Annual Progress Report (APR)

2017 Air Quality Annual Progress Report (APR) for
The Highland Council

In fulfilment of Part IV of the
Environment Act 1995

Local Air Quality Management

Decmeber 2017

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Executive Summary: Air Quality in Our Area

Air Quality in The Highland Council

Air Quality in The Highland Council area is generally good. The existing air quality issues relate to Nitrogen dioxide pollution in Inverness City Centre. The Council monitors air quality though existing automatic network stations and with passive sampling methods to identify areas where air quality might be poor. We also use the planning process to ensure appropriate siting of development with the potential to pollute, and new sensitive receptors.

Figure 1 Passive monitoring in Inverness

An Air Quality Management Area (AQMA) was declared in 2014 for Nitrogen dioxide covering a small area around the junction between Queensgate and Academy Street where there is relevant exposure in the form of flats in upper stories. The Council

Figure 2 Automatic Monitoring in Inverness

has worked with partners, including SEPA, HITRANS, NHS Highland, Inverness BID to prepare an Action Plan to improve the Air Quality within the AQMA.

Actions to Improve Air Quality

Actions identified cover six broad areas:

- Action 1 – promote smarter travel choices;
- Action 2 – Actively promote low emission vehicles and supporting infrastructure;
- Action 3 – use the planning system to ensure that air quality is fully considered for new development;
- Action 4 – Traffic management to reduce emissions within the AQMA;
- Action 5 – communication to inform the public about health impacts of air pollution and how they can change behaviour to reduce emissions and reduce exposure; and
- Action 6 – Continue to monitor and assess air quality in line with government guidance for LAQM.

Local Priorities and Challenges

The Highland Council will be working with partners to progress measures included in the action plan.

How to Get Involved

Information on air quality within the Highlands can be obtained at www.highland.gov.uk/pollution

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1. Local Air Quality Management

This report provides an overview of air quality in The Highland Council during 2016. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Progress Report (APR) is summarises the work being undertaken by The Highland Council to improve air quality and any progress that has been made.

Table 1.1 – Summary of Air Quality Objectives in Scotland

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m^3	Annual mean	31.12.2005
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 µg/m^3	Annual mean	31.12.2010
Particulate Matter ($PM_{2.5}$)	10 µg/m^3	Annual mean	31.12.2020
Sulphur dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005
Benzene	3.25 µg/m^3	Running annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon Monoxide	10.0 mg/m^3	Running 8-Hour mean	31.12.2003

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

2. Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12 months, setting out measures it intends to put in place in pursuit of the objectives.

A summary of AQMAs declared by The Highland 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: http://www.scottishairquality.co.uk/laqm/aqma?id=374 .

Figure 3 Inverness City Centre AQMA

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	Description	Action Plan
AQMA Inverness City Centre	NO_2 annual mean	Inverness	An area around the junction of Academy Street, Queensgate and Strothers Lane which includes a number of upper story residential flats.	Name and Link to Action Plan

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

The Highland Council has produced an action plan in pursuit of improving local air quality. The action plan is currently in final draft form and will be formally adopted by Council in 2018. The draft action plan identifies measures as set out in Table 2.2

The Highland Council will follow up on progress with action plan measures throughout 2018 and will report on progress in 2018 Annual Progress Report.

Table 2.2 – Progress on Measures to Improve Air Quality

Data taken from Draft Air Quality Action Plan. Implementation dates will be established once AQAP is completed.

No	Measure	Category	Focus	Lead Authority
1	Enhancement to train station and cycle parking	Transport Planning and infrastructure	Improvements to the Station facilities including improved cycle parking at Inverness Station	Development and Infrastruscture
2	Further encouragement of active travel	Promoting Travel Alternatives	Intensive active travel campaign	Development and Infrastructure
3	Making Academy Street more pedestrian friendly	Traffic management	Wider pavements and crossing points	Development and Infrastructure
4	Cycling Strategy	Promoting travel alternatives	Encourage greater levels of cycling and support the 'Cycling City' concept	Development and Infrastructure
5	Travel plan for Highland Council	Promoting travel alternatives	Workplace travel planning	Chief Executive
6	Engage with schools	Promoting Travel alternatives	School travel plans	Community Services
7	Promotion and encouragement of online tool for car sharing	Alternatives to Private Vehicle use	Promote online tool for car sharing	Development and Infrastructure
8	Investigate the feasibility of increasing the number of low emission buses in Inverness	Promoting low emission transport	Investigate the feasibility of increasing the number of low emission buses in Inverness	Community Services
9	Limits on Euro standards of buses	Promoting low emission transport	Investigate implementation of limits on Euro standards for buses through the SQP	Community Services
10	Further electric charging points in Inverness town centre and on the road network in the Highlands	Promoting low emission transport	Procuring/supporting provision of further electric vehicle charging infrastructure	Development and Infrastructure
11	Investigating using lower emission vehicles within the council's (Inverness based) fleet	Promoting low emission transport	Investigating using lower emission vehicles within the council's (Inverness based) fleet	Community Services

No	Measure	Category	Focus	Lead Authority
12	Investigate using the taxi licensing system to reduce emissions form taxis	Promoting low emission transport	Investigate using the taxi licensing system to reduce emissions form taxis	Community Services
13	Feasibility study investigating the use of parking charge differentiation for LEVs	Promoting low emission transport	Feasibility study investigating the use of parking charge differentiation for LEVs	Community Services
14	Ecostars	Promoting low emission transport	Use ecostars scheme to encourage lower emission freight transport	Community Services
15	Ensuring that relevant planning applications are identified in consultation with EH Officers	Policy guidance and development Control	Ensuring that relevant planning application are identified in consultation with EH Officers	Development and Infrastructure
16	Ensuring that planning applications with potential air quality impacts are fully assessed for their impacts at relevant locations using appropriate methodologies	Policy guidance and development Control	Ensuring that planning applications with potential air quality impacts are fully assessed for their impacts at relevant locations using appropriate methodologies	Development and Infrastructure
17	Ensuring that appropriate mitigation is not only proposed but also implemented where any relevant impacts are identified	Policy guidance and development Control	Ensuring that appropriate mitigating is not only proposed but also implemented where any relevant impacts are identified	Development and Infrastructure
18	Encouraging travel plans for relevant new development	Promoting travel alternative	Encouraging travel plans for relevant new development	Development and Infrastructure
19	Encouraging electric vehicle infrastructure through the planning system	Promoting low emission transport	Encouraging electric vehicle infrastructure through the planning system	Development and Infrastructure
20	Providing information re. sustainable transport for residents of new developments	Policy guidance and development control	Use planning system to distribute sustainable transport information	Development and Infrastructure
21	Using SCOOT system more effectively to ensure traffic is not queuing on Academy Street	Traffic Management	Using SCOOT system more effectively to ensure traffic is not queuing on Academy Street	Development and Infrastructure

No	Measure	Category	Focus	Lead Authority
22	Study using microsimulation modelling to more accurately investigate impacts of traffic light phasing at the Queensgate/ Academy Street junction	Traffic Management	Study using microsimulation modelling to more accurately investigate impacts of traffic light phasing at the Queensgate/ Academy Street junction	Development and Infrastructure
23	Review bus movements round Inverness, both in terms of routes in and out of the bust station, bus stops and routes around the city centre		Minimise impact of bus movements and optimise use of LEV	Community Services
24	Completion of Phase 1 of West Link	Traffic management	Strategic Highway Improvements should reduce need for cross city journeys	Development and Infrastructure
25	Investigate the feasibility of shortening delivery hours to reduce delivery vehicles causing congestion at peak hours in central streets	Freight and delivery management	Investigate the feasibility of shortening delivery hours to reduce delivery vehicles causing congestion at peak hours in central streets	Community Services
26	Investigate the feasibility of taking refuse collection vehicles out of the city centre at peak times	Freight and delivery management	Investigate the feasibility of taking refuse collection vehicles out of the city centre at peak times	Community Services
27	Communicate with residents within the AQMA (and more widely) about issues and this action plan	Public information	Communicate with residents within the AQMA (and more widely) about issues and this action plan	Community Services
28	Improve Bus Information provision	Public information	Improve Bus Information provision	Community Services
29	Real time bus information	Public information	Provision of real time bus information displays	Community Services
30	Support exiting campaigns for active travel	Public information	Eg. Step Count Challenge; Big Bike Revival; Active Travel map for City	Chief Executive
31	Appropriate signposting to car parks and other destinations	Transport planning and infrastructure	Ensure signposting avoids unnecessary journeys through AQMA	Community Services
32	Improve communication within the council	Policy guidance and development Control	Workshop for council officers	Chief Executive

2.3 Cleaner Air for Scotland

Cleaner Air for Scotland – The Road to a Healthier Future (CAFS) is a national cross-government strategy that sets out how the Scottish Government and its partner organisations propose to reduce air pollution further to protect human health and fulfil Scotland's legal responsibilities as soon as possible. A series of actions across a range of policy areas are outlined, a summary of which is available at http://www.gov.scot/Publications/2015/11/5671/17. Progress by The Highland Council against relevant actions within this strategy is demonstrated below.

2.3.1 Transport – Avoiding travel – T1

All local authorities should ensure that they have a corporate travel plan (perhaps within a carbon management plan) which is consistent with any local air quality action plan. The Highland Council is currently in the process of reviewing the corporate grey fleet and the revising the Council's carbon management plan (CMP).

The CAFS will be referenced in both, but the CMP review will specifically focus on air quality through the transport chapter. Consulting on this review is scheduled to begin in early 2018.

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

Scottish Government expects any Scottish local authority which has or is currently developing a Sustainable Energy Action Plan to ensure that air quality considerations are covered. The Highland Council's Carbon Management Plan 2013 - 2020 (CMP) provides a framework for monitoring and reducing carbon emissions from the Council's internal operations.

In 2010, the Council introduced mandatory climate change screenings for all committee papers, covering all committees and all subject matters. This was amended in 2013 to also incorporate any potential Climate Change/Carbon CLEVER implications.

The Highland Council has taken a number of steps to embed climate change action across the organisation. This includes staff engagement and awareness activities including climate change and sustainability training for new staff, an annual programme of events and campaigns focused on climate change including Earth Hour, Cycle to Work Week, the Step Count Challenges, behaviour change initiatives

on energy saving and active travel utilising the ISM behaviour change tool, national and European campaigns (including National Climate Week). We also introduced a TRIAD-management campaign encouraging all staff to reduce their energy consumption in a bid to reduce the overall energy cost. The Highland Climate Challenge game pilot introduced carbon reducing behaviours amongst students at eight primary schools in the Highlands, with the view to roll this out to all primary schools in the coming year.

The Highland Council is also working on embedding climate change and sustainability guidelines in its new sustainable procurement framework, as well as working with Heads of Service and Elected Members to provide information on climate change issues and how these issues could impact different agendas across the Council.

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.

The Highland Council undertook automatic (continuous) monitoring at 1 site during 2016. In addition to this DEFRA undertook automatic (continuous) monitoring at 3 sites during 2016. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at http://www.scottishairquality.co.uk/data/ .

Maps showing the location of the monitoring sites are provided in http://www.scottishairquality.co.uk/latest/ . Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

A new site came on line in September 2016. The site is at Queensgate, Inverness and monitors Nitrogen dioxide by chemi-luminescence. The site is within the Inverness City Centre AQMA. The monitoring location is 4m from the carriageway of Queensgate and at the façade of 6 Queensgate which has exposure relevant to the annual mean Nitrogen dioxide objective at first floor level and above.

3.1.2 Non-Automatic Monitoring Sites

The Highland Council undertook non- automatic (passive) monitoring of NO_2 at 29 sites during 2016. Table A.2 in Appendix A shows the details of the sites.

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

3.2 Individual pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for annualisation and bias. For some sites where the monitoring location is not representative of relevant exposure results have also been adjusted using the distance from roads calculator. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

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

For diffusion tubes, the full 2016 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

There were three passive dissufion tube monitoring sites at which the annual mean Nitrogen dioxide concentration was recorded to be in excess of the air quality objective in 2016. Two fo the sites IV2F and IV2G lie outwith the AQMA. Neither of these sites represent exposure relevant to the annual mean objective. The third site, IV9A, lies within the Inverness City Centre AQMA. This site however is a kerbside site and is also at a location where there is no relevant exposure. At other sites within the AQMA NO2 concentrations are less than the AQS Objective, either measured at relevant exposure, or corrected to be representative of relevant exposure. In particular the result from the new automatic monitor was 36.6mg/m3. This result was however derived from short term monitoring as the site was only delivering data for the last four months of 2016. 2017 will be the first full data year for this site.

There were no recorded exceedances of the 1-hour mean Nitrogen dioxide objective at any site in Highland in 2016.

Figure A3 and A4 illustrate the trend observed in annual mean Nitrogen dioxide concentration at:

- the automatic sites at Fort William and Inverness Telford Street between 2008 and 2016; and
- at two of the longer running diffusion tube sites on Queensgate Inverness (IV3A) and Station Road Dingwall (RC2) between 2004 and 2016.

At both off the diffusion tube sites there has been no discernable growth or decline in annual mean NO_2 concentration. Although there have been significant year on year variations in concentration. The trend illustrated at the Fort William automatic site is much the same. At Telford Street, however, there has been an overall growth in

concentration since 2008. There was a significant step change reduction in concentration between 2012 and 2013. Up until 2012 and from 2013 onwards the annual mean NO_2 concentration at Telford Street has been increasing year on year.

3.2.2 Particulate Matter (PM_{10})

Figure A2 Trend in passive Nitrogen dioxide monitoring results for site IV3A, Queensgate, Inverness in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 18µg/m^3.

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

There were no exceedances of the PM_{10} air quality objectives in The Highland Council Area in 2016.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A compares the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years with the air quality objective of 10µg/m^3.

There were no exceedances of the $PM_{2.5}$ air quality objective in The Highland Council area in 2016.

3.2.4 Sulphur Dioxide (SO_2)

There was no monitoring for Sulphur dioxide undertaken in Highland in 2016.

3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene

There was no monitoring undertaken for any of these pollutants within The Highland Council area in 2016

4. New Local Developments

4.1 Road Traffic Sources

No new road traffic sources have been identified in 2016.

4.2 Other Transport Sources

No other new transport sources, including; Airports; locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential relevant exposure within 15m; locations with a large number of movements of diesel locomotives, and potential long-term exposure within 30m; or ports for shipping, have been identified in 2016

4.3 Industrial Sources

No new industrial installations for which an air quality assessment has been carried out; existing industrial installations where emissions have increased substantially, or new relevant exposure has been introduced; new or significantly changed industrial installations with no previous air quality assessment; new major fuel storage depots storing petrol; petrol stations; or poultry farms have been identified in 2016.

4.4 Commercial and Domestic Sources

12 new biomass combustion plant and 3 new combined heat and power plant were identified in 2016. Details of the plant are included in Appendix D. 11 of the biomass plant were screened out of further consideration using the screening methods described in LAQM.TG(16). 1 of the biomass plant was the subject of modelling to identify an appropriate stack height and quantify impacts and was subsequently ruled out for further consideration.

The CHP plant were screened using the CHP Screening tool. None of the 3 CHP plant required further investigation in terms of LAQM.

4.5 New Developments with Fugitive or Uncontrolled Sources

No new developments with fugitive or uncontrolled sources were identified in 2016.

5. Conclusions and Proposed Actions

5.1 Conclusions from New Monitoring Data

At all monitoring locations with relevant exposure the annual mean Nitrogen dioxide concentration was less than the AQS Objective.

Monitoring data obtained within the AQMA indicates that the AQ Objectives may now being achieved at relevant exposure locations within the AQMA. The automatic monitoring data obtained within the AQMA is however only available for part of 2016. 2017 will deliver a full calendar year of automatic monitoring data within the AQMA. This dataset will deliver a more robust indication of pollutant concentrations relative to the AQS Objective.

5.2 Conclusions relating to New Local Developments

No new local developments were identified in 2016 with the capacity to significantly impact upon local air quality.

5.3 Proposed Actions

Monitoring data has not identified any new exceedance of the objectives for any pollutant.

The diffusion tube sites particularly on Academy Street in Inverness would benefit from review to identify if relocation would ensure better representation of relevant exposure.

No changes are required to the existing AQMA and although monitoring indicates possible AQS Objective compliance, a full calendar year of automatic monitoring within the AQMA has yet to be completed. Once further monitoring data becomes available it may be necessary to reconsider the status of the AQMA.

The Draft Air Quality Action Plan for the Inverness City centre AQMA will be considered for formal adoption by the Highland Council at a Committee meeting in 2018.

Next course of action for The Highland Council will be:

- Submit Air Quality Progress Report for 2017 by the end of June 2018.
- Progress with implementation of Action Plan measures.

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)
IV4	Inverness	Roadside	265709	845670	NO_2; $PM_{10;}$ $PM_{2.5}$	N	Chemiluminescent; Daily Gravimetric	2.5	4	3
FW1	Fort William	Suburban	210857	774431	$NO_{2;}$ Ozone	N	Chemiluminescent	77	47	2.5
SV1	Strath Vaich	Rural	234831	875029	Ozone	N	Chemiluminescent	717	n/a	3
IV3	Inverness Queensgate	Roadside	266650	845446	NO_2	Y	Chemiluminescent	0	4	1.3

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

(2) N/A if not applicable.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?
IV1	Union Street	Roadside	266681	845361	NO_2	N	0	4	N
IV2E	Academy Street E	Kerbside	266610	845487	NO2	N	1.5	1.5	N
IV2F	Academy Street F	Roadside	266629	845473	NO2	N	N/A	2	N
IV2G	Academy Street G	Roadside	266704	845413	NO2	N	N/A	2	N
IV3A	Queensgate A	Roadside	266650	845428	NO2	Y	0	4	N
IV3B	Queensgate B	Kerbside	266632	845431	NO2	Y	2.5	1.5	N
IV3C	Queensgate C	Roadside	266609	845404	NO2	N	0	4	N
IV3H	Queensgate H	Roadside	266650	845446	NO2	Y	0	4	Y
IV3K	Queensgate K	Roadside	266650	845446	NO2	Y	0	4	Y

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?
IV3L	Queensgate L	Roadside	266650	845446	NO2	Y	0	4	Y
IV4A	Telford Street A	Roadside	265710	845672	NO2	N	2.5	4	Y
IV4B	Telford Street B	Roadside	265710	845672	NO2	N	2.5	4	Y
IV4C	Telford Street C	Roadside	265710	845672	NO2	N	2.5	4	Y
IV6A	Church Street A	Roadside	266586	845337	NO2	N	0	2	N
IV6B	Church Street B	Roadside	266513	845476	NO2	N	2.5	2.5	N
IV7	Strothers Lane	Roadside	266706	845506	NO2	N	0	3	N

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?
IV8	Margaret Street	Roadside	266654	845532	NO2	N	0	3	N
IV9A	Academy St/Queensgate A	Kerbside	266666	845441	NO2	Y	n/a	0.5	N
IV9B	Academy St/Queensgate B	Kerbside	266657	845447	NO2	Y	3.5	0.5	N
IV9C	Academy St/Queensgate C	Roadside	266677	845451	NO2	Y	n/a	2	N
IV9D	Academy St/Queensgate D	Kerbside	266659	845467	NO2	Y	2.5	0.5	N

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?
IV10	Glenurquhart Road	Roadside	266086	844749	NO2	N	8	3	N
NA1	Rosebank 1	Roadside	288104	856434	NO2	N	18	1.5	N
NA2	Rosebank 2	Roadside	288075	856421	NO2	N	38	1.5	N
NA3	Rosebank 3	Intermediate	288102	856394	NO2	N	0	38	N
RC1	Wyvis Terrace	Roadside	254430	858968	NO2	N	7.5	1	N
RC2	Station Road	Roadside	255200	858185	NO2	N	0	1	N
RC3	Kintail Place	Urban Background	255112	859866	NO2	N	4	1	N
RC4	Burns Crescent	Urban Background	254420	859288	NO2	N	4	1	N

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

(2) N/A if not applicable.

Figure A1 – Maps of diffusion tube monitoring locations - Inverness

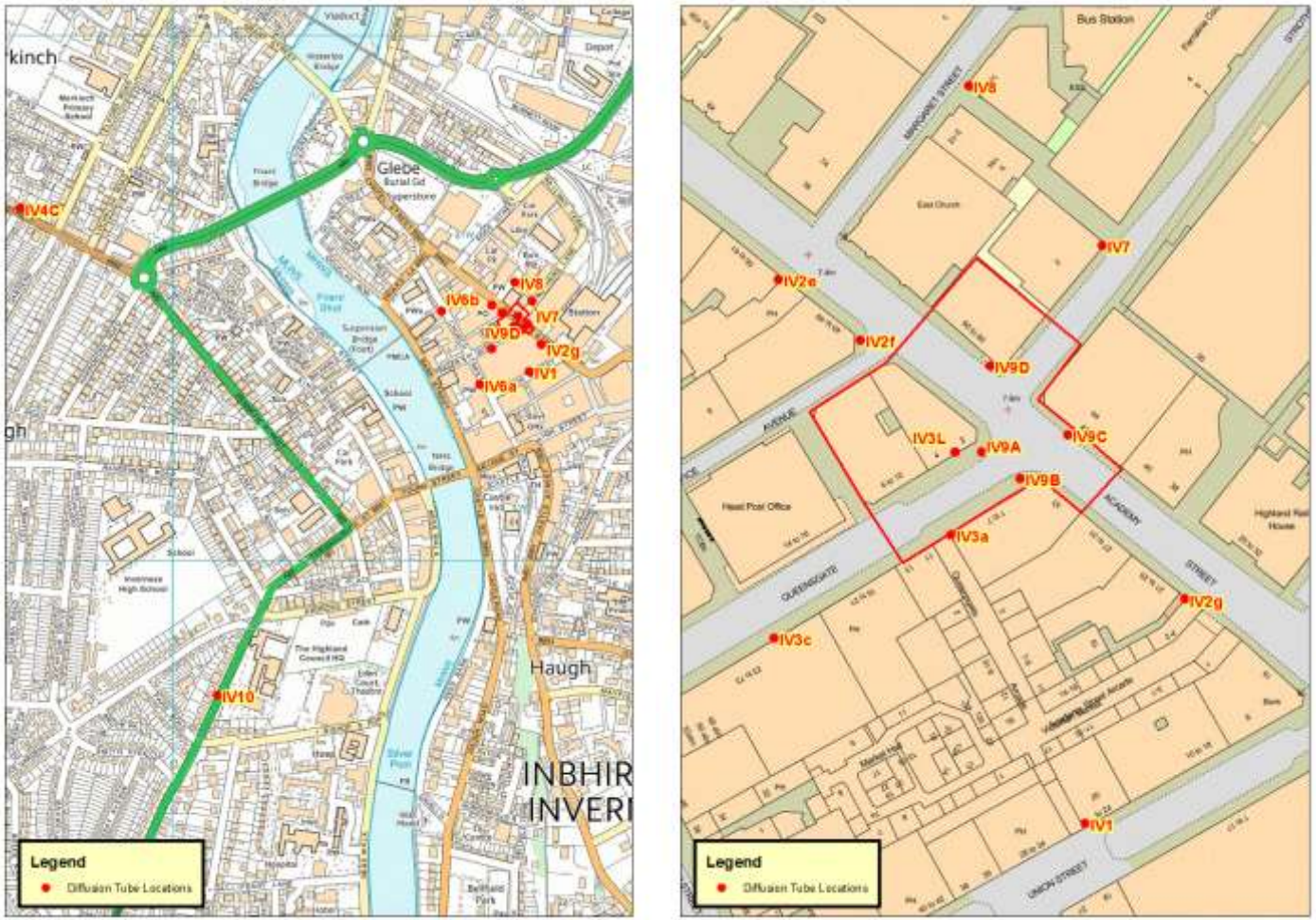

Figure A2 Map of diffusion tube monitoring locations – Dingwall and Nairn

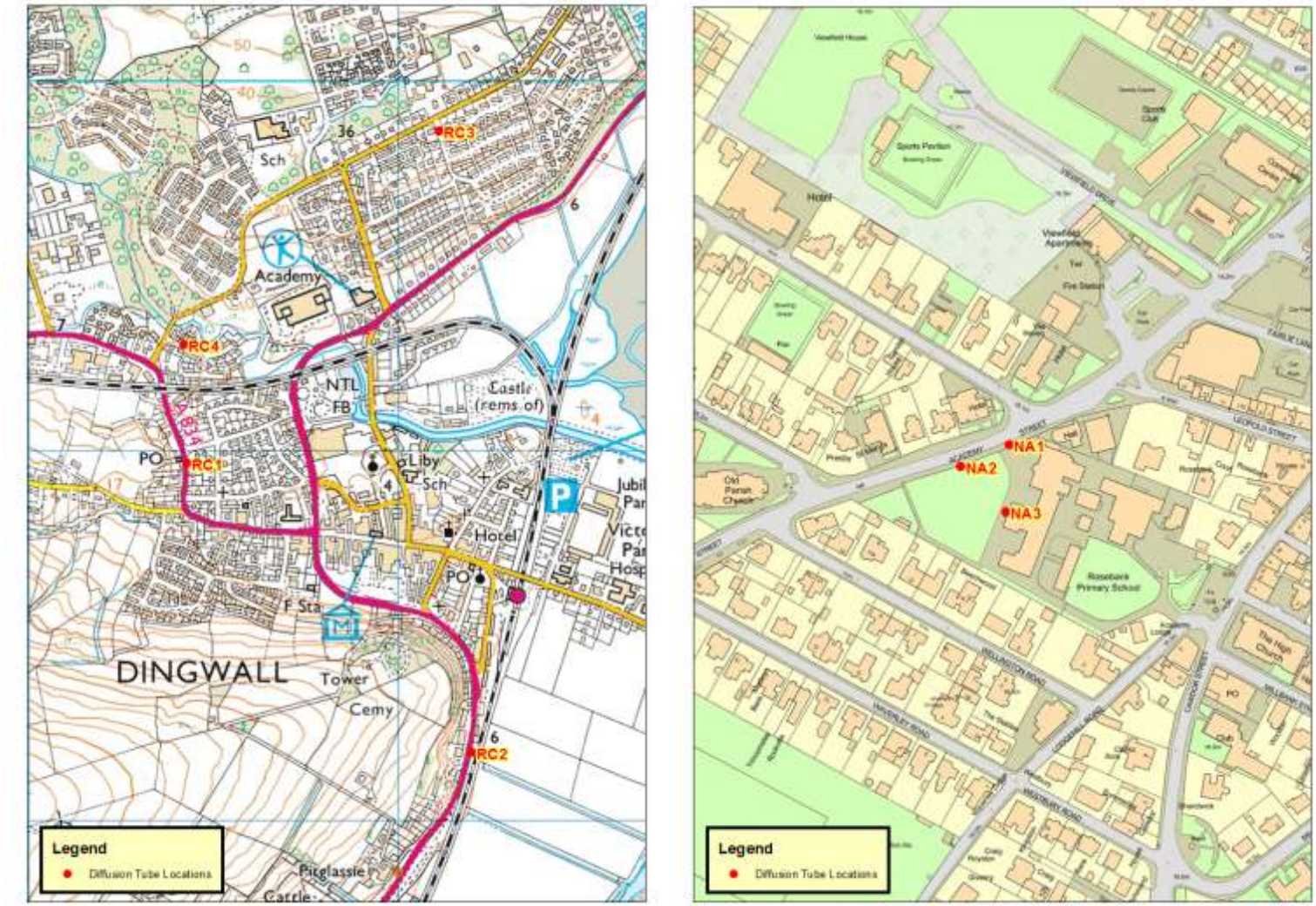

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2012	2013	2014	2015	2016
FW1	Suburban	Automatic		88.4	12.1	9	11	12.7	10.1
IV1	Roadside	Diffusion Tube		91.7	**41.7**	27.4	26.4	20.4	26.7
IV2E	Kerbside	Diffusion Tube		91.7	N/A	**42.1**	39.2	36.6	37.2
IV2F	Roadside	Diffusion Tube		91.7	N/A	39.9	38.2	38.1	**42.4**
IV2G	Roadside	Diffusion Tube		91.7	N/A	**40.8**	38.7	39.3	**45.7**
IV3	Roadside	Automatic	99.1	32.9	N/A	N/A	N/A	N/A	36.8
IV3A	Roadside	Diffusion Tube		75	**47**	38.4	37.1	32.1	38
IV3B	Kerbside	Diffusion Tube	80	33	**41.5**	34.4	31.3	35.2	37.5
IV3C	Roadside	Diffusion Tube		91.7	**46.5**	34.3	33	29.4	37.2
IV3H	Roadside	Diffusion Tube	100	50	N/A	N/A	N/A	N/A	33.2

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2012	2013	2014	2015	2016
IV3K	Roadside	Diffusion Tube	100	50	N/A	N/A	N/A	N/A	33.3
IV3L	Roadside	Diffusion Tube	100	50	N/A	N/A	N/A	N/A	32.7
IV4	Roadside	Automatic		98.7	29.2	21	21	25.3	26.4
IV4A	Roadside	Diffusion Tube		75	30.2	22.3	21.2	21.5	25.0
IV4B	Roadside	Diffusion Tube		75	32	22.9	20.6	20.8	25.4
IV4C	Roadside	Diffusion Tube		75	29.5	22.8	20.2	21	25.4
IV6A	Roadside	Diffusion Tube		83.3	N/A	29.4	31.2	25	31.8
IV6B	Roadside	Diffusion Tube		91.7	N/A	19.2	19	17.1	18.1
IV7	Roadside	Diffusion Tube		66.7	N/A	33.9	30.3	24.3	29.6
IV8	Roadside	Diffusion Tube		91.7	N/A	25.5	22.5	21.9	24.4
IV9A	Kerbside	Diffusion Tube		83.3	N/A	N/A	37.8	**44.8**	**49.9**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2012	2013	2014	2015	2016
IV9B	Kerbside	Diffusion Tube		83.3	N/A	N/A	29.1	36.2	29.0
IV9C	Roadside	Diffusion Tube		17.7	N/A	N/A	33.1	32.6	37.7
IV9D	Roadside	Diffusion Tube		83.3	N/A	N/A	28.9	31.7	26.7
IV10	Roadside	Diffusion Tube	100	17.7	N/A	N/A	N/A	16.7	15.9
NA1	Roadside	Diffusion Tube	25	16.6	N/A	N/A	N/A	N/A	18.2
NA2	Roadside	Diffusion Tube	12.5	8.3	N/A	N/A	N/A	N/A	25.1
NA3	Intermediate	Diffusion Tube	100	66.7	N/A	N/A	N/A	N/A	10.4
RC1	Roadside	Diffusion Tube		83.3	24.6	17.6	16.2	17.6	13.6
RC2	Roadside	Diffusion Tube		83.3	37.3	30.8	28.7	27.6	32.1
RC3	Urban Background	Diffusion Tube		83.3	9.8	7.1	6.9	6.7	7.9

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2012	2013	2014	2015	2016
RC4	Urban Background	Diffusion Tube		66.7	11.9	8.9	8.1	7.9	8.5

Notes: Exceedences of the NO_2 annual mean objective of 40µg/m3 are shown in **bold**.

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

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75%. Where monitoring location is not representative of relevant exposure means have been adjusted for distance from the road. See Appendix C for details.

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2012	2013	2014	2015	2016
FW1	Suburban background	Automatic		88.4	0	0	0	0(70)	0
IV3	Roadside	Automatic	99.1	32.9	N/A	N/A	N/A	N/A	0(115)
IV4	Roadside	Automatic		98.7	0	0	0	0(106)	0

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

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

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

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

Figure A1 Trend in Automatic Nitrogen dioxide monitoring results for site IV4, Telford Street, Inverness and site FW1 Fort William

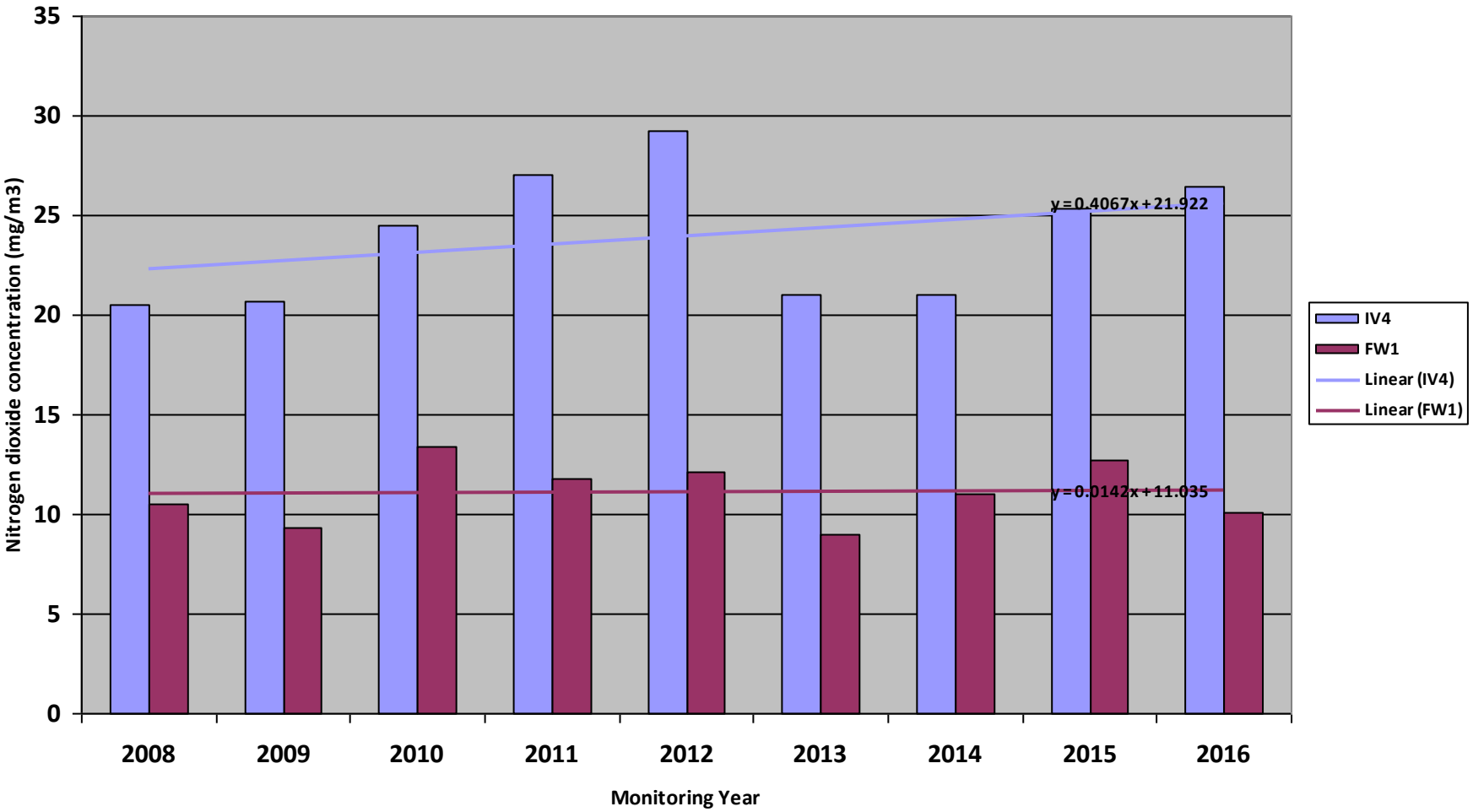

Figure A2 Trend in passive Nitrogen dioxide monitoring results for site IV3A, Queensgate, Inverness and site RC2, Station Road, Dingwall.

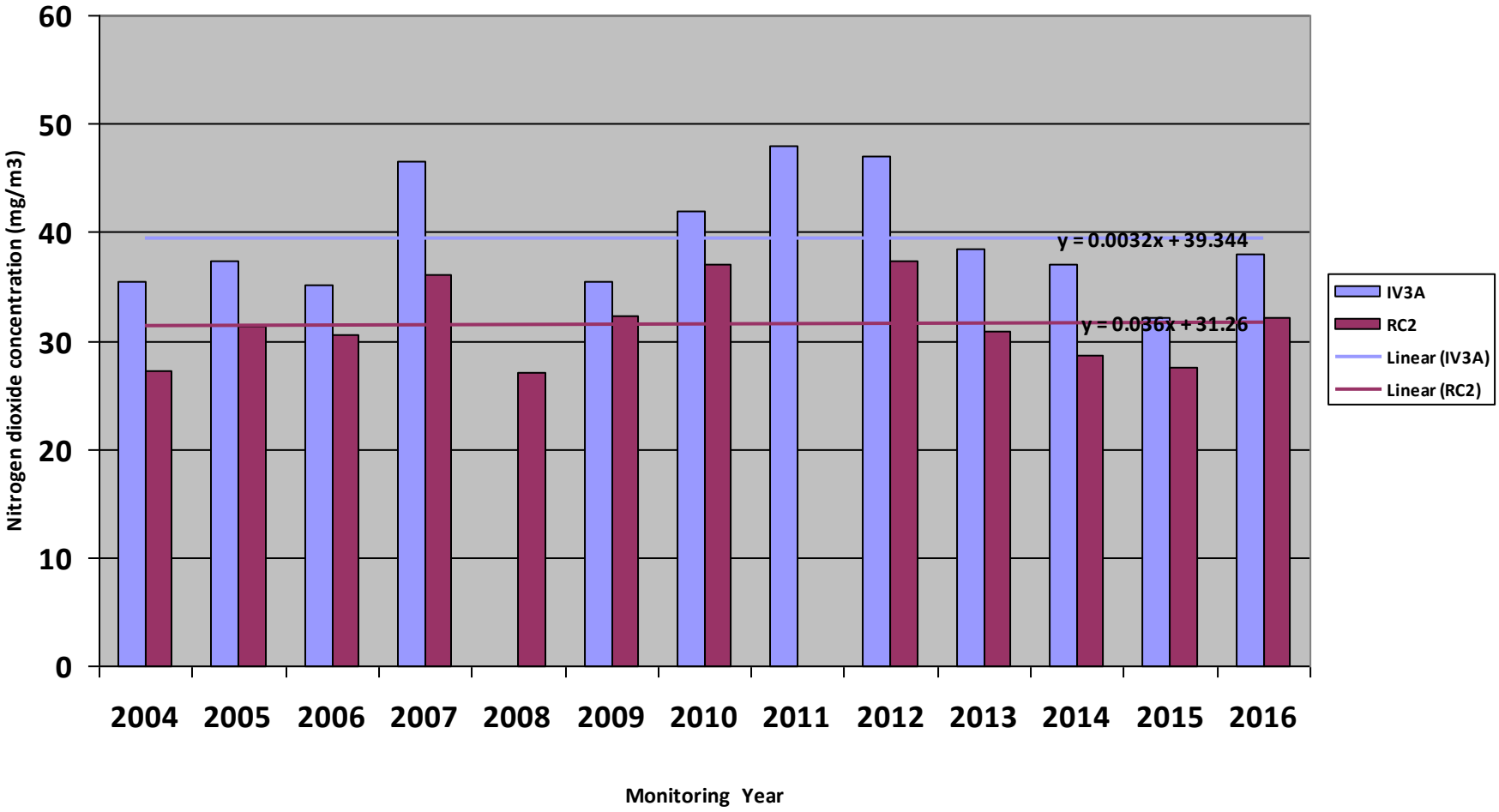

Table A.5 – Annual Mean PM10 Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	PM_{10} Annual Mean Concentration (µg/m^3) (3)				
				2012	2013	2014	2015	2016
IV4	Roadside		90.2	11	11.7	10.9	9	8.6

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2012	2013	2014	2015	2016
IV4	Roadside		90.2	1	0	0	0	0

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

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

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

(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
				2012	2013	2014	2015	2016
IV4	Roadside		97.8	6	6	6	5	4.8

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

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

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

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

Appendix B: Full Monthly Diffusion Tube Results for 2016

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

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
IV1	30.7		25.9	35.7	39.7	27.7	16.8	24.5	20.2	27.4	25.2	22.5	26.9	26.7
IV2E	53.4		43.1	42.6	41.9	35.8	35.3	42.5	39.8	43.7	50.5	42.2	42.8	42.4
IV2F	49.2		40.7	44	44.6	38.1	35.3	40.4	37.8	44.5	49.2	47.3	42.8	42.4
IV2G	57.7		49.4	49	49.4	40.2	38	43.5	36.2	42.3	51.5	50.1	46.1	45.7
IV3A	42.4		34.3	42	47.1	35.9	33.9	36.4	35.3				38.4	38
IV3B	45.6		46.7	42.4	45.8								45.2	44.7
IV3C	42.4		36.8	38.7	44.6	38.7	24.6	45.7	31.7	36.8	35.6	37.3	37.5	37.2
IV3H							23.4	38.6	30.9	39.8	38.6	36.1	34.6	34.2
IV3K							24.2	35.7	33	37.4	37.7	40.4	34.7	34.4
IV3L							20	38.1	30.2	39.7	38.9	37.2	34	33.7
IV4A	32.9				18	13	14.8	18.2	26.8	32.9	30.7	25.4	23.6	22.7
IV4B	33.4				16.5	13.1	13.9	17.3	28.4	31.4	32.5	28.7	23.9	23
IV4C	34.5				16.9	13.3	16.6	17.6	25.4	33.5	32.1	25.9	24	23
IV6A	41.1		26.2	39.8	34.2	31.7	21.8	32.5		30.5	31.3	32.5	32.2	31.8

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
IV6B	23.4		20	21.2	22.6	21	13.3	17.6	17.3	22.6	23	22.2	20.4	20.2
IV7				22.9	21.8	17.8	18.3	24.4	26.4	34.1	35.6		25.2	24.9
IV8	30.2		27	24.1	24.8	20.7	18.7	21.5	21.7	28	28.4	26.3	24.7	24.4
IV9A	65.1		45	47.7	58.8	42	45.3	51.4	43.9	50.7	54		50.4	49.9
IV9B	54.5		41.2	46.5	40.8	36.2	33.1	41.3	38.1	41.6	41.7		41.5	41.1
IV9C										54.3	45.9		50.1	49.6
IV9D	43.3		36.6	40.8	46.1	44.1	26.2	39.5	31.7	7.9	40.1		35.6	35.3
IV10	29.1		24.9										27	25.9
NA1					31.1		16.3						23.7	22.8
NA2					31.7								31.7	30.4
NA3					9.4	11.1	7.2	9.7	7.2	12.3	12.6	10.1	10	9.6
RC1		27.2		17.4	28.2	13.8	15.5	17.4	24.7	24.4	35.2	23.2	22.7	21.8
RC2		37.8		24.3	16.7	28.9	30	29.9	45.1	36.6	48.5	37.2	33.5	32.1
RC3		10.1		6.4	5.1	4.6	5.3	4.7	13	9	13.2	11.3	8.3	7.9
RC4		13		7.9	6.3	5.2		8	16.6		15.9	13.9	10.8	10.4

(1) See Appendix C for details on bias adjustment

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

Choice of Bias Adjustment Factor for diffusion tube monitoring

A bias adjustment factor is applied to diffusion tube monitoring results to account for bias between diffusion tube results and a reference method automatic monitor.

There are three options for bias adjustment of diffusion tube monitoring undertaken in the Highlands in 2016.

A diffusion tube co-location study has taken place at site IV4, the Telford Street AUN site, Inverness. In 2016 the bias adjustment factor obtained by this study was 0.96.

A diffusion tube co-location study has been undertaken at site IV3, the Inverness Queensgate Automatic monitoring site. The bias adjustment factor derived from this study for 2016 was 0.99.

DEFRA provides a combined bias adjustment factor for each of the laboratories undertaking diffusion tube analysis, based upon the combined result of a number of UK co-location studies. The combined bias adjustment factor for 2016 for Gradko 20% TEA in water based upon 21 studies is 0.94.

The results reported in table B1 and in A3 have been bias adjusted using the local bias adjustment factors as follows:

Bias Adjustment Factor	**Sites**
Queensgate Site study derived factor 0.99	IV1, IV2E, IV2F, IV2G, IV3A, IV3B, IV3C, IV3H, IV3K, IV3L, IV6A, IV6B, IV7, IV8, IV9A, IV9B, IV9C, IV9D
Telford Street site study derived factor 0.96	IV4A, IV4B, IV4C, IV10, NA1, NA2, NA3, RC1, RC2, RC3, RC4

Short-term to Long-term Data Adjustment

For some of the diffusion tube sites a lack of data, or the data set covering an incomplete year, has necessitated an adjustment from short term to long term data. The period mean (covering the period of the short term monitoring) is compared with the annual mean at two or more background sites with good data capture. The comparison generates a ratio which when applied to the short term monitoring mean allows for variations in concentration at different times of the year to be accounted for. The sites, Aberdeen – Errol Place and Glasgow – Townhead were used to derive a period mean adjustment for the sites identified below:

Table C.1 IV3B Inverness (Jan, Mar-May)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	20.99	20.25	1.04
Glasgow – Townhead	Urban Background	26.39	26.14	1.01
			Average	1.02

Table C.2 Site IV3H, IV3K & IV3L (Jul-Dec)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	20.99	22.22	0.94
Glasgow – Townhead	Urban Background	26.39	26.40	0.99
			Average	0.97

Table C.3 Site IV7 (April-Nov)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	20.99	17.10	1.23
Dundee – Mains Loan	Urban Background	26.40	23.01	1.15
			Average	1.19

Table C.4 Site IV9C (Nov-Dec)

Site	Site Type	Annual Mean	Period Mean	Ratio

Aberdeen – Errol Place	Urban Background	20.99	32.54	0.64
Dundee – Mains Loan	Urban Background	26.40	38.69	0.68
			Average	0.66

Table C.5 Site IV10 (Jan, Mar)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	20.99	26.68	0.79
Dundee – Mains Loan	Urban Background	26.40	31.43	0.84
			Average	0.81

Table C.6 Site NA1 (May, Jul)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	20.99	12.97	1.62
Dundee – Mains Loan	Urban Background	26.40	16.85	1.57
			Average	1.59

Table C.7 Site NA2 (May)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	20.99	10.80	1.94
Dundee – Mains Loan	Urban Background	26.40	17.82	1.48
			Average	1.71

Table C.8 Site NA3 (May-Dec)

Site	Site Type	Annual Mean	Period Mean	Ratio

Aberdeen – Errol Place	Urban Background	20.99	19.15	1.1
Dundee – Mains Loan	Urban Background	26.40	24.12	1.09
			Average	1.09

Table C.9 Site RC4 (Feb, Apr-Jun, Aug-Sep, Nov-Dec)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	20.99	20.29	1.03
Dundee – Mains Loan	Urban Background	26.40	26.30	1.00
			Average	1.02

QA/QC of Automatic Monitoring

The AURN sites in Highland are operated for DEFRA by Bureau Veritas with QA/QC provided by Ricardo E and E.

Site IV3 is operated by The Highland Council as part of the Scottish Air Quality Database (SAQD). QA/QC for the SAQD is provided by Ricardo E and E.

QA/QC of diffusion tube monitoring

Gradko who supply and analyse the tubes reported here have supplied the following QA/QC statement:

Supply and Analysis of Nitrogen Dioxide (NO2) Diffusion Tubes

Analysis of the NO2 diffusion tubes is carried out using ion chromatography techniques in accordance with Gradko International Ltd U.K.A.S. accredited (ISO/IEC 17025) internal laboratory procedure GLM 7, which is a recommended UV spectrophotometric method.
Reporting of the NO2 analysis results is sent to electronically to each authority in PDF format or if requested EXEL format. The report is issued within 10 working days from receipt of the exposed diffusion tubes to the Gradko Laboratory.

Quality Assurance: The laboratory has a fully documented Quality Management System, which has been assessed and accredited by U.K.A. S. (Accreditation No. 2187). A copy of the Quality Manual Contents Index is available on request.

Quality Control Procedures: All tube components are maintained in a high state of cleanliness. New absorbent is prepared by the Laboratory and checked for levels of nitrogen dioxide.
The diffusion tubes are prepared in a dedicated clean laboratory and stored under refrigerated conditions to maintain stability. A sample of each batch of tubes prepared is checked by the analyst for blank levels. If the tubes are stored for more than one week, a further sample is taken and checked for any increases in blank levels. If the levels reach a pre-determined value, the batch of tubes is discarded Analytical Quality Control Procedures are implemented by the use of internal standards checks using certified standards from two different sources, and the use of external proficiency schemes such as AIR/WASP Inter- Comparison Project which is administered by the UK Health & Safety Laboratory.

100% of submissions by Gradko to the AIR/PT NO2 proficiency scheme were satisfactory over the monitoring period.

Tube Exposure Procedure

The Highland Council exposes diffusion tubes according to the method described in “Passive Diffusion Air Monitors – Instruction Manual for Exposure and Location” by Gradko International Ltd. Guidance is also found in “Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance” by AEA for DEFRA.

Appendix D: Information about New Sources

Table D.1 Biomass Installations screened

Name	Location	NGR X	NGR Y	Capacity (kW)	Screening Outcome
Dalfaber District Heating scheme	Aviemore	290158	813929	1042	Detailed assessment not required
BSW Boat of Garten	Boat of Garten	294434	819777	1152	As above
Scroggie Farm	Dingwall	253399	861089	917	As above
Binnilidh Mor	Dalchreichart, Glenmoriston	229342	812856	60	As above
Bridgend Primary School	Alness	265655	869854	2*201	As above
Bonar Bridge Primary School	Bonar Bridge	261647	891774	2*201	As above
Farr Secondary School	Bettyhill	270532	961922	2*151	As above
Edderton Primary School	Edderton	270534	884177	2*60	As above

Name	Location	NGR X	NGR Y	Capacity (kW)	Screening Outcome
Kinlochbervie Primary School	Kinlochbervie	223004	956475	2*250	Air Quality Assessment undertaken – outcome
Drumnahaving	Achany, Lairg	258364	904420	421	Detailed assessment not required
Redwoods Nursing Home	Alness	265305	868934	218	As above
Ferry Inn	Scrabster	310055	970394	201	As above

Table D.2 Biomass CHP installations screened

Name	Location	NGR X	NGR Y	Capacity (kWe)	Screening Outcome – percentage of NO_2 objective concentration
Balmenach Distillery	Cromdale, Glenlivet	307941	827066	249	14.3%
Baird's Maltings	Inverness	267097	846582	1180	32.9%
Wick District Heating Scheme	Pulteneytown, Wick	315742	959306	170	9.7%

Glossary of Terms

Please add a description of any abbreviation included in the APR – An example is provided below.

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
APR	Air quality Annual Progress Report
AQS	Air Quality Strategy – in this context will usually refer to the UK Government and Devolved Administrations Air Quality Strategy 2007
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

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