2014 Air Quality Progress Report for The Highland Council

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

April 2014

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Executive Summary

This document is a progress report undertaken by The Highland Council as part of the Local Air Quality Management Review and Assessment process.

Across the vast majority of the Highland Council Area air quality is good.

This report reviews air quality monitoring results since the last round of review and assessment and identifies new development which may be significant in terms of impact upon local air quality.

New monitoring data indicates that the Annual Mean Objective for Nitrogen dioxide is being exceeded at measurement locations in the Oldtown area of Inverness on Queensgate and Academy Street. This is an area that was the subject of a detailed assessment for this pollutant that was undertaken by The Highland Council throughout 2013. The report "Detailed Assessment of Air Quality in Inverness" completed in May 2014 by consultants acting on behalf of The Highland Council has confirmed that the Annual Mean Nitrogen dioxide Objective may not be achieved at locations where there is relevant exposure on Queensgate and Academy Street. The Highland Council will proceed to declare an air quality management area in response to this report and will undertake Further Assessment and the formulation of an Air Quality Action Plan as is required by the Regulations.

New development identified in this progress report will be formally assessed at the next round of updating and screening assessment due in April 2015.

The Highland Council's next steps in the LAQM process will be:

- to declare a local air quality management area for Nitrogen dioxide in the Oldtown area of Inverness
- to undertake a further assessment with respect to Nitrogen dioxide in the Oldtown area of Inverness
- to begin work on an Air Quality Action Plan.
- to complete an updating and screening assessment at the end of April 2015.

Table of Contents

1 Introduction 6

1.1 Description of Local Authority Area 6

1.2 Purpose of Progress Report 6

1.3 Air Quality Objectives 7

1.4 Summary of Previous Review and Assessments 9

2 New Monitoring Data 13

2.1 Summary of Monitoring Undertaken 13

2.2 Comparison of Monitoring Results with Air Quality Objectives 23

3 New Local Developments 42

3.1 Road Traffic Sources 42

3.2 Other Transport Sources 42

3.3 Industrial Sources 42

3.4 Commercial and Domestic Sources 42

3.5 New Developments with Fugitive or Uncontrolled Sources 43

4 Air Quality Planning Policies 45

5 Local Transport Plans and Strategies 46

6 Climate Change Strategies 47

7 Conclusions and Proposed Actions 48

7.1 Conclusions from New Monitoring Data 48

7.2 Conclusions relating to New Local Developments 48

7.3 Proposed Actions 48

8 References 50

List of Tables

Table 1.1	Air quality objective included in the Regulations for the purposes of LAQM in Scotland
Table 1.2	Review and Assessment Reports and Outcomes
Table 2.1	Details of automatic monitoring sites
Table 2.2	Details of non-automatic monitoring sites
Table 2.3	Results of automatic monitoring for NO2: comparison with automatic mean objective
Table 2.4	Results of automatic monitoring for NO2: comparison with 1-hour mean objective
Table 2.5	Results of NO2 diffusion tubes 2013
Table 2.6	Results of NO2 diffusion tubes 2009 - 2013
Table 2.7	Results of automatic monitoring for PM10: comparison with annual mean objective
Table 2.8	Results of automatic monitoring for PM10: comparison with 24 hour mean objective
Table 2.9	UK Air Quality Strategy objectives for the protection of human health, July 2007

List of Figures

Figure 2.1	Map of automatic monitoring sites
Figure 2.2	Maps of non-automatic monitoring sites
Figure 2.3	Trends in annual mean NO2 concentration measured at automatic monitoring sites, and traffic flow at Inverness (Telford street)
Figure 2.4	Trends in annual mean Nitrogen dioxide concentrations measured at IV2b, Union Street, Inverness diffusion tube site
Figure 2.5	Trends in annual mean Nitrogen dioxide concentrations measured at urban background diffusion tube monitoring sites in Dingwall – RC3 Kintail Place and RC4 Burns Crescent
Figure 2.6	Trends in annual mean Nitrogen dioxide concentrations measured at roadside diffusion tube monitoring sites in Dingwall – RC1 Wyvis Crescent and RC2 Station Road
Figure 2.7	Trends in annual mean PM10 concentrations

Appendices

Appendix A QA/QC

Appendix B Diffusion tube raw data

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. 15% 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 rapidly growing 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 Progress Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) 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.

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the LAQM process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

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 micrograms per cubic metre µg/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 µg/m^3	Running annual mean	31.12.2003
	3.25 µg/m^3	Running annual mean	31.12.2011
1,3-Butadiene	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.50 µg/m^3	Annual mean	31.12.2004
	0.25 µg/m^3	Annual mean	31.12.2008
Nitrogen dioxide	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}) (gravimetric)	50 µg/m^3, not to be exceeded more than 7 times a year	24-hour mean	31.12.2011
	18 µg/m^3	Annual mean	31.12.2011
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.

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 Sulpur 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

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 NO2 objective likely to be exceeded.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

There are no changes to the automatic monitoring locations with the Highland Council Area for the calendar year 2013.

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.

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.

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 of behalf of DEFRA. Data from the sites is available, fully ratified, for download on the internet.

Figure 2.1 Map(s) of Automatic Monitoring Sites (if applicable)

Table 2.1 Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	OS Grid Reference		Pollutants Monitored	Monitoring Technique	In AQMA?	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?
IV4	Inverness	Roadside	265709	845670	PM_{10} $PM_{2.5}$	Gravimetric	N	Y(2.5m)	4m	N
					NO2	Chemiluminescent				
FW1	Fort William	Suburban	210857	774431	NO2	Chemiluminescent	N	N/A	N/A	N
					Ozone					
SV1	Strath Viach	Rural	234831	875029	Ozone		N	N/A	N/A	N

2.1.2 Non-Automatic Monitoring Sites

The Highland Council monitored Nitrogen dioxide by passive diffusion tube at 21 sites in Inverness and Dingwall in 2013.

Four of the tubes (RC1-RC4) are at sites in the town of Dingwall, two roadside sites and two urban background, and there is exposure relevant to the Annual Mean objective at each of the four locations.

Three tubes (IV4a-c) are at a site collocated with the automatic monitor on Telford Street, Inverness. The monitoring location is 4 metres from the carriageway on Telford Street

The remaining 14 tubes are at sites in the Oldtown area of Inverness. All except four of these sites are at ground floor level. Property at ground floor level in this area of the city centre is exclusively occupied by retail or commercial premises. There is however relevant exposure at several locations at first floor level and above.

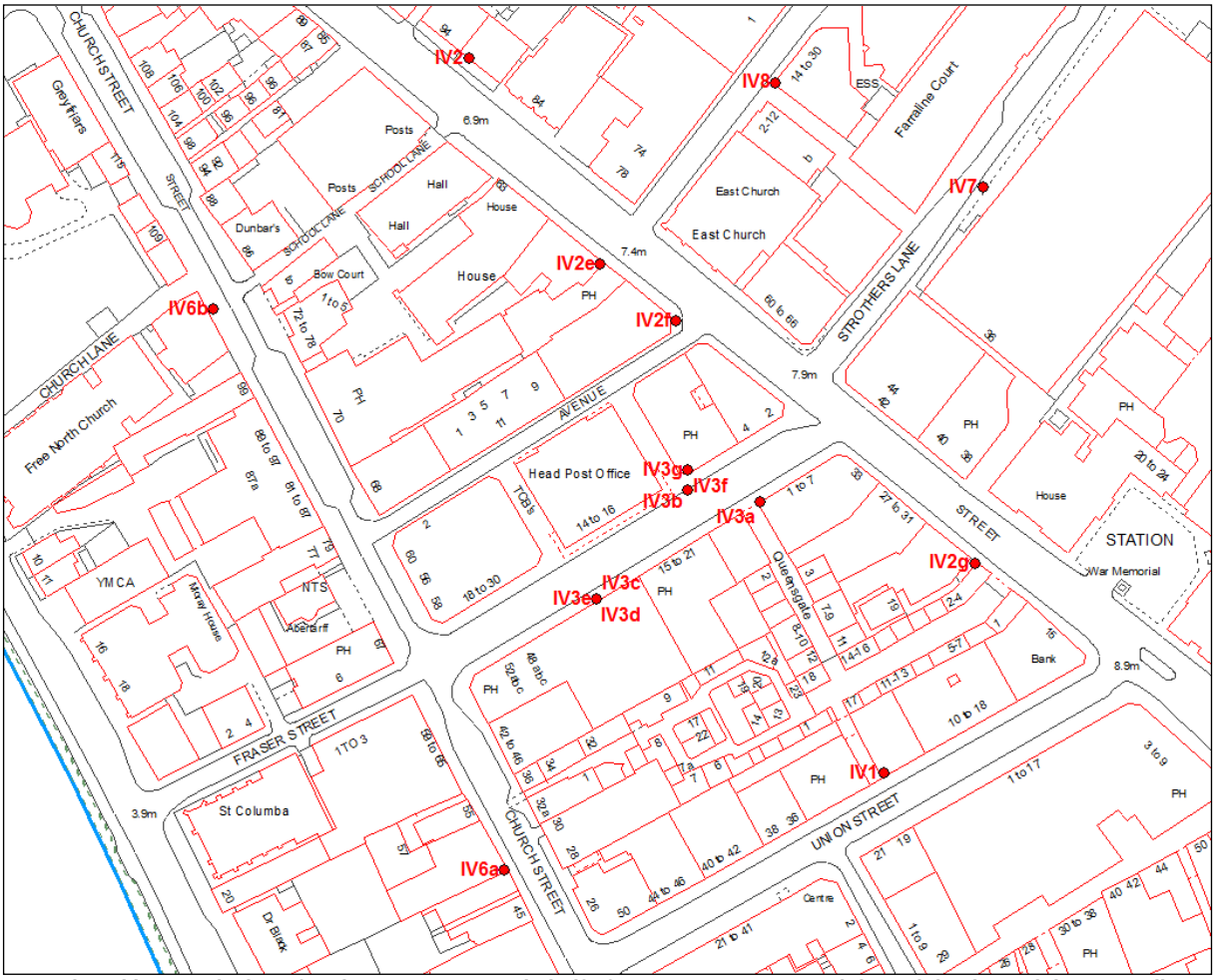
4 sites on Queensgate monitored Nitrogen dioxide concentrations at first and second floor level intended to inform the Detailed Assessment for Nitrogen dioxide undertaken throughout 2013.

Details of all these sites are in Table 2.2 below.
Figure 2.2 shows the location of all current diffusion tube sites.
QA/QC arrangements for these sites are described in the appendix.

Figure 2.2 Map(s) of Non-Automatic Monitoring Sites (if applicable)

Inverness

Inverness Old Town (All sites as at January 2014)



Dingwall

Table 2.2 Details of Non- Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
IV1	Union Street	Roadside	266681	845361	3	NO_2	N	N	Y[a]	3	Y
IV2b	Academy Street	Roadside	266577	845538	2	NO_2	N	N	Y(0m)	5	Y
IV2e	Academy Street E	Roadside	266610	845487	2.5	NO2	N	N	Y[a]	2	Y
IV2f	Academy Street F	Roadside	266629	845473	2	NO2	N	N	N	2	Y
IV2g	Academy Street G	Roadside	266704	845413	3	NO2	N	N	N	2	Y
IV3a	Queensgate A	Roadside	266650	845428	3	NO_2	N	N	Y[a]	3	Y
IV3b	Queensgate B	Kerbside	266632	845431	2.5	NO_2	N	N	Y[a]	0.5	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
IV3c	Queensgate C	Roadside	266609	845404	3	NO_2	N	N	Y[a]	3	Y
IV3d	Queensgate D	Roadside	266609	845404	6.8	NO2	N	N	Y(0m)	7[b]	Y
IV3e	Queensgate E	Roadside	266609	845404	9.6	NO2	N	N	Y(0m)	3[b]	Y
IV3f	Queensgate F	Roadside	266635	845437	5.4	NO2	N	N	Y(0m)	3[b]	Y
IV3g	Queensgate G	Roadside	266632	845436	9.6	NO2	N	N	Y(0m)	3[b]	Y
IV4	Telford Street	Roadside	265710	845672	3	NO_2	N	Y	Y (1.5m)	4	N
IV6a	Church Street A	Roadside	266586	845337	2.5	NO2	N	N	Y[a]	3	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
IV6b	Church Street B	Roadside	266513	845476	2.5	NO2	N	N	Y(2m)	1	Y
IV7	Strothers Lane	Roadside	266706	845506	2.5	NO2	N	N	Y[a]	3	Y
IV8	Margaret Street	Roadside	266654	845532	2.5	NO2	N	N	Y[a]	3	Y
RC1	Wyvis Terrace	Roadside	254430	858968	4	NO_2	N	N	Y (0m)	1	Y
RC2	Station Road	Roadside	255200	858185	4	NO_2	N	N	Y (0m)	1	Y
RC3	Kintail Place	Urban Background	255112	859866	4	NO_2	N	N	Y (2.5m)	1	N/A
RC4	Burns Crescent	Urban Background	254420	859288	4	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 (NO_2)

The data obtained through monitoring in The Highland Council Area throughout 2013 indicates that 3 of the sites at which monitoring took place experienced levels of Nitrogen dioxide in excess of the Annual mean Nitrogen dioxide Objective concentration of 40ug/m^3.

At a further 2 sites the measured annual mean concentration was less than the Objective but within 10%(ie. >36ug/m^3).

Automatic Monitoring Data

There were no recorded breaches of the Nitrogen dioxide objectives at any of the automatic monitoring sites in Highland in 2013

The Telford Street AUN site recorded an annual mean Nitrogen dioxide concentration of 21 ug/M^3. As the monitoring location is not representative of worst case relevant exposure the method described in Box 2.2 of LAQM.TG(09) was used to correct the pollutant concentration for distance. The resultant predicted Nitrogen dioxide annual mean concentration is 22.6 ug/m^3.

There were no occasions when the recorded 1-hour mean Nitrogen dioxide concentration was in excess of the 200 ug/m^3 and therefore 1-hour mean objective was achieved at this location.

The Fort William AUN site recorded an annual mean Nitrogen dioxide concentration of 8.98 ug/m^3 and there were no occasions when the 1-hour mean concentration was in excess of 200 ug/m^3.

The trend for growth in pollutant concentration at Telford Street observed since 2009 has reversed in 2013 with a concentration similar to that observed in 2009 being returned.

Table 2.3 Results of Automatic Monitoring for NO_2: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2013 %	Annual Mean Concentration (µg/m^3)				
					2009	2010	2011	2012	2013
IV4 Telford Street	Roadside	N	98	98	20.7	24.5 [2]	27	29.2	21
Fort William	Suburban	N	91.7	91.7	9.35 [1]	13.4	11.8 [3]	12.1	8.98

1. only 87.9% of data was captured from the Fort William site in 2009

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

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

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

Figure 2.3 Trends in Annual Mean NO_2 Concentrations Measured at Automatic Monitoring Sites

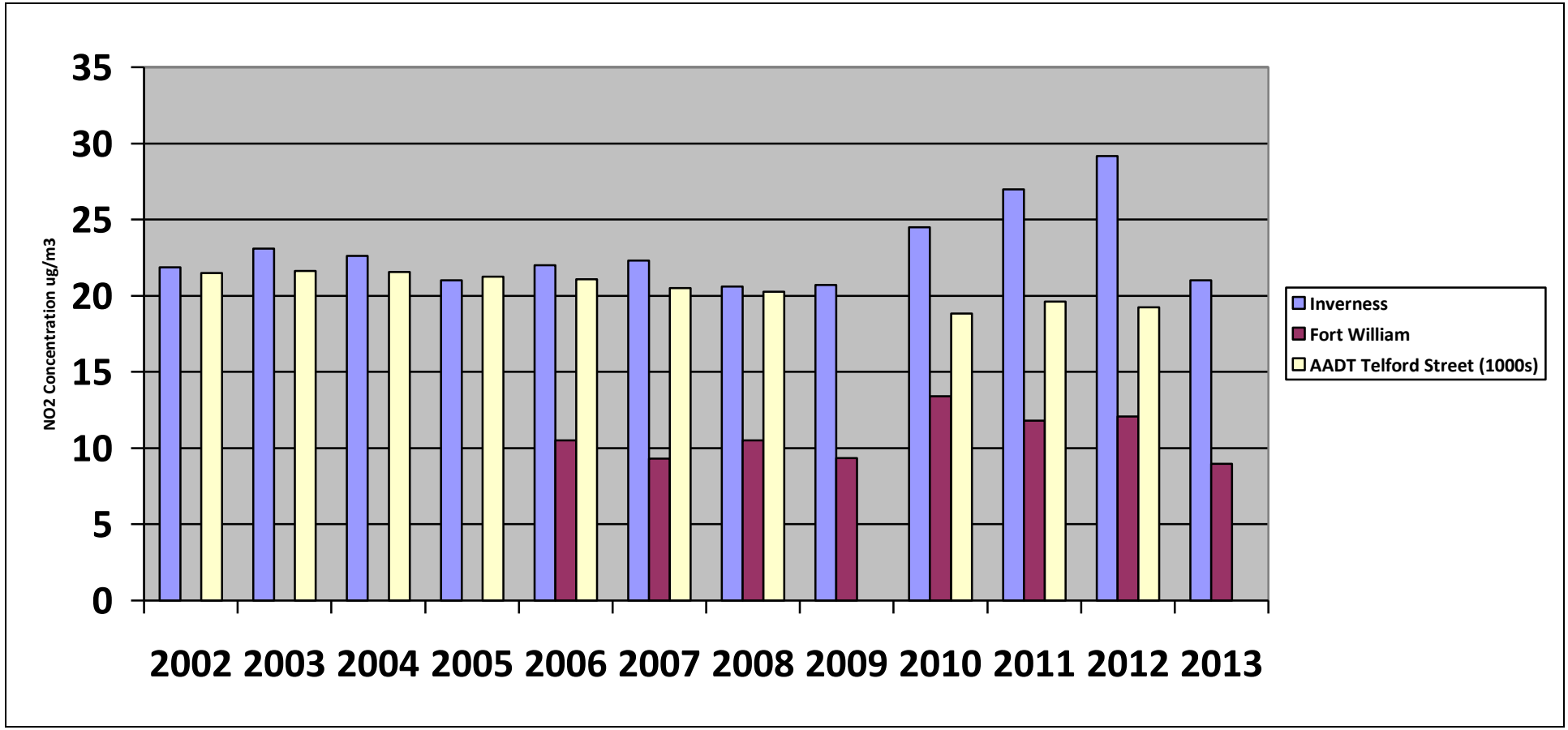


Table 2.4 Results of Automatic Monitoring for NO_2: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2013 %	Number of Hourly Means > 200µg/m^3				
					2009	2010	2011	2012	2013
IV4 Telford Street	Roadside	N	98	98	0	0(118)	0	0	0
Fort William	Suburban	N	91.7	91.7	0(73)	0	0(102)	0	0

If the data capture for full calendar year is less than 90%, the 99.8th percentile of hourly means is included in brackets

Diffusion Tube Monitoring Data

There were three diffusion tube monitoring sites where annual mean Nitrogen dioxide concentration was in excess of the objective in 2013.

Sites IV2e and IV2g, both roadside sites, are on Academy Street, Inverness. There is relevant exposure in the locus of IV2e however it is at first floor level not ground floor level. The bias adjusted annual mean concentration recorded is 42.1 ug/m^3. There is no relevant exposure on in the locus of IV2g where an annual mean concentration of 40.8 ug/m^3 was recorded.

Site IV3b is a Kerbside site, 0.5m from the kerb. There is relevant exposure however this is at first floor and above and the façade is 3m from the kerb. An annual mean concentration of 46.3 ug/m^3 was recorded. The "NO_2 fall off with distance calculator" can been used to estimate the annual mean concentration at the façade, which is 34.4 ug/m^3. This corresponds reasonably well with the result obtained from the other two ground floor sites on Queensgate, IV2a and IV2c, both of which are mounted at the façade and returned annual mean concentrations of 38.4 ug/m3 and 34.3 ug/m3 respectively.

Sites IV2f and IV3a returned annual mean concentration within 10% of the objective.

All other sites were more than 10% below the objective.

Results for all diffusion tube sites are displayed in table 2.5.

There were no sites at which an annual mean concentration of more than 60 ug/m3 was recorded indicating that it is unlikely that the 1-hour objective was exceeded.

Choice of Bias Adjustment Factor for Diffusion Tubes

The Technical Guidance LAQM.TG(09) recommends that a bias adjustment factor should be applied to passive diffusion tube measured annual mean concentrations.

The bias adjustment factor compensates for variation in the accuracy of diffusion tube samples in comparison to the reference automatic monitoring method. Bias adjustment factors are derived by exposing diffusion tubes at an automatic monitoring site and comparing the results with that achieved by the automatic monitor (co-location). Three diffusion tubes are exposed at the Telford Street AUN site and have been used to determine a locally obtained bias adjustment factor for 2012 of 0.9. It has been noted that the locally derived bias adjustment factor has shown considerable variation over the last few years. The locally derived factor for 2012 was 1.26 and in 2011 was 1.09.

Each year a national database of co-location studies is produced and is available via the Review and Assessment Helpdesk. From this database it is possible to obtain the combined bias adjustment factor for a particular laboratory and diffusion tube preparation method. For 2012 the combined bias adjustment factor returned by the database is 0.95. The combined factor has been derived from 24 co-location studies which includes the Telford Street study.

LAQM,TG(09) offers guidance as to the circumstances in which either of the aforementioned factors might be more appropriate. Taking that advice in to account it would normally be considered that the local bias adjustment factor is more appropriate for use with the Highland Council's diffusion tube survey results. As there is some uncertainty associated with the local bias factor given it's variability in in recent years, the combined bias adjustment factor, 0.95, has been used in the presentation of diffusion tube results in this report. It should be noted that this is a more conservative approach.

Trends in non-automatic Nitrogen dioxide Monitoring

Over the last 10 years a gradually increasing trend has been evident at all diffusion tube sites although a marked reduction from 2012 to 2013 is also demonstrated. Trends at diffusion tube sites are illustrated in figures 2.4, 2.5 and 2.6.

Table 2.5 Results of NO_2 Diffusion Tubes 2013

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months or %)	2013 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.95
IV1	Union Street, Inverness	Roadside	N	N	12	27.4
IV2B	Academy Street, Inverness	Roadside	N	N	12	27.6
IV2E	Academy Street, Inverness	Roadside	N	N	9	**42.1**
IV2F	Academy Street, Inverness	Roadside	N	N	9	39.9
IV2G	Academy Street, Inverness	Roadside	N	N	10	**40.8**
IV3A	Queensgate, Inverness	Roadside	N	N	11	38.4
IV3B	Queensgate, Inverness	Kerbside	N	N	12	**46.3**
IV3C	Queensgate, Inverness	Roadside	N	N	11	34.3
IV3D	Queensgate, Inverness	Roadside	N	N	9	33.6
IV3E	Queensgate, Inverness	Roadside	N	N	11	34.7

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months or %)	2013 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.95
IV3F	Queensgate, Inverness	Roadside	N	N	10	34.4
IV3G	Queensgate, Inverness	Roadside	N	N	11	29.4
IV4A	Telford Street, Inverness	Roadside	N	Y	12	22.3
IV4B	Telford Street, Inverness	Roadside	N	Y	12	22.9
IV4C	Telford Street, Inverness	Roadside	N	Y	12	22.8
IV6A	Church Street, Inverness	Roadside	N	N	11	29.5
IV6B	Church Street, Inverness	Roadside	N	N	10	19.2
IV7	Strothers Lane, Inverness	Roadside	N	N	11	33.9
IV8	Margaret Street, Inverness	Roadside	N	N	11	25.2
RC1	Wyvis Terrace, Dingwall	Roadside	N	N	10	17.6

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months or %)	2013 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.95
RC2	Station Road, Dingwall	Roadside	N	N	10	30.8
RC3	Kintail Place, Dingwall	Urban background	N	N	10	7.1
RC4	Burns Crescent, Dingwall	Urban background	N	N	10	8.9

An exceedence of the NO_2 annual mean AQS objective of 40µg/m^3 is marked bold

Table 2.6 Results of NO_2 Diffusion Tubes (2009 to 2013)

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
			2009 (Bias Adjustment Factor = 0.9)	2010 (Bias Adjustment Factor = 0.92)	2011 (Bias Adjustment Factor = 1.09)	2012 (Bias Adjustment Factor = 1.26)	2013 (Bias Adjustment Factor = 0.95)
IV1	Roadside	N	22.35	26.76	28.33	**41.71**	27.4
IV2b	Roadside	N	25.78	29.28	31.15	35.53	27.6
IV3a	Roadside	N	35.49	**41.93**	**48.05**	**46.98**	38.4
IV3b	Kerbside	N	30.65	36.31	34.01	**56.74**[b]	**46.3**
IV3c	Roadside	N				**46.54**	34.3
IV4	Roadside	N	20.82	24.38	27.24	30.56	22.7
RC1	Roadside	N	22.91	26.04		24.58	17.6
RC2	Roadside	N	32.33	36.98		37.28	30.8
RC3	Roadside	N	8.79	10.03		9.78	7.1
RC4	Roadside	N	11.73	12.16		11.92	8.9

An exceedence of the NO_2 annual mean AQS objective of 40µg/m^3 is marked bold.

[a] Means have been "annualised" as in Box 3.2 of LAQM.TG(09), if full calendar year data capture is less than 75%

[b] 2012 IV3b site relocated from roadside to kerbside.

Figure 2.4 Trend in Annual Mean Nitrogen dioxide Concentration measured a roadside diffusion tube Site IV2b, Academy Street, Inverness

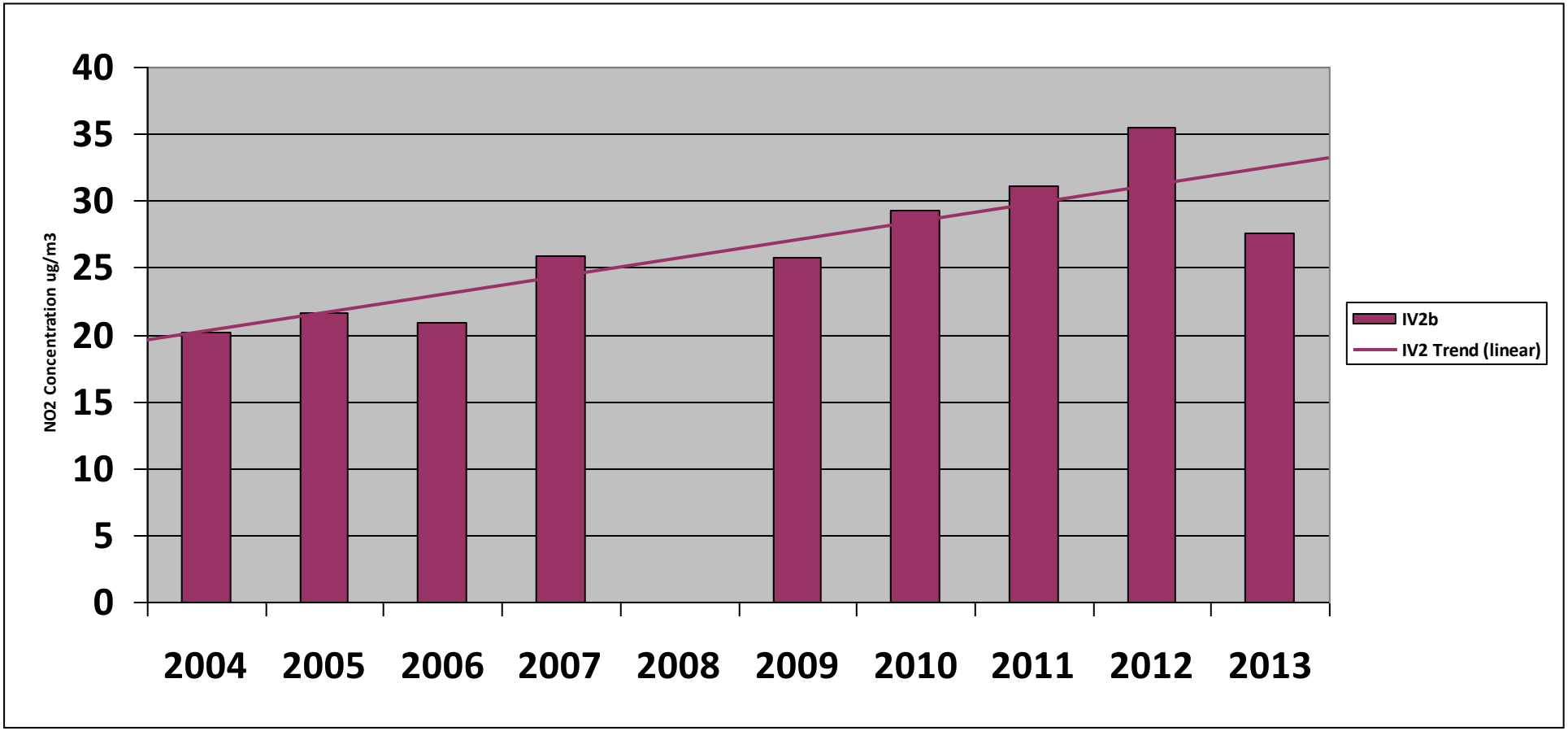


Figure 2.5 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Urban Background Diffusion Tube Monitoring Sites in Dingwall – RC3 Kintail Place and RC4 Burns Crescent.

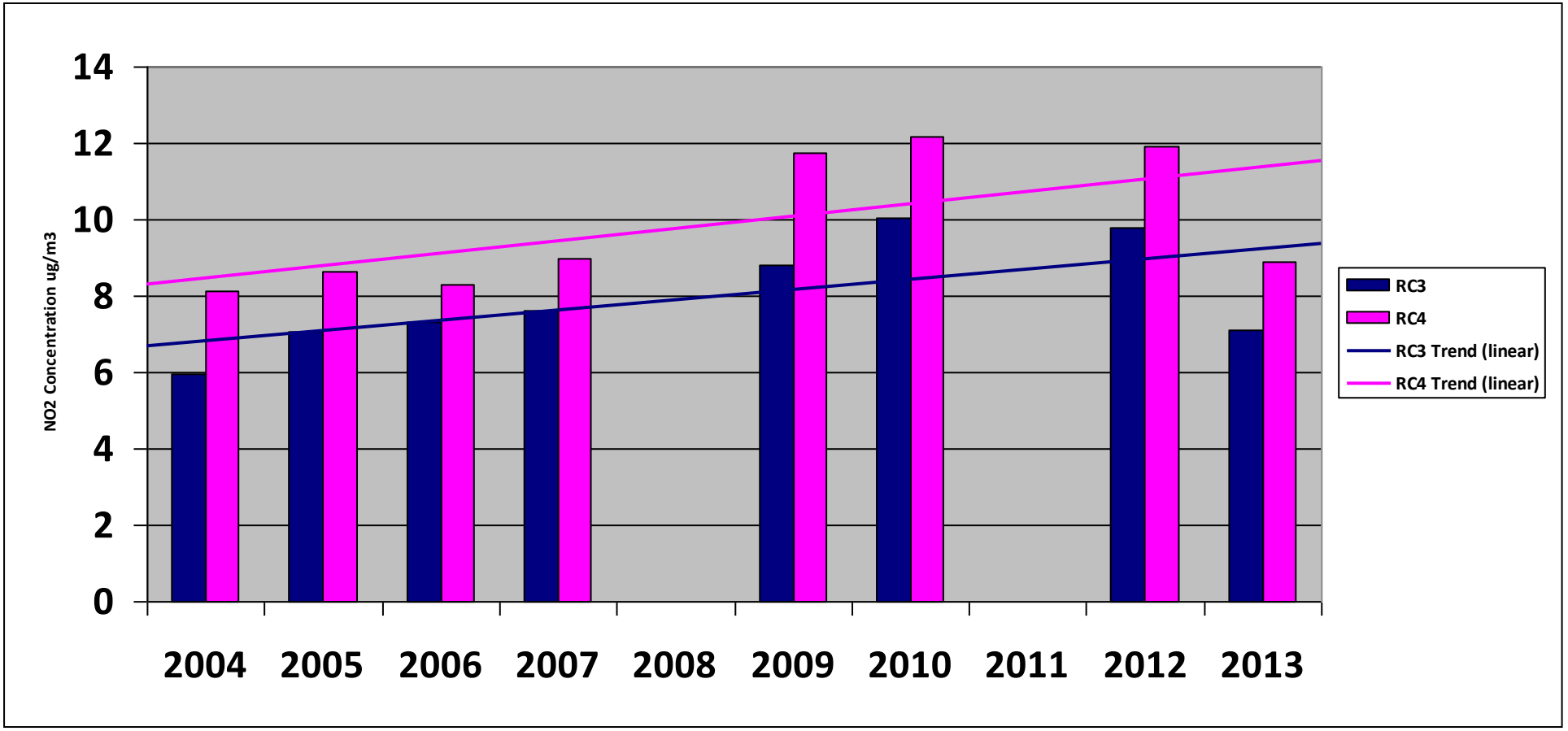
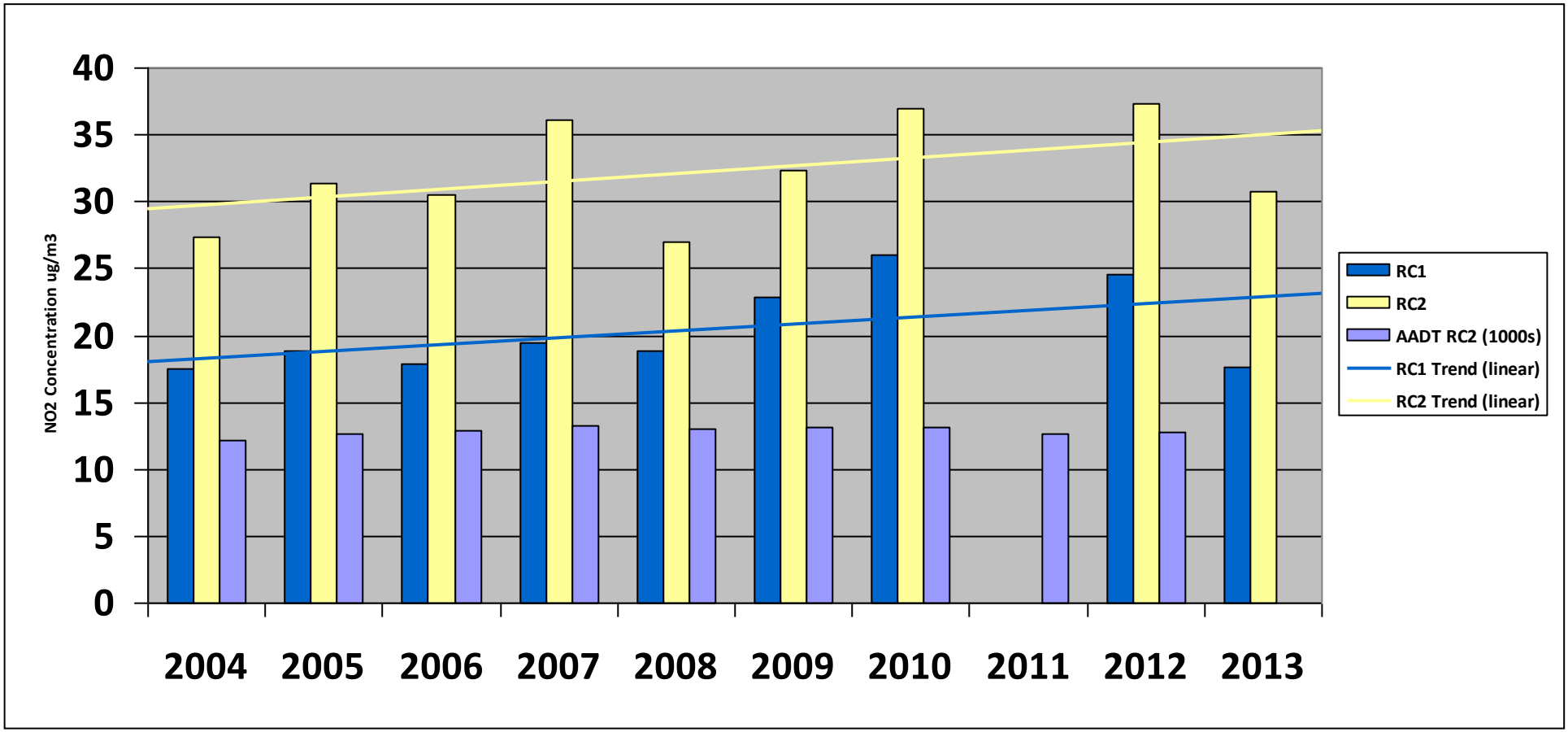


Figure 2.6 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Roadside Diffusion Tube Monitoring Sites in Dingwall – RC1 Wyvis Terrace and RC2 Station Road.



2.2.2 Particulate Matter (PM_{10})

PM10 annual mean concentrations at Telford Street are significantly below the 2010 annual mean objective. Concentrations have shown a generally reducing trend over the last seven years. Concentrations in 2010 showed a significant upward deviation from the general trend.

The 24 hour mean objective was not exceeded in 2013.

The monitoring location at Telford Street is 4 metres from the kerb. While the majority of dwellings on the street are this distance or greater from the kerb, there are a small number of dwellings that are 2.5 metres from the kerb. However PM10 concentrations are such that it is unlikely that concentrations, even at closest receptors are in excess of the objectives.

Table 2.7 Results of Automatic Monitoring for PM_{10}: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2013 % [b]	Confirm Gravimetric Equivalent (Y or N/A)	Annual Mean Concentration (µg/m^3)				
						2009	2010	2011	2012	2013
Inverness	Roadside	N	91.8	91.8	Y	11.6	14	11.8	11.02	11.7

Figure 2.7 Trends in Annual Mean PM_{10} Concentrations

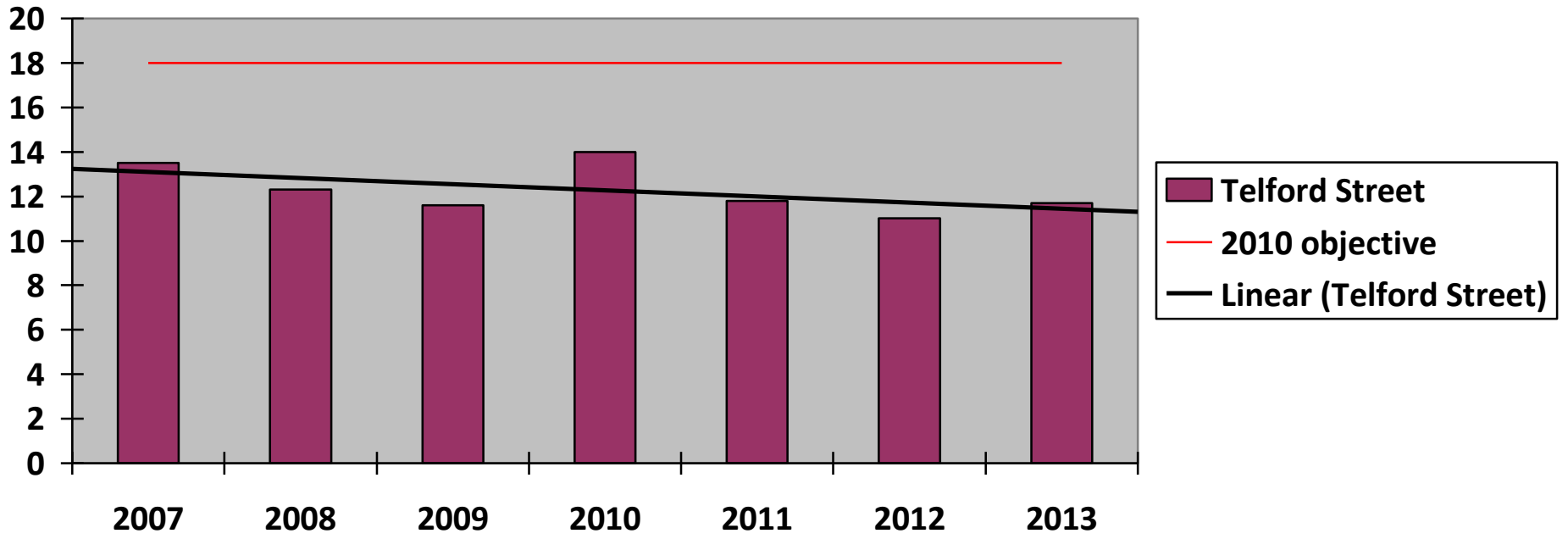


Table 2.8 Results of Automatic Monitoring for PM_{10}: Comparison with 24-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2013 %	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m^3				
						2009	2010	2011	2012	2013
Inverness	Roadside	N	91.8	91.8	Y	0	2(24.9)	0(20)	1	0

Where data capture for the monitoring period is less than 90%. The 98.1th percentile is displayed in brackets.

2.2.3 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 ugm-3 (limit)	Annual Mean	2020
Ozone	100 ugm-3 not to be exceeded more than 10 times a year	8 hourly running mean or hourly mean	31st December 2005

The annual mean PM2.5 concentration (daily gravimetic) measured at Telford Street, Inverness was 6.1 ugm-3 in 2012. This is less than the objective to be achieved by 2020 for the pollutant in Scotland.

In 2013 the maximum daily 8-hour running mean ozone concentration was greater than 100 ugm-3 on less than 10 occasions at Fort William and on 23 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.

2.2.4 Summary of Compliance with AQS Objectives

The Highland Council has measured concentrations of Nitrogen dioxide above the annual mean objective at relevant locations not currently part of an AQMA, however a detailed assessment completed in 2014 has indicated that the Local Authority should proceed to declare an AQMA for the affected area.

3 New Local Developments

3.1 Road Traffic Sources

An application to construct 3.2 km of new single carriageway road as part of the Inverness West Link was granted permission. This development will be considered in the next round of updating and screening assessment.

3.2 Other Transport Sources

An application to construct a new port on the site of the former oil construction yard at Whiteness Point, Ardersier was granted permission. This development will be considered in the next round of updating and screening assessment.

3.3 Industrial Sources

There are no new, proposed or significantly changed industrial installations identified since the last round of review and assessment. There are no major fuel storage depots storing petrol, petrol stations or poultry farms identified that have not been previously assessed.

3.4 Commercial and Domestic Sources

There are 36 new biomass combustion installations identified since the last round of review and assessment. These, along with the 53 biomass combustion installations identified in the 2013 Progress Report, will be considered in the next updating and screening assessment.

No areas where the combined impact of several biomass combustion sources may be relevant have been identified.

There are no new areas where domestic solid fuel burning may be significant.

3.5 New Developments with Fugitive or Uncontrolled Sources

No new developments with fugitive or uncontrolled sources have been identified since the last round of review and assessment.

The Highland Council confirms that there are no new or newly identified local developments in the categories listed below which may have an impact on air quality within the Local Authority area.

- **Industrial sources**
- **New developments with fugitive or uncontrolled sources.**

The Highland Council has identified the following new or previously unidentified local developments which may impact on air quality in the Local Authority area.

Inverness West Link, Inverness, 3.2 km of new single carriageway
Whiteness Point, Ardersier, construction of new port
Lochbroom House, Ullapool, Biomass
Craighill Residential Home, Tain, Biomass 199kW
UHI WHC, Portree, Biomass 300kW
Balmenach Distillery, Cromdale, Biomass 4350KW
Kilchoan House Hotel, Acharacle, Biomass 199KW
Community Biomass Heating Scheme, Banavie, Biomass 199kW
Aviemore Health Centre, Aviemore, Biomass 95kW
St. Vincent's Hospital, Kingussie, Biomass 199kW
Dingwall Health Centre, Dingwall, Biomass 130KW
Auchtertyre Primary School, Auchtertyre, Biomass 150kW

Kirkhill Primary School, Kirkhill, Biomass

Forss House Hotel, Thurso, Biomass 130kW

Ardtornish House, Morvern, Biomass 200kW

Belford Hospital, Fort William, Biomass 800kW

Maryburgh Court, Fort William, Biomass 65kW

Poyntzfield Farm, Balblair, Biomass 400kW

Ardersier Primary School, Ardersier, Biomass 150kW

ARKE, Kilbeg, Isle of Skye, Biomass 100kW

Ellands Farm, Brodie, Biomass 199kW

Glenspean Lodge Hotel, Roy Bridge, Biomass 65kW

Milton Burn 1, Aviemore, Biomass 70kW

Milton Burn 2, Aviemore, Biomass 70kW

ICT Stadium, Inverness, Biomass 199kW

Drimnin Distillery, Lochaline, Biomass 1200kW

Balachroick House, Glen Feshie, Biomass 50kW

Raigmore Hospital Housing, Inverness, Biomass 1000kW

Balavil Sports Hotel, Newtonmore, Biomass 199kW

Balblair Distillery, Edderton, Biomass 4350kW

Glentruim Estate, Newtonmore, Biomass 130kW

Home Farm DHS, Portree, Biomass 568kW

RNI, Inverness, Biomass 199kW

Russwood Visitor Centre, Newtonmore, Biomass 70KkW

Drumore of Cantrae, Cawdor, Biomass 60kW

Scotsburn Court, Tain, Biomass 199kW

Averon Leisure, Alness, Biomass 199kW

These will be taken into consideration in the next Updating and Screening Assessment

4 Air Quality Planning Policies

The Following planning policies determine the Highland Council's approach to the relationship between planning and air quality.

The Highland Wide Local Development Plan, April 2012
Policy 72 "Pollution" sets out the general principles of the Authority's approach to pollution issues in the development planning process.
Policy 73 "Air Quality" specifically identifies air quality as an issue for consideration.

5 Local Transport Plans and Strategies

The Highland Council local Transport Strategy 2010/11 – 2013/14 is available to view on The Highland Council website at http://www.highland.gov.uk.

One of the main objectives of the strategy is to “manage/reduce the impacts of transport on the natural and built environment”, a sub-objective of which is to “protect and enhance current air quality of the Highland Area”.

6 Climate Change Strategies

The Highland Council Carbon Management Plan 2013-2020 sets out a plan to reduce carbon emissions by 3% a year between 2013 and 2020. The plan focuses on carbon emissions from:

- Energy use in buildings
- The vehicle fleet
- Business travel
- Street lighting
- Internal waste
- Water
- Emissions arising from procurement.

The Highland Council is part of The Highland Climate Change Declaration, which is made up of 22 Highland organisations from across the public private and voluntary sectors who are committed to:

- measuring their carbon footprint and working to reduce emissions from operations by 3% a year,
- providing an annual update of progress towards emission reductions,
- sharing information and working with partners to promote good practice on climate change.

The members also encourage and work with others in business and communities to:

- adapt to the impact of climate change,
- reduce their own greenhouse gas emissions,
- make the public committed to action.

7 Conclusions and Proposed Actions

7.1 Conclusions from New Monitoring Data

New monitoring data has identified diffusion tube monitoring sites in the Oldtown area of Inverness where Nitrogen dioxide concentrations are in excess of the Annual Mean Objective. The area is currently outside an AQMA although a detailed assessment for Nitrogen dioxide in this area, completed in April 2014 has identified the need to declare an air quality management area and the Highland Council has committed to this action.

The 8-hour Running Mean Objective for Ozone was exceeded at Strath Viach automatic rural monitoring site. Ozone is however not included in the local air quality management process and there is no relevant exposure at the monitoring location.

No other exceedences of the objectives were identified.

7.2 Conclusions relating to New Local Developments

38 New local developments have been identified which will require to be considered during the next updating and screening assessment.

Initial consideration of these developments does not indicate a need to proceed to detailed assessment.

7.3 Proposed Actions

The Highland Council has completed a detailed assessment investigating that has determined a need to declare an air quality management area for Nitrogen dioxide in the Oldtown area of Inverness.

The Highland Council will proceed to declare an air quality management area, and relative to this will undertake a further assessment and the formation of an action plan.

The Highland Council will submit an updating and screening assessment report in April 2015.

The Highland Council will submit an action plan progress report in April 2015

8 References

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2. **The Air Quality (Scotland) Regulations 2000**
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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
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17. The Higlhand Council, **Progress Report** 2013
18. Air Quality Consultants on behalf of The Highland Council, **Detailed Assessment of Air Quality in Inverness** May 2014
19. NETCEN, **Air Quality Monitoring: Highland**, 2005
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21. **Clean Air Act 1993**
22. http://www.scottishairquality.co.uk/data/
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24. 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
25. AEA Technology, **QA/QC Data Ratification report for the Automatic Urban and Rural Network, October – December 2008 and Annual Review for 2008**, June 2009.
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29. http://www.uwe.ac.uk/aqm/review/
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31. Health and Safety Laboratory on behalf of DEFRA and the devolved administrations, **WASP - Annual Performance Criteria for NO2 Diffusion Tubes used in Local Air Quality Management (LAQM), 2008 onwards, and Summary of Laboratory Performance in Rounds 117-124.**

Appendices

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

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 0.90.

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.

However there has been significant variation in the bias adjustment factor returned by the local co-location study in the last few years. Generally a bias factor of around 0.9 has been generated by the study. This was the case up until 2011 when the factor was 1.09 and 2012 when the factor was 1.26. This year, 2013, the factor has returned to a level similar to that demonstrated in years prior to 2011.

The combined bias adjustment factor for 2013 based upon 24 studies including the Telford Street study is 0.95.

The Highland Council has chosen to use this bias adjustment factor which is more conservative than the locally derived factor.

PM Monitoring Adjustment

The method used for the measurement of PM10 at Telford Street, Inverness is considered to be equivalent to the reference method. No adjustment of the dataset has been necessary.

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 (NO_2) Diffusion Tubes

Analysis of the NO_2 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 NO_2 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 WASP Inter- Comparison Project and NETCEN which are administered by the UK Health & Safety Laboratory.

100% of submissions by Gradko to the WASP Inter-comparison Project Rounds 120-124 were satisfactory.

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:

Nitrogen dioxide diffusion tube raw data for all sites

Month	Site											
	IV1	IV2b	IV2e	IV2f	IV2g	IV3a	IV3b	IV3c	IV3d	IV3e	IV3f	IV3g
JAN	29.36	33.44				40.37	52.67	38.47				
FEB	35.87	34.49	49.09			44.42	59.78	42.97	41.03	38.24	41.97	34.87
MAR	42.07	40.63	50.80		48.85	49.54	55.51	48.03	50.29	49.85	41.64	41.75
APR	37.06	47.35	31.95	43.26	46.38	46.09	52.70	38.72	39.62	40.27	42.78	33.57
MAY	28.22	26.31	48.26	38.57	44.53		52.61		29.83	33.41	36.68	25.66
JUN	25.11	27.57	45.92	41.34	44.06	36.09	51.73	36.07	34.15	63.96	34.91	50.35
JUL	25.71	25.69	46.68	38.30	39.39	37.06	46.71	30.15	31.01	29.04	34.37	27.68
AUG	26.03	22.96	42.58	37.47	37.51	37.95	41.56	30.61	30.61	27.53	31.95	25.51
SEP	22.71	18.85	40.70	40.92	40.41	36.53	44.48	28.98	26.16	23.65	29.95	20.93
OCT	33.98	31.17		48.83	46.11	41.32	47.91	35.76	35.62	36.78	42.47	34.12
NOV	20.36	20.31	42.62	43.31	43.97	39.72	41.79	33.82		29.99	25.33	23.49
DEC	19.09	20.13		46.16	38.25	35.56	37.94	33.39		28.58		22.37

Month	Site											
	IV4a	IV4b	IV4c	IV6a	IV6b	IV7	IV8	RC1	RC2	RC3	RC4	
JAN	33.07	32.68	31.17					24.28	37.17	12.34	13.50	
FEB	31.11	30.66	35.25	35.21		33.22	43.32	29.53	45.96	14.91	17.83	
MAR	22.76	27.55	28.39	43.55	30.31	43.10	35.47	19.48	35.70	8.57	10.29	
APR	20.31	21.02	18.94	31.55	23.96	35.79	24.83	12.35	26.20	5.35	6.68	
MAY	19.19	20.35	17.05	28.63	19.40	35.93	22.38	14.21	27.50	5.42	6.00	
JUN	17.42	18.54	19.99	29.06	18.53	34.35	22.94	12.88	25.60	3.88	5.62	
JUL	16.19	16.15	15.50	25.70	15.97	30.81	22.17	14.36	25.56	4.26	5.94	
AUG	19.70	18.48	18.63	25.93	16.91	30.79	20.63	15.69	31.03	4.67	7.45	
SEP	23.86	22.45	21.03	25.71	14.78	32.61	21.38	18.09	29.88	6.09	8.23	
OCT	26.92	25.41	27.25	38.92	23.23	40.25	29.12	24.57	39.23	9.65	12.21	
NOV	26.18	29.45	29.84	30.11	19.76	40.41	25.93					
DEC	24.61	27.17	24.92	26.80	19.37	35.42	23.36					