA (SO ₂) (01/07/2007 - 09/03/2022) API Teledyne T100 (SO ₂) (09/03/2022 - Present)	Horiba 360 APSA (SO ₂) (2005 - 23/04/2014)		
Reference Method Monitoring Technique:	PM₁₀	R&P 1400 TEOM: Gravimetric Palas FIDAS 200: Optical, light-scattering	R&P 1400 TEOM: Gravimetric	R&P 1400 TEOM: Gravimetric Palas FIDAS 200: Optical, light-scattering	R&P 1400 TEOM: Gravimetric
	NO_x	Horiba 360 APNA: Chemiluminescence API Teledyne T200: Chemiluminescence	Horiba 360 APNA: Chemiluminescence	Monitor Labs ML9841B: Chemiluminescence API Teledyne T200: Chemiluminescence	Casella ML9841B: Chemiluminescence
	SO₂	Horiba 360 APSA: UV fluorescence API Teledyne T100: UV fluorescence	Horiba 360 APSA: UV fluorescence		
Date Site Installed:	1997	2005	07/11/2007	30/09/2010	
Date Site Removed:	Still operational	23/04/2014	Still operational	30/04/2019	
Comments:		PM ₁₀ TEOM transferred from Park Street to Grahams Road on 20/12/2011		PM ₁₀ TEOM transferred from Grahams Road to Hope Street on 10/10/2018	

Table 4: Measured Automatic PM₁₀ Annual Mean Results 2011 - 2021

Site ID	Site Type	PM ₁₀ Annual Mean Concentration (µg/m ³)										
		Pre AQMA		AQMA Declared	AQMA Active							
		2011	2012	2013	2014	2015	2016	2017	2018	2019	COVID-19	
										2020	2021	
A5	Falkirk Hope Street								11	13	9	9
	A5 Falkirk Hope Street Valid Data Capture for Monitoring Year (%)								20 ⁽¹⁾	71	87	91
A6	Falkirk Park Street	15	14	15	14							
	A6 Falkirk Park Street Valid Data Capture for Monitoring Year (%)	93	95	96	31 ⁽¹⁾							
A7	Falkirk West Bridge Street	19	18	19	18	15	15	10	12	10	7	9
	A7 Falkirk WBS Valid Data Capture for Monitoring Year (%)	76	98	97	85	80	98	88	67	98	38	100
A12	Falkirk Grahams Road		16	16	13	11	13	12				
	A12 Falkirk Grahams Road Valid Data Capture for Monitoring Year (%)		96	95	94	78	95	98				

Notes: **Exceedances of the PM₁₀ annual mean objective of 18µg/m³ are shown in bold.**

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

Graph 1: Measured Automatic PM₁₀ Annual Mean Results with NAQS Objective Limit (2011 – 2021)

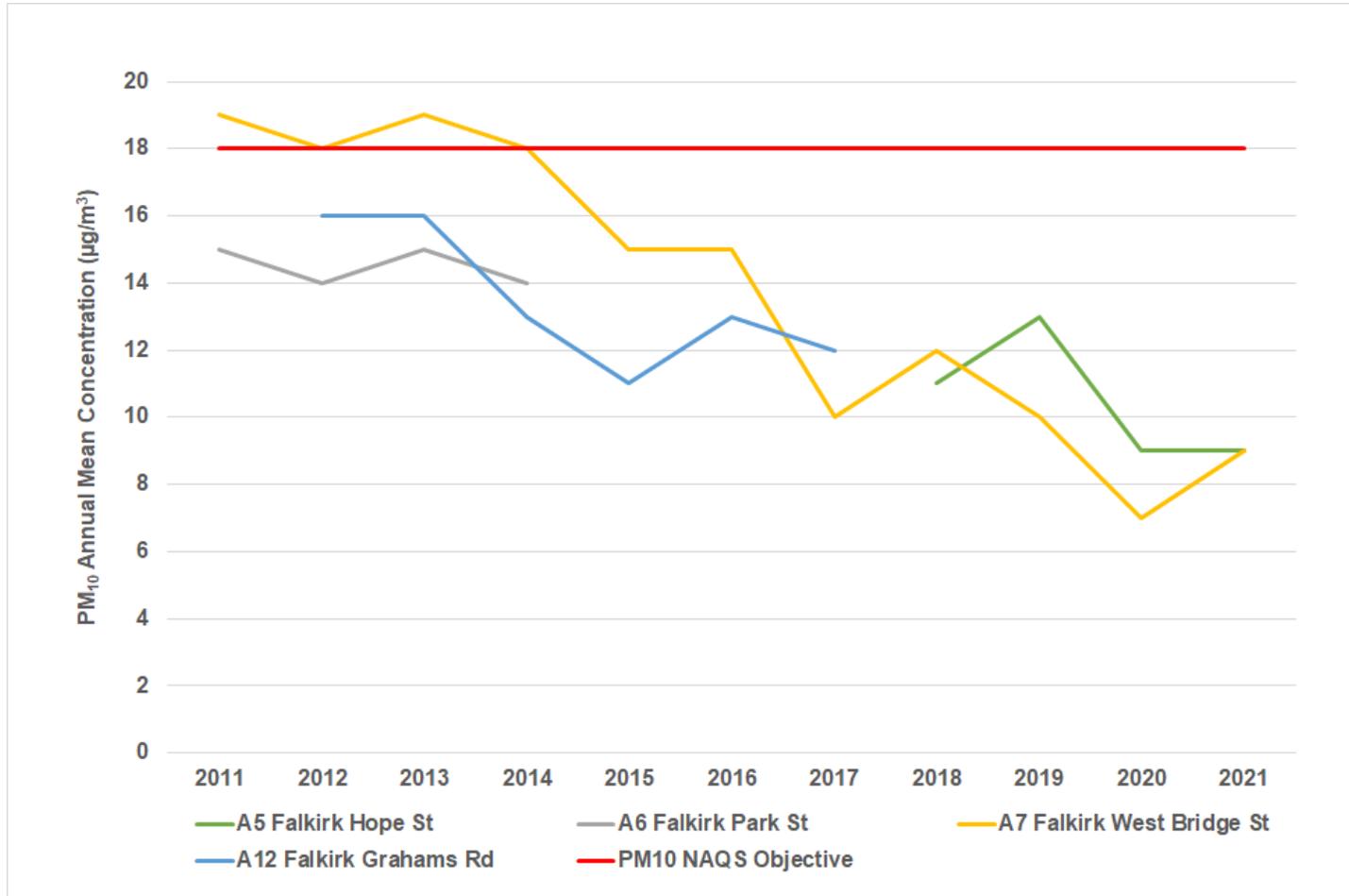


Table 5: Number of Days PM₁₀ 24-hr Mean Concentrations Above 50µg/m³ (2011 - 2021)

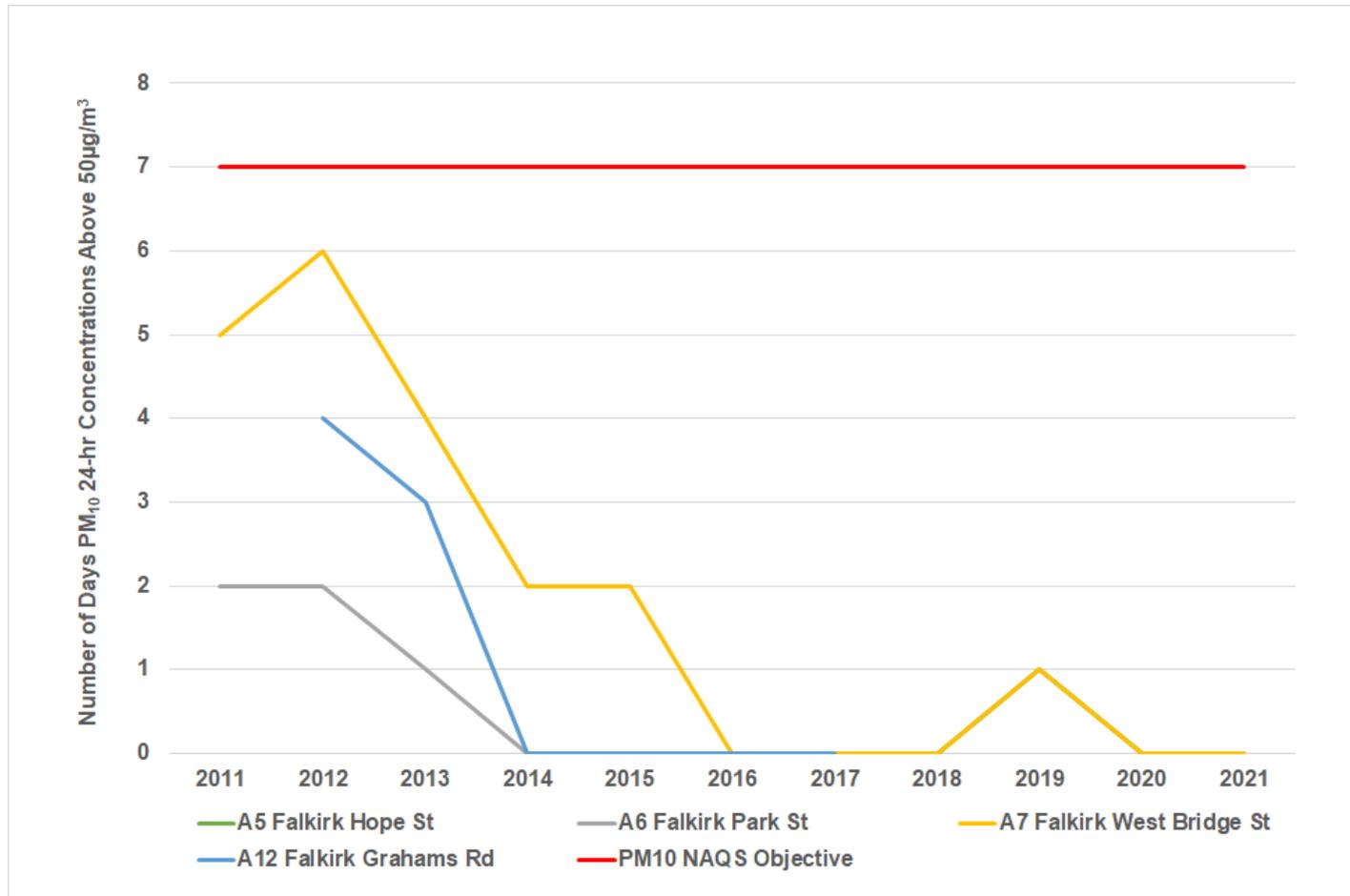
Site ID	Site Type	Number of Days PM ₁₀ 24-hr Mean Concentrations Above 50µg/m ³											
		Pre AQMA		AQMA Declared	AQMA Active							COVID-19	
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
A5	Falkirk Hope Street								0 (30)	1	0	0	
A6	Falkirk Park Street	2 (38)	2 (38)	1 (34)	0 (34)								
A7	Falkirk West Bridge Street	5 (49)	6 (46)	4 (49)	2 (40)	2 (29)	0	0	0 (47)	1	0 (18)	0	
A12	Falkirk Grahams Road		4 (44)	3 (38)	0 (32)	0 (18)	0	0					

Notes: Exceedances of the PM₁₀ 24-hour mean objective (50 µg/m³ not to be exceeded more than seven times/year) are shown in bold. If the period of valid data is less than 85%, the 98.1st percentile of 24-hour means is provided in brackets.

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

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

Graph 2: Number of Days PM₁₀ 24-hr Mean Concentrations Above 50µg/m³ (2011 - 2021)



Conclusions and Proposed Action

The FTC AQMA was declared on the 25th January 2013 following NAQS exceedances of PM₁₀ (annual mean and 24-hour mean elements). Since the AQMA was declared, measured concentrations of PM₁₀ (using automatic monitoring methods) have gradually decreased and have since become compliant with the NAQS objectives consistently over the past six years (since 2015).

The FTC 2015 AQAP¹ identified that the “principal source of PM₁₀ pollution in FTC is road traffic, with commercial and residential combustion as significant contributors.” The PM₁₀ source apportionment (as displayed in Figure 3.16 within the AQAP report) identified that, at locations where the PM₁₀ concentrations are predicted to exceed NAQS objective concentrations the exceedances are principally attributable to road traffic emissions.

As a result of the ongoing automatic air quality monitoring within the FTC AQMA and with the achievement and on-going work of the AQAP measures (as described in

the above section “FTC AQAP Measures Achieved and On-going”), the Council has demonstrated that the annual mean and 24-hr mean concentrations of PM₁₀ complies with the relevant NAQS objective.

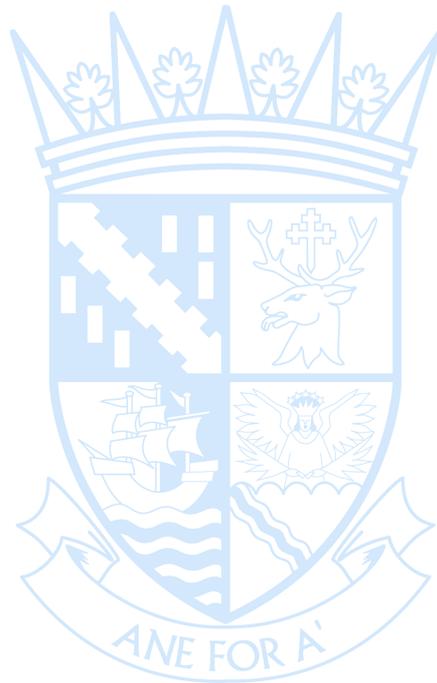
As stated within the [Air Quality in Scotland \(LAQM\) website](#) in relation to AQMA Revocation:

“Where a local authority feels that it has sufficient evidence to justify the need to amend/revoke an AQMA at any time, it should submit that evidence to the Scottish Government for appraisal. For those authorities that have continuous monitoring, the Scottish Government would expect them to keep the AQMA under regular review, and to act where necessary, rather than await the next round of reviews and assessments.”

Falkirk Council will continue to have (automatic, reference method) PM₁₀ monitoring capabilities within the FTC area for many years to come. It is anticipated that annual Scottish Government LAQM funding will continue to be provided for this. This will provide a valuable resource for public health resources into the future.

Falkirk Council is requesting the permission of the Scottish Government and Scottish Environment Protection Agency (SEPA) to revoke the FTC AQMA for PM₁₀ (annual mean and 24-hr mean elements only). Pending permission approval, Falkirk Council will notify all

other statutory consultees and publicise the revocation through local / social media, so the public and local businesses are fully aware of the situation.



References

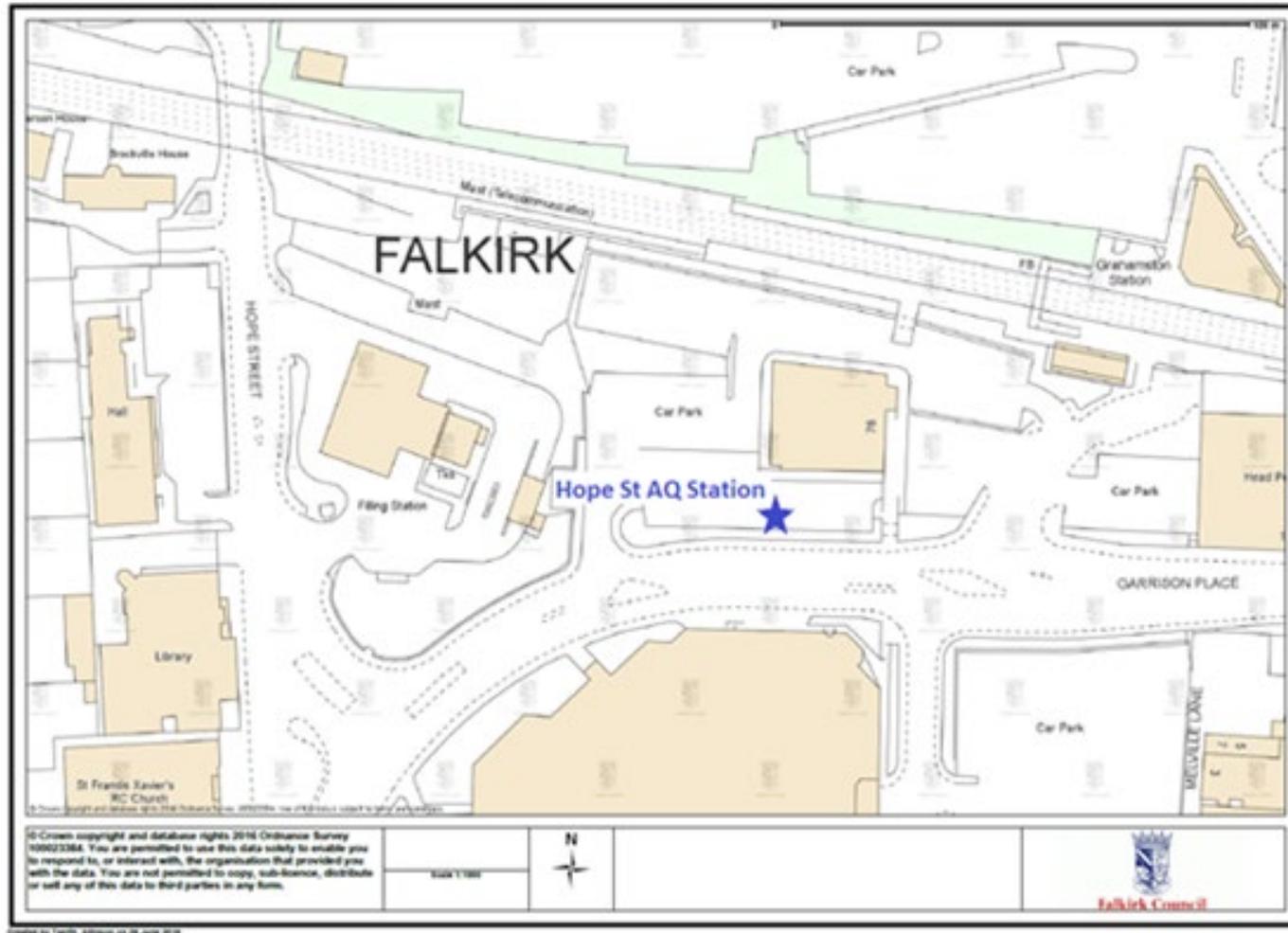
1. [Air Quality Management Action Plan \(Falkirk Town Centre and Haggs\)](#) (June 2015, Golder Associates for Falkirk Council, Report Number: 11514880001)
2. [Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management](#) (27/09/1996, Council of the European Union, Ref: 31996L0062)
3. [Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe](#) (21st May 2008, European Parliament, Council of the European Union, Ref: Document 32008L0050)
4. [The Air Quality Standards Regulations 2010](#) (25th March 2010, UK Secretary of State, 2010 No. 1001)
5. [Environment Act 1995](#) (19th July 1995, UK Government, 1995 Chapter 25)
6. [The Air Quality Strategy for England, Scotland, Wales and Northern Ireland](#) (Volume 1, July 2007, Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland)
7. [Cleaner air for Scotland: the road to a healthier future](#) (4th November 2015, The Scottish Government)
8. [Cleaner Air for Scotland 2 - Towards a Better Place for Everyone](#) (15th July 2021, The Scottish Government)
9. [The Air Quality \(Scotland\) Regulations 2000](#) (31st March 2000, The Scottish Government)
10. [The Air Quality \(Scotland\) Amendment Regulations 2002](#) (11th June 2002, The Scottish Government)
11. [The Air Quality \(Scotland\) Amendment Regulations 2016](#) (1st April 2016, The Scottish Government)

12. [WHO global air quality guidelines: particulate matter \(PM2.5 and PM10\), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide](#) (22nd September 2022, World Health Organisation)
13. [Local Air Quality Management Technical Guidance \(TG16\)](#) (April 2021, Department for Environment, Food and Rural Affairs)
14. [Scottish Air Quality Website Quality Assurance / Quality Control](#) (2021, Ricardo)

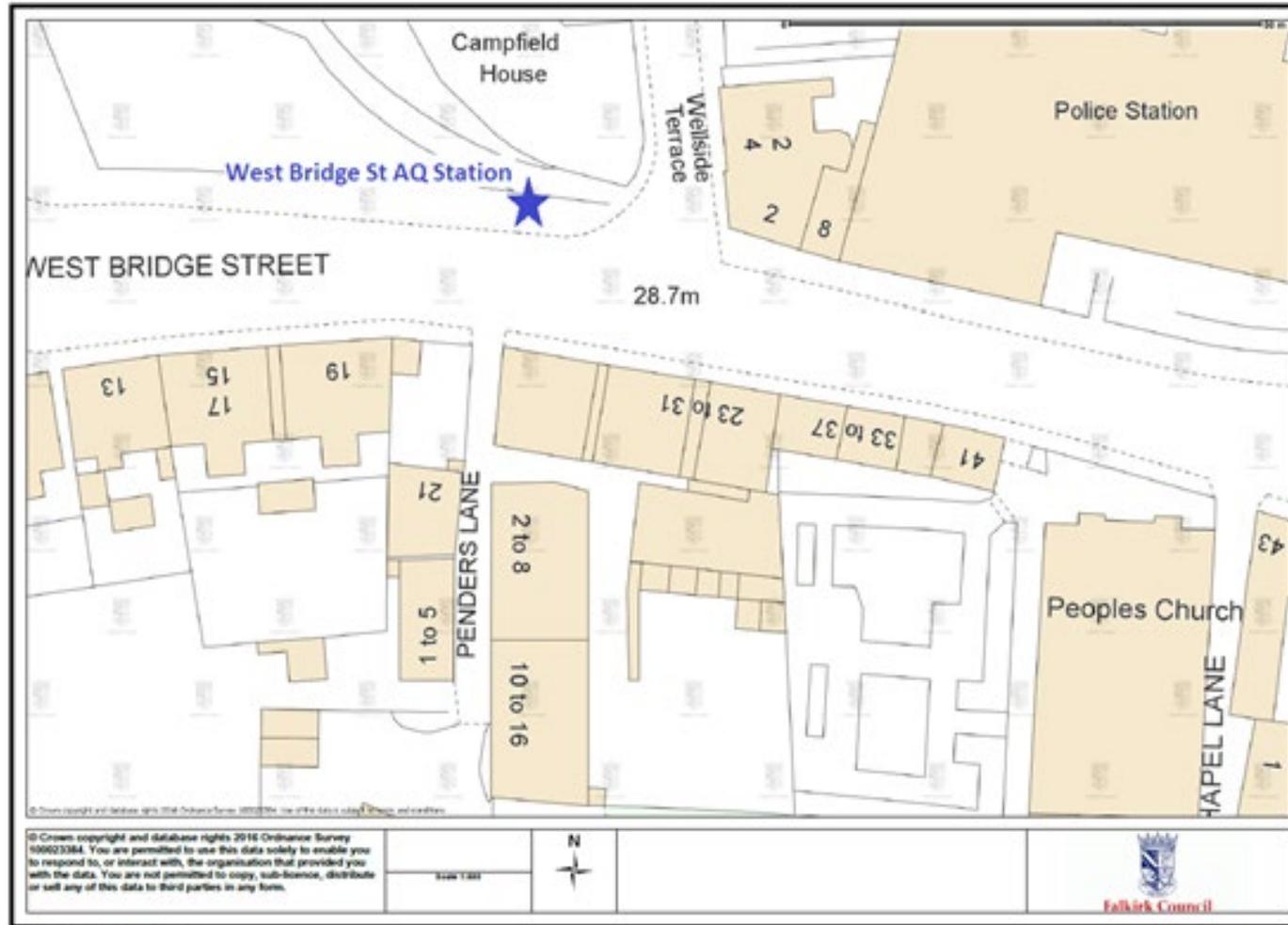


Appendix A – Maps of Automatic Monitoring Stations

A) A5 Falkirk Hope Street



B) A7 Falkirk West Bridge Street



Created by Tenth: Address on 06 June 2016

Glossary of Terms

Abbreviation	Description
AADT	Annual Average Daily Traffic – total volume of vehicle traffic on a highway or road for a year divided by 365 days.
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	Annual Progress Report in relation to air quality
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
BAM	Beta Attenuation Monitor
CAFS	Cleaner Air for Scotland
DEFRA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
ECSVEP	East Central Scotland Vehicle Emissions Partnership
EfW	Energy from Waste
EIA	Environmental Impact Assessment
EPUK	Environmental Protection UK
EU	European Union
FEL	Forth Environment Link
FDMS	Filter Dynamics Measurement System
FPS	Flood Prevention Scheme
GCMS	Gas Chromatography–Mass Spectrometry - analysis method

HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
MCPD	Medium Combustion Plant Directive
NAQS	National Air Quality Strategy
NO ₂	Nitrogen Dioxide
NO _x	Oxides of Nitrogen
PDU	Public Display Unit
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
PV	Photovoltaic (in relation to solar energy)
QA/QC	Quality Assurance and Quality Control
SEA	Supporting Environmental Appraisal
SEPA	Scottish Environment Protection Agency
SO ₂	Sulphur Dioxide
TD	Thermal Desorption – Analysis Method
TEOM	Tapered Element Oscillating Microbalance
TGT	Tail Gas Treatment

References

1. <https://www.gov.scot/coronavirus-covid-19/> The Scottish Government 'Coronavirus (Covid-19) in Scotland' Information, 11 May 2021.
2. <https://laqm.defra.gov.uk/documents/LAQM-TG16-April-21-v1.pdf> DEFRA and Devolved Administrations, April 2021.
3. [Civil Aviation Authority, UK Airport Statistics](#), CAA, Accessed June 2023.
4. <https://www.scottishairquality.scot/technical-reports/equivalence-study-investigate-particulate-matter-monitoring-scotland-using-fidas> "Equivalence Study to Investigate Particulate Matter Monitoring in Scotland Using The Fidas 200", Ricardo for The Scottish Government, Ref: ED11195, Issue 1, Published: 10/05/2023

