2013 Air Quality Progress Report for Stirling Council

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

April 2013

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Executive Summary

The 2013 Progress Report for Stirling Council followed the guidance in TG09 Technical Guidance.[1] New monitoring data for NO_2 and PM_{10} was analysed to determine if any air quality objectives had been exceeded during 2010. 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 exceedence of air quality objectives for any pollutant. It was determined that there were no new emission sources, or sources that had not been previously assessed, that could result in air quality objectives being exceeded. Overall, it was concluded that there is no requirement to proceed to a Detailed Assessment for any pollutant at present. The next report to be completed will be the 2014 Progress Report.

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1 Introduction

1.1 Description of Local Authority Area

Stirling Council is located in the centre of Scotland and covers approximately 2,196 km^2. The Council is bordered by East Dunbartonshire Council to the south west, West Dunbartonshire Council to the west, Argyll and Bute Council to the north-west, Perth and Kinross Council to the north, Clackmannanshire Council and Falkirk Council to the east and North Lanarkshire Council to the south. A map of the area covered by Stirling Council and outlined in black is provided in Figure 1.1. The yellow outlined area represents the boundary of Loch Lomond and the Trossachs National Park.

The population of the Stirling Council area is approximately 86,000 with the majority of the residents based in or around Stirling in the urbanised region of the south east. 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, Gartmore and Balfron. The majority of industrial and commercial businesses are based in the southeastern area around Stirling, Cowie, Bridge of Allan and Dunblane, and it is in this area where the highest concentrations of NO_2 and PM_{10}, which are the principal pollutants of concern, are found. Stirling Council covers a large 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 relatively complex terrain including several lochs, forests and Munros.

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 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 Local Air Quality Management 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 microgrammes 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	31.12.2010
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	31.12.2010
	18 µg/m^3	Annual mean	31.12.2010
Sulphur dioxide	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

Before 2006 Air Quality Assessments were undertaken in accordance with statutory guidance. None of these indicated a need to declare an AQMA and their conclusions are not detailed in this Report.

Stirling Council submitted an Updating and Screening Assessment (USA) in April 2006. That report concluded that there was unlikely to be an exceedence of the Air Quality (AQ) objectives at locations of relevant public exposure. The measured NO_2 annual mean concentration at Port Street in Stirling was, however, close to the AQ objective. It was also identified that two industrial sites had reduced or were proposing a reduction in atmospheric emissions. The report also highlighted that due to proposed commercial and domestic developments in the Stirling area there was likely to be an increase in road traffic flows in the south-east of the Council area.

The Progress Report in 2007 identified that annual mean pollutant concentrations at Port Street remained close to the objective; however, the site had a low data capture rate and so the results were not considered to be reliable. It was, therefore, recommended that additional monitoring be undertaken. PM_{10} concentrations at Craigs Roundabout were determined to be at risk of exceeding the 2010 annual mean objective. Further monitoring and a re-evaluation of the results in 2008 was recommended. The main air quality concerns within the Stirling Council area were the elevated concentrations of NO_2 and PM_{10} along the A9 and A84 in central Stirling, which were primarily due to road traffic emissions. Although previously measured concentrations were below AQ objectives at locations of relevant public exposure, concentrations were close to the objective limits.

The Progress Report in 2008 found that the results of the NO_2 monitoring indicated that it was unlikely that the air quality objectives would be exceeded. The PM_{10} monitoring did, however, identify a risk of the 2010 annual mean objective being exceeded at Craigs Roundabout, based on a forward projection of 2007 annual mean measured concentrations. However, the exceedence was predicted only when the 1.3 adjustment factor had been applied. Based on the updated industrial, domestic, commercial and road traffic information, it was concluded to be unlikely that any other AQ objective would be exceeded in the Stirling Council area.

The 2009 Updating and Screening Assessment considered new monitoring data for NO_2 and PM_{10} and confirmed that there were no exceedences of any AQ objectives within the Council area. Additionally, PM_{10} concentrations were projected forward to 2010 for comparison with then future objectives and it was calculated that the objectives would be met. New sources of atmospheric emissions were investigated and assessed to determine if any sources would cause an exceedence of AQ objectives for any pollutant and it was concluded that there were no new emission sources, or sources that had not been previously assessed, that could result in AQ objectives being exceeded. It was concluded that there was no requirement to proceed to a Detailed Assessment for any pollutant or due to any new emission sources.

The 2010 Progress Report found that the only exceedence of an air quality objective within the Council area was at Craigs Roundabout where the levels of PM_{10} exceeded the 2010 objective of 18µg/m^3 by 1µg/m^3. However, concentrations of

PM_{10} had probably been increased due to extensive demolition work close to the monitoring location. Further monitoring was to be carried out to determine if this was the case. New sources of atmospheric emissions were investigated and assessed to determine if any sources would cause an exceedence of air quality objectives for any pollutant. It was determined that there were no new emission sources, or sources that had not been previously assessed, that could result in air quality objectives being exceeded. Overall, it was concluded that there was no requirement to proceed to a Detailed Assessment for any pollutant.

The 2011 Progress Report identified that the NO_2 air quality objectives were met during 2010 at all monitoring locations and that measured NO_2 from 2007 to 2010 had been similar, with no significant increase or decrease identified at most sites. The annual mean PM_{10} concentration of 17µg/m^3 was below the objective of 18µg/m^3 by 1µg/m^3 and showed a decrease from the 2009 figure of 19 µg/m^3. New sources of atmospheric emissions were investigated and assessed to determine if any sources would cause an exceedence of air quality objectives for any pollutant. It was determined that there were no new emission sources, or sources that had not been previously assessed, that could result in AQ objectives being exceeded. Overall, it was concluded that there was no requirement to proceed to a Detailed Assessment for any pollutant.

The 2012 Updating and Screening Assessment analysed new monitoring data for NO_2 and PM_{10} to determine if any air quality objectives had been exceeded during 2011. Examination of the previous 5 years of data showed that there was no obvious trend in annual mean NO_2 concentrations across the diffusion tube network although the concentration had decreased at 8 out of 10 sites between 2010 and 2011. Data from the automatic monitoring station at Craigs Roundabout, Stirling had shown an annual mean concentration of 26-32µg/m^3 for NO_2 over the last five years with an average of 29.2µg/m^3. The annual mean concentration of PM_{10} over the same period had ranged between 16-19.9µg/m^3 with an average of 17.6µg/m^3. There was a decrease between 2010 and 2011 with the latest annual mean being 16µg/m^3. New and changed sources of atmospheric emissions were investigated and assessed to determine if any sources would cause an exceedence of AQ objectives for any pollutant. It was established that there were no other new emission sources, or sources that had not been previously assessed, that would be likely to result in AQ objectives being exceeded.

Table 1.2 summarises the outcome of previous reports.

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

Report	Date Completed	Summary & Conclusions
Updating and Screening Assessment 2006 [2]	August 2006	Unlikely to be exceedence 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-east of the Council area.

Progress Report 2007 [3]	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 Craigs Roundabout at risk of exceeding the 2010 annual mean objective.
Progress Report 2008 [4]	June 2008	Unlikely that NO_2 objectives would be exceeded. Based on forward projection, PM_{10} monitoring identified risk of 2010 annual mean objective exceedence at Craigs Roundabout. No other AQ objective likely to be exceeded.
Updating and Screening Assessment 2009 [5]	June 2009	Monitoring confirmed no exceedences of the AQ objectives for NO_2 & PM_{10} during 2008. No risk of exceedences of any other AQ objectives.
Progress Report 2010 [6]	November 2010	PM_{10} annual mean concentration at Craigs 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[7]	October 2011	No exceedences of AQ objectives for NO_2 and PM_{10} during 2010.
Updating & Screening Assessment 2012 [8]	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.

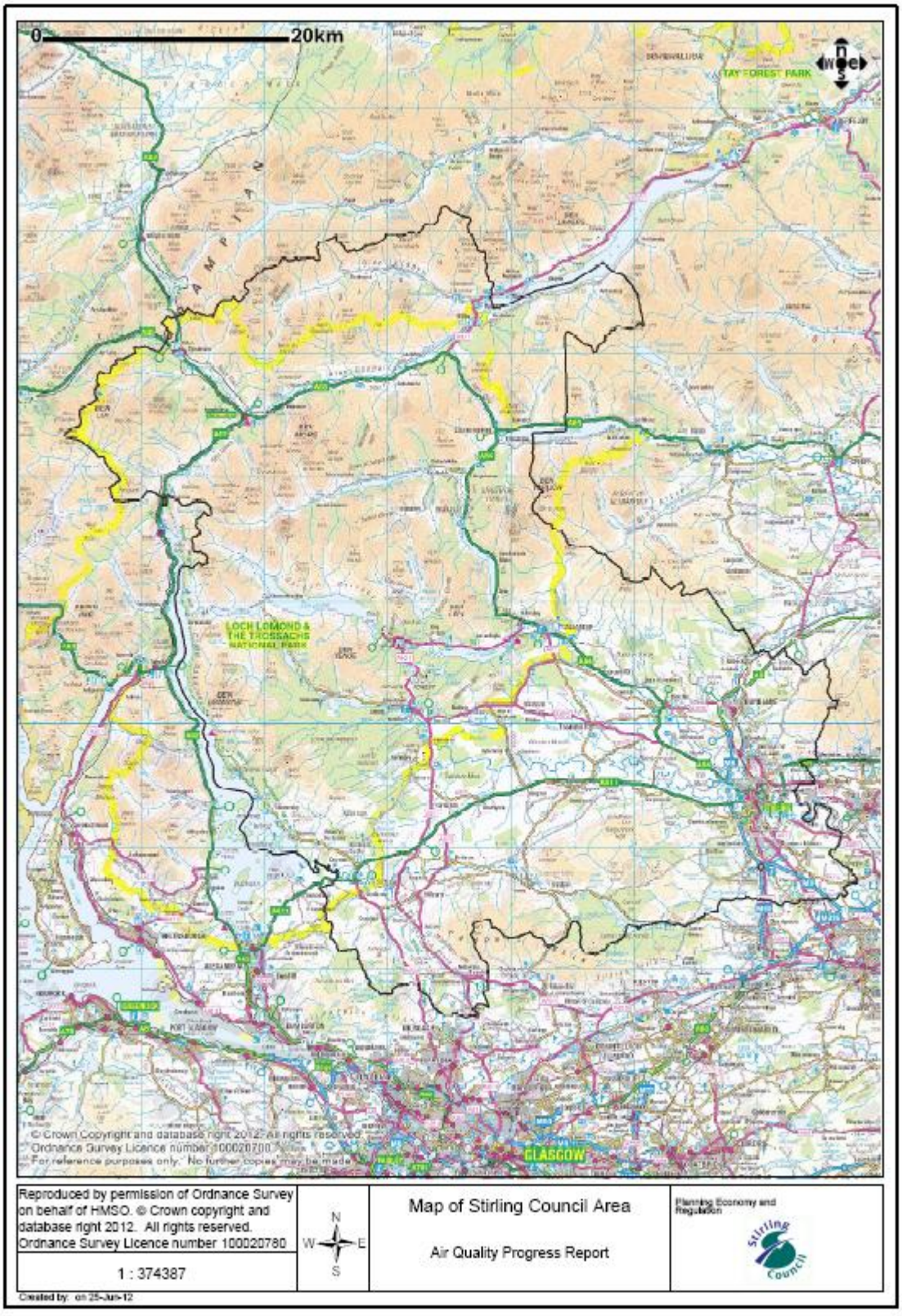


Figure 1.1. – Map of Stirling Council Area

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

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 PM_{10}. Details of this site are presented in Table 2.1.
The location of the automatic monitoring site within the Council area is presented in Figures 2.1. and 2.2. There were no changes to this during 2012.

The data capture for the site was 90% for NO_2 and 88.6% for PM_{10}. 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.

Figure 2.1. Large Scale Map of Automatic Monitoring Sites

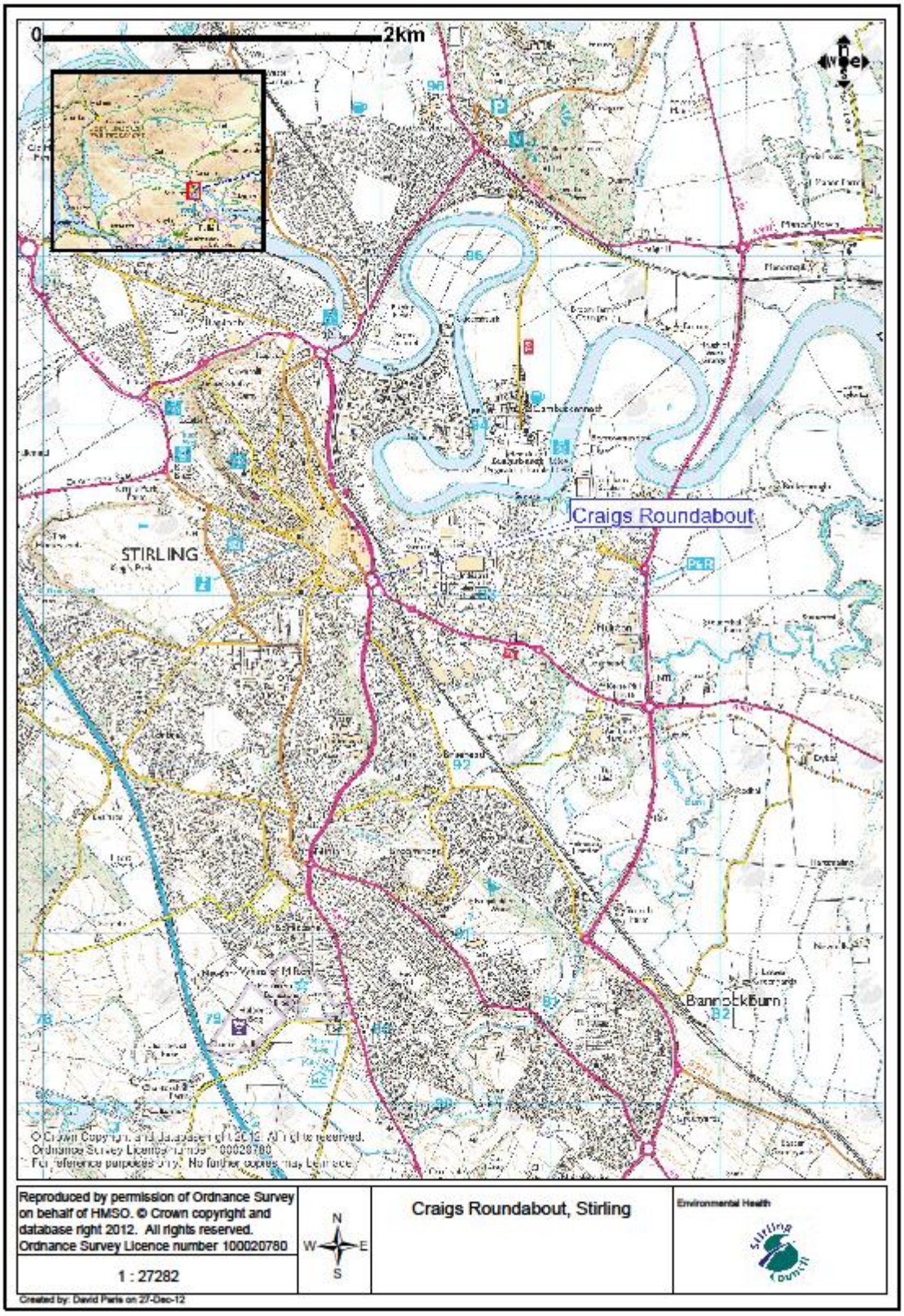


Figure 2.2. Small Scale Map of Craigs Roundabout (with Automatic Monitoring Sites)

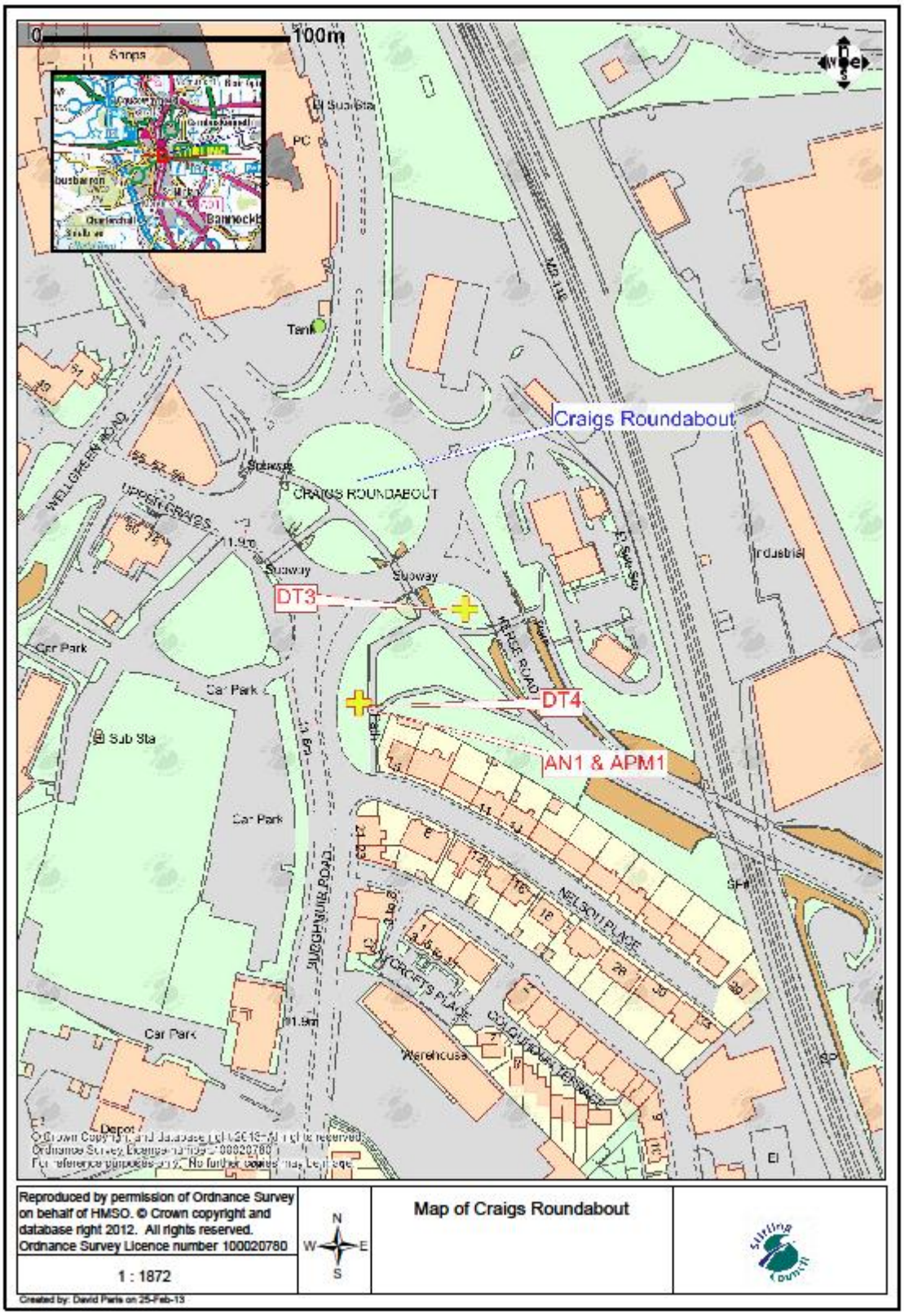


Table 2.1. Details of Automatic Monitoring Site at Craigs Roundabout

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
AN1	Craigs Roundabout	Roadside	279944	693005	2.5	NO_2	N	Chemiluminescence	Y (10m)	3m	Y
APM1	Craigs Roundabout	Roadside	279944	693005	2.5	PM_{10}	N	TEOM	Y (10m)	3m	Y

2.1.2 Non-Automatic Monitoring Sites

Non-automatic monitoring using diffusion tubes is carried out for NO_2 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 co-located with the automatic analyser at Craigs Roundabout to enable a local bias-adjustment factor to be calculated. This is discussed in more detail in Appendix A.

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 95.8% for 2012. 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 2.3. Map of Non-Automatic Monitoring Sites

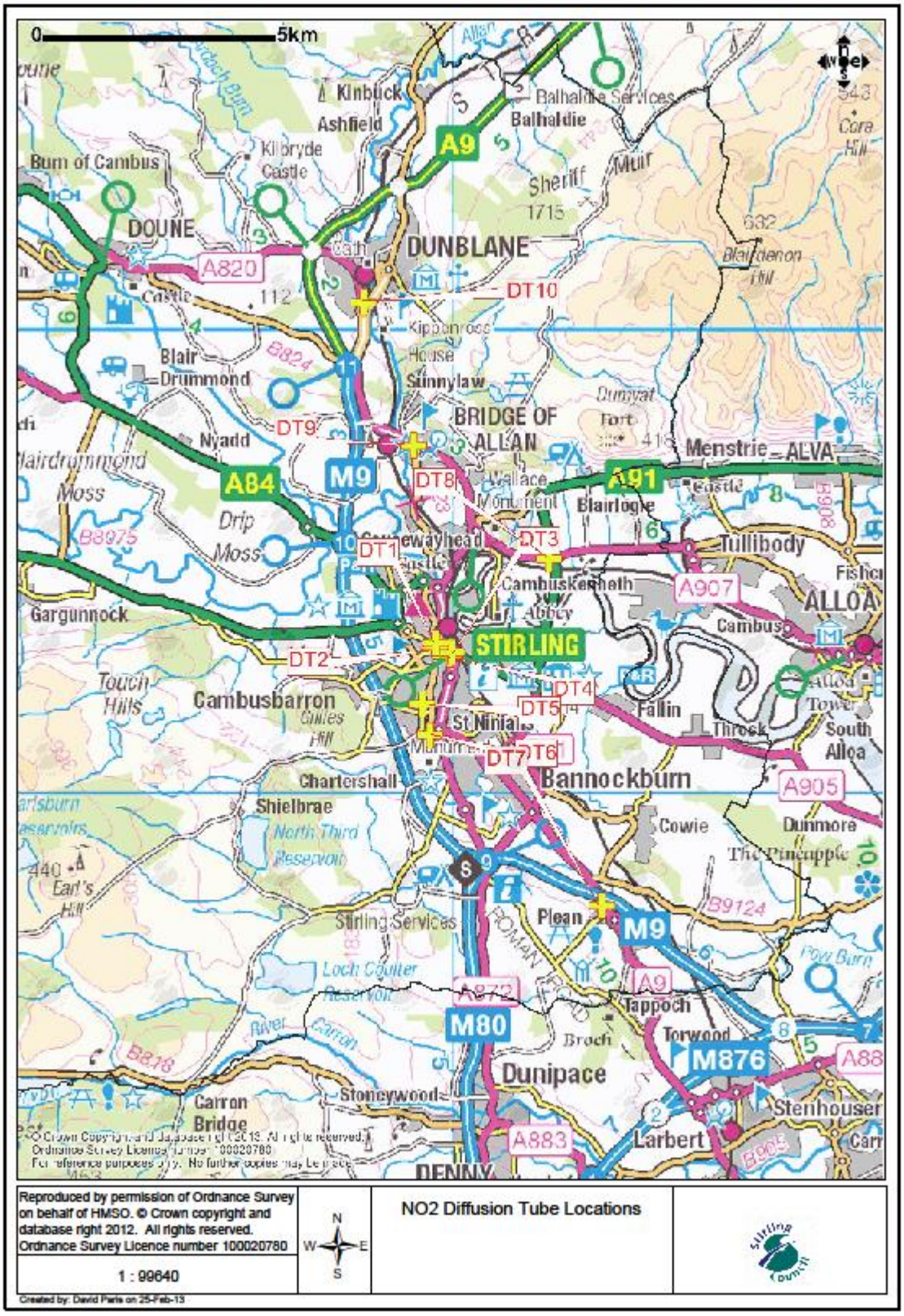


Table 2.2. Details of Non- Automatic Monitoring Sites

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

2.2 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 foodstore, 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 20m of the automatic monitoring sites AN1, APM1 and the NO_2 diffusion tube site DT4 at Craigs 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 is considerable uncertainty over how representative the NO_2 and PM_{10} measurements obtained at AN1, APM1 and DT4 are for the second six months of 2012.

2.2.1 Nitrogen Dioxide (NO_2)

Automatic Monitoring Data

A summary of the ratified monitoring data for NO_2 at the automatic site at Craigs Roundabout, Stirling is shown in Tables 2.3 and 2.4.

A trend graph is shown in Figure 2.3 which illustrates that the annual mean NO_2 concentration has consistently remained below the limit concentration of 40µg/m^3 during the last 5 years.

Early in August 2012 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 some weeks of NO_2 results.

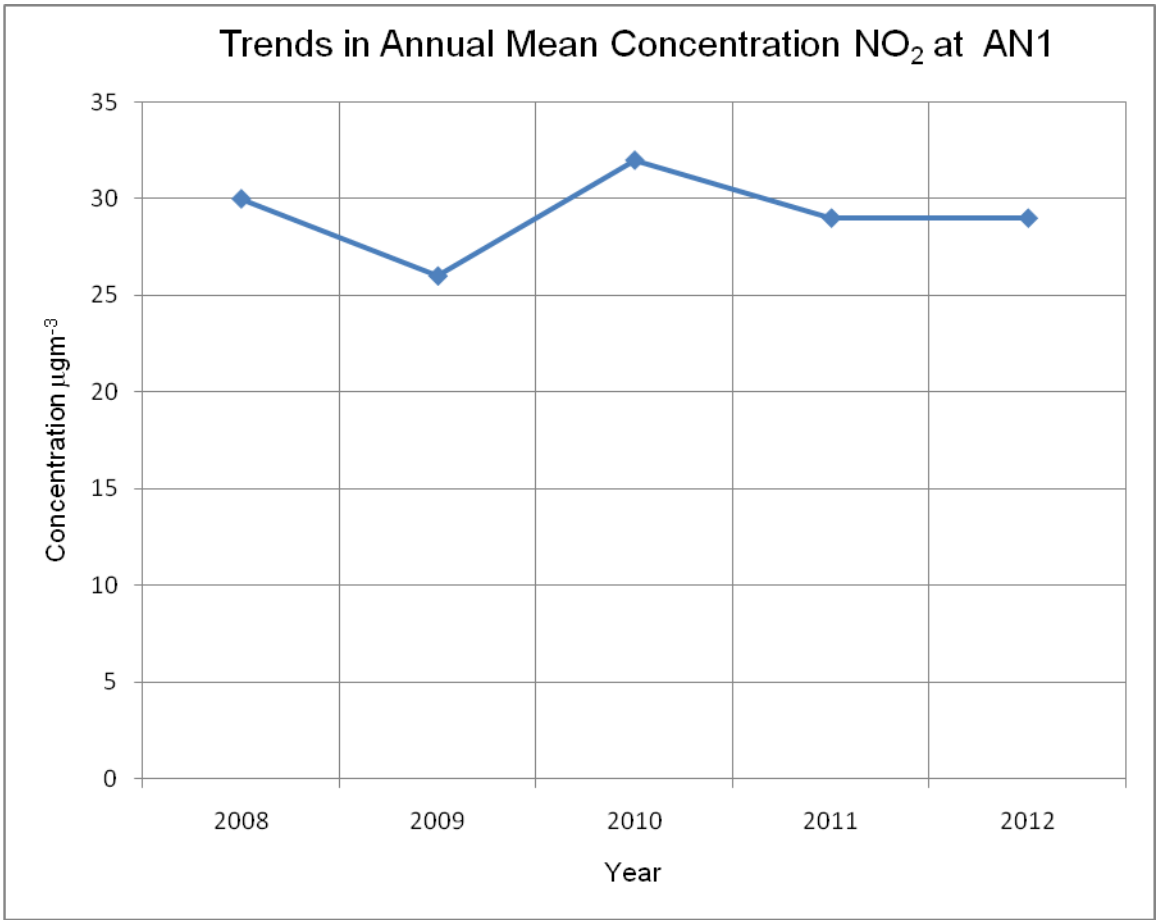
Table 2.3. Results of Automatic Monitoring for NO_2: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2012 %	Annual Mean Concentration (µg/m^3)				
					2008	2009	2010	2011	2012
AN1- Craigs Roundabout	Roadside	N	90	90	30	26	32	29	29

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 2012 %	Number of Hourly Means > 200µg/m^3				
					2008	2009	2010	2011	2012
AN1- Craigs Roundabout	Roadside	N	90	90	0	0	0	1	0

Figure 2.4. Trends in Annual Mean NO_2 Concentrations Measured at Automatic Monitoring Site



Diffusion Tube Monitoring Data

A summary of the bias-adjusted annual mean diffusion tube concentrations of NO_2 across the monitoring network for 2012 is shown in Table 2.5. The raw monthly results are included in Appendix A. A summary of data for the last five years is shown in Table 2.6. A trend graph is shown in Figure 2.5 which illustrates that there is no clear trend but does illustrate that the annual mean NO_2 concentration has consistently remained below the limit concentration of 40µg/m^3 during the last 5 years.

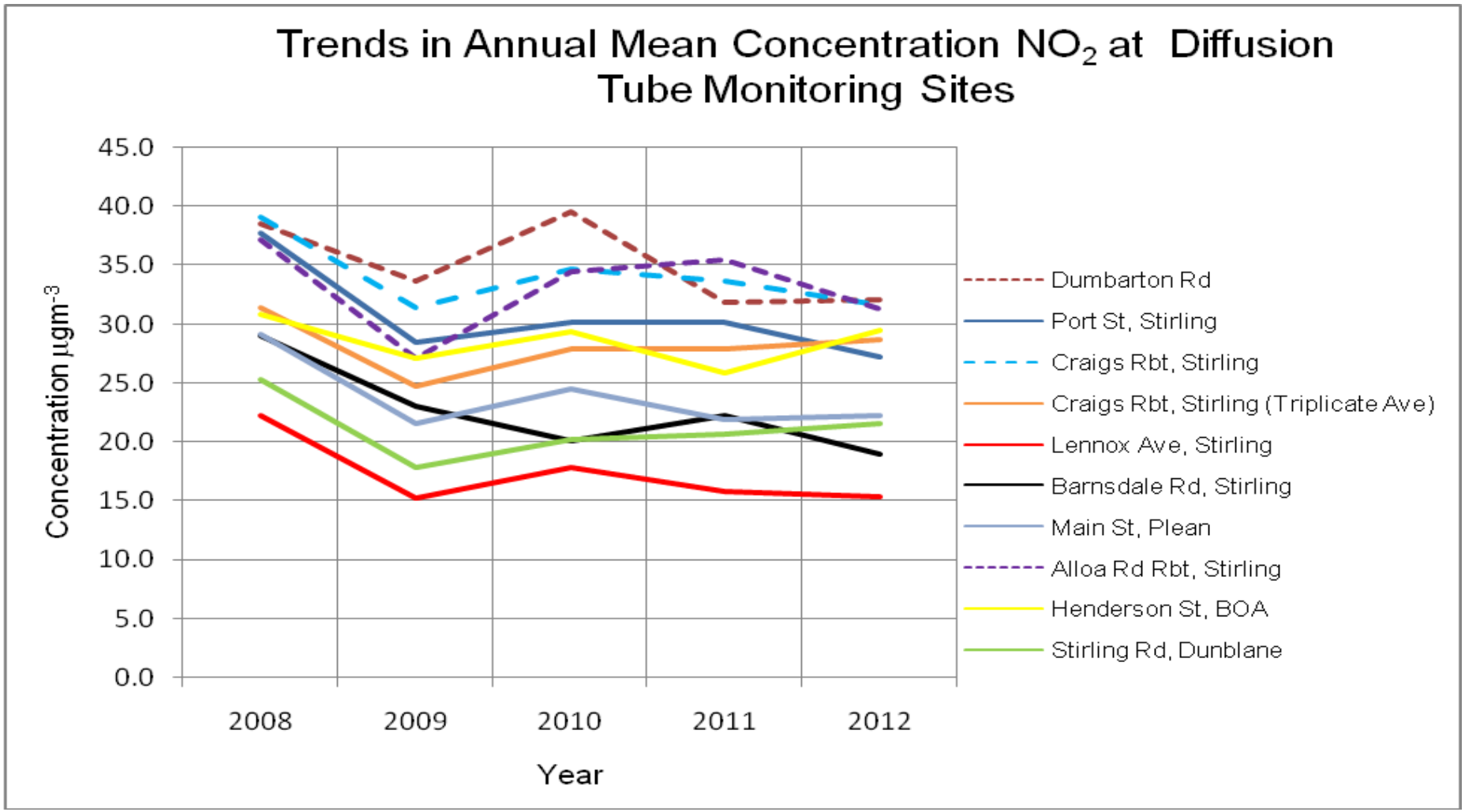
Table 2.5. Results of NO_2 Diffusion Tubes 2012

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Full Calendar Year Data Capture 2012 (%)	2012 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.9
DT1	Dumbarton Road, Stirling	Kerbside	N	N	100	32.1
DT2	Port Street, Stirling	Kerbside	N	N	91.7	27.2
DT3	Craigs Roundabout (1)	Roadside	N	N	100	31.6
DT4	Craigs Roundabout (2) (automatic analyser)	Roadside	N	Triplicate and Collocated Tube	100	29.0
DT5	Lennox Avenue, Stirling	Urban background	N	N	91.7	15.4
DT6	Barnsdale Road, Stirling	Roadside	N	N	91.7	18.9
DT7	Main Street, Plean	Roadside	N	N	100	22.2
DT8	Alloa Road Roundabout	Roadside	N	N	83.3	31.3
DT9	Henderson Street, Bridge of Allan	Roadside	N	N	91.7	29.5
DT10	Stirling Road, Dunblane	Roadside	N	N	100	21.5

Table 2.6. Results of NO_2 Diffusion Tubes (2008 to 2012)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m^3				
			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
DT2	Port Street, Stirling	N	37.7	29.8	30.1	30.1	27.2
DT3	Craigs Roundabout (1)	N	39.1	33.1	34.7	33.7	31.6
DT4	Craigs Roundabout (2) (automatic analyser)	N	28.6	26.0	28.4	28.2	29.0
DT5	Lennox Avenue, Stirling	N	22.2	17.4	17.8	27.3	15.4
DT6	Barnsdale Road, Stirling	N	29.0	24.4	20.0	28.1	18.9
DT7	Main Street, Plean	N	29.1	22.9	24.5	27.9	22.2
DT8	Alloa Road Roundabout	N	37.2	28.2	34.5	15.8	31.3
DT9	Henderson Street, Bridge of Allan	N	30.8	28.6	29.3	22.2	29.5
DT10	Stirling Road, Dunblane	N	25.3	18.6	22.3	21.9	21.5

Figure 2.5. Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites



2.2.2 Particulate Matter (PM_{10})

As can be seen from Table 2.1., the monitoring site (APM1) is representative of relevant public exposure.
A summary of the ratified monitoring data for PM_{10} at the automatic site at Craigs Roundabout, Stirling is shown in Tables 2.7 and 2.8. A trend graph is shown in Figure 2.6. The annual mean concentration of PM_{10} over the period 2008-2012 has ranged between 16-19.9µg/m^3 with an average of 17.2µg/m^3. While there was a decrease between 2010 and 2011, the latest annual mean was 16µg/m^3, although for the reasons explained at the start of this Chapter, there is some uncertainty concerning how representative this is.

Early in September 2012 the PM_{10} monitor stopped functioning properly due to a loss of power which resulted in the loss of firmware. Difficulties then occurred in reinstalling the firmware which necessitated the unit being removed to the maintenance company's facility in England for reprogramming. This resulted in the loss of some weeks PM_{10} results.

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 %	Valid Data Capture 2012 %[a]	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration µg/m^3				
						2008	2009	2010	2011	2012
APM1	Roadside	N	88.6	88.6	Y	16.1	**19**	17	16	16

[a] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

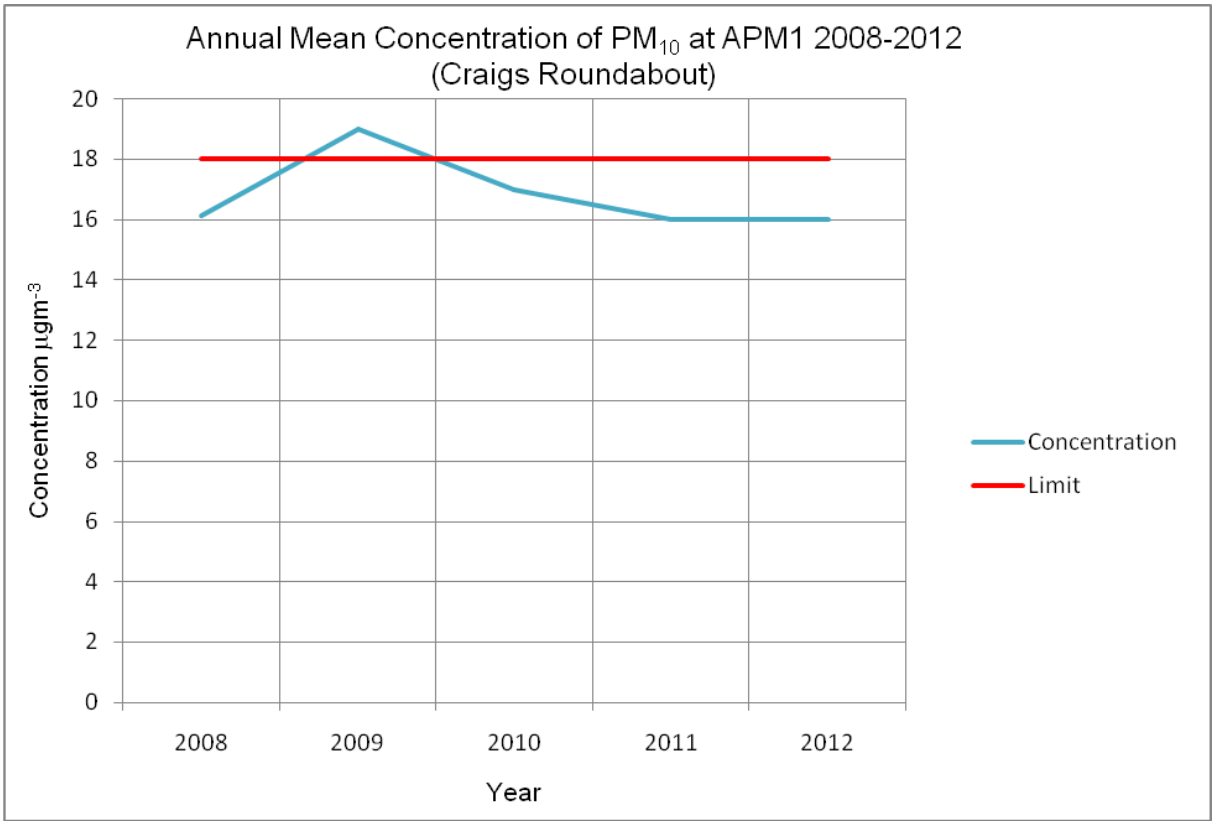
In bold - exceedence of the PM_{10} annual mean AQS objective of 18µg/m^3

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

[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 2.6. Trends in Annual Mean PM_{10} Concentrations



This illustrates that there is no clear trend, with monitoring indicating that PM_{10} concentrations are generally slightly below the Air Quality objective. For the reasons detailed in Chapter 2.2, there is uncertainty concerning the 2012 monitoring results.

2.2.3 Other Pollutants

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

2.2.4. Summary of Compliance with AQS Objectives

Stirling Council has examined the results from monitoring in its area. Concentrations are all below the objectives for NO_2 and PM_{10}, therefore there is no need to proceed to a Detailed Assessment for NO_2 or PM_{10}.

3 New Local Developments

3.1 Road Traffic Sources

Stirling Council confirms that there are no new roads meeting the criteria outlined below.

- 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.
- Roads with significantly changed traffic flows.
- Bus or coach stations.

3.2 Other Transport Sources

Stirling Council confirms there are no other transport sources meeting the criteria outlined below.

- Airports.
- Locations where diesel or steam trains 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

3.3 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.

3.4 Commercial and Domestic Sources

The following biomass combustion plants are to be installed within the Stirling Council area:

- 199kW biomass boiler at The Green Welly Stop, Tyndrum which will burn wood pellets & chips.
- Danstoker Multimiser biomass boiler (200 kW) at Sauchieburn Estate which will burn woodchips.

- 75 kW biomass boiler at the Falls Of Dochart Inn Gray Street Killin which will burn dried logs

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. More information concerning them is shown in Appendix B.
There are currently no areas where domestic fuel burning is relevant.

3.5 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 the following have been considered:

- **Road traffic sources**
- **Other transport sources**
- **Industrial sources**
- **Commercial and domestic sources**
- **New developments with fugitive or uncontrolled sources.**

4 Local / Regional Air Quality Strategy

4.1 Local Air Quality Strategy

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

5 Planning Applications

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

- A Biogas development converting organic matter into renewable heat, power & fertiliser through anaerobic digestion near Claylands, Fintry
- The erection of 44 dwelling houses including infrastructure and landscaping North Of Northlea Station Wynd, Doune.
- The erection of 48 houses with associated works at Leny Road, Deanston.
- Erection of 80 flats, 22 studios, 11 townhouses and 9 family flats at Airthrey Road, Stirling.
- Development of a class 1 retail foodstore, petrol filling station with associated access, car parking and other associated works North Of Dunblane Cemetery Barbush, Dunblane.
- Erection of a 60 bedroom hotel with associated restaurant, service facilities, car park and landscaping at Forthside Way 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:-

- A mixed use development comprising business, hotel/leisure, housing, restaurant, retail, open space and supporting infrastructure at Drip Road Raploch Stirling. This is a major phased development which has the potential to affect traffic flows and routes through north and west Stirling but is associated with wider Planning issues. Aspects of it may require further consideration in future Air Quality Assessments as detailed plans emerge.
- The development of 58 residential units and associated landscaping, drainage and roads infrastructure on the eastern edge of Balfron.
- The regeneration of part of St Ninians town centre comprising: construction of new retail and related units for shops, financial/professional services, food, drink and business uses as well as the formation of new vehicular access and junction improvements to Glasgow Road (A872) at Maitland Crescent St Ninians, Stirling.
- The development of coal bed methane production, including drilling, well site establishment, inter-site connection services, site access tracks, a gas delivery

and water treatment facility, ancillary facilities, infrastructure and associated water outfall point near Letham. It is likely that SEPA will have a role in considering this application, but the extent of this has yet to be determined.

6 Air Quality Planning Policies

6.1 Stirling Local Development Plan[9]

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 Guidance[10]. The LDP is currently undergoing a consultation process.

The Overarching Policy and Sustainable Development Criteria[11] 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, masterplans, 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.

Air quality has been highlighted as a potential issue at the following locations from a Planning perspective:

1) Norbord particleboard and medium density fibreboard (MDF) manufacturing plant at Cowie.
2) The Berryhills North/South residential development site at Cowie.
3) The Station Road residential development site at Cowie.
4) The Ochilview residential development site at Cowie.

6.2 Strategic Environmental Assessment

Air quality was extensively considered in both the Interim (2010)[12] and Updated (2012)[13] Environmental Reports which were produced in the assessment of the LDP.

7 Local Transport Plans and Strategies

7.1 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)[14] which considers the various facets of traffic impacts. It has been suggested that the Local Transport Strategy 2006[15] 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, viz

7.1.1 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[16] of the Transport Strategy was undertaken which highlighted that although NO_2 concentrations had increased since 2004, all were below Air Quality Objectives. It was also noted that PM_{10} concentrations had reduced.

7.1.2 Stirling City Transport Strategy 2020[17]

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 Strategy[18] 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, viz, "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 Craigs 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.[19]

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.

8 Climate Change Strategies

8.1 Climate Change

Each of Scotland's 32 local authorities signed Scotland's Climate Change Declaration[20] 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 issues.[21] Included in the Annual Statement is progression of the 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.

9 Implementation of Action Plans

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

10 Conclusions and Proposed Actions

10.1 Conclusions from New Monitoring Data

During 2012, Stirling Council undertook monitoring of NO_2 and PM_{10} concentrations at various locations. The results indicate that the NO_2 and PM_{10} air quality objectives were not exceeded during 2012 at any monitoring locations.

10.2 Conclusions relating to New Local Developments

The assessment has been conducted in accordance with the TG09 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.

10.3 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 2014 Progress Report.

11 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.
4 Stirling Council 2008 Progress Report.
5 Stirling Council 2009 Updating and Screening Assessment.
6 Stirling Council 2010 Progress Report.
7 Stirling Council 2011 Progress Report.
8 Stirling Council 2012 Updating and Screening Assessment.
9 http://www.stirling.gov.uk/localdevplan
10 http://www.stirling.gov.uk/services/business-and-trade/planning-and-building-standards/local-and-statutory-development-plans/supplementary-planning-guidance
11 http://www.stirling.gov.uk/services/planning-and-the-environment/sustainable-development/sustainable-development-strategy
12 http://www.stirling.gov.uk/__documents/temporary-uploads/economy,-planning-_and_-regulation/draft-proposed-ldp/interim-non-technical-summary-report-2010.pdf
13 http://www.stirling.gov.uk/__documents/temporary-uploads/economy,-planning-_and_-regulation/draft-proposed-ldp/sea-update-of-interim-env-report.pdf
14 http://www.stirling.gov.uk/__documents/temporary-uploads/economy,-planning-_and_-regulation/draft-proposed-ldp/background-reports/transport-background-paper-15.10.12.pdf
15 http://www.stirling.gov.uk/__documents/transport/transport-planning/transport-policy/stirling-local-transport-strategy-1.pdf
16 http://www.stirling.gov.uk/__documents/temporary-uploads/chief-executives-office/lts-midterm-review.pdf
17 http://www.stirling.gov.uk/__documents/transport/transport-planning/transport-policy/stirling-city-transport-strategy.pdf
18 http://www.lochlomond-trossachs.org/images/stories/Planning/PDF/LocalPlan/Adopted/Chapter_3.pdf
19 http://www.tactran.gov.uk/documents/TACTRANRTS-FinalNov2008.pdf
20 http://climatechange.sustainable-scotland.net/
21 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 B: Biomass Boiler Assessments

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

The raw monthly average NO_2 diffusion tube results are summarised in Table A:1

Factor from Local Co-location Studies

A local co-location study was carried out at the Craigs Roundabout automatic monitoring site using triplicate NO_2 diffusion tubes. The calculation was carried out using the local bias adjustment spreadsheet tool (AEA_DifTPAB_v04 (1).xls) and the bias adjustment factor was found to be 0.9 (see Table A2 below).

Discussion of Choice of Factor to Use

The national bias adjustment factor spreadsheet was found to be 0.86 (Table A.3) however this was based on the result from one co-location study. This was close to the local adjustment factor of 0.9.

It was decided to use the locally derived bias correction factor of 0.9 to adjust the raw monthly diffusion tube results. This decision is based on the following:

- The local co-location site received “good” precision and had a high quality of NO_2 chemiluminescence results.
- The diffusion tube data were available for 11 months,
- The national bias adjustment factor spreadsheet contains data from fewer than five other sites for the same laboratory and method for 2012,
- The precision for the local study was found to be good.

PM_{10} Monitoring Adjustment

Ricardo-AEA was funded by The Scottish Government to provide Volatile Correction Model (VCM) corrected TEOM (Tapered Element Oscillating Microbalance) data to Local Authorities under the Scottish Air Quality Database and Website (SAQD) project.
The VCM uses purge (volatile) particulate matter measurements provided by FDMS (Filter Dynamics Measurement System) instruments located within 130 km of the TEOM in question to assess the loss of particulate matter (PM_{10}) from the TEOM. The TEOM measurements are then corrected to ambient pressure and temperature using meteorological data from met monitoring sites within 260 km of the TEOM. The volatile fraction is then added back on to the TEOM measurements to give Gravimetric Equivalent mass concentrations. Hourly average purge measurements from all Scottish FDMS monitoring sites within the Scottish Government-run network (SAQD) and the national network (AURN) were used for the correction.

Table A.1. Raw Unadjusted Monthly Diffusion Tube NO_2 Concentrations

ID	SITE	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Mean	% Data capture
1	DumbartonRd,Stirling (DT1)	41.8	38.0	33.9	35.2	39.5	29.5	34.2	40.6	22.8	37.5	46.7	28.1	35.7	100
2	Port St, Stirling (DT2)	39.7	39.0	31.7	29.5	28.1	26.5	-	28.4	21.9	32.2	41.7	41.7	30.2	91.7
3	Craigs Rbt, Stirling (DT3)	41.0	36.8	30.6	36.4	39.9	37.0	36.1	38.3	27.2	39.2	47.5	44.0	35.2	100
4A	Craigs Rbt, Stirling	33.2	36.1	26.7	1.2	46.0	24.9	25.3	30.7	24.3	37.3	42.8	37.0	30.5	100
4B	Craigs Rbt, Stirling	33.5	33.9	27.9	<1	42.9	23.8	24.4	29.9	23.4	35.6	47.1	40.9	33.0	100
4C	Craigs Rbt, Stirling	30.2	37.8	29.7	<1	35.4	24.2	25.0	29.4	24.3	33.6	43.3	40.9	32.2	100
4	*Craigs Rbt, Triplicate Average (DT4)*	*32.3*	*35.9*	*28.1*	*1.2*	*41.4*	*24.3*	*24.9*	*30.0*	*24.0*	*35.5*	*44.4*	*39.6*	*31.9*	100
5	Lennox Ave, Stirling (DT5)	23.7	21.3	16.3	13.1	16.1	13.1	13.4	15.1	3.6	18.6	24.1	27.3	17.1	100
6	Barnsdale Rd, Stirling (DT6)	-	28.6	19.4	18.3	20.8	16.9	19.6	21.1	13.8	21.9	-	29.9	21.0	83.3
7	Main St, Plean (DT7)	-	25.8	24.8	26.4	22.0	22.1	21.4	25.1	15.5	26.5	28.4	33.9	24.7	91.7
8	Alloa Rd Rbt, Stirling (DT8)	35.6	34.8	30.8	26.0	36.4	37.3	32.7	41.0	23.5	37.7	42.0	39.0	34.7	100
9	Henderson St, BOA (DT9)	39.4	63.9	34.6	29.8	22.4	27.0	23.1	27.7	24.0	31.0	35.1	35.0	32.8	100
10	Stirling Rd, Dunblane (DT10)	29.3	55.0	21.6	18.7	16.6	15.2	15.3	20.1	15.9	20.3	27.7	31.6	23.9	100

Table A.2. Local NO_2 Diffusion Tube Bias Correction Calculation

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	05/01/2012	01/02/2012	33.2	33.5	30.2	32	1.8	6	4.5
2	01/02/2012	29/02/2012	36.1	33.9	37.8	36	2.0	5	4.9
3	29/02/2012	28/03/2012	26.7	27.9	29.7	28	1.5	5	3.8
4	28/03/2012	25/04/2012	1.2	<1	<1				
5	25/04/2012	30/05/2012	46.0	42.9	35.4	41	5.5	13	13.5
6	30/05/2012	27/06/2012	24.9	23.8	24.2	24	0.6	2	1.4
7	27/06/2012	01/08/2012	25.3	24.4	25.0	25	0.5	2	1.1
8	01/08/2012	30/08/2012	30.7	29.9	29.4	30	0.7	2	1.6
9	30/08/2012	26/09/2012	24.3	23.4	24.3	24	0.5	2	1.3
10	26/09/2012	31/10/2012	37.3	35.6	33.6	36	1.9	5	4.6
11	31/10/2012	28/11/2012	42.8	47.1	43.3	44	2.4	5	5.8
12	28/11/2012	03/01/2013	37.0	40.9	40.9	40	2.3	6	5.6
13									

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
31	97	Good	Good
34	96	Good	Good
25	93	Good	Good
21	97		Good
23	94	Good	Good
18	97	Good	Good
19	92	Good	Good
26	33	Good	or Data Capture
26	100	Good	Good
37	97	Good	Good
43	95	Good	Good
40	95	Good	Good
Overall survey -->		Good precision	Good Overall DC

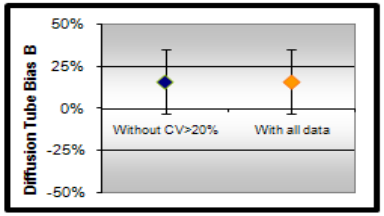
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Craigs Roundabout, Stirling

Precision: 11 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 10 periods of data	
Bias factor A	0.9 (0.77 - 1.08)
Bias B	12% (-7% - 31%)
Diffusion Tubes Mean:	33 μgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	30 μgm^{-3}
Data Capture for periods used:	96%
Adjusted Tubes Mean:	30 (25 - 36) μgm^{-3}

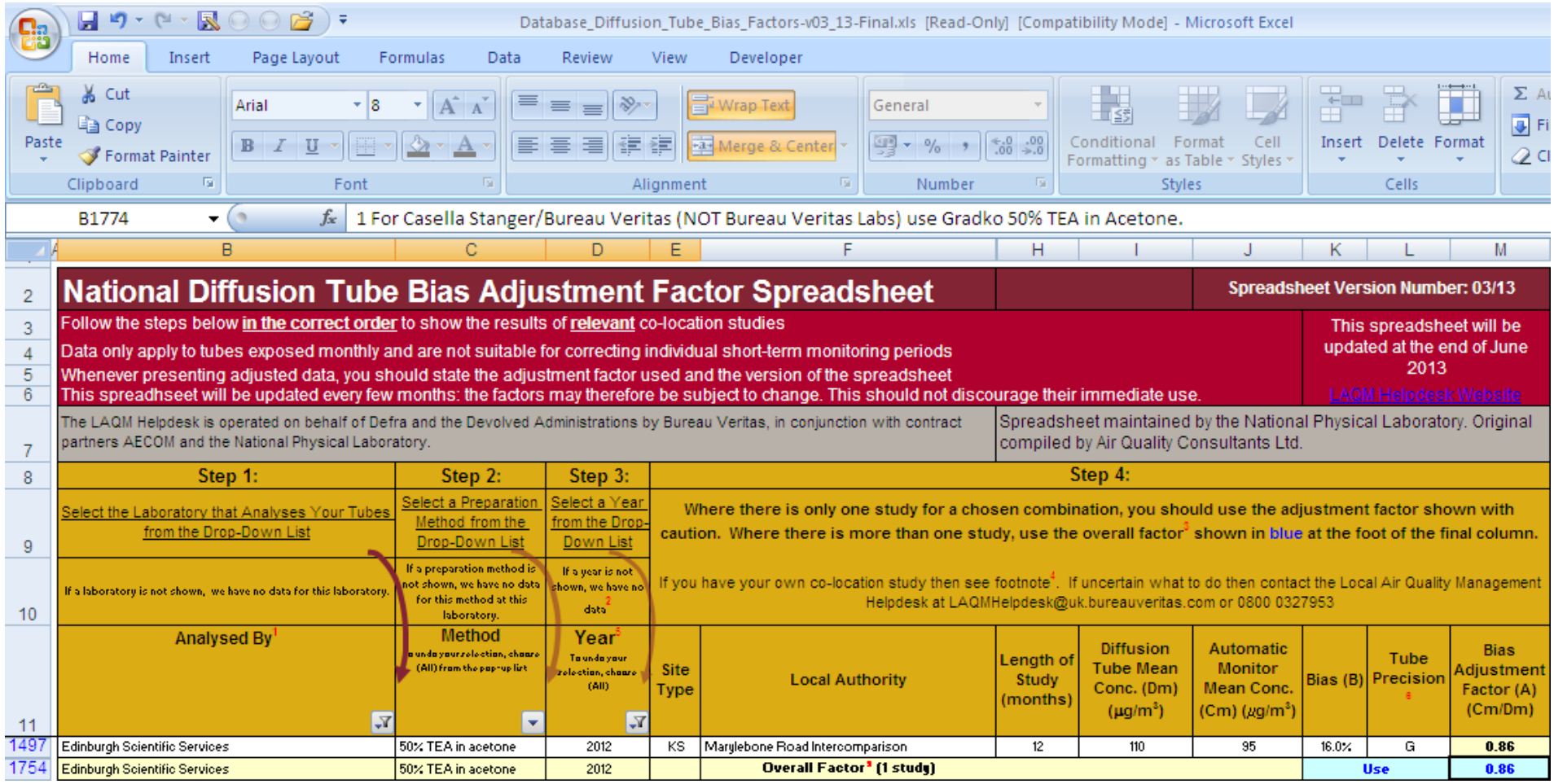
Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 10 periods of data	
Bias factor A	0.9 (0.77 - 1.08)
Bias B	12% (-7% - 31%)
Diffusion Tubes Mean:	33 μgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	30 μgm^{-3}
Data Capture for periods used:	96%
Adjusted Tubes Mean:	30 (25 - 36) μgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

If you have any enquiries about this spreadsheet please contact the LAQM Helpdesk at: LAQMHelpdesk@uk.bureauveritas.com

Table A.3. National NO_2 Diffusion Tube Bias Correction



Database_Diffusion_Tube_Bias_Factors-v03_13-Final.xls [Read-Only] [Compatibility Mode] - Microsoft Excel

Home | Insert | Page Layout | Formulas | Data | Review | View | Developer

B1774: 1 For Casella Stanger/Bureau Veritas (NOT Bureau Veritas Labs) use Gradko 50% TEA in Acetone.

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/13

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies

Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods

Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet

This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2013

LAQM Helpdesk Website

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 shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, 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 (To undo your selection, choose (All) from the pop-up list)	Year[5] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[a]	Bias Adjustment Factor (A) (Cm/Dm)
1497	Edinburgh Scientific Services	50% TEA in acetone	2012	KS	Marylebone Road Intercomparison	12	110	95	16.0%	G	**0.86**
1754	Edinburgh Scientific Services	50% TEA in acetone	2012		**Overall Factor[3] (1 study)**				**Use**		**0.86**

QA/QC of Automatic Monitoring

The automatic monitoring equipment is audited every 6 months by Ricardo-AEA, Glengarnock Technology Centre, Lochshore Business Park, Glengarnock. It is regularly serviced and calibrated by Enviro Technolgy Services. The Air Pollution Report for 2012 from Ricardo-AEA is shown below

QA/QC of Diffusion Tube Monitoring

The diffusion tubes used by Stirling Council are supplied and analysed by Edinburgh Scientific Services (ESS). The laboratory is UKAS accredited and participates in 3 schemes which ensure that the NO_2 tube results meet acceptable standards. These are:

- The WASP scheme - run by the Health & Safety Laboratory (HSL). Every 3 months ESS receives four diffusion tubes spiked with set amounts of nitrite. The tubes are analysed and results returned to HSL. Results are compared with the known spiking levels and with the results from other participating laboratories. Feedback on the performance is provided. The results from this scheme show that the laboratory achieved a Z score of between 0.0 and 1.1 during 2012.
- Field Intercomparison Study - run by National Physical Laboratory (NPL) as part of the Support to Local Authorities for Air Quality Management Contract funded by the Scottish Government, DEFRA and the Devolved Administrations. Every 3 months, 3 tubes and a blank which have been exposed at a field intercomparison site are supplied to ESS for analysis. The results are compared with those from the automatic chemiluminescent analyzer at the site, which is defined as the reference method for measurement of NO_2
- NO_2 Solution Test - run by NPL as part of the above contract. Every 6 months a QC NO_2 solution is provided to ESS. This solution is used as an internal check for analysis of NO_2 tubes in the laboratory and is tested after every 20 NO_2 tube samples.

Air Pollution Report

Produced by Ricardo-AEA on behalf of the Scottish Government

STIRLING CRAIG'S ROUNDABOUT
1st January to 31st December 2012

These data have been fully ratified by Ricardo-AEA

POLLUTANT	PM_{10}*	NO_2	NO_X
Maximum hourly mean	116 µg m^{-3}	151 µg m^{-3}	1692 µg m^{-3}
Maximum daily mean	51 µg m^{-3}	76 µg m^{-3}	929 µg m^{-3}
99.8th percentile of hourly means	-	122 µg m^{-3}	-
98.08th percentile of daily means	39 µg m^{-3}	-	-
Average	16 µg m^{-3}	29 µg m^{-3}	76 µg m^{-3}
Data capture	88.6 %	90.1 %	90.1 %

* PM_{10} as measured by a TEOM using the VCM for Gravimetric Equivalent concentrations.
All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.
NO_X mass units are NO_X as NO_2 µg m^{-3}

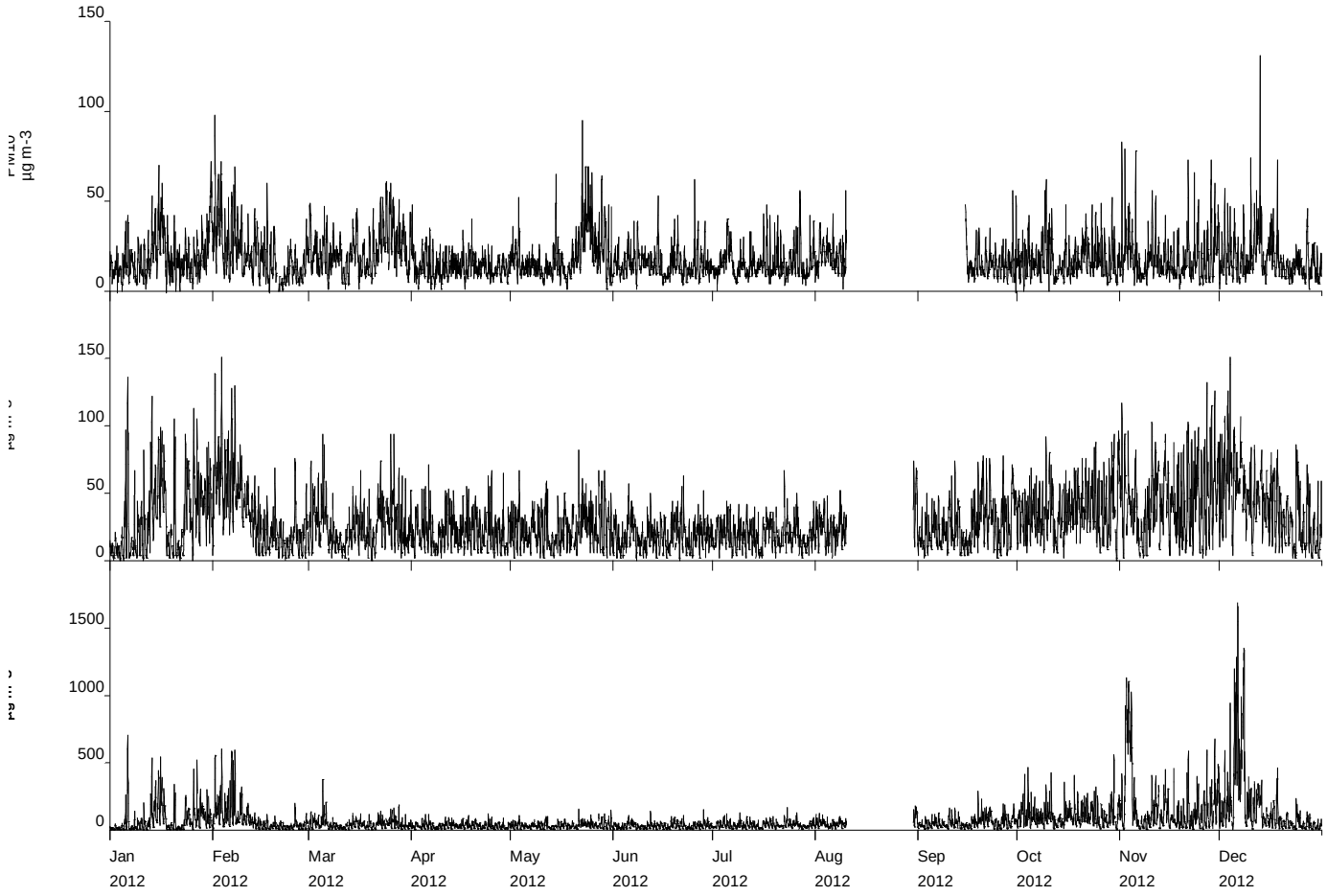
Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	1	1
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	0	-
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0

Note: For a strict comparison against the objectives there must be a data capture of >90% throughout the calendar year

RICARDO-AEA

Produced by Ricardo-AEA on behalf of the Scottish Government

Stirling Craig's Roundabout
Hourly Mean Data for 1st January to 31st December 2012



Appendix B: Biomass Boilers

Scottish Government feedback from the 2012 Updating & Screening Assessment stated "The report identifies biomass boilers which it states have been previously assessed. The Local Authority is advised to include the findings of assessments such as these in future reports. LAQM TG 09 also recommends that the Local Authority considers whether the assessment is adequate for LAQM purposes and states whether this is the case." Advice was sought from the LAQM helpdesk concerning a related enquiry concerning the assessment of biomass emissions as well as the most appropriate way of addressing the SG feedback. The advice received was to include the results of such assessments in the next Progress Report and to provide the information used in the Progress Report rather than wait until the next USA. These are therefore shown below. It is considered that the assessments were adequate for LAQM purposes.

Sauchieburn Estate – Woodchip burning Danstoker Multimiser biomass boiler

Figure B.1. PM_{10}

Review and Assessment Tool for PM_{10} from biomass combustion stacks

The maximum emissions of PM_{10} in g/s from biomass combustion source emissions are calculated for your given stack details. Greater emission rates may result in exceedence of the 24 hour objective for PM10 in England, Wales and Northern Ireland or the annual mean objective in Scotland.

Enter required information in Cream Cells
Resulting Emission in Red Bold

Building height	5.6	m
Stack diameter	0.2	m
Stack height	7.07	m
Location {Scotland, Rest of UK}	Scotland	
PM_{10} Annual mean background concentration (include roadside contribution at relevant receptors)	8	µg/m^3
Calculated Effective stack height	2.4	m
Target Emission Rate	0.0297	g/s

If the maximum stack emission rate is less than the target above then it is not likely that the most stringent objective for PM_{10} will be exceeded

Figure B.2. Annual NO_2

Review and Assessment Tool for oxides of nitrogen emissions from biomass combustion stacks
Annual mean NO_2 objective

The target emissions of NO_x in g/s from biomass combustion source emissions are calculated for your given stack details. Greater emission rates may result in exceedence of the annual mean objective for NO_2

Enter required information in Cream Cells
Resulting Emission in Red Bold

Building height	5.6	m
Stack diameter	0.2	m
Stack height	7.07	m
Location {Scotland, Rest of UK}	Scotland	
NO_2 Annual mean background concentration (include roadside contribution at relevant receptors)	6	µg/m^3
Calculated Effective stack height	2.4	m
Target Emission Rate	0.101	g/s

Figure B.3. Hourly NO_2

Review and Assessment Tool for oxides of nitrogen emissions from biomass combustion stacks
Hourly mean NO_2 objective

The target emissions of NO_x in g/s from biomass combustion source emissions are calculated for your given stack details. Greater emission rates may result in exceedence of the annual mean objective for NO_2

Enter required information in Cream Cells
Resulting Emission in Red Bold

Building height	5.6	m
Stack diameter	0.2	m
Stack height	7.07	m
Location {Scotland, Rest of UK}	Scotland	
NO_2 Annual mean background concentration (include roadside contribution at relevant receptors)	6	µg/m^3
Calculated Effective stack height	2.4	m
Target Emission Rate	0.1266	g/s

If the maximum stack emission rate is less than the target above then it is not likely that the hourly mean objective for NO_2 will be exceeded

Figure B.4. Combined Assessment

Sauchieburn	PM_{10}	NO_2 Annual Mean	NO_2 Hourly Mean
Enter emission factor (gGJ^{-1})	76	90	90
Enter net thermal input (kW)	200	500	500
Emission Rate (gs^{-1})=	0.015	0.045	0.045
Enter Background concentration ($\mu g\ m^{-3}$)	8	6	6
Background adjusted emission rate (gs^{-1})=	0.00063	0.00173	0.00173
Enter Target Emission Rate (gs^{-1}) from (Biomass Spreadsheet)	0.0030	0.1010	0.1266
Further assessment required?	No	No	No

The Green Welly Stop, Tyndrum - 199kW wood pellets/chips biomass boiler.

Figure B.5. PM_{10}

Review and Assessment Tool for PM_{10} from biomass combustion stacks

The maximum emissions of PM_{10} in g/s from biomass combustion source emissions are calculated for your given stack details. Greater emission rates may result in exceedence of the 24 hour objective for PM10 in England, Wales and Northern Ireland or the annual mean objective in Scotland.

Enter required information in Cream Cells
Resulting Emission in Red Bold

Building height	3	m
Stack diameter	0.2	m
Stack height	6	m
Location {Scotland, Rest of UK}	Scotland	
PM_{10} Annual mean background concentration (include roadside contribution at relevant receptors)	7	$\mu g/m^3$
Calculated Effective stack height	5.0	m
Target Emission Rate	0.057	g/s

If the maximum stack emission rate is less than the target above then it is not likely that the most stringent objective for PM_{10} will be exceeded

Figure B.6. Annual NO_2

Review and Assessment Tool for oxides of nitrogen emissions from biomass combustion stacks
Annual mean NO_2 objective

The target emissions of NO_x in g/s from biomass combustion source emissions are calculated for your given stack details. Greater emission rates may result in exceedence of the annual mean objective for NO_2

Enter required information in Cream Cells
Resulting Emission in Red Bold

Building height	3	m
Stack diameter	0.2	m
Stack height	6	m
Location {Scotland, Rest of UK}	Scotland	
NO_2 Annual mean background concentration (include roadside contribution at relevant receptors)	3	$\mu g/m^3$
Calculated Effective stack height	5.0	m
Target Emission Rate	0.1918	g/s

If the maximum stack emission rate is less than the target above then it is not likely that the annual mean limit value for NO_2 will be exceeded

Figure B.7. Hourly NO_2

Review and Assessment Tool for oxides of nitrogen emissions from biomass combustion stacks
Hourly mean NO_2 objective

The target emissions of NO_x in g/s from biomass combustion source emissions are calculated for your given stack details. Greater emission rates may result in exceedence of the annual mean objective for NO_2

Enter required information in Cream Cells
Resulting Emission in Red Bold

Building height	3	m
Stack diameter	0.2	m
Stack height	6	m
Location {Scotland, Rest of UK}	Scotland	
NO_2 Annual mean background concentration (include roadside contribution at relevant receptors)	3	$\mu g/m^3$
Calculated Effective stack height	5.0	m
Target Emission Rate	0.2117	g/s

If the maximum stack emission rate is less than the target above then it is not likely that the hourly mean objective for NO_2 will be exceeded

Figure B.8. Combined Assessment

Green Welly Stop	PM_{10}	NO_2 Annual Mean	NO_2 Hourly Mean
Enter emission factor (gGJ^{-1})	76	90	90
Enter net thermal input (kW)	199	199	199
Emission Rate (gs^{-1})=	0.015	0.018	0.018
Enter Background concentration ($\mu g\ m^{-3}$)	7	3	3
Background adjusted emission rate (gs^{-1})=	0.00060	0.00062	0.00062
Enter Target Emission Rate (gs^{-1}) from (Biomass Spreadsheet)	0.0570	0.1918	0.1266
Further assessment required?	No	No	No

Falls Of Dochart Inn, Gray Street, Killin - 75 kW log burning biomass boiler.

Figure B.9. PM_{10}

Review and Assessment Tool for PM_{10} from biomass combustion stacks

The maximum emissions of PM_{10} in g/s from biomass combustion source emissions are calculated for your given stack details. Greater emission rates may result in exceedence of the 24 hour objective for PM10 in England, Wales and Northern Ireland or the annual mean objective in Scotland.

Enter required information in Cream Cells
Resulting Emission in Red Bold

Building height	5.6	m
Stack diameter	0.2	m
Stack height	7.3	m
Location {Scotland, Rest of UK}	Scotland	
PM_{10} Annual mean background concentration (include roadside contribution at relevant receptors)	7	$\mu g/m^3$
Calculated Effective stack height	2.8	m
Target Emission Rate	0.0364	g/s

If the maximum stack emission rate is less than the target above then it is not likely that the most stringent objective for PM_{10} will be exceeded

Figure B.10. Annual NO_2

Review and Assessment Tool for oxides of nitrogen emissions from biomass combustion stacks
Annual mean NO_2 objective

The target emissions of NO_x in g/s from biomass combustion source emissions are calculated for your given stack details. Greater emission rates may result in exceedence of the annual mean objective for NO_2

Enter required information in Cream Cells
Resulting Emission in Red Bold

Building height	5.6	m
Stack diameter	0.2	m
Stack height	7.3	m
Location {Scotland, Rest of UK}	Scotland	
NO_2 Annual mean background concentration (include roadside contribution at relevant receptors)	3	$\mu g/m^3$
Calculated Effective stack height	2.8	m
Target Emission Rate	0.1225	g/s

If the maximum stack emission rate is less than the target above then it is not likely that the annual mean limit value for NO_2 will be exceeded

Figure B.11. Hourly NO_2

Review and Assessment Tool for oxides of nitrogen emissions from biomass combustion stacks
Hourly mean NO_2 objective

The target emissions of NO_x in g/s from biomass combustion source emissions are calculated for your given stack details. Greater emission rates may result in exceedence of the annual mean objective for NO_2

Enter required information in Cream Cells
Resulting Emission in Red Bold

Building height	5.6	m
Stack diameter	0.2	m
Stack height	7.3	m
Location {Scotland, Rest of UK}	Scotland	
NO_2 Annual mean background concentration (include roadside contribution at relevant receptors)	3	$\mu g/m^3$
Calculated Effective stack height	2.8	m
Target Emission Rate	0.1423	g/s

If the maximum stack emission rate is less than the target above then it is not likely that the hourly mean objective for NO_2 will be exceeded

Figure B.12. Combined Assessment

Falls of Dochart Inn	PM_{10}	NO_2 Annual Mean	NO_2 Hourly Mean
Enter emission factor (gGJ^{-1})	76	90	90
Enter net thermal input (kW)	75	75	75
Emission Rate (gs^{-1})=	0.006	0.007	0.007
Enter Background concentration ($\mu g\ m^{-3}$)	7	3	3
Background adjusted emission rate (gs^{-1})=	0.00023	0.00023	0.00023
Enter Target Emission Rate (gs^{-1}) from (Biomass Spreadsheet)	0.0364	0.1225	0.1423
Further assessment required?	No	No	No