



2014 Air Quality Progress Report for Stirling Council

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

November, 2014

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Executive Summary

This 2014 Progress Report for Stirling Council has followed the guidance in TG09 Technical Guidance.¹ Monitoring data for NO₂ and PM₁₀ for the year 2013 was analysed to determine if any air quality objectives had been exceeded during that year. No concentrations were found to exceed the objectives.

New sources of atmospheric emissions were investigated and assessed to determine if any of them would cause an exceedance of air quality objectives for any pollutant. These included a number of new biomass applications, however it was agreed with the council that due to the size and location of these, there is unlikely to be any significant impact and that they will be assessed fully in next year's Updating and Screening Assessment.

Overall, it was concluded that there were no new emission sources, or sources that had not been previously assessed, that were likely to result in air quality objectives being exceeded. Therefore, there is no requirement to proceed to a Detailed Assessment for any pollutant at present. The next report to be completed will be the 2015 Updating and Screening Assessment.

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1 Introduction

1.1 Description of Local Authority Area

Stirling Council lies in the centre of Scotland and covers approximately 2,200 square kilometres. Due to its central location, it is bordered by the following six councils;

- East Dunbartonshire (South-West);
- West Dunbartonshire (West);
- Argyll and Bute (North-West);
- Perth and Kinross (North);
- Clackmannanshire and Falkirk (East);
- North Lanarkshire (South).

The population of Stirling Council district has remained static at around 86,000. The council area is diverse in its nature and topography. It is largely a rural area, with most of the residents being based in or around Stirling in the urbanised region which contains most of the industrial and commercial activity. The main population centres are Stirling, Cowie, Callander, Bridge of Allan, Dunblane and Aberfoyle. The north and western part of Stirling Council area is largely rural with a few small population centres in Killin, Kippen, Buchlyvie, Lochearnhead and Balfron.

Stirling Council covers an area extending from the densely populated central belt to the foothills of the Grampian Mountains. The south-eastern part of the council area is relatively flat and encompasses the upper section of the Forth Valley, which is aligned east-west. The eastern border of the Council area is marked by the Ochil Hills. The southern boundary of the Council area is marked by the Campsie Hills and Kilsyth Hills. The northern and western areas of Stirling Council area have more hilly terrain with several lochs, forests and mountains. A map of Stirling Council is provided in Figure 1.1.

1.2 Purpose of Progress 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 exceedances 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 Local Air Quality Management process.

They are not intended to be as detailed as Updating and Screening Assessment Reports. If the Progress Report identifies the risk of exceedance 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.

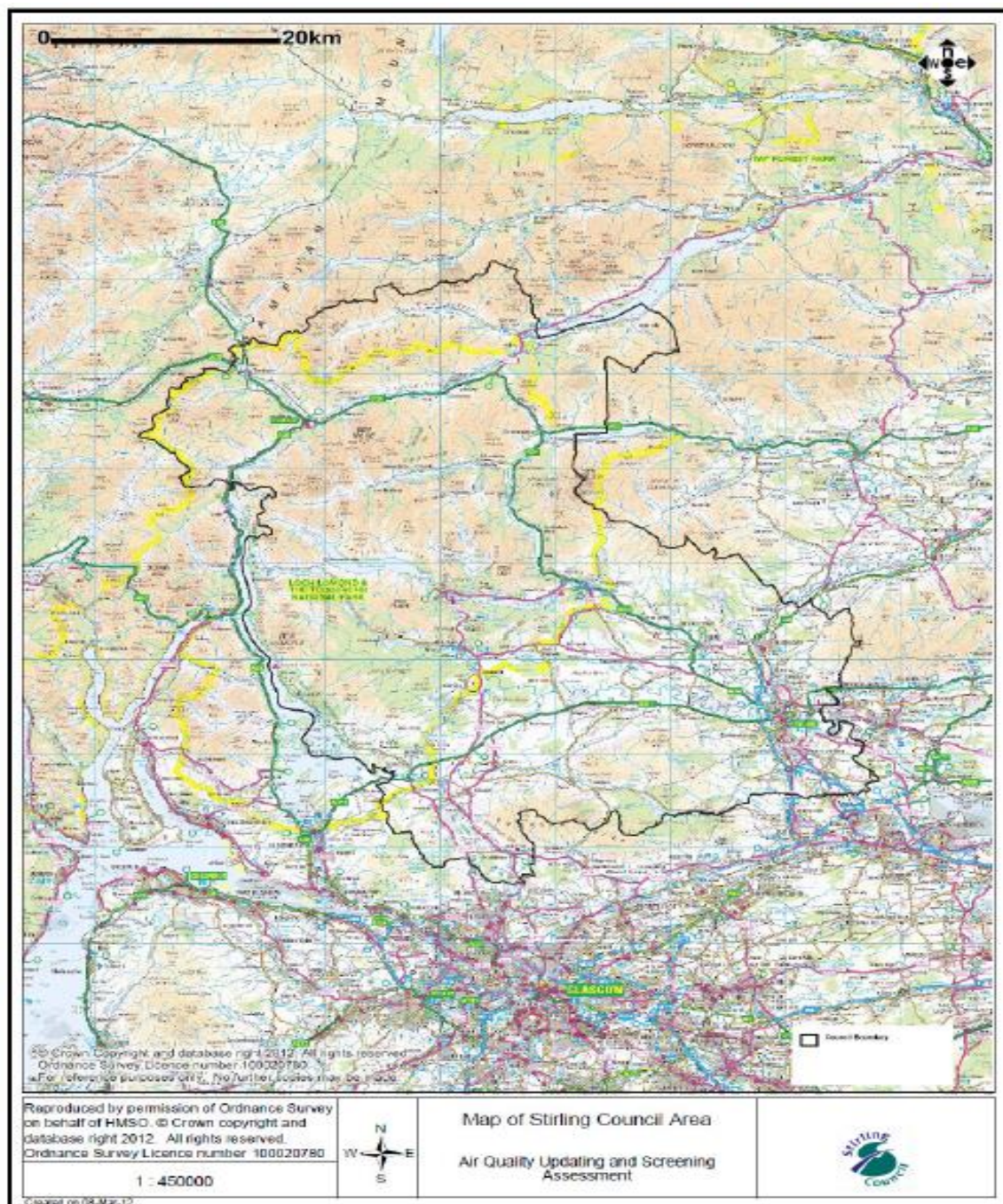


Figure 1.1 Stirling Council area

1.3 Air Quality Objectives

The LAQM air quality objectives 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 $\mu\text{g}/\text{m}^3$ (milligrams per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedances 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 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.50 $\mu\text{g}/\text{m}^3$	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
Particulate Matter (PM ₁₀) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2010
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

Table 1.2 summarises the Air Quality Review and Assessment reports submitted by Stirling Council since 2006 with the most recent report of 2012 listed last.

Table 1.2 Summary of Previous Air Quality Review and Assessment Reports 2006-2012

Report	Date Completed	Summary and Conclusions
Updating and Screening Assessment 2006	August 2006	Unlikely to be exceedance of AQ objectives. NO ₂ annual mean concentration at Port Street, Stirling close to AQ objective. Two industrial sites had reduced or were proposing reduction in atmospheric emissions. Proposed commercial and domestic developments in the Stirling area meant there was likely to be an increase in road traffic flows in the south-

Report	Date Completed	Summary and Conclusions
		east of the Council area.
Progress Report 2007	May 2007	NO ₂ concentrations at Port Street close to objective but site had a low data capture rate and results possibly unreliable. PM ₁₀ concentrations at Craig's Roundabout at risk of exceeding the 2010 annual mean objective.
Progress Report 2008	June 2008	Unlikely those NO ₂ objectives would be exceeded. Based on forward projection, PM ₁₀ monitoring identified risk of 2010 annual mean objective exceedance at Craig's Roundabout. No other AQ objective likely to be exceeded.
Updating and Screening Assessment 2009	June 2009	Monitoring confirmed no exceedances of the AQ objectives for NO ₂ & PM ₁₀ during 2008. No risk of exceedances of any other AQ objectives.
Progress Report 2010	November 2010	PM ₁₀ annual mean concentration at Craig's Roundabout exceeded AQ objective but extensive demolition works adjacent to the monitoring location may have been cause. Monitoring continued to establish if "one off" or trend. No other AQ objective likely to be exceeded.
Progress Report 2011	October 2011	No exceedances of AQ objectives for NO ₂ and PM ₁₀ during 2010.
Updating & Screening Assessment 2012	April 2012	No AQ objectives exceeded during the year. Previous 5 years data indicate no obvious trend in annual mean NO ₂ concentrations across the diffusion tube network.
Progress Report 2013	April 2013	No exceedances of AQ objectives for NO ₂ and PM ₁₀ during 2012.

Stirling Council operates one automatic monitoring site at Craigs' Roundabout where there is a chemiluminescence NO_x automatic analyser and a Tapered Element Oscillating Microbalance (TEOM) analyser for PM₁₀. Details of this site are presented in Table 2.1.

The location of the automatic monitoring site within the Council area is shown in Figure 1.2. The locations of the non-automatic monitoring sites (NO₂ diffusion tubes) are shown in 2.2. There were no changes to this during 2013.

The data capture for the site was 79.36% for NO₂ and 91.57% for PM₁₀. Routine calibrations are carried out by Enviro Technology Services and six monthly site audits are carried out by Ricardo-AEA. The QA/QC procedures and data ratification reports are described in more detail in Appendix A.

It should be noted that there was a problem with the air conditioning of the air quality monitoring cabin on the 23 November. There was no NO₂ data from the 23rd November to 17th December and the 27th December to 31st December 2013.

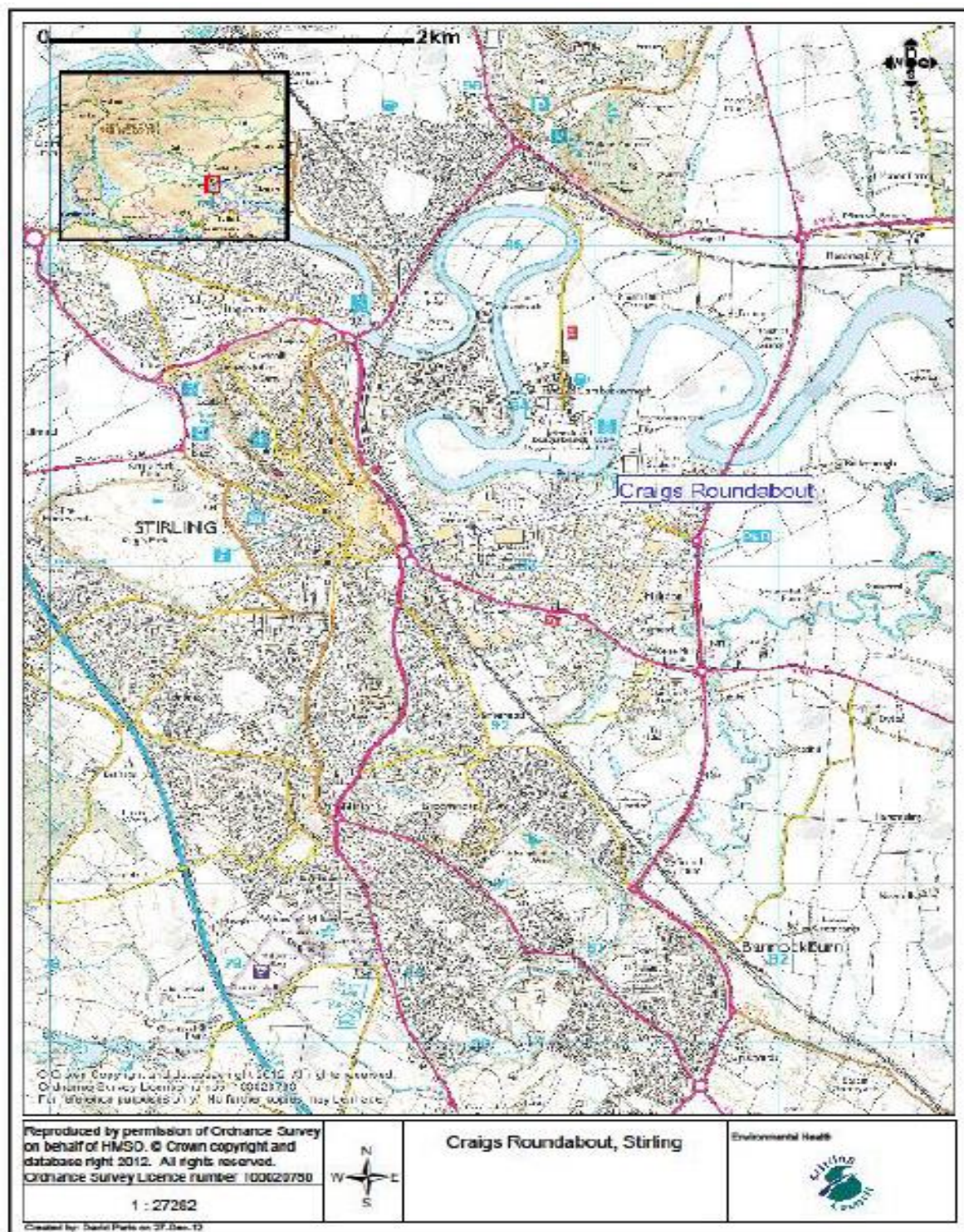


Figure 1.2 Large Scale Map showing location of Automatic Monitoring Site

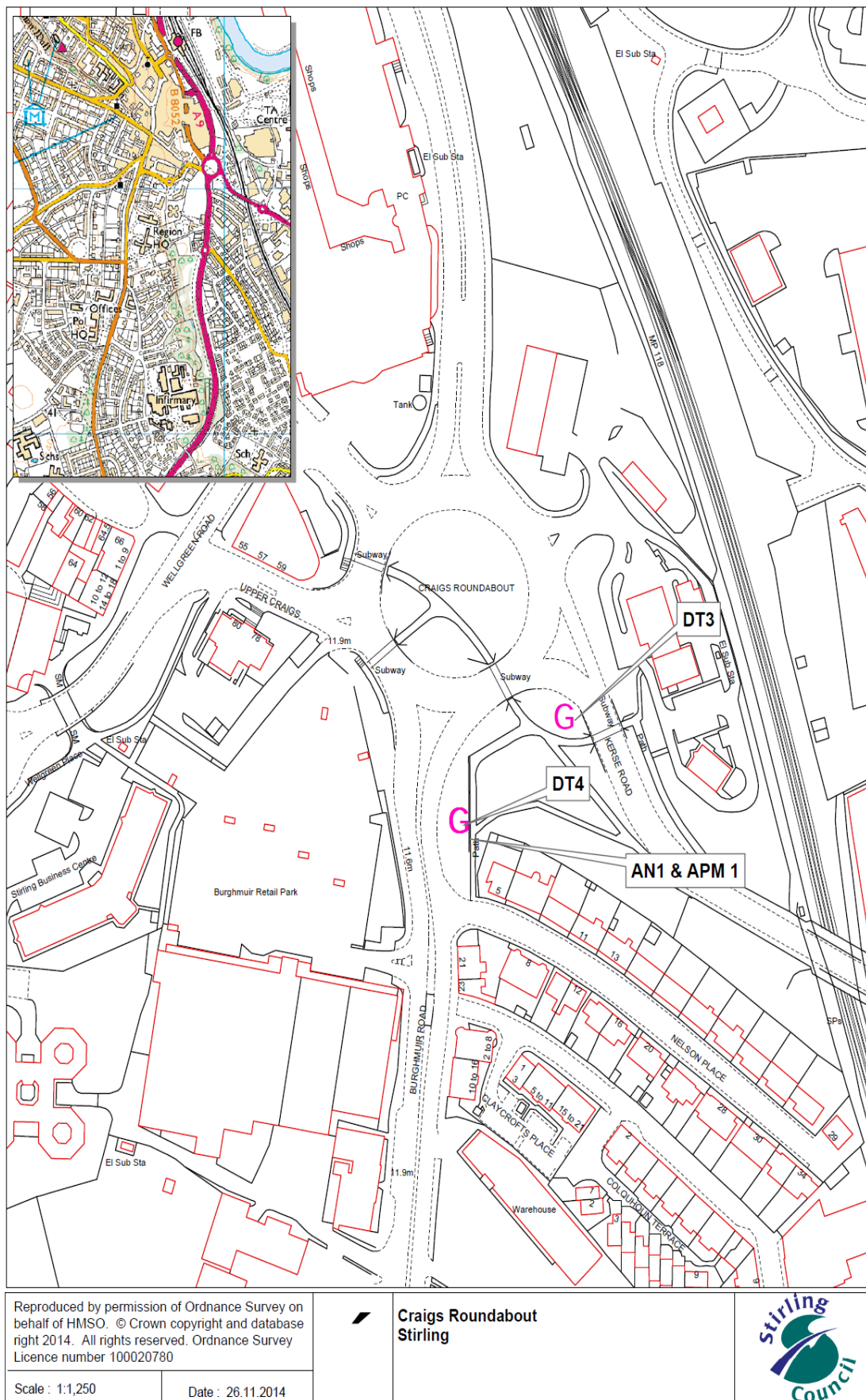


Figure 1.3 Small Scale Map of Craig's Roundabout (with Automatic Monitoring Sites)

Table 1.3 Details of Automatic Monitoring Site at Craig's Roundabout

Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	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?
Craig's Roundabout AN1	Roadside	279944	693005	2.5	NO ₂	N	Chemiluminescence	Y (10m)	3m	Y
Craig's Roundabout APM1	Roadside	279944	693005	2.5	PM ₁₀	N	TEOM	Y (10m)	3m	Y

Table 1.4 Details of Non- Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Site Height (m)	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?
DT1	Dumbarton Rd, Stirling	Kerbside	279655	693240	2.5	NO ₂	N	N	Y (2m)	0.5m	Y
DT2	Port St, Stirling	Kerbside	279634	693160	2.5	NO ₂	N	N	Y (2m)	0.5m	Y
DT3	Craigs Roundabout, Stirling	Roadside	279987	693043	2.5	NO ₂	N	N	N	2m	Y
DT4	Craigs Roundabout, Stirling	Roadside	279944	693005	2.5	NO ₂	N	Y	Y (10m)	3m	Y
DT5	Lennox Ave, Stirling	Urban background	279354	691933	2.5	NO ₂	N	N	N (4m)	1.5m	N
DT6	Barnsdale Rd, Stirling	Roadside	279520	691252	2.5	NO ₂	N	N	Y (18m)	1.5m	Y
DT7	Main St, Plean	Roadside	283222	687582	2.5	NO ₂	N	N	Y (6m)	1.5m	Y
DT8	Alloa Rd Roundabout	Roadside	282075	695057	2.5	NO ₂	N	N	Y (9m)	2m	Y
DT9	Henderson St, Bridge of Allan	Roadside	279177	697497	3	NO ₂	N	N	Y (7m)	1.5m	Y
DT10	Stirling Rd, Dunblane	Roadside	278081	700580	2.5	NO ₂	N	N	Y (8m)	1.5m	Y

1.4.1 Non-Automatic Monitoring Sites

Non-automatic monitoring using diffusion tubes is carried out for NO₂ at 10 sites. This is based on the history of consistently low concentrations recorded across the network before 2009 when the number of monitoring sites was reduced from 22 to 10. Seven of the sites are located within Stirling including a set of three tubes located with the automatic analyser at Craigs Roundabout to enable a local bias-adjustment factor to be calculated. A recommendation of this report is however to add another diffusion tube location at the A9 entrance to Stirling University as this road has shown a significant traffic increase recently. This is discussed in more detail in section 6.2.

The tubes are provided and analysed by Edinburgh Scientific Services using 50% TEA in Acetone and are changed on a monthly basis by Stirling Council personnel.

The data capture was 95.83% for 2013. A map of the diffusion tube locations is shown in Figure 2.3. The QA/QC for diffusion tube analysis is included in more detail in Appendix A.

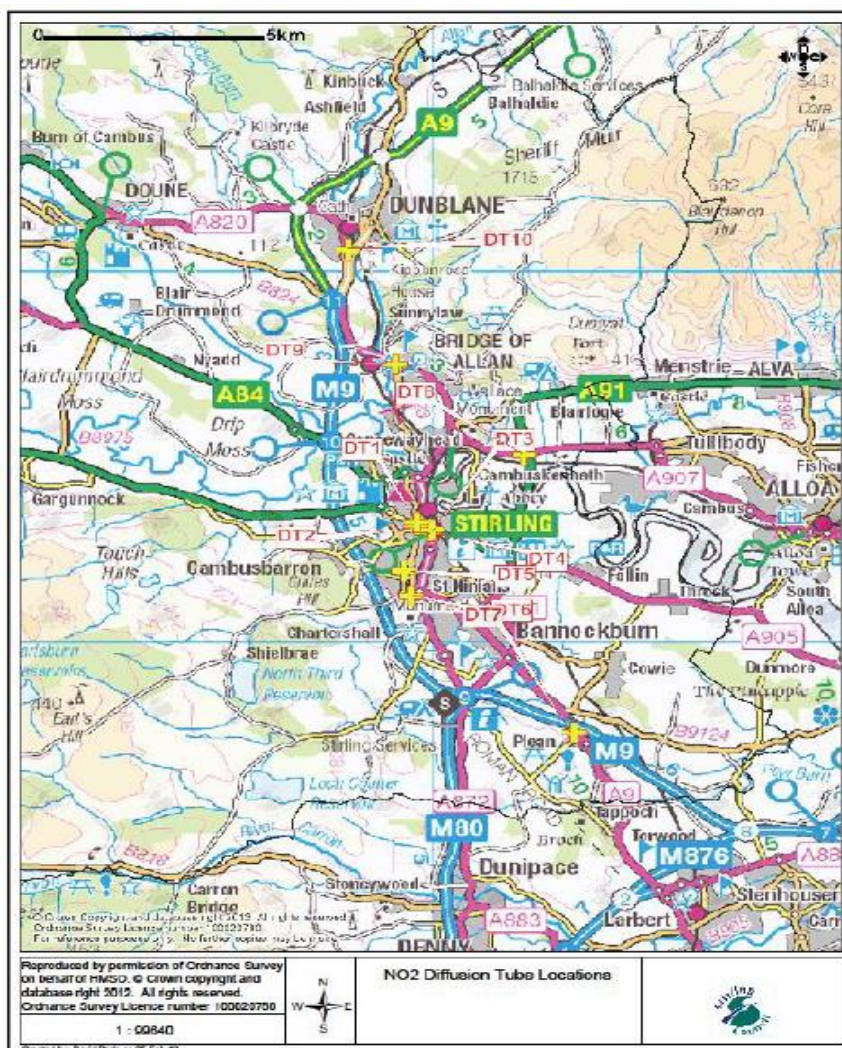


Figure 1.4 Map of Non-Automatic Monitoring Sites

1.5 Comparison of Monitoring Results with Air Quality Objectives

In the 2012 Updating and Screening Assessment, reference was made to a new retail park comprising a food store, 2 retail units, car park, service yard and landscaping to be located at Burghmuir Industrial Estate, Stirling. Construction of this development commenced in June 2012 and it opened for business in December 2012. The site perimeter is within 200m of the automatic monitoring sites AN1, APM1 and the NO₂ diffusion tube site DT4 at Craig's Roundabout. During the period of construction there may have been periods when dust was emitted from the retail park site as well as from construction vehicles entering and leaving the site. The site is accessed from the northbound carriageway of Burghmuir Road which is a Dual Carriageway at this location and there were regular periods during construction when one northbound carriageway was blocked off to allow construction traffic to enter and leave the site. This resulted in traffic on the northbound carriageway queuing to a far greater extent than would normally be the case. Consequently there was considerable uncertainty over how representative the NO₂ and PM₁₀ measurements obtained at AN1, APM1 and DT4 were for the second six months of 2012. However the results for 2013 are much more consistent.

1.5.1 Nitrogen Dioxide (NO₂)

Automatic Monitoring Data

A summary of the ratified monitoring data for NO₂ at the automatic site at Craig's Roundabout, Stirling is shown in Tables 1.5 and 1.6.

A bar chart is shown in Figure 1.5 which illustrates that the annual mean NO₂ concentration has consistently remained below the limit concentration of 40µg/m³ during the last 5 years.

Early in Nov 2013 a malfunction was identified in the NO_x monitoring equipment with data loss occurring. This was identified as an air conditioning fault which was finally resolved by replacing the existing air conditioning unit with a replacement. This resulted in the loss of a month worth of NO₂ results.

Table 1.5. Results of Automatic Monitoring for NO₂: 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)					
					2008	2009	2010	2011	2012	2013
AN1 – Craigs Roundabout	Roadside	N	79%	79%	30	26	32	29	29	31.7

Table 1.6. Results of Automatic Monitoring for NO₂: Comparison with 1-hour Mean Objective
A reading of 1 indicates level of above 200ug/m³

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period%	Valid Data Capture 2013%	Number of hourly means above 200µg/m ³					
					2008	2009	2010	2011	2012	2013
AN1 – Craigs Roundabout	Roadside	N	79	79	0	0	0	1	0	1

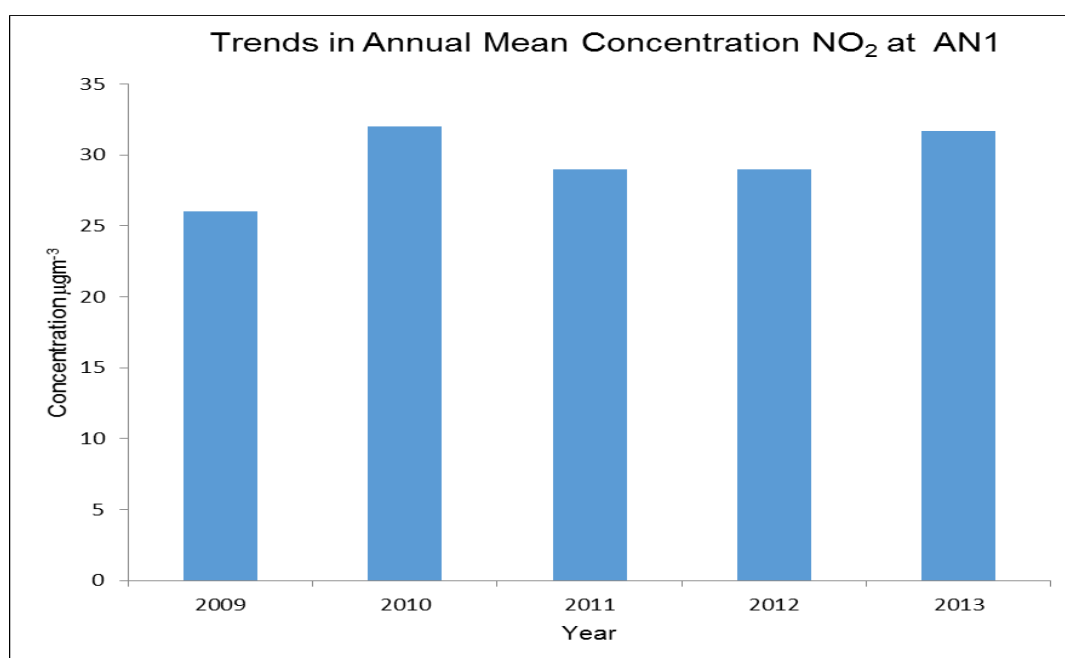


Figure 1.5. Trends in Annual Mean NO₂ Concentrations Measured at Automatic Monitoring Site

Diffusion Tube Monitoring Data

A summary of the bias-adjusted annual mean diffusion tube concentrations of NO₂ across the monitoring network for 2013 is shown in Table 1.7. The raw monthly results are included in Appendix A. A summary of data for the last six years is shown in Table 1.8. A trend graph is shown in Figure 1.6 which illustrates that there is no clear trend but does illustrate that the annual mean NO₂ concentration has consistently remained below the limit concentration of 40µg/m³ during the last 5 years.

Table 1.7. Results of NO₂ Diffusion Tubes 2013

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Full Calendar Year Data Capture 2013(%)	2013 Annual Mean Concentration (µg/m ³) – Bias Adjustment factor = 1.03
DT1	Dumbarton Road, Stirling	Kerbside	N	N	91.7	35.0
DT2	Port Street, Stirling	Kerbside	N	N	91.7	30.8
DT3	Craigs Roundabout (1)	Roadside	N	N	91.7	36.8
DT4	Craigs Roundabout (2) (automatic analyser)	Roadside	N	Triplicate and Collocated Tube	94.4	30.3
DT5	Lennox Avenue, Stirling	Urban Background	N	N	100	17.8
DT6	Barnsdale Road, Stirling	Roadside	N	N	100	22.2
DT7	Main Street, Pleau	Roadside	N	N	100	26.1
DT8	Alloa Road Roundabout	Roadside	N	N	100	36.5
DT9	Henderson Street, Bridge of Allan	Roadside	N	N	100	31.7
DT10	Stirling Road, Dunblane	Roadside	N	N	100	20.7

Table 1.8. Results of NO₂ Diffusion Tubes (2008 to 2013)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m ³					2013 (Bias Adjustment Factor =1.03)
			2008 (Bias Adjustment Factor =1.06)	2009 (Bias Adjustment Factor =0.92)	2010 (Bias Adjustment Factor =1.08)	2011 (Bias Adjustment Factor =1.02)	2012 (Bias Adjustment Factor =0.9)	
DT1	Dumbarton Road, Stirling	N	38.6	34.9	39.6	31.8	32.1	35
DT2	Port Street, Stirling	N	37.7	29.8	30.1	30.1	27.2	30.8
DT3	Craigs Roundabout (1)	N	39.1	33.1	34.7	33.7	31.6	36.8
DT4	Craigs Roundabout (2) (automatic analyser)	N	28.6	26.0	28.4	28.2	29.0	30.3
DT5	Lennox Avenue, Stirling	N	22.2	17.4	17.8	27.3	15.4	17.8
DT6	Barnsdale Road, Stirling	N	29.0	24.4	20.0	28.1	18.9	22.2
DT7	Main Street, Plean	N	29.1	22.9	24.5	27.9	22.2	26.1
DT8	Alloa Road Roundabout	N	37.2	28.2	34.5	15.8	31.3	36.5
DT9	Henderson Street, Bridge of Allan	N	30.8	28.6	29.3	22.2	29.5	31.7
DT10	Stirling Road, Dunblane	N	25.3	18.6	22.3	21.9	21.5	20.7

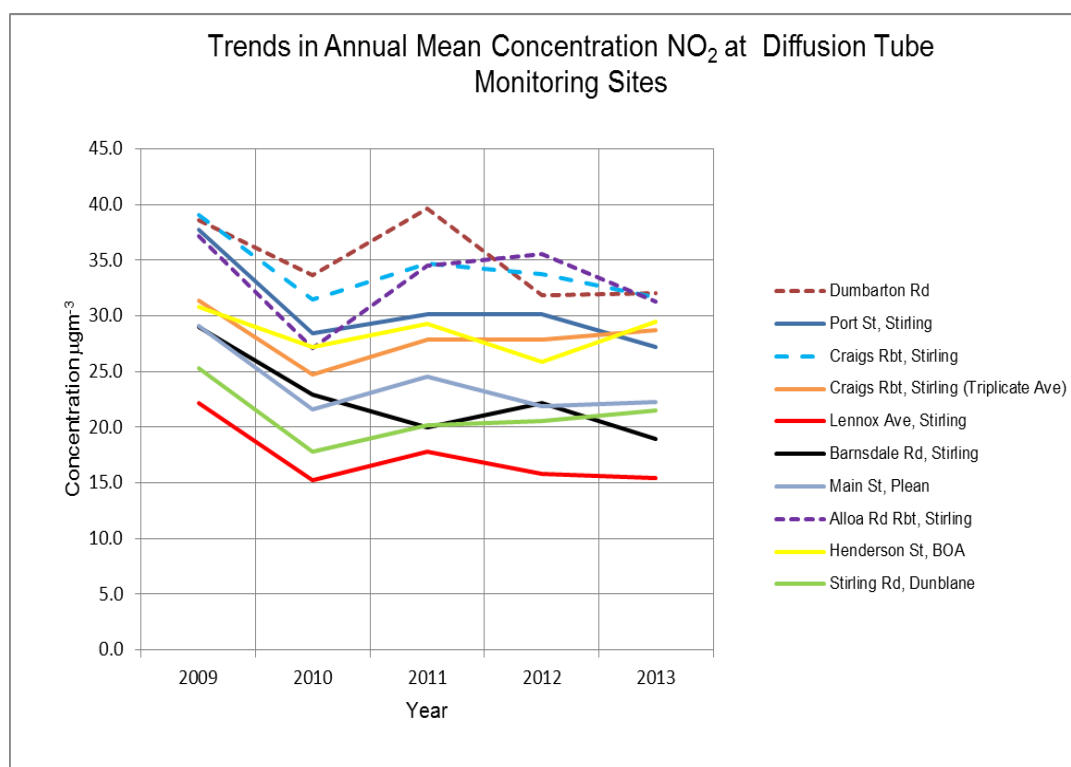


Figure 1.6. Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites

1.5.2 Particulate Matter (PM₁₀)

Stirling Council assesses exposure to PM₁₀ concentration by measuring at the most likely location of maximum exposure. This is at Craigs Roundabout (monitoring site APM1) which is a major traffic junction in the centre of Stirling and is considered to be the most representative location for relevant public exposure. It has a TEOM automatic monitor permanently sited at the roundabout.

A summary of the ratified monitoring data for PM₁₀ at Craig's Roundabout is shown below in Tables 1.9 and 1.10 and in Figure 1.7. These show that the annual mean concentration of PM₁₀ over the period 2008-2013 has ranged between 16-19.9µg/m³ with an average of 17.2µg/m³. The limit is 18µg/m³, so for most of the period, the limit was not breached. It is believed that the higher figure for 2009 was probably caused by an extended period of demolition works going on nearby.

Table 1.9. Results of Automatic Monitoring for PM₁₀: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period%	Valid Data Capture 2012% ^a	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration (µg/m ³)					
						2008	2009	2010	2011	2012	2013
APM1	Roadside	N	88.6	88.6	Y	16.1	19	17	16	16	17

In bold - exceedance of the PM₁₀ annual mean objective of 18µg/m³.

Table 1.10. 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 2012% ^a	Confirm Gravimetric Equivalent (Y or NA)	Number of Daily Means > 50 µg/m ³					
						2008	2009	2010	2011	2012	2013
APM1	Roadside	N	88.6	88.6	Y	0	4	0	1	1(39)	1

^a as data capture for full calendar year is less than 90%, the 98.1th percentile of 24-hour means is shown in brackets.

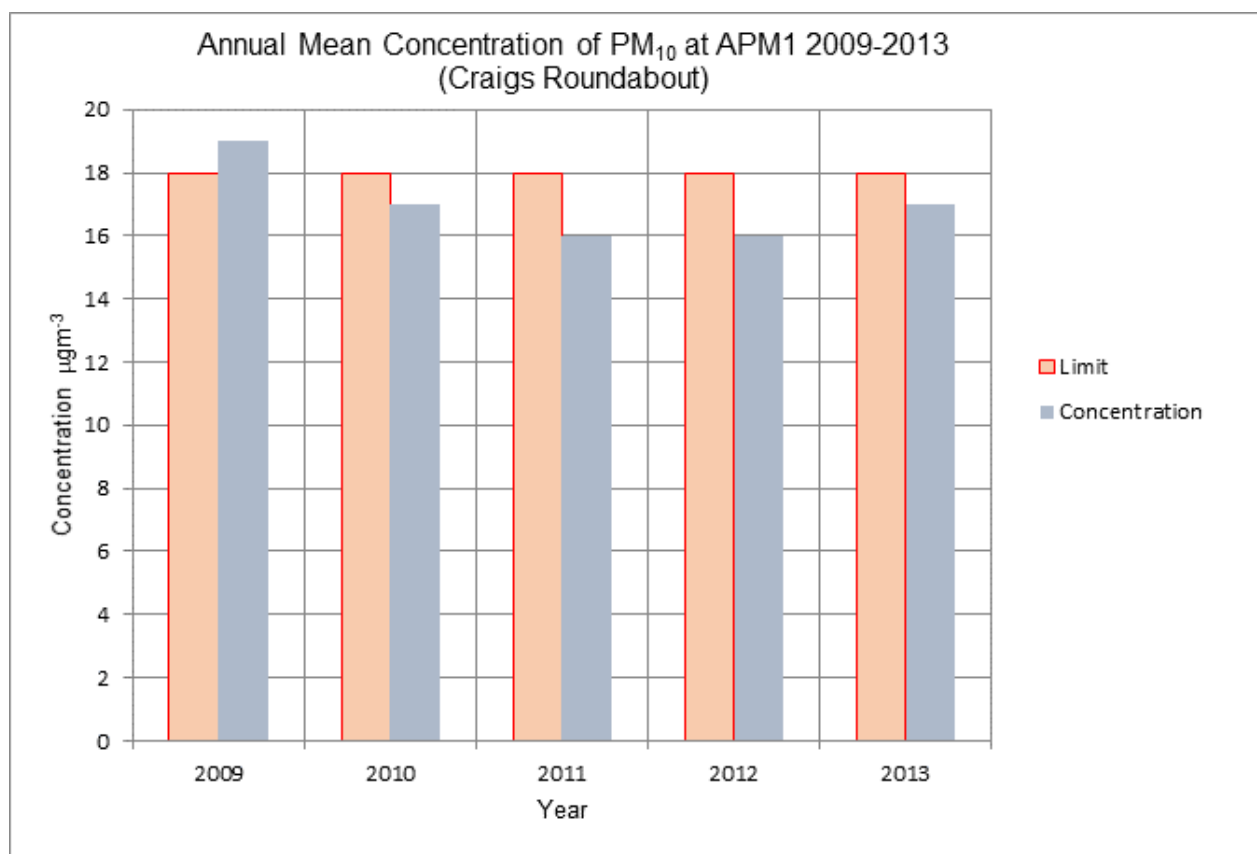


Figure 1.7. Trends in Annual Mean PM₁₀ Concentrations

Tables 1.9 and Figure 1.7 show that though the profile is reasonably consistent over the period, it remains close to the 18µg/m³ limit and this should be borne in mind when considering any future developments which may affect traffic flow or emissions.

1.5.3 Other Pollutants

There is no monitoring for any other pollutants within the Stirling Council Area.

1.5.4 Summary of Compliance with AQS Objectives

Stirling Council has examined the results from monitoring in its areas. Concentrations are all below the objectives for NO₂ and PM₁₀ therefore there is no need to proceed to a detail assessment for NO₂ or PM₁₀

2 New Local Developments

2.1 Road Traffic Sources

Stirling Council was contacted and they confirmed as with last year, that there are no new roads meeting these criteria;

- Narrow congested streets with residential properties close to the kerb.
- Busy streets where people may spend one hour or more close to traffic.
- Roads with a high flow of buses and/or HGVs.
- Junctions.
- New roads constructed or proposed since the last Updating and Screening Assessment.
- Bus or coach stations.

2.2 Other Transport Sources

Stirling Council also confirmed there are no other transport sources meeting the criteria outlined below;

- Airports.
- Locations where non-electric trains with associated emissions are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.
- Locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.
- Ports for shipping

2.3 Industrial Sources

Stirling Council confirms that there are no new/newly identified industrial sources meeting the criteria outlined below.

- Industrial installations: new or proposed installations for which an air quality assessment has been carried out.
- Industrial installations: existing installations where emissions have increased substantially or new relevant exposure has been introduced.
- Industrial installations: new or significantly changed installations with no previous air quality assessment.
- Major fuel storage depots storing petrol.
- Petrol stations.
- Poultry farms.

2.4 Commercial and Domestic Sources

The following biomass combustion plants have been granted planning permission within the Stirling Council area in 2013:

- 160kW Hertz boiler at Borestone Primary School, St Ninians, Stirling which will burn fuel pellets.
- 94kw ETA PE-K 90 biomass boiler at Ballagan House, Strathblane which will burn wood pellets.
- 200kW Herz biomass boiler at Cambusmore House, Doune fired by wood chips.
- 60kW Herz Pelletstar BioControl boiler at Easter Glenboig Farm, Fintry which will burn fuel pellets.
- 200kW Hertz boiler at Old Viewforth, Stirling which will burn fuel pellets.
- Installation of biomass boiler at Old Leckie Farm, Gargunnock – specification for boiler not yet provided.
- Biomass boiler at Upper Drumbane, Drumloist Road, and Callander – specification for boiler not yet designed.

These developments are expected to have a minimal impact on local air quality. In accordance with advice received from the LAQM helpdesk concerning a specific enquiry about biomass boiler assessment, these have been included in this Progress Report, rather than waiting until the next Updating & Screening Assessment in 2015. If required, their emissions can be assessed in that report.

2.5 New Developments with Fugitive or Uncontrolled Sources

Stirling Council confirms that there are no new/newly identified potential sources of fugitive or uncontrolled particulate matter meeting the criteria outlined below.

- Landfill sites.
- Quarries.
- Unmade haulage roads on industrial sites.
- Waste transfer stations etc.
- Other potential sources of fugitive particulate emissions.

Stirling Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the local authority area. Stirling council confirms that all of the following have been considered.

- Road traffic sources
- Other transport sources
- Industrial sources
- Commercial and domestic sources
- New development with fugitive or uncontrolled sources

3 Local/ Regional Air Quality Strategy

3.1 Local Air Quality Strategy

A Local Air Quality Strategy was produced in 2006. There are currently no plans for further developments to the Strategy.

4 Planning Applications

The following new developments have been granted planning permission within the Stirling Council area.

The following developments were applied for in 2013 and have been granted planning permission:

- Construction of 88 new dwelling houses and flats with associated groundworks and landscaping at Glendevon Drive and Huntly Crescent, Raploch.
- Part demolition of buildings and extension and redevelopment of Stirling Community Hospital to provide 5 GP practices, 130 bed residential accommodation, ambulance station, parking etc.
- Erection of restaurant with licensed bar and associated living accommodation, formation of car parking and associated landscaping at land adjacent to Craigforth Bungalow, Raploch.
- Change of use from office building to hotel comprising 96 guest rooms with public area at Drummond House, Wellgreen Place, and Stirling.
- New mixed use development comprising commercial, retail, affordable residential and associated landscape works and car parking at Land between Seaforth Place, Station Road and Goosecroft Road, Stirling.

Most of the new developments are likely to have some impact on local air quality. Emissions of dust and particulate matter are likely to occur during the construction phases of the new building developments. During the construction phase there will also be an increase in HGV traffic in the vicinity of the development sites. Increased volumes of HGV traffic may result in an increase in local particulate concentrations due to both the use of diesel fuel and through dust from construction.

Following completion of new housing, retail or industrial developments, it is possible that there will be a local increase in road traffic due to increased domestic residents or customers and visitors to business or retail units. The exact number of vehicles will depend on the scale of the development and the overall impact will depend on the increased volume of traffic on the affected roads. It was concluded that these proposed developments would have a minimal impact on local air quality.

Applications which are currently being considered and which may require further assessment include:-

- Mixed use development comprising Sheriffmuir Park Centre including garden centre, heritage centre, rural offices, biomass heating system and Sheriffmuir Park housing to comprise 165 residential units at land adjacent to north east and south of Kippendavie Mains, Kellie Wynd, Dunblane.

5 Air Quality Planning Policies

5.1 Stirling Local Development Plan

The Planning etc. (Scotland) Act 2006 introduced a number of reforms to the Scottish planning system. Outwith the four City Regions there is no requirement to prepare Strategic Development Plans, however, all planning authorities must prepare Local Development Plans for their individual areas. This comprises The Local Development Plan (LDP) and Supplementary Guidance¹⁰. The LDP is currently undergoing a consultation process.

The Overarching Policy and Sustainable Development Criteria¹¹ are the principal link between national policy aims and the LDP objectives and policies. They are intended to be used both as a guide to the high level aspirations of the Council for developers and, along with the more detailed policies, in assessing proposals and reaching planning decisions.

The range of topics covered by Primary Policies has been determined by considering those issues of particular local concern. Primary Policies are backed up with more detailed Policies. Many Primary Policies and more detailed Policies are further supported by Supplementary Guidance (SG).

The LDP supports good quality development, in the right place, that meets the community's needs (social, economic and environmental), in order to contribute positively to the creation of vibrant, mixed and healthy communities. All developments, land use changes and other proposals, plus related frameworks, master plans, planning briefs, strategies, etc., will require to demonstrate a number of objectives, including Compatibility with the Spatial Strategy and conformity with the relevant Sustainable Development Criteria (SDC). These criteria include minimising adverse impacts on water, air and soil quality.

5.1 Strategic Environmental Assessment

Air quality was extensively considered in both the Interim (2010)¹² and Updated (2012) Environmental Reports which were produced in the assessment of the LDP.

6 Local Transport Plans and Strategies

6.1 Stirling Transport Strategies

There are a number of documents which have been produced in support of the Local Development Plan (LDP). These include a Transport & Access Background Report (2012) which considers the various facets of traffic impacts. It has been suggested that the Local Transport Strategy 2006 monitoring framework captures information which can inform any debate and response to 'congestion' including, among other issues, air quality monitoring.

A number of transport related documents have been produced which recognise air quality as a potential issue.

6.1.1 Local Transport Strategy 2006

The Local Transport Strategy (LTS) 2006 seeks to:-

- Maintain and manage the existing transport Network effectively to reduce the likelihood of Air Quality Objectives being breached.
- Effectively promote and increase awareness of sustainable transportation and the benefits it provides. Any Modal Shift can be measured in various ways including Air Quality measurements although it is recognised that the causes of Modal Shift may be difficult to determine.

Air Quality measurements are considered as one way of establishing the effectiveness of some of the Policies set out in the Local Transport Strategy.

In 2011 a mid term review of the Transport Strategy was undertaken which highlighted that although NO₂ concentrations had increased since 2004, all were below Air Quality Objectives. It was also noted that PM₁₀ concentrations had reduced.

6.1.2 Stirling City Transport Strategy 2020

The City Transport Strategy (CTS) is a sub-section of the overarching Local Transport Strategy (LTS), which also incorporates the Loch Lomond & the Trossachs National Park Transport Strategy¹⁸ and the Smaller Towns and Villages Transport Strategy. The LTS provides the policy framework for sustainable transport, with each of the individual supporting strategies describing how this will be delivered at a local level. It supports objectives on a broad range of issues affecting the local community including health, education, employment and air quality. It considers various options, via, "Do Nothing", "Base", "Roads Capacity", "Do Something" and "Aspirational" with a matrix illustrating the effects of each strategy on the five Scottish Transport Appraisal Guidance objectives, including the environment. The "Do Nothing" and "Roads Capacity" options have been rejected with the three remaining being favoured. The extent to which they are implemented is subject to funding.

Among the CTS objectives is improving the centre of the city through "Vital Stirling" as the main focus of commercial and community life, whilst enhancing air quality and the amenity of the street environment with increased priority for pedestrians and non-motorised forms of transport. The

monitoring framework will assess the CTS strategy and Baseline data will be collected using various techniques, including air pollution measured at Craig's roundabout.

There are a number of policy and guideline elements that will be developed to support and complement the strategy such as Lorry Parking and Coach Parking Management Plans, Travel Plans, Transport Assessments and Developer Contributions, Cycling & Walking, Asset Management and City Centre development guidelines.

The transport strategies developed by Stirling Council fit into a wider framework of Regional and National Strategies, in which air quality is a consideration. Stirling Council is a member of the TACTRAN Regional Partnership which also includes Perth and Kinross, Dundee and Angus Councils.

This sets out a vision for improving the region's transport infrastructure, services and other facilities over the period to 2023 with a vision to deliver a transport system, shaped by engagement with its citizens, which helps deliver prosperity and connects communities across the region and beyond, which is socially inclusive and environmentally sustainable and which promotes the health and well-being of all. To support this Vision, Objectives have been defined under four broad themes:

- Economy, Accessibility, Equity and Social Inclusion;
- Environment; Health and Well-being;
- Safety and Security;
- Integration.

The Strategy seeks to build on existing good practice and develop new measures and projects to ensure these Objectives are achieved. Over the coming years, through partnership working and implementation of the Delivery Plan, the Strategy aims to ensure the transport system supports a growing economy while at the same time connects communities and protects the environment. The TACTRAN Partnership Board and Scottish Ministers approved the finalised Regional Transport Strategy in 2008 giving it statutory status.

6.2 Traffic Data for Air Quality

Table 6.1 Average daily traffic for 2012 and 2013

Location Number	Location	Location Coordinates	Annual Average Daily Traffic (2 way)		% change 2012 to 2013	Notes
			2012	2013		
1	C121 Dumbarton Road	279492,693326	6774	7053	4.1	
2	C121 Port Street					No data for 2012 or 2013
3	A9 Burghmuir Road	279933,692938	22340	24877	11.4	
4	A905 Kerse Road	280070,692969	21785	23224	6.6	
5	Lennox Avenue					No data for 2012 or 2013
6	Barnsdale Road					No data for 2012 or 2013
7	A907 Alloa Road	281998,695048	11769	12425	5.6	
8	A9 Main Street, Plean	283372,687289	9755	10119	3.7	2013 data is estimated
9	A9 Henderson Street, Bridge of Allan	279230,697459	14220			No data for 2013
10	B8033 Dunblane	278267,700986	9562			No data for 2013

Table 6.2 Average daily traffic for 2012 and 2013 at South entrance to Stirling University

Location	Location Coordinates	Annual Average Daily Traffic (2 way)		% change 2012 to 2013	Notes
		2012	2013		
A9 west entrance to Stirling University	280363,696249	11979	13939	16.4	

The data shows an increase in traffic numbers in 2013. The largest increase of 16.4% at the west entrance to Stirling University seen in Table 6.2. This is the access junction from the A9 just south of Bridge of Allan. Also, an 11.4% was seen on the A9 at Burghmuir road as seen in Table 6.1. Stirling Council Road department cannot explain the large increase in numbers as over recent years, traffic numbers have remained static. This year's increase may be due to the catching up with the long term trend.

There is no air quality monitoring site at the A9 west entrance to the University and it is recommended that Stirling Council fit a NO_x tube there, so that they can track future trends. In addition, it is recommended that a NO_x tube is fitted at the roundabout (grid reference 805 956), where Airthrey Road (A9) meets the A907. This roundabout is likely to experience similar volumes of traffic and has a number of domestic dwellings in close proximity.

7 Climate Change Strategies

7.1 Climate Change

Each of Scotland's 32 local authorities signed Scotland's Climate Change Declaration²⁰ in early 2007. The Declaration is a public statement where local authorities acknowledge the reality and implications of climate change and their responsibility to respond effectively. The Declaration also welcomes the actions of the UK and Scottish governments and the opportunities for local authorities to work in partnership with others in responding to climate change. Stirling Council produces Annual Statements highlighting Council priorities in addressing climate change issues²¹. Included in the Annual Statement is progression of the Local Development Plan (LDP).

The objectives set out in Chapter 7 concerning the LDP also include consideration of appropriate measures for mitigation of and adaptation to climate change. Equally, the Sustainable Development Criteria set out in the same Chapter include a commitment to ensuring development contributes to reduction in greenhouse gas emissions, in line with, or better than national targets, and encourages energy and heat efficiency, and the use of low and zero carbon power generation. Reducing the need to travel and encouraging active travel and other more sustainable travel and transport opportunities are also commitments given in the LDP.

8 Implementation of Action Plans

As Stirling Council currently does not have an AQMA, an action plan has not been implemented.

9 Conclusions and Proposed Actions

9.1 Conclusions from New Monitoring Data

During 2013, Stirling Council undertook monitoring of NO₂ and PM₁₀ concentrations at various locations. The results indicate that the NO₂ and PM₁₀ air quality objectives were not exceeded during 2013 at any monitoring locations.

9.2 Installation of new monitoring tubes

There has been a large increase of traffic numbers along the A9 particularly in the location of south of entrance to Stirling University. It is recommend that Stirling Council fit a NO_x tube at the University roundabout so that they can track future trends.

9.3 Maintenance of Equipment

During 2012 and 2013 there have been periods where monthly data was missing due to the failure of the air conditioning unit on the automated monitoring system. Because of this failure one month's monitoring data was not recorded during 2013. Stirling council should consider replacing the unit or changing their maintenance routine.

9.4 Conclusions Relating to New Local Developments

The assessment has been conducted in accordance with the TG(09) Technical Guidance. Updated information of road, rail, industrial, domestic and fugitive emissions sources including biomass installations has been obtained and compared against the criteria and conditions described in the Guidance. It was determined that there is no need to proceed to a Detailed Assessment for any of the emission sources. Some Planning Applications listed in Chapter 5 may require more detailed consideration, depending on the details which emerge as these are progressed.

9.5 Proposed Actions

The assessment has identified that it is not necessary to proceed to a Detailed Assessment for any pollutant. No new areas where additional monitoring is required have been identified at this time. The next report to be submitted is the 2015 Updating and Screening Assessment.

References

1. Local Air Quality Management Technical Guidance LAQM. TG(09), DEFRA, Scottish Government, DOE, Welsh Assembly Government, 2009.
2. Stirling Council 2006 Updating and Screening Assessment
3. Stirling Council 2007 Progress Report
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10. <http://www.stirling.gov.uk/localdevplan>
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17. http://www.stirling.gov.uk/_documents/temporary-uploads/chief-executives-office/its-midterm-review.pdf
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19. http://www.lochlomond-trossachs.org/images/stories/Planning/PDF/LocalPlan/Adopted/Chapter_3.pdf
20. <http://www.tactran.gov.uk/documents/TACTRANRTS-FinalNov2008.pdf>
21. <http://www.climatechange.sustainable-scotland.net>
22. http://www.stirling.gov.uk/_documents/temporary-uploads/chief-executives-office/cmp-executive-report-app1-jan13.pdf

Appendices

Appendix A: Quality Assurance / Quality Control (QA/QC) Data

Appendix A: QA: QC Data

Table A.1 Raw Unadjusted Monthly Diffusion Tube NO₂ Concentrations

Enter bias adjustment- 1		2013												
	Ref No	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Mean
Dumbarton Rd, Stirling	1	41.7	47.3	41.4	29.7	27.6	27.7	28.1	24.0	29.9	Damaged	40.7	35.4	34.0
Port St, Stirling	2	36.0	39.1	35.2	25.7	23.5	25.1	26.6	24.2	25.3	Damaged	39.5	29.2	29.9
Craigs Rbt, Stirling	3	43.1	45.5	45.1	39.0	28.3	30.8	31.3	24.7	36.2	Damaged	36.7	31.9	35.7
Craigs Rbt, Stirling	4A	42.9	38.3	37.8	29.2	24.6	22.1	22.5	22.2	26.4	Damaged	36.7	29.6	30.2
Craigs Rbt, Stirling	4B	40.6	38.5	35.7	29.6	24.7	22.8	10.9	22.4	25.6	Damaged	37	30.0	28.9
Craigs Rbt, Stirling	4C	41.2	34.4	34.1	26.8	23.7	22.6	19.2	21.3	23.9	32.0	39	32.6	29.2
Lennox Ave, Stirling	5	28.7	25.3	26.7	13.8	9.9	10.8	12.1	9.0	14.1	19.1	22.2	15.1	17.2
Barnsdale Rd, Stirling	6	28.9	30.4	34.1	20.8	11.4	15.8	16.3	14.3	20.8	23.3	26.6	16.5	21.6
Main St, Pleau	7	34.6	32.9	39.5	27.0	18.8	20.6	20.6	15.7	21.4	27.3	27.5	18.3	25.4
Alloa Rd Rbt, Stirling	8	44.8	43.7	39.0	36.7	26.9	31.9	31.5	29.3	33.8	37.5	39.3	31.0	35.5
Henderson St, BOA	9	36.2	40.3	38.4	29.3	28.2	25.2	21.2	24.1	29.2	32.3	38.4	26.5	30.8
Stirling Rd, Dunblane	10	27.5	25.9	25.5	17.3	15.6	14.9	14.0	15.9	16.1	20.8	30.2	17.7	20.1

Appendix B: Bias Adjustment Factor

Table B.1 National Diffusion Tube Bias Adjustment Factor

National Diffusion Tube Bias Adjustment Factor Spreadsheet							Spreadsheet Version Number: 09/14			
<p>Follow the steps below <u>in the correct order</u> to show the results of <u>relevant</u> co-location studies</p> <p>Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods</p> <p>Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet</p> <p>This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.</p>									<p>This spreadsheet will be updated at the end of March 2015</p> <p>LAQM Helpdesk Website</p>	
The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.							Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.			
Step 1:	Step 2:	Step 3:	Step 4:							
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor ³ shown in blue at the foot of the final column.							
If a laboratory is not chosen, we have no data for this laboratory.	If a preparation method is not chosen, we have no data for this method at this laboratory.	If a year is not chosen, we have no data ²	If you have your own co-location study then see footnote ⁴ . If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953							
Analysed By ¹	Method <small>To make your selection, choose (All) from the pop-up list</small>	Year ² <small>To make your selection, choose (All)</small>	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) ($\mu\text{g}/\text{m}^3$)	Automatic Monitor Mean Conc. (Cm) ($\mu\text{g}/\text{m}^3$)	Bias (B)	Tube Precision ⁶	Bias Adjustment Factor (A) (Cm/Dm)
ESG Didcot	50% TEA in acetone	2013	R	West Oxfordshire District Council (WODC)	10	51	40	29.6%	G	0.77
Aberdeen Scientific Services	20% TEA in water	2013		Overall Factor ³ (1 study)				Use		0.83
Edinburgh Scientific Services	50% TEA in acetone	2013		Overall Factor ³ (7 studies)				Use		0.75
ESG Didcot	20% TEA in water	2013		Overall Factor ³ (3 studies)				Use		0.85
ESG Didcot	50% TEA in acetone	2013		Overall Factor ³ (44 studies)				Use		0.81
ESG Glasgow	20% TEA in water	2013		Overall Factor ³ (1 study)				Use		0.72
ESG Glasgow	50% TEA in acetone	2013		Overall Factor ³ (1 study)				Use		0.73
Exova	20% TEA in water	2013		Overall Factor ³ (1 study)				Use		0.91
Glasgow Scientific Services	20% TEA in water	2013		Overall Factor ³ (5 studies)				Use		0.99
Gradko	20% TEA in water	2013		Overall Factor ³ (36 studies)				Use		0.95
Gradko	50% TEA in acetone	2013		Overall Factor ³ (20 studies)				Use		1.01
Kent Scientific Services	20% TEA in water	2013		Overall Factor ³ (1 study)				Use		0.77

Appendix C: AEA Energy & Environment

Table C.1 Precision and Accuracy of Triplicate Tubes

Checking Precision and Accuracy of Triplicate Tubes



Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	01/01/2013	31/01/2013	42.9	40.6	41.2	42	1.2	3	3.0	37.03	93.5	Good	Good
2	01/02/2013	28/02/2013	38.3	38.5	34.4	37	2.3	6	5.7	38.33	91.1	Good	Good
3	01/03/2013	31/03/2013	37.8	35.7	34.1	36	1.9	5	4.6	41.57	99.7	Good	Good
4	01/04/2013	30/04/2013	29.2	29.6	26.8	29	1.5	5	3.8	27.43	98.6	Good	Good
5	01/05/2013	31/05/2013	24.6	24.7	23.7	24	0.6	2	1.4	27.50	83.3	Good	Good
6	01/06/2013	30/06/2013	22.8	22.6	10.8	19	6.9	37	17.1	21.42	90.3	Poor Precision	Good
7	01/07/2013	31/07/2013	10.9	19.2	12.1	14	4.5	32	11.1	22.58	96.8	Poor Precision	Good
8	01/08/2013	31/08/2013	22.4	21.3	9.0	18	7.4	42	18.5	28.23	60.41	Poor Precision or Data Capture	
9	01/09/2013	30/09/2013	25.6	23.9	14.1	21	6.2	29	15.4	31.55	70.85	Poor Precision or Data Capture	
10	01/10/2013	31/10/2013		32.0	19.1	26	9.1	36	82.0	28.88	61.67	Poor Precision or Data Capture	
11	01/11/2013	30/11/2013	37.0	39.0	22.2	33	9.2	28	22.8	35.91	88.49	Poor Precision	Good
12	01/12/2013	31/12/2013	30.0	32.6	15.1	26	9.4	36	23.5	27.62	56.01	Poor Precision or Data Capture	
13													

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

Overall survey -->

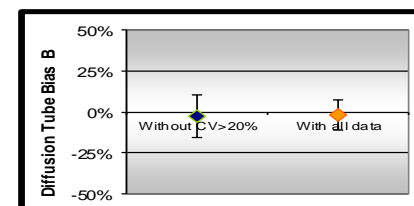
Poor precision (Check average CV & DC from Accuracy calculations)

Site Name/ ID: **Craigs Roundabout, Stirling**

Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 5 periods of data	
Bias factor A	1.03 (0.9 - 1.19)
Bias B	-3% (-16% - 11%)
Diffusion Tubes Mean:	33 μgm^{-3}
Mean CV (Precision):	4
Automatic Mean:	34 μgm^{-3}
Data Capture for periods used:	93%
Adjusted Tubes Mean:	34 (30 - 40) μgm^{-3}

Precision **5 out of 12 periods have a CV smaller than 20%**

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 7 periods of data	
Bias factor A	#REF!
Bias B	#REF!
Diffusion Tubes Mean:	μgm^{-3}
Mean CV (Precision):	
Automatic Mean:	μgm^{-3}
Data Capture for periods used:	
Adjusted Tubes Mean:	μgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

If you have any enquiries about this spreadsheet please contact the LAQM Helpdesk at:

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