



2015 Updating and Screening
Assessment for
The Highland Council

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

April 2015

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Executive Summary

This report details the findings of the 2015 round of review and assessment undertaken by the Highland Council.

For the vast majority of the Highland Council Area, air quality is considered to be good. Previous rounds of review and assessment have identified an area of the city centre of Inverness with poorer air quality. An Air Quality Management Area (AQMA) has been declared for this area and the Highland Council is undertaking its duties in terms of Action Planning. An Action Plan for the Inverness City Centre AQMA is expected to be published in 2016.

Monitoring carried out in 2014 and an assessment of new or significantly changed local developments has not indicated any additional areas, outside of the existing AQMA, where the UK Air Quality Objectives are unlikely to be met.

Detail Assessment is not required for any pollutants.

The Highland Council will continue to review and assess local air quality in the Highland Council Area.

A progress report for 2016 will be completed by the Highland Council

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1 Introduction

1.1 Description of Local Authority Area

The area of the Highland Council covers approximately 25,659 square kilometres, excluding inland water, around one third of the Scottish mainland. The area includes Skye and other Inner Hebridean islands. The central and western regions of the area are a combination of high mountain and moorland and deep glens bordered by a coastline of sea lochs. In the north east lies the "flow" country of Caithness. Further south on the east coast lie three estuarine systems, the Dornoch, the Cromarty and the Moray firths, which are flanked by extensive arable land. The Great Glen Fault runs approximately east – west from coast to coast between Inverness and Fort William. To the south of the Great Glen Fault, lie the massive upland areas of the Monadhliath and Cairngorm mountains, including the recently formed Cairngorm National Park. To the south west the area extends to the Ardnamurchan peninsula. 17% of the land area is afforested. Over 20% of the Highlands is designated as National Scenic Area.

Inverness is the capital city of the Highlands and had an estimated population of 67,960 in 2010. The next largest settlements in the Highlands at that time were Fort William (population 9,823) and Nairn (population 9,203)

In 2011 the total population of the Highlands was around 232,000. The majority of the population live in the eastern coastal areas of the Highlands, in the city of Inverness and in the numerous smaller towns along the A9 and A96 transport corridors. Population density in the Highlands was 8.7 per square kilometre in 2011 in comparison to the Scottish population density of 67.4 per square kilometre.

Industrial development is also concentrated in south and east, although there are some other significant industrial developments elsewhere such as the "Alcan" facility at Fort William.

Over most of the Highlands the transport network is sparse and for a large proportion of the network the usage is very light. 85% of the road network is classified as rural.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 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 exceedences are

considered likely, the local authority must then 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.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in **Scotland** are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland) Amendment Regulations 2002 (Scottish SI 2002 No 297), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in Scotland

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	3.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005

Particles (PM₁₀) (gravimetric)	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
Sulphur dioxide	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

1.4 Summary of Previous Review and Assessments

The first Review and Assessment of Air Quality in Highland was completed in 1998. The table below outlines the previous reports which have been published by the Highland Council as part of the Review and Assessment process.

The Local Air Quality Updating and Screening Assessment Report, 2003, identified that a Detailed Assessment would have to be carried out.

Detailed assessment was carried out for the following pollutants:

- Benzene. The screening assessment indicated that the running annual mean air quality objective for Benzene may be exceeded:
 - a) in the vicinity of petrol terminals at Inverness harbour, and
 - b) near the Talisman Energy UK Ltd, Nigg Oil Terminal petroleum refining process at Nigg.

- Sulphur Dioxide. The screening assessment indicated that:
 - a) there was a risk that the 15 minute mean air quality objective for SO₂ could be exceeded in Castletown in Caithness as a result of the density of dwellings which burn solid fuel; and
 - b) a Detailed Assessment would need to be carried out in respect of the ALCAN Aluminium Smelter in Fort William as the number of stacks which emit SO₂ at that site, did not lend themselves to simple screening techniques.

- Nitrogen dioxide. Both the Scottish Executive and the Scottish Environment Protection Agency voiced concern over levels of NO₂ in Inverness City Centre as measured by passive diffusion tube and so a Detailed Assessment was also undertaken for Nitrogen dioxide.

The Detailed Assessment Report, published in 2005, concluded that there was little likelihood of a failure to meet the objectives for these pollutants.

The 2008 Progress Report identified that the monitoring data generated by the Automatic Monitoring station at Telford Street, Inverness suggested a likely exceedence of the PM10 annual mean objective at this location. It was concluded that a detailed assessment for PM10 would be required although later amendments to the monitoring dataset suggest that this is no longer necessary.

The Updating and Screening Assessment of 2009 identified a requirement to progress to a detailed assessment for particles (PM10) and Nitrogen dioxide with respect to a biomass installation in Halkirk, Caithness.

The 2010 Progress Report identified that the biomass installation in Halkirk had been modified in the process of gaining authorisation from SEPA and was not in fact requiring further assessment under LAQM.

The 2011 Progress report did not identify any requirement for further assessment.

The Updating and Screening Assessment completed in 2012 reported diffusion tube monitoring results at a site in Queensgate, Inverness that were in excess of the annual mean objective. The Highland Council was required to proceed to a detailed assessment of Nitrogen dioxide at Queensgate.

The 2013 Progress Report reported that new monitoring data indicated that there might be exceedences of the objectives for Nitrogen dioxide at roadside locations in the Old Town area of Inverness, confirming the need for detailed assessment in that area.

The detailed assessment, which includes additional monitoring and modelling was carried out through 2013 and recommended the declaration of an Air Quality Management Area for an area in the vicinity of the junction between Queensgate and Academy Street, Inverness with respect to predicted failure to achieve the Annual Mean Nitrogen dioxide Air Quality Objective.

The 2014 Progress report confirmed through monitoring the need to declare an AQMA at the Queensgate/Academy Street junction.

The Highland Council declared the Inverness City Centre AQMA which was brought into being by order on the 9th September 2014.

The Highland Council has engaged consultants to assist in the action planning process and to undertake further modelling work that will inform the action plan steering group. It is anticipated that the draft action plan will be ready for consultation early in 2016.

Figure 1.1 Map of AQMA Boundary

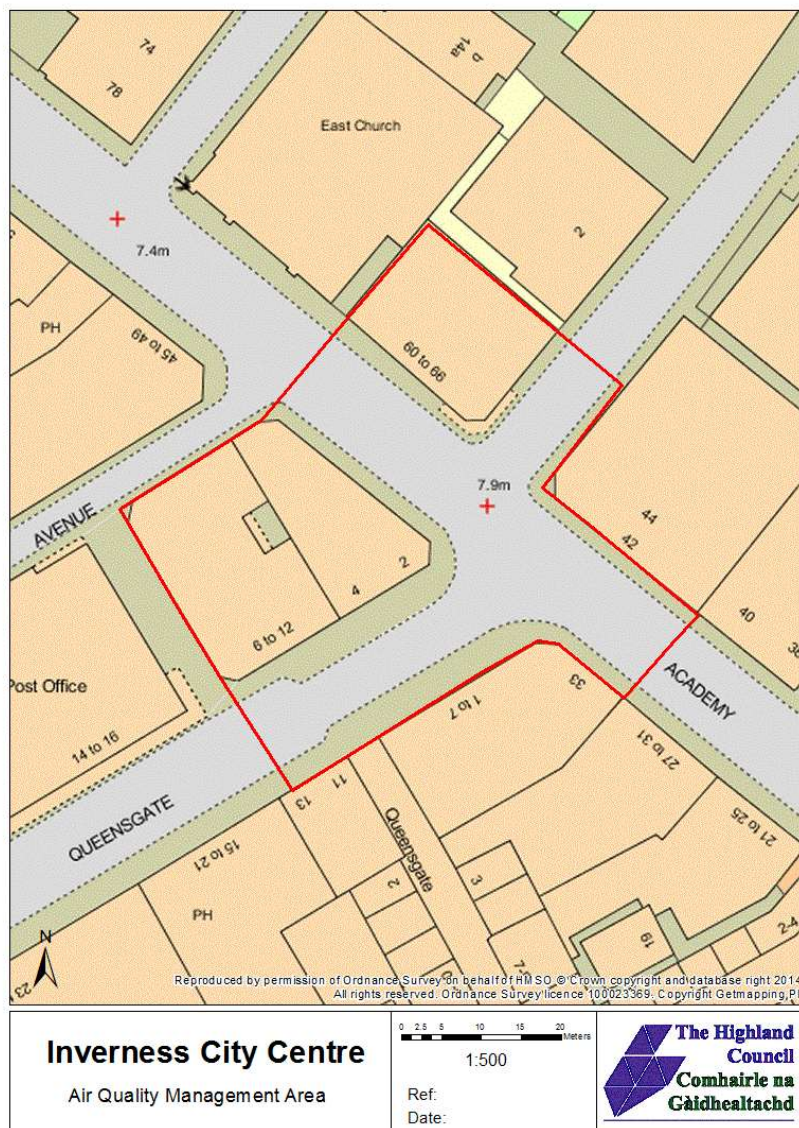


Table 1.2 Review and Assessment Reports and Outcomes

Date	Report	Outcome
1998	Air Quality in the Highlands - First Stage Review and Assessment	No requirement to proceed to second stage review and assessment
2001	Addendum to Air Quality in the Highlands	
2003	Updating and Screening Assessment	Proceed to detailed assessment for: Benzene in the vicinity of fuel storage facilities at Nigg and Inverness; Sulphur dioxide in respect of areas with a high density of domestic solid fuel burning; Sulphur dioxide in the vicinity of the Alcan Site, Fort William; and Nitrogen dioxide in Inverness city centre.
2005	Progress Report	Detailed assessment not required
2005	Detailed Assessment	Concluded: That there was no likelihood of the objective for benzene not to be met in the Highland Council Area; That the air quality objective for Sulphur dioxide is being met in the Highland Council Area; That the air quality objectives for Nitrogen dioxide are being met in the Highland Council Area; and that there is no requirement to declare an Air Quality Management Area in the Highland Council Area.
2006	Updating and Screening Assessment	Detailed Assessment not required
2007	Progress Report	Detailed Assessment not required

The Highland Council

Date	Report	Outcome
2008	Progress Report	Likely exceedence identified at Telford Street, Inverness for PM ₁₀ . Detailed Assessment required. (subsequently this requirement was removed following a correction to the monitoring data)
2009	Updating and Screening Assessment	Detailed Assessment required for NO ₂ and PM ₁₀ in Halkirk, Caithness. (subsequently this requirement was removed following a change to the emissions from a biomass process)
2010	Progress Report	Detailed Assessment not required
2011	Progress Report	Detailed assessment not required
2012	Updating and Screening Assessment	Detailed assessment required for Nitrogen dioxide at Queensgate, Inverness
2013	Progress Report	Detailed assessment required for Nitrogen dioxide at Queensgate and Union Street, Inverness
2014	Detailed Assessment	Identified an area around Queensgate/Academy Street junction with relevant exposure, where the Annual Mean NO ₂ objective likely to be exceeded.
2014	Progress Report	Most recent monitoring confirmed the need to declare an Air Quality Management Area around the Queensgate/Academy Street junction

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

There are currently three automatic monitoring sites in the Highland Council Area. These sites remain unchanged since the last round of review and assessment.

Nitrogen dioxide is monitored at two sites being Telford Street, Inverness, a roadside site 4 metres from the A862 and Fort William, a suburban site in a mixed residential and recreational area.

Small particles as PM10 and PM2.5 are monitored at Telford Street, Inverness.

Ozone is monitored at two sites being the aforementioned Fort William site, and Strath Viach a rural site in a remote glen five miles from the nearest road.

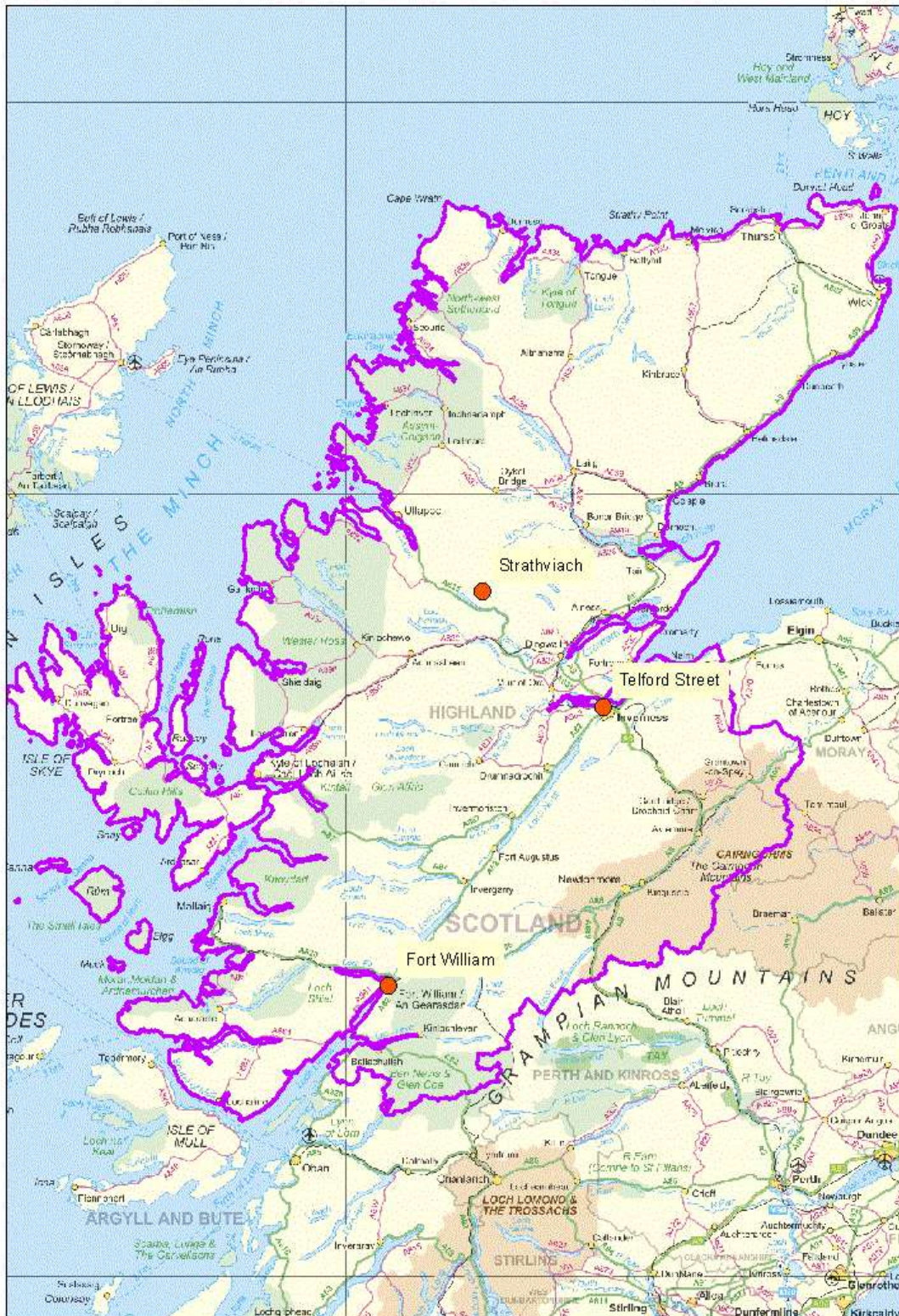
All three stations are part of the UK Automatic Urban and Rural Network and are managed by Bureau Veritas on behalf of DEFRA. Data from the sites is available, fully ratified, for download on the internet.

Figure 2.1 shows the location of automatic monitoring sites.

Table 2.1 contains the detail description of the sites.

QA/QC detail for the sites is included in the appendices to this document.

Figure 2.1 Map of Automatic Monitoring Sites



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Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Inverness – Telford Street	Roadside	265709	845670	PM10, PM2.5, NO ₂	N	Gravimetric (PM) Chemiluminescent (NO ₂)	Y (2.5m)	4m	N
Fort William	Suburban	210857	774431	NO ₂ , ozone	N	Chemiluminescent	N	N/A	N
Strathviach	Rural Background	234831	875029	Ozone	N	Chemiluminescent	N	N/A	N

2.1.2 Non-Automatic Monitoring Sites

The Highland Council continues to utilise non-automatic monitoring methods for Nitrogen dioxide at a number of sites mainly in the city of Inverness.

In November 2014 an additional 4 diffusion tube sites (IV9a-d) were added within the declared AQMA. There are now 6 diffusion tube monitoring sites within the Inverness City Centre AQMA.

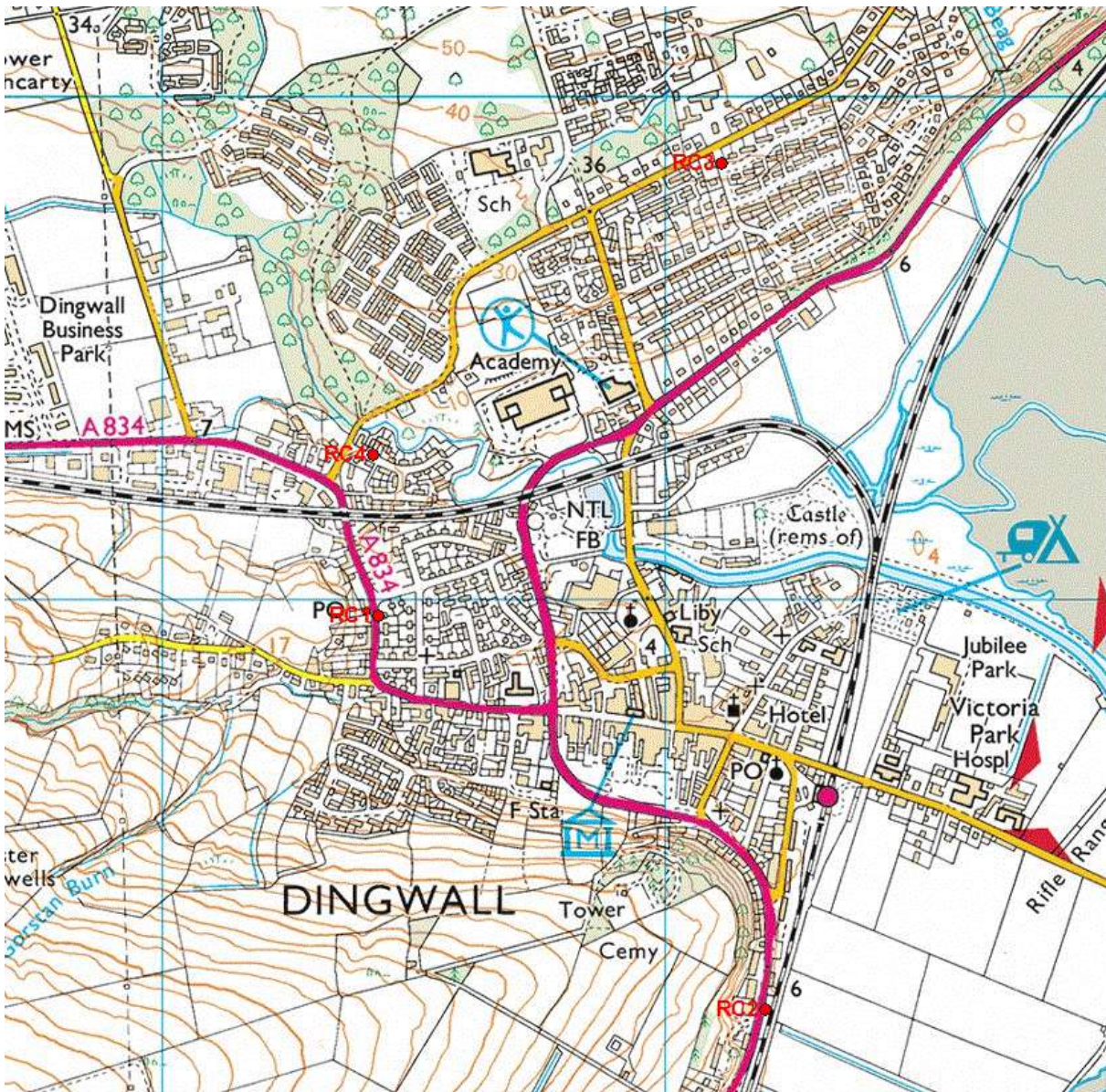
The four diffusion tube sites on Queensgate at first and second floor level (IV3d-g) were also removed in March 2014 due to difficulties with servicing these sites in the long term. Site IV2b on Academy Street was removed in July 2014 due to redevelopment of the monitoring site.

There were therefore 25 diffusion tube sites operating for all or part of 2014. This includes four sites in the Ross-shire market town of Dingwall, the only diffusion tube monitoring currently undertaken by the Highland Council out with Inverness. Details of the monitoring sites and maps showing their location are included in Figure 2.2 and Table 2.2 below.

Three diffusion tubes are collocated with the AUN automatic monitoring equipment on site IV4, Telford Street in Inverness. A local bias adjustment factor for Nitrogen dioxide diffusion tubes has been derived from the collocation exercise and was used to bias adjust all other diffusion tube monitoring results.

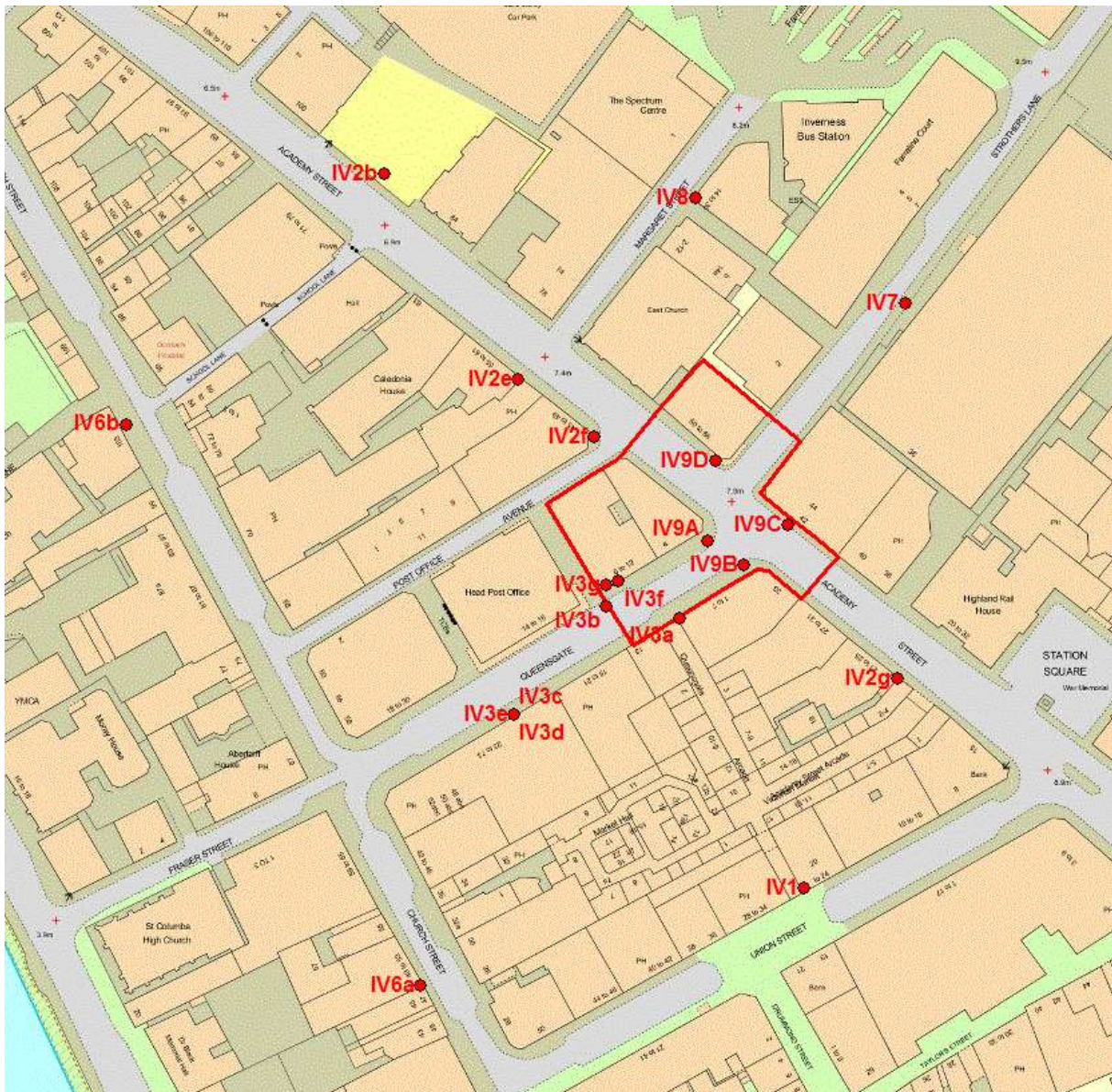
Diffusion tubes are supplied and analysed by Gradko International Ltd, and are deployed in accordance with the technical guidance. Detail of the QA/QC for the monitoring and laboratory performance data is included in the Appendices.

Figure 2.2 Map of Non-Automatic Monitoring Sites – Dingwall



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Figure 2.2 Map of Non-Automatic Monitoring Sites – Inverness City Centre



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Table 2.2 Details of Non-Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
IV1 Union Street	Roadside	266681	845361	NO ₂	N	N	Y ^a	3	Y
IV2b Academy Street	Roadside	266577	845538	NO ₂	N	N	Y(0m)	5	Y
IV2e Academy Street E	Roadside	266610	845487	NO ₂	N	N	Y(5m) ^a	1.5	Y
IV2f Academy Street F	Roadside	266629	845473	NO ₂	N	N	N	2	Y
IV2g Academy Street G	Roadside	266704	845413	NO ₂	N	N	N	2	Y
IV3a Queensgate A	Roadside	266650	845428	NO ₂	N	N	Y(7) ^a	3	Y
IV3b Queensgate B	Kerbside	266632	845431	NO ₂	N	N	Y(7) ^a	0.5	Y
IV3c Queensgate C	Roadside	266609	845404	NO ₂	N	N	Y(7) ^a	3	Y
IV3d Queensgate D	Roadside	266609	845404	NO ₂	N	N	Y(7m)	7 ^b	Y
IV3e Queensgate E	Roadside	266609	845404	NO ₂	N	N	Y(7m)	10 ^b	N
IV3f Queensgate F	Roadside	266635	845437	NO ₂	N	N	Y(7m)	7 ^b	Y
IV3g Queensgate G	Roadside	266632	845436	NO ₂	N	N	Y(7m)	10 ^b	N
IV4 Telford Street	Roadside	265710	845672	NO ₂	N	Y	Y (1.5m)	4	N
IV6a Church Street A	Roadside	266586	845337	NO ₂	N	N	Y ^a	3	Y
IV6b Church Street B	Roadside	266513	845476	NO ₂	N	N	Y(2m)	1	Y
IV7 Strothers Lane	Roadside	266706	845506	NO ₂	N	N	Y ^a	3	Y

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
IV8 Margaret Street	Roadside	266654	845532	NO ₂	N	N	Y(6) ^a	3	Y
IV9a Queensgate LHS	Kerbside	266666	845441	NO ₂	Y	N	Y(7) ^a	0.5	Y
IV9b Queensgate RHS	Kerbside	266657	845447	NO ₂	Y	N	N	0.5	Y
IV9c Strothers Lane RHS	Roadside	266659	845467	NO ₂	Y	N	N	1	Y
IV9d Strother's Lane LHS	Kerbside	266677	845451	NO ₂	Y	N	Y(7) ^a	0.5	Y
RC1 Wyvis Terrace	Roadside	254430	858968	NO ₂	N	N	Y (0m)	1	Y
RC2 Station Road	Roadside	255200	858185	NO ₂	N	N	Y (0m)	1	Y
RC3 Kintail Place	Urban Background	255112	859866	NO ₂	N	N	Y (2.5m)	1	N/A
RC4 Burns Crescent	Urban Background	254420	859288	NO ₂	N	N	Y (2.5m)	1	N/A

Note ^a Exposure relevant to the annual mean objective at first floor level or above, monitoring carried out at ground floor level.

Note ^b monitoring carried out at upper story level of buildings with relevant exposure, distance to kerb stated is vertical distance.

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

The annual mean Nitrogen dioxide objective concentration was exceeded at the following monitoring locations:

- **IV3f Queensgate** – An annual mean concentration of 48ug/m³ was recorded at this location. The monitoring site is within the existing AQMA. It is at first floor level at the façade of a residential building and as such is representative of relevant exposure. This location is one of four monitoring points at first and second floor level that were monitored during the period of detailed assessment prior to the declaration of the AQMA. Monitoring at the site ended in February 2014 and the January 2014 data was missing. The annual mean concentration stated has been produced by annualising the actual monitoring data in accordance with the guidance in LAQM.TG(09). Details of this procedure are included in the appendices. Because of the very limited basis of the actual monitoring data extreme caution is necessary when interpreting the significance of the stated annual mean.

In addition to the exceedance identified above the annual mean Nitrogen dioxide concentration was within 10% of the objective concentration at the following monitoring locations:

- **IV2e Academy Street** – An annual mean of 39.2ug/m³ was recorded at this monitoring location. There is no relevant exposure at the ground floor monitoring location. There is nearby relevant exposure in first and second floor flats. Applying a fall off with distance correction to the data suggests an annual mean at first floor relevant exposure might be 31.1ug/m³.
- **IV2f Academy Street** – An annual mean of 38.2ug/m³ was recorded at this monitoring location. The location sits just outside the existing AQMA. There is no relevant exposure at the monitoring location.

- **IV2g Academy Street** – An Annual mean of $38.7\mu\text{g}/\text{m}^3$ was recorded at this monitoring location. The location is outside the existing AQMA. There is no relevant exposure at the monitoring location.
- **IV3a Queensgate** – an annual mean of $37.1\mu\text{g}/\text{m}^3$ was recorded at this monitoring location. The location is within the existing AQMA. There is no relevant exposure at the monitoring location which is at ground floor level. Applying a distance correction to the data suggests that first floor concentrations might be $33.3\mu\text{g}/\text{m}^3$. There is no first floor relevant exposure at the monitoring location however there is first floor relevant exposure at the other side of the street and it might be expected that results from this monitoring location would be reasonably representative of concentrations at locations where there is relevant exposure.
- **IV9a Queensgate** – A projected annual mean Nitrogen dioxide concentration of $37.8\mu\text{g}/\text{m}^3$, based upon annualised short term monitoring, was obtained at this location. This is a new site and only two months (November, December) of monitoring data was available. The monitoring position is kerbside, 0.5m from the carriageway. Relevant exposure at the location consists of first floor flats, 5m from the carriageway. Applying a distance correction to the data suggests that annual mean Nitrogen dioxide concentration at the relevant exposure might be $26\mu\text{g}/\text{m}^3$. Again the very limited data that forms the basis for this prediction means that caution should be exercised when interpreting the significance of the state annual mean. As more data becomes available for this monitoring location the actual situation should become more clear.

At all the other monitoring locations the Annual Mean Nitrogen dioxide Objective was achieved in 2014.

The 1-hour Mean Nitrogen dioxide Objective was achieved at all monitoring location in Highland in 2014

Automatic Monitoring Data

The results of the automatic monitoring are included in the table below both in terms of comparison with the annual mean objective and the 1-hour mean objective.

Where valid data capture was less than 75% the mean has been “annualised” as in box 3.2 of LAQM.TG(09)

Data for the previous five years has also been included. Where ever the percentage of data capture required results have been adjusted according to the guidance contained with LAQM.TG(09).

Relevant exposure on the Telford Street is mostly greater than 4 metres from the carriageway however there are several properties adjacent to the road link that are closer to the carriageway being 2.5 metres from the carriageway edge. The monitoring location is therefore not representative of worst case relevant exposure.

Where the monitoring position does not represent relevant exposure the results have been adjusted according.

Table 2.3 Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %	Valid Data Capture 2014 %	Annual Mean Concentration $\mu\text{g}/\text{m}^3$				
					2010	2011	2012	2013	2014
Telford Street	Roadside	N	99.3	99.3	24.5 ¹	27	29.2	21	21.03
Fort William	Suburban	N	98.7	98.7	13.4	11.8 ²	12.1	8.98	10.98

1. only 88.8% of data was captured from the Inverness site in 2010

2. only 64% of data was captured from the Fort William site in 2011

Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %	Valid Data Capture 2014 %	Number of Exceedences of Hourly Mean ($200 \mu\text{g}/\text{m}^3$)				
					2010	2011	2012	2013	2014
Telford Street	Roadside	N	99.3	99.3	0(118)	0	0	0	0
Fort William	Suburban	N	98.7	98.7	0	0(102)	0	0	0

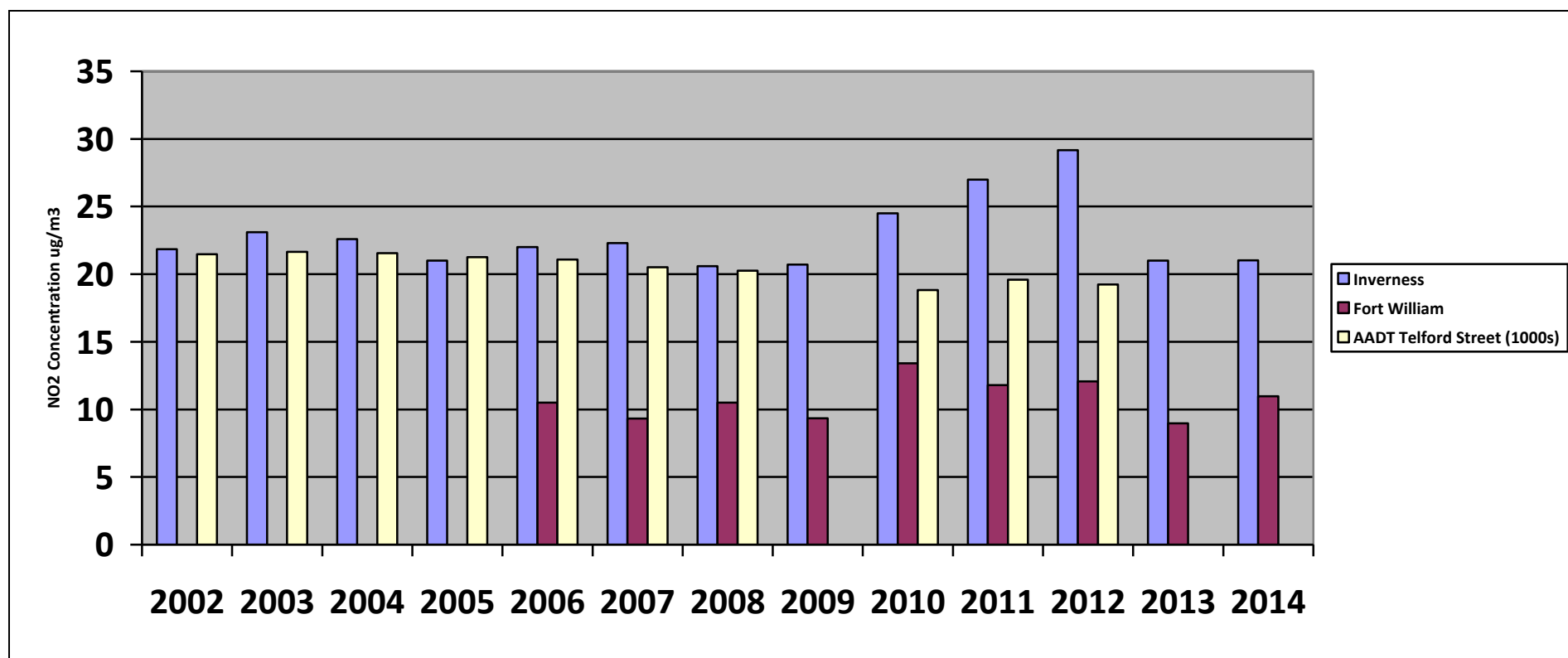
If the period of valid data is less than 90%, the 99.8th percentile of hourly means is included in brackets

Trends

A graph to demonstrate trends is included in figure 2.3. From 2002 until 2010 both sites had annual concentrations that remained at around the same level year on year. From 2010 until 2012 an obvious increasing trend was evident at the Telford Street site however after 2012 concentrations returned to around the level seen before 2010 and are again not showing any particular rising or falling trend year on year.

The reason for the variation witnessed between 2010 and 2012 is not known. The Highland Council is not aware of any change in local conditions that might explain this change.

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Automatic Monitoring Sites



Diffusion Tube Monitoring Data

A summary of the Nitrogen dioxide diffusion tube dataset is included in Table 2.5 below. Annual means have been derived from the monthly average results. Where monitoring took place for less than a full calendar year the results have been annualised as in Box 3.2 of LAQM.TG(09). Results have also been bias adjusted using a locally derived bias adjustment factor obtained from a colocation study at the AUN Station on Telford Street. Where a sample location is not representative of relevant exposure the results have been corrected for distance from the carriageway.

Some of the results in this dataset are derived from monitoring periods of less than one full calendar year. Where this is the case the annual means have been annualised following the guidance contained within Box 3.2 of LAQM.TG(09). For this exercise data from three sites on the AUN were used to derive a period adjustment factor which was then applied to the short period data to generate an estimate of the annual mean. The sites used on this occasion were Aberdeen- Errol Place, Fort William and Glasgow – Waulkmilkglen, all of which had data capture in 2014 in excess of 90%.

Where the monitoring location differs from the relevant exposure in terms of relative distance to the kerb a correction has been applied to give an estimate of the concentration at the point of relevant exposure. The NO₂ with distance from roads calculator, created by Air Quality Consultants Ltd and published on the Scottish Air Quality website, has been used to determine this correction.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2014

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.88)
								2014 ($\mu\text{g}/\text{m}^3$)
IV1	Union Street, Inverness	Roadside	N	N	100		N	26.4
IV2b	Academy Street, Inverness	Roadside	N	N	58.3	Y	N	25.2
IV2e	Academy Street, Inverness	Roadside	N	N	100		N	39.2
IV2f	Academy Street, Inverness	Roadside	N	N	100		N	38.2
IV2g	Academy Street, Inverness	Roadside	N	N	100		N	38.7
IV3a	Queensgate, Inverness	Roadside	Y	N	100		N	37.1
IV3b	Queensgate, Inverness	Kerbside	Y	N	100		Y	31.3
IV3c	Queensgate, Inverness	Roadside	N	N	100		N	33
IV3d	Queensgate, Inverness	Roadside	N	N	8.3	y	N	33.98 ^a
IV3e	Queensgate, Inverness	Roadside	N	N	8.3	y	N	27.91 ^a

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.88)
								2014 ($\mu\text{g}/\text{m}^3$)
IV3f	Queensgate, Inverness	Roadside	Y	N	8.3	y	N	48.01 ^a
IV3g	Queensgate, Inverness	Roadside	Y	N	16.7	y	N	23.7 ^a
IV4	Telford Street, Inverness	Roadside	N	Triplicate and collocated	100		Y	22.6
IV6a	Church Street, Inverness	Roadside	N	N	100		N	31.2
IV6b	Church Street, Inverness	Roadside	N	N	100		N	19
IV7	Strother's Lane, Inverness	Roadside	N	N	83.3		N	30.3
IV8	Margaret Street, Inverness	Roadside	N	N	100		N	22.5
IV9a	Queensgate, Inverness	Kerbside	Y	N	16.7	Y	Y	37.8 ^a
IV9b	Queensgate Inverness	Kerbside	Y	N	16.7	Y	Y	29.1 ^a
IV9c	Academy Street, Inverness	Roadside	Y	N	16.7	Y	N	33.1 ^a

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.88)
								2014 ($\mu\text{g}/\text{m}^3$)
IV9d	Academy Street, Inverness	Kerbside	Y	N	16.7	Y	Y	28.9 ^a
RCD1	Wyvis Terrace, Inverness	Roadside	N	N	91.7		N	16.2
RCD2	Station Road, Dingwall	Roadside	N	N	91.7		N	28.7
RCD3	Kintail Place, Dingwall	Urban Background	N	N	91.7		N	6.7
RCD4	Burns Crescent, Dingwall	Urban Background	N	N	91.7		N	8.1

^a note: very limited data available for these sites. Annualised means calculated for these sites should be interpreted with extreme caution.

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes for long term sites (2010 to 2014)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2010 (Bias Adjustment Factor = 0.92)	2011 (Bias Adjustment Factor = 1.09)	2012 (Bias Adjustment Factor = 1.26)	2013 (Bias Adjustment Factor = 0.95)	2014 (Bias Adjustment Factor = 0.88)
IV1	Roadside	N	26.8	28.3	41.7	27.4	26.4
IV2b	Roadside	N	29.3	31.1	35.5	27.6	
IV2e	Roadside	N				42.1	39.2
IV2f	Roadside	N				39.9	38.2
IV2g	Roadside	N				40.8	38.7
IV3a	Roadside	Y	41.9	48	47	38.4	37.1
IV3b	Kerbside	Y			41.5	34.4	31.3
IV3c	Roadside	N			46.5	34.3	33
IV4	Roadside	N	24.4	27.2	30.6	22.7	20.6
IV6a	Roadside	N				29.4	31.2
IV6b	Roadside	N				19.2	19
IV7	Roadside	N				33.9	30.3
IV8	Roadside	N				25.2	22.5
RC1	Roadside	N	26		24.6	17.6	16.2
RC2	Roadside	N	37		37.3	30.8	28.7
RC3	Urban background	N	10		9.8	7.1	6.9
RC4	Urban background	N	12.2		11.9	8.9	8.1

2.2.2 PM₁₀

Fine Particles as PM₁₀ are monitored at the Telford Street AUN site by gravimetric sampler. In 2014 data capture was good achieving 97.5%.

There were no exceedences of either the annual mean objective or the 24 hour mean objective in 2014.

There is a generally decreasing trend evident in Annual Mean PM₁₀ concentrations at Telford Street.

Table 2.7 Results of Automatic Monitoring of PM₁₀: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % ^a	Valid Data Capture 2014 % ^b	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration $\mu\text{g}/\text{m}^3$				
						2010	2011	2012	2013	2014
Telford Street	Roadside	N	97.5	97.5	Y	14	11.8	11	11.7	10.9

Figure 2.4 Trends in Annual Mean PM₁₀ Concentrations

A trend chart may be inserted here. Please discuss any trends shown.

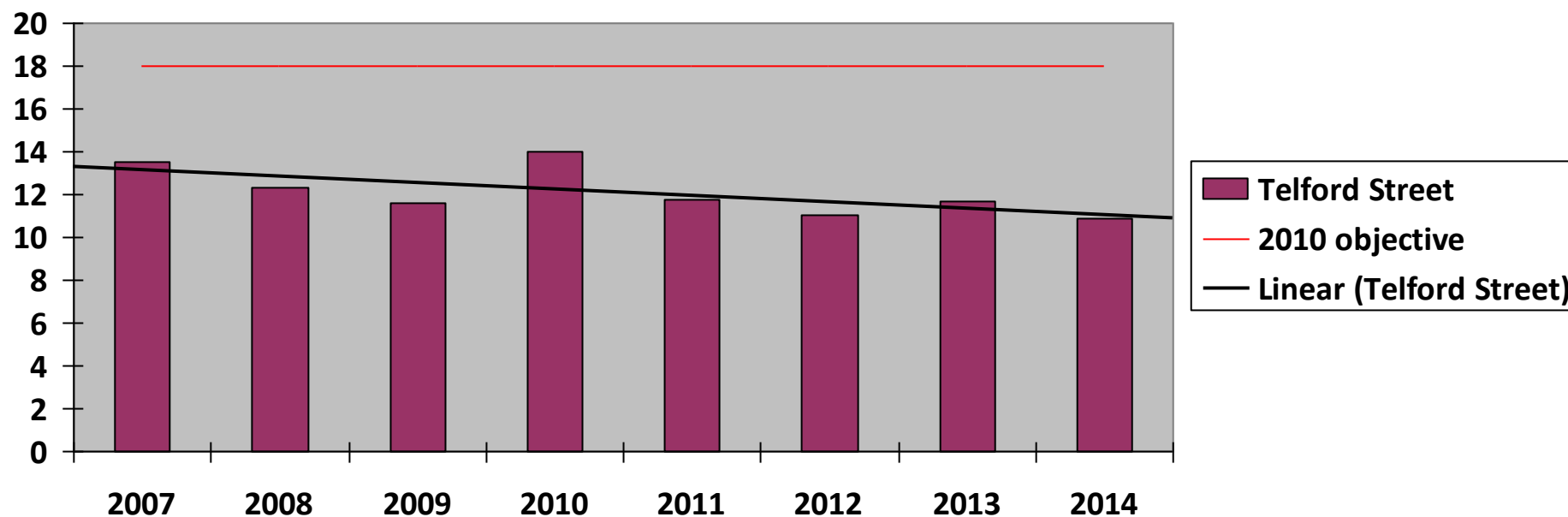


Table 2.8 Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour mean Objective

Site ID	Site Type	Within AQMA ?	Valid Data Capture for monitoring Period %	Valid Data Capture 2014 %	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 µg/m ³)				
						2010 ^a	2011 ^a	2012	2013	2014
Telford Street	Roadside	Y	95	92	Y	2(24.9)	0(20)	1	0	0

^a where data capture was less than 90% the 90th percentile of 24-hour means is included in brackets

2.2.3 Sulphur Dioxide

There is no monitoring of Sulphur dioxide in the Highland Council Area

2.2.4 Benzene

There is no monitoring of Benzene in the Highland Council Area.

2.2.5 Other pollutants monitored

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007 identified UK Air Quality Objectives for the protection of human health. Some of these objectives, including those for PM2.5 and Ozone, are not included in the regulations at present. The objectives for these two pollutants are described in table 2.9 below. The results of the automatic monitoring within Highland for these pollutants are included here for information.

Table 2.9 UK Air Quality Strategy Objectives for the protection of human health, July 2007

Pollutant	Air Quality Objective		To be achieved by
	Concentration	Measured as	
Particles (PM2.5) (Gravimetric)	12 ug _m -3 (limit)	Annual Mean	2020
Ozone	100 ug _m -3 not to be exceeded more than 10 times a year	8 hourly running mean or hourly mean	31 st December 2005

The annual mean PM2.5 concentration (daily gravimetric) measured at Telford Street, Inverness was 6 ug_m-3 in 2014. This is less than the objective to be achieved by 2020 for the pollutant in Scotland.

In 2014 the maximum daily 8-hour running mean ozone concentration was greater than 100 ug_m-3 on less than 10 occasions at Fort William and on 17 occasions at Strath Viach. The objective was therefore achieved at Fort William but was not

achieved at Strath Viach. It should be noted that there is no relevant exposure at Strath Viach.

2.2.6 Summary of Compliance with AQS Objectives

The Highland Council has examined the results from monitoring in the Highland Council area. Concentrations outside of the AQMA are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

The Highland Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

The Highland Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

3.3 Roads with a High Flow of Buses and/or HGVs.

The Highland Council confirms that there are no new/newly identified roads with high flows of buses/HGVs.

3.4 Junctions

The Highland Council confirms that there are no new/newly identified busy junctions/busy roads.

3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

A 3.2km section of new single carriageway road is being undertaken as part of the Inverness West Link. The road development was the subject of an air quality assessment at the development planning stage that determined there was no likelihood of the air quality objectives being exceeded as a result of the development.

The Highland Council has assessed new/proposed roads meeting the criteria in Section A.5 of Box 5.3 in TG(09), and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.6 Roads with Significantly Changed Traffic Flows

The Highland Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

The Highland Council confirms that there are no relevant bus stations in the Local Authority area.

4 Other Transport Sources

4.1 Airports

The Highland Council confirms that there are no airports meeting the criteria of box 5.4 of TG(09) in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

The Highland Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

4.2.2 Moving Trains

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

4.3 Ports (Shipping)

The Highland Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

The Highland Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

Norbord a timber based products production facility near Inverness received planning permission for a new production line. The existing facility and the new facility are authorised by SEPA. The development includes the provision of a 57MWth Biomass combustion facility to supply process heat. A detailed air Quality assessment was carried out at the planning and authorisation stage indicating that the emission from the new development would not result in a failure to achieve the air quality objectives.

The Highland Council has assessed industrial installations with substantially increased emissions, and concluded that it will not be necessary to proceed to a Detailed Assessment.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

The Highland Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.2 Major Fuel (Petrol) Storage Depots

There are major fuel (petrol) storage depots within the Local Authority area, but these have been considered in previous reports.

5.3 Petrol Stations

The Highland Council confirms that there are no petrol stations meeting the specified criteria.

5.4 Poultry Farms

The Highland Council confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

Since the last round of Updating and Screening Assessment, 2012, the Highland Council has identified 109 individual biomass combustion installations. These have been assessed according to the guidance in LAQM.TG(09). Details of the installations are included in the appendices.

For none of these installations did an assessment indicate a necessity to proceed to a detailed assessment.

The Highland Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.2 Biomass Combustion – Combined Impacts

There are no areas within Highland where the density of individual biomass installations is such that combined impacts are likely to be significant.

The Highland Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.3 Domestic Solid-Fuel Burning

The Highland Council carried out a detailed assessment in 2005 with respect to domestic solid fuel burning that concluded there was no likelihood of a failure to achieve the air quality objectives within the local authority area because of this activity.

The Highland Council has assessed areas of significant domestic solid fuel use, and concluded that it will not be necessary to proceed to a Detailed Assessment.

7 Fugitive or Uncontrolled Sources

The Highland Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

New monitoring data available within the Highland Council area for the monitoring year 2014 indicates that there are no locations, with relevant exposure and out with existing AQMA, where actual or potential exceedences of air quality objectives have occurred.

Within the Inverness City Centre AQMA monitoring indicates that the Annual Mean Nitrogen dioxide objective of 40ug/m³ is still not being met at locations where there is relevant exposure.

8.2 Conclusions from Assessment of Sources

Assessment of sources has not indicated any locations where potential exceedences of air quality objectives might occur.

8.3 Action Planning Progress

Since the declaration of the Inverness City Centre AQMA in September 2014 the Highland Council has taken the following steps towards the publication of an Air Quality Action Plan for the AQMA.

- Formation of Action Plan Steering Group which has met, discussed options and is developing a draft action plan.
- Engaged specialist support to assist in the development of an action plan with the assistance of a Scottish Government Action Plan support grant.

The Highland Council anticipates undertaking formal consultation on the Draft Action Plan early in 2016.

8.4 Proposed Actions

The Highland Council will continue to review and assess local air quality and will submit a progress report in 2016.

With respect to the Inverness City Centre AQMA the Highland Council will develop an Air Quality Action Plan and work with partners to bring pollutant concentration within the AQMA to a level below the UK Air Quality Objectives.

9 References

1. DEFRA in partnership with the devolved administrations, **The Air Quality Strategy for England, Scotland, Wales and Northern Ireland**, July 2007.
2. **The Air Quality (Scotland) Regulations 2000**
3. **The Air Quality (Scotland) (Amendment) Regulations 2002**
4. DEFRA in partnership with the devolved administrations, **Local Air Quality Management Technical Guidance LAQMTG(09)**, 2009
5. The Highland Council, **Air Quality in The Highlands – First Stage Review and Assessment** 1998.
6. The Highland Council, **Addendum to Air Quality in the Highlands**, 2001.
7. The Highland Council, **Updating and Screening Assessment**, 2003
8. The Highland Council, **Progress Report**, 2005
9. The Highland Council, **Detailed Assessment Report**, 2005
10. The Highland Council, **Updating and Screening Assessment**, 2006.
11. The Highland Council, **Progress Report** 2007.
12. The Highland Council, **Progress Report** 2008.
13. The Highland Council, **Updating and screening Assessment**, 2009
14. The Highland Council, **Progress Report** 2010.
15. The Highland Council, **Progress Report** 2011
16. The Highland Council, **Updating and screening Assessment**, 2012
17. The Highland Council, **Progress Report** 2013
18. The Highland Council, **Progress Report** 2014
19. Air Quality Consultants on behalf of The Highland Council, **Detailed Assessment of Air Quality in Inverness** May 2014
20. NETCEN, **Air Quality Monitoring: Highland**, 2005
21. **Environment Act 1995**
22. **Clean Air Act 1993**
23. <http://www.scottishairquality.co.uk/data/>
24. <http://www.scottishairquality.co.uk/laqm/>
25. AEA Energy and Environment on behalf of the Scottish Government, **Measurement and Modelling of Fine Particulate Emissions (PM10 and PM2.5) from Wood Burning Biomass Boilers**, 2008
26. Ricardo AEA , **QA/QC Report for the Automatic Urban and Rural Network, Oct-Dec 2014 and Annual Review 2014**, June 2015.
27. Gradko (International) Ltd, **Passive Diffusion Tube Monitors – Instruction manual for Exposure and Location**.
28. AEA Energy and Environment, **Technical Guidance – Screening Assessment for Biomass Boilers**, 2008
29. Air Quality Consultants, **Nitrogen dioxide Concentrations and Distance from Roads**, 2008
30. <http://www.uwe.ac.uk/aqm/review/>
31. AEA Energy and Environment for DEFRA and the devolved administrations, **Diffusion Tubes for Ambient NO2 Monitoring – Practical Guidance for Laboratories and Users**, 2008
32. Health and Safety Laboratory for BV/NPL on behalf of DEFRA and the devolved administrations, **Summary of Laboratory Performance in AIR/WASP NO2 Proficiency Testing Scheme (April 2013 – February 2015)**.

Appendices

Appendix A: QA/QC Data

Factor from Local Co-location Studies (if available)

A diffusion tube co-location study has taken place at site IV4, a roadside site on Telford Street, Inverness. The tubes are co-located with the Telford Street AUN Station. AEA's DifTPAB spreadsheet tool has been used to determine the precision and accuracy of the diffusion tube co-location study. Overall data capture of the automatic monitor data was good. Precision of both the automatic data and the diffusion tube data were identified as good. The bias factor was determined to be 0.88.

Diffusion Tube Bias Adjustment Factors

The combined bias adjustment factor for 2014 for Gradko 20% TEA in water based upon 16 studies is 0.90

Discussion of Choice of Factor to Use

The Highland Council has been advised by the reviewer of the Authority's previous rounds review and assessment report to consider using the local bias adjustment factor for the adjustment of diffusion tubes in future reporting.

The Highland Council has used the local bias adjustment factor.

PM Monitoring Adjustment

No Adjustment of PM10 results has been carried out in this report.

Short-term to Long-term Data Adjustment

For some of the diffusion tube sites a lack of data has necessitated an adjustment from short term to long term data. The sites in the table below were used for this adjustment as follows:

IV2B Inverness Academy Street (Jan-Jul)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	22	20.28	1.084507
Fortwilliam	Suburban	11	10.71	1.026667
Glasgow - Waulkmilkglen	Rural Background	10.975	10.157	1.08052
			Average	1.063898

Site IV3D (Jan)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	22	30	0.733333
Fortwilliam	Suburban	11	14	0.785714
Glasgow - Waulkmilkglen	Rural Background	10.975	11	0.997727
			Average	0.838925

Sites IV3E and F (Feb)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	22	29	0.758621
Fortwilliam	Suburban	11	11	1
Glasgow - Waulkmilkglen	Rural Background	10.975	15	0.731667
			Average	0.830096

IV3G (Jan-Feb)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	22	29.5	0.745763
Fortwilliam	Suburban	11	12.5	0.88
Glasgow - Waulkmilkglen	Rural Background	10.975	13	0.844231
			Average	0.823331

IV9a,b,c,d (Nov-Dec)

Site	Site Type	Annual Mean	Period Mean	Ratio
Aberdeen – Errol Place	Urban Background	22	32.5	0.676923
Fortwilliam	Suburban	11	13.5	0.814815
Glasgow - Waulkmilkglen	Rural Background	10.975	13.55	0.809963
			Average	0.767234

QA/QC of Automatic Monitoring

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

QA/QC of diffusion tube monitoring

Gradko 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 electronically to each authority in PDF format or if requested EXCEL 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 WASP and 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 B: List of Small Biomass Installations (50kW-20MWth)

Name	Location	NGR x	NGR y	Capacity kW
Bridgend Primary School	Alness	265655	869854	150
Seaforth House	Main Street, Golspie	283679	900109	150
Milton of Kildary Primary	Milton of Kildary	276721	875163	150
Lybster Primary School	Main Street, Lybster	324884	935969	150
Upper Geiselittle	Thurso	312506	965568	1000
Invergordon Academy	Invergordon	270904	869074	199
1 Balnagore	Fearn, Tain	282087	877951	111
Inverness High School	Inverness	265874	845066	150
Golspie High School & Swimming pool	Golspie	283378	900074	150
Golspie Primary School	Golspie	283378	900176	150
Grantown Primary School	Grantown on Spey	303534	827895	150
Kilchiumen Primary School	Station Road, Fort Augustus	237575	809079	150
Fortrose Academy	Academy Street, Fortrose	272950	856477	199
Black Isle Leisure Centre	Deans Road, Fortrose	273066	856376	150
Invergordon Leisure Centre	Academy Road, Invergordon	271051	869177	199
Isobel Rhind Centre	Tomich Road, Invergordon	271073	868721	150
Glenurquhart Primary	St. Drostan, Drumnadrochit	250654	829279	150
Invernevis House	Belford Road, Fort William	210966	774318	150
Bayview House	10 Orlig Street, Thurso	311275	968644	150
Beaully Primary School	Croyard Road, Beaully	252429	846464	150
Hilton Primary	Temple Crescent, Inverness	267500	843784	150
Bught Nursery	Inverness	265691	843636	150
Adelphi Distillery Ltd	Glenbeg, Acharacle	161141	760991	2222
Croy Primary School	Dalcroy Road, Croy	279730	849585	150
Hanover Housing	Glebe Court, Kingussie	276349	800811	210
Craighill health Centre	Craighill Terrace, Tain	277259	881808	0
Kingussie High School	Ruthven Road, Kingussie	275861	800318	521

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Tomatin Distillery	Tomatin, Inverness-shire	279131	829395	4347
Broomhill House	Dulnain Bridge	299321	822609	98
Taeblair Farm	Munlochy	263199	851329	1260
Glenmore Lodge	Aviemore	298735	809390	195
Grant House	Castle Road East, Grantown-on-Spey	303475	828317	100
The Torridon	Annat, Torridon	188869	854242	360
Coul House Hotel	Contin	246243	856342	152
Carrbridge Hotel	Carrbridge	284421	814952	199
COOP Caol	Killmallie Road, Caol	210977	776107	140
Oykell Bridge Hotel	Oykell Bridge, Sutherland	277888	881667	165
Dell of Abernethy	Nethy Bridge	301301	810601	90
Craig Dhu	Laggan	267300	795432	100
Seaforth Home	Maryburgh	253578	856822	218
Ullapool High School	Ullapool	213166	894256	150
Kingussie Primary School	Kingussie	275605	800497	150
Kinloch Lodge	Sleat, Isle of Skye	170579	815839	96
Allt Shellach Hotel	Ballachulish	205600	760190	199
Fairburn House	Marybank	245463	852984	199
Activity Centre	Fairburn	245336	852896	99
Puffin Pool	Dingwall	255556	858665	99
Raigmore Hospital	Inverness	268730	844917	3400
Greenhouses	Skibo Castle	273556	889182	800
Craighill Residential Home	Tain	277259	881815	199
UHI WHC	Portree	147175	843822	300
Balmenach Distillery	Cromdale, Morayshire	307930	827095	4350
Kilchoan House Hotel	Kilchoan, Acharacle	149028	763756	199
Community Biomass Heating Building	Banavie, Fort William	211600	776790	199
Aviemore Health Centre	Muirton, Aviemore	289662	813353	95
St Vincent's Hospital	Gynack Road, Kingussie	275370	801140	199
Dingwall Health Centre	Ferry Road, Dingwall	255715	858645	130
Auchtertyre Primary School	Auchtertyre	183930	827540	150

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Forss House Hotel	Forss, Thurso	303575	968778	130
Ardtornish House	Morvern, Oban	147437	747437	200
Belford Hospital	Fort William	210590	773995	800
Poyntzfield Farm	Balblair	271199	864306	400
ARKE	Kilbeg, Isle of Skye	165090	806150	100
Ellands Farm	Brodie	296030	857815	199
Glenspean Lodge Hotel	Roy Bridge	229885	781205	65
Milton Burn 1	Aviemore	289401	813741	70
Milton Burn 2	Aviemore	289463	813798	70
ICT Stadium	Inverness	267170	847079	199
Drimnin Distillery	Lochaline	155500	755500	1200
Balachroick House	Glen Feshie	284500	800500	50
Raigmore Hospital Housing	Inverness	268379	845083	1000
Balavil Sports Hotel	Newtonmore	271781	799359	199
Balblair Distillery	Edderton	270640	885680	4350
Glentruim Estate	Newtonmore	267978	795042	130
Home Farm DHS	Portree	147735	844308	880
RNI	Inverness	262260	844500	199
Russwood Visitor Centre	Newtonmore	271651	798557	70
Drumore of Cantrae 1	Cawdor	280030	846535	60
Scotsburn Court	Tain	277867	882007	199
Averon Leisure	Alness	265506	869685	199
Royal Brackla Distillery	Cawdor	286070	851530	4350
Achfary DHS	Achfary, Lairg	229224	939628	199
Castlehill	Inshes, Inverness	296708	844260	95
Sleat Primary School	Teangue, Isle of Skye	165515	806536	130
Fort William Gaelic Primary School	Caol, Fort William	211238	776419	199
Staffin Primary School	Staffin, Isle of Skye	148779	867344	130
Portree Primary School	Portree, Isle of Skye	148170	843960	150
Dunbeath Primary School	Dunbeath	315880	929521	130
Former Borrowdale Primary School	Glendale, Isle of Skye	116629	849322	50

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Mackays Hotel	River Street, Wick	336265	950788	199
Russwood Sawmill	Station Sawmill, Newtonmore	271626	898673	195
Clynelish Distillery	Brora	289772	905307	7812
Lundavra Primary School	Lundavra Road, Fortwilliam	209652	772857	440
UHI residence	Aird, Fort William	210927	774357	199
Nonikiln Farmhouse	Alness	266199	871220	50
Foulis Mains A	Evanton	258802	864371	582
Foulis Mains B	Evanton	258802	864371	543
Caol Joint Campus School	Fort William	210594	776279	611
36 High Street	Kingussie	275828	800651	199
Craiglea Lodge	Latheronwheel	318858	932797	121
Balliefurth	Grantown on Spey	301500	823598	90
Ulbster Arms Hotel	Halkirk	312955	959411	195
Glencoe House Hotel	Glencoe	210264	759421	199
Norscot	Bower, Wick	323627	762979	130
Cairn House	Waterloo Place, Inverness	266334	845838	60
Rose Farm Poultry Unit	Rose farm, Cromarty	276520	865922	199
Sutherland Arms Hotel	Golspie	383945	900515	199
Lubcroy Lodge	Lairg	235598	901876	90
Balnastraid	Duthill	293210	824126	90

Appendix C

Raw Diffusion Tube Data

	IV1	IV2b	IV2e	IV2f	IV2g	IV3a	IV3b	IV3c	IV3d
Jan	28.42	29.35	55.24	51.26	53.05	50.26	56.87	42.69	46.03
Feb	28.11	26.78	45.44	27.78	49.45	45.77	47.28	41.08	
Mar	34.53	25.68	44.07	49.65	43.90	44.09	47.85	36.01	
Apr	37.71	27.19	45.74	51.77	46.11	49.52	48.32	41.39	
May	42.69	29.12	48.77	42.28	47.66	49.33	59.90	50.48	
Jun	31.79	25.28	37.86	39.17	39.77	37.72	44.56	34.69	
Jul	25.96	25.24	37.61	41.11	33.80	35.64	42.46	31.30	
Aug	28.00		46.06	44.46	43.54	36.35	50.71	31.71	
Sep	29.52		39.87	38.98	38.34	38.52	46.02	33.12	
Oct	24.96		41.41	42.25	40.78	39.00	43.28	31.60	
Nov	30.53		51.32	48.88	45.67	43.82	46.01	43.34	
Dec	17.74		41.33	43.00	45.33	35.49	36.86	32.36	

	IV3e	IV3f	IV3g	IV4a	IV4b	IV4c	IV6a	IV6b	IV7
Jan			32.45	32.48	31.48	32.96	36.69	26.51	35.18
Feb	38.21	65.73	32.97	31.89	29.58	31.93	35.82	27.89	
Mar				23.40	21.01	21.18	36.64	22.97	34.66
Apr				21.83	22.72	20.90	42.25	23.56	37.21
May				18.36	19.56	18.46	41.40	24.72	37.34
Jun				17.87	15.67	15.30	33.52	19.70	25.12
Jul				16.41	15.25	12.36	20.09	16.52	30.25
Aug				17.28	20.17	19.24	28.40	17.55	35.88
Sep				24.19	21.91	21.11	31.40	18.63	36.06
Oct				25.89	25.59	23.25	32.28	15.81	36.51
Nov				32.93	30.04	31.10	56.45	25.28	
Dec				26.07	27.39	27.47	31.19	19.46	36.55

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	IV8	IV9a	IV9b	IV9c	IV9d	RC1	RC2	RC3	RC4
Jan	32.18								
Feb	29.11					31.52	44.97	14.65	17.38
Mar	25.96					13.42	28.53	6.94	7.86
Apr	25.81					16.66	29.21	6.94	8.36
May	29.76					14.46	31.32	5.46	6.50
Jun	22.15					10.60	26.55	3.79	4.94
Jul	20.32					11.08	26.55	4.43	6.06
Aug	20.11					17.73	32.80	5.91	7.70
Sep	24.08					17.41	32.21	6.43	8.20
Oct	24.96					19.03	33.89	7.12	3.72
Nov	29.04	62.41	50.62	61.39	55.23	29.73	38.33	14.42	17.96
Dec	23.61	49.66	35.66	36.76	30.50	20.55	34.08	10.06	13.15