2012 Air Quality Updating and Screening Assessment for Stirling Council

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

April, 2012

TSI Scotland

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Executive Summary

The 2012 Updating and Screening Assessment Report for Stirling Council was undertaken by TSI Scotland Ltd in accordance with Local Air Quality Management Technical Guidance LAQM.TG(09) (Ref.1).

New monitoring data for NO_2 and PM_{10} were analysed to determine if any air quality objectives had been exceeded during 2011. All concentrations were found to be below the objectives.

Examination of the previous 5 years of data show that there is no obvious trend in annual mean NO_2 concentrations across the diffusion tube network although the concentration has decreased at 8 out of 10 sites between 2010 and 2011. Data from the automatic monitoring station at Craigs Roundabout, Stirling have 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 has 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 air quality objectives for any pollutant.

A new retail park comprising a foodstore, 2 retail units, car park, service yard and landscaping to be located at Burghmuir Industrial Estate, Stirling was given full planning permission in February 2012. The air quality assessment that was submitted with the application considered a projected traffic increase on the A9 Burghmuir Road of 17%. The DMRB assessment predicted an annual mean concentration of 13.1µg/m^3 of PM_{10} and 26.8µg/m^3 of NO_2 at receptor locations 5m from the centre of Burghmuir road. The submitted assessment assumed a vehicle split of 99% LDV and 1% HGV and a speed of 30mph. For the purposes of LAQM, the DMRB assessment was repeated for 2012 with an estimated higher proportion of HGVs of 10% and a slower vehicle speed of 20mph. The results were an annual mean concentration of 13.6µg/m^3 of PM_{10} and 29.8µg/m^3 of NO_2. It was therefore

concluded that the development would not result in an exceedence of the air quality limit of 18µg/m^3.

The site entrance is approximately 50m from Craigs Roundabout monitoring site in Stirling where the annual mean PM_{10} concentration was 16µg/m^3 for 2011. It is likely that this monitoring site will record any influence of traffic increases on this section of the road on local air quality and it is therefore not necessary to undertake any additional monitoring at this time.

Data obtained from the Department for Transport showed that the A9, Henderson Street in Bridge of Allan experienced a growth in traffic flow of 32% from 9327 to 12,374. There is an NO_2 diffusion tube located in Henderson Street which has recorded an annual mean concentration of between 23.3 and 30.8µg/m^3 over the last five years. A DMRB assessment was undertaken using background concentrations for 2010 with the increased traffic flow figures to check the predicted PM_{10} concentration at this location. The results showed a predicted annual mean concentration of 14.7µg/m^3. It is therefore concluded that it is not necessary to proceed to a Detailed Assessment for NO_2 or PM_{10} for this location and diffusion tube monitoring will continue.

It was determined that there were no other 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 Progress Report in April 2013.

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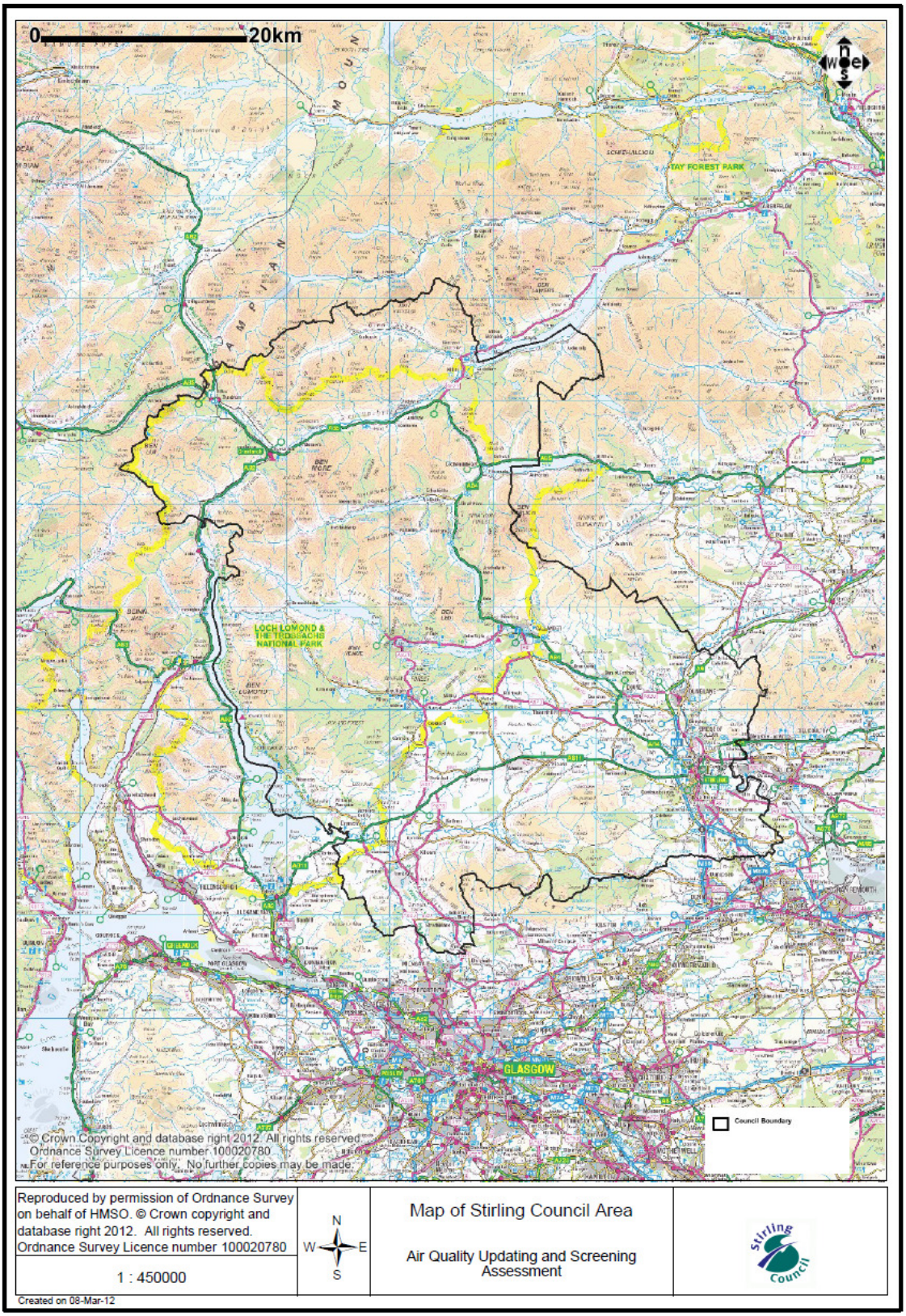
1 Introduction

1.1 Description of Local Authority Area

Stirling Council is located in the centre of Scotland and covers approximately 2,196 square kilometres. 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 Stirling Council is provided in Figure 1.1.

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 south-eastern area around Stirling, Cowie, Bridge of Allan and Dunblane. 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.

Figure 1.1 Map of Stirling Council Area



1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

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

1.3 Air Quality Objectives

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

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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	3.25 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 $\mu g/m^3$	Annual mean	31.12.2010
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, 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 Summary of Previous Air Quality Review and Assessment Reports 2004-2010

Report	Date Completed	Summary and Conclusions
Progress Report 2011 (Ref.2)	October 2011	New monitoring data confirmed that there were no exceedences of the Air Quality Strategy (AQS) objectives for nitrogen dioxide (NO_2) and (PM_{10}) during 2010.
Progress Report 2010 (Ref.3)	Nov 2010	The PM_{10} annual mean concentration at Craigs Roundabout, Stirling was 19µg/m^3 and therefore exceeded the objective. However, there were extensive demolition works adjacent to the monitoring location. It was concluded that monitoring should continue and that there was no need to proceed to a Detailed Assessment. It was also concluded that there was no risk of exceedences of any other AQS pollutant objectives.
Updating and Screening Assessment 2009 (Ref.4)	Jun 2009	New monitoring data confirmed that there were no exceedences of the Air Quality Strategy (AQS) objectives for nitrogen dioxide (NO_2) and (PM_{10}) during 2008. It was also concluded that there was no risk of exceedences of any other AQS pollutant objectives.
Progress Report 2008 (Ref.5)	2008	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 TEOM concentrations and applying the 1.3 gravimetric equivalent adjustment factor. Based on the updated industrial, domestic, commercial and road traffic information, it was concluded to be unlikely that any other AQS objective would be exceeded in the Stirling Council area.
Progress Report 2007 (Ref.6)	2007	Diffusion tube monitoring highlighted that annual mean NO_2 concentrations at Port Street remained close to the objective of 40µg/m^3. 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 were recommended.
Updating and Screening Assessment 2006 (Ref.7)	August 2006	The report concluded that there was unlikely to be an exceedence of the AQS objectives at locations of relevant public exposure. The measured NO_2 annual mean concentration at Port Street in Stirling was, however, close to the AQS 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.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Stirling Council has previously operated two automatic analysers. One located at Craigs Roundabout, Stirling and one at Main Street, Cowie. The OSIRIS light scattering monitor located at Cowie was decommissioned during 2011. This was due to the history of decreasing results recorded at the site from 13-6.3µg/m^3 between 2006 and 2010. The monitor is still in working order and is available for use at another location should a need be identified for further particulate monitoring.

At Craigs Roundabout, there is a chemiluminescence NO_x automatic analyser and a Tapered Element Oscillating Microbalance (TEOM) analyser for PM_{10}. Details of the automatic monitoring site are presented in Table 2.1. The locations of all monitoring sites (automatic and non-automatic) within the Council area are presented in Figures 2.1-2.3.

The data capture for the site was 93.9% for NO_2 and 88.8% for PM_{10}. Routine calibrations are carried out by Casella and 6 monthly site audits are carried out by AEA. The QA/QC procedures and data ratification reports are described in more detail in Appendix A.

Figure 2.1 Map of Automatic Monitoring Site at Craigs Roundabout, Stirling

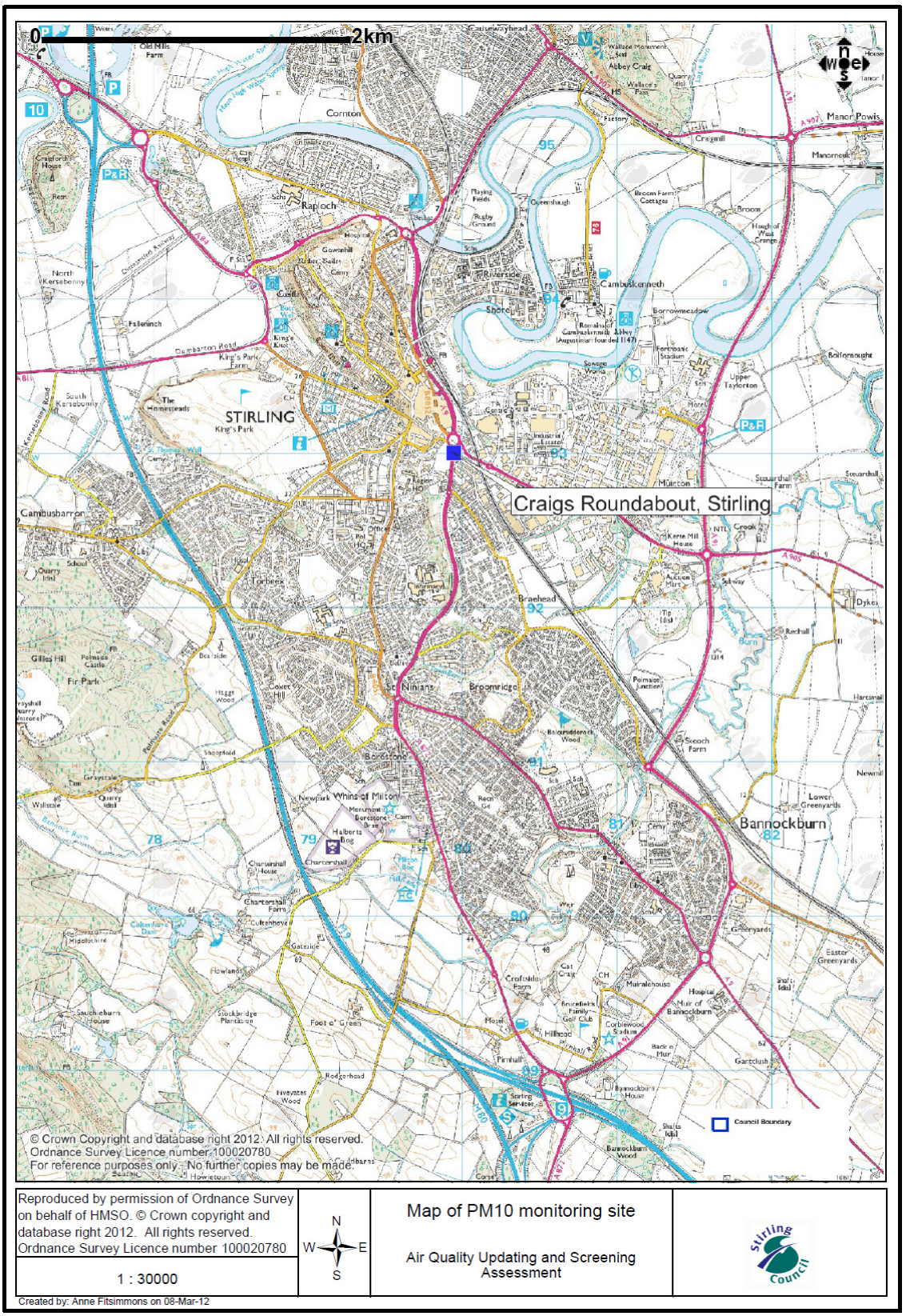


Figure 2.2 Detailed Map of Automatic Monitoring Site at Craigs Roundabout, Stirling

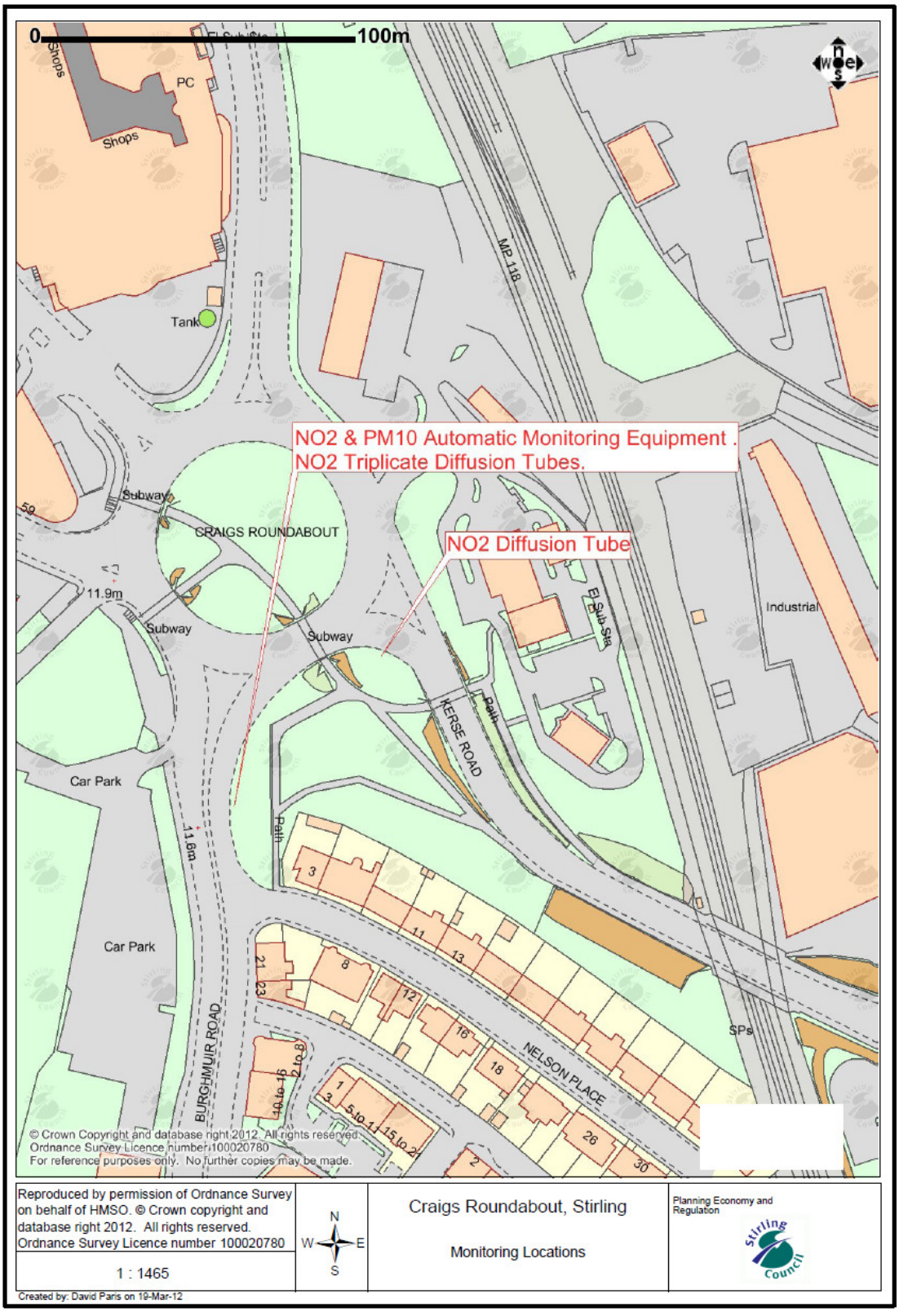


Table 2.1 Details of Craigs Roundabout Automatic Monitoring Site

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

2.1.2 Non-Automatic Monitoring Sites

Non-automatic monitoring is carried out for NO_2 only. There were 22 sites until April 2010 when the number was reduced to 10 based on the history of consistently low concentrations recorded across the network in previous years. 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 91.6% for 2011. (The January 2011 tubes were not collected and analysed due to the severe weather) 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

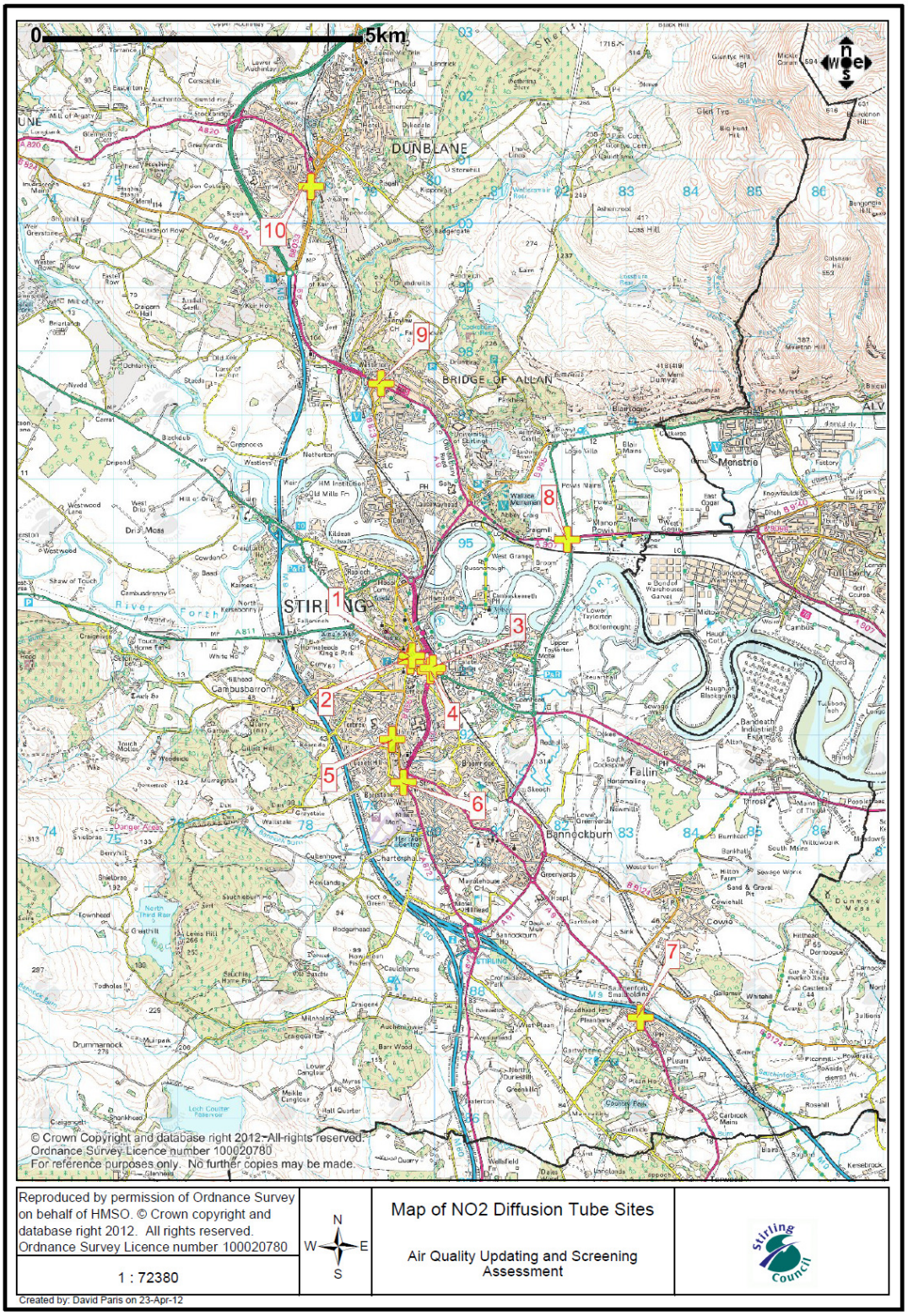


Table 2.2 Details of Non-Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
Dumbarton Road, Stirling	Kerbside	279655	693240	NO_2	N	N	Y (2m)	0.5m	Y
Port Street, Stirling	Kerbside	279634	693160	NO_2	N	N	Y (2m)	0.5m	Y
Craigs Roundabout (1)	Roadside	279987	693043	NO_2	N	N	N	2m	Y
Craigs Roundabout (2) (automatic analyser)	Roadside	279944	693005	NO_2	N	Y	Y (10m)	3m	Y
Lennox Avenue, Stirling	Urban background	279354	691933	NO_2	N	N	N (4m)	1.5m	N
Barnsdale Road, Stirling	Roadside	279520	691252	NO_2	N	N	Y (18m)	1.5m	Y
Main Street, Plean	Roadside	283222	687582	NO_2	N	N	Y (6m)	1.5m	Y
Alloa Road Roundabout	Roadside	282075	695057	NO_2	N	N	Y (9m)	2m	Y
Henderson Street, Bridge of Allan	Roadside	279177	697497	NO_2	N	N	Y (7m)	1.5m	Y
Stirling Road, Dunblane	Roadside	278081	700580	NO_2	N	N	Y (8m)	1.5m	Y

2.2 Comparison of Monitoring Results with AQ Objectives

2.2.1 Nitrogen Dioxide

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 2.4 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 with an average of 29.2µg/m^3.

Figure 2.4 Trend Graph for the Annual Mean Nitrogen Dioxide Concentration measured at the Automatic Monitoring Site at Craigs Roundabout, Stirling

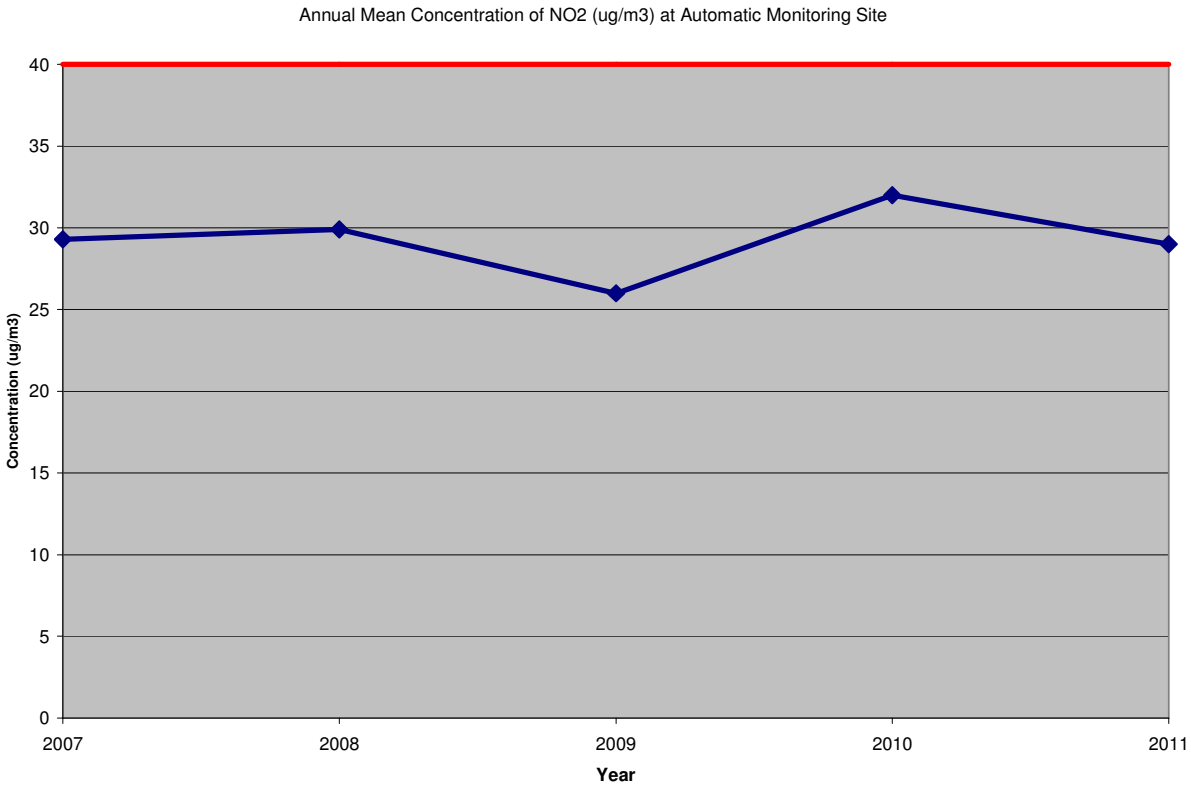


Table 2.3 Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture 2011 % [b]	Annual Mean Concentration µg/m^3				
				2007	2008	2009	2010	2011
3-Craigs Roundabout	Roadside	N	93.9%	29.3	29.9	26	32	29

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

Site ID	Site Type	Within AQMA?	Valid Data Capture 2011 % [b]	Number of Exceedences of 1-hour Objective of 200µg/m^2				
				2007	2008	2009	2010	2011
3-Craigs Roundabout	Roadside	N	93.9%	0	0	0	0	1

Diffusion Tube Monitoring Data

A summary of the bias-adjusted annual mean diffusion tube concentrations of NO_2 across the monitoring network for 2011 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 that the annual mean NO_2 concentration has consistently remained below the limit concentration of 40µg/m^3 during the last 5 years with a decrease at 8 out of 10 sites between 2010 and 2011.

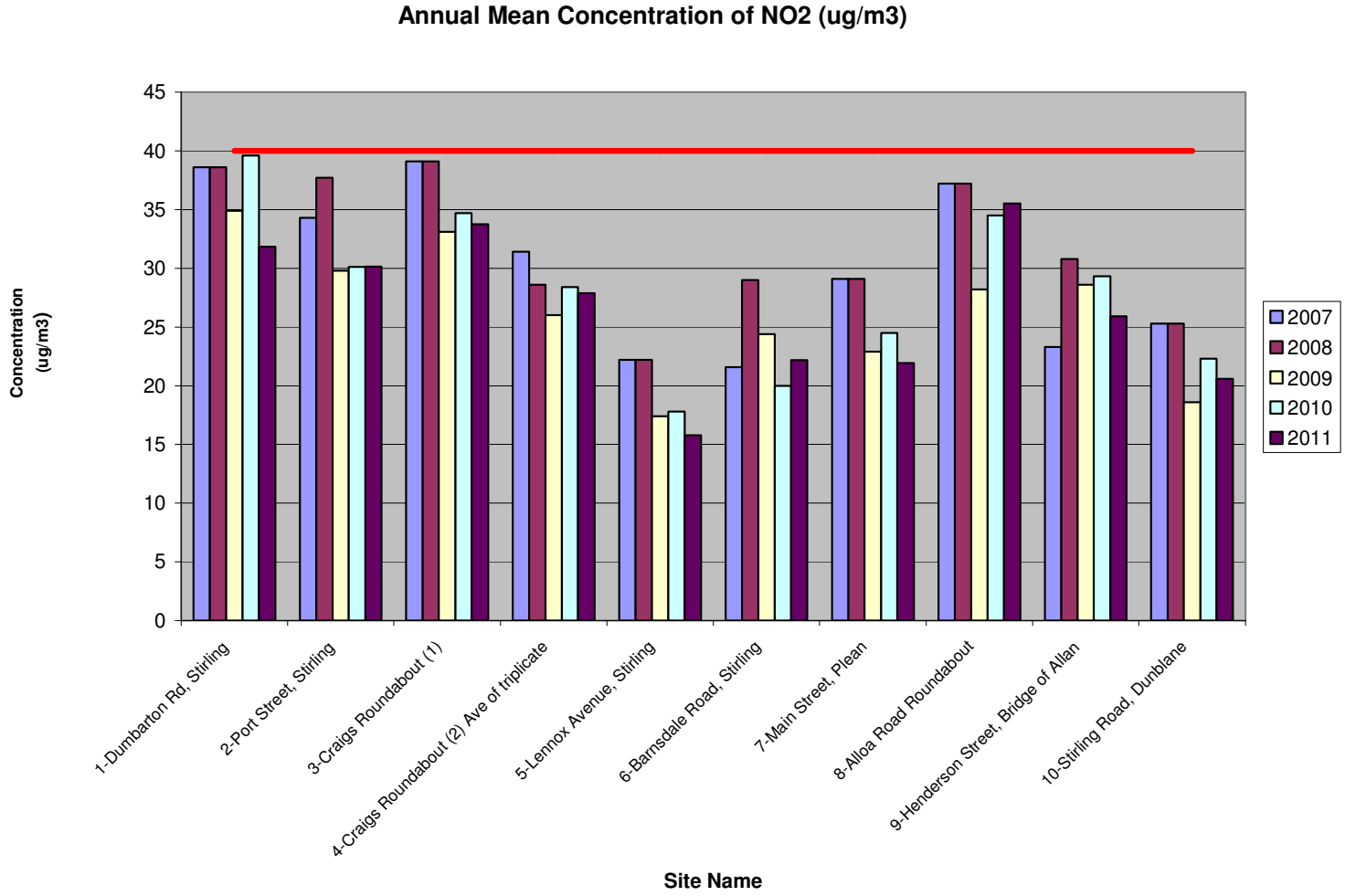
Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2011

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment Factor = 1.02) 2011 (µg/m^3)
1	Dumbarton Road, Stirling	Kerbside	N	N	91.7	N	N	31.8
2	Port Street, Stirling	Kerbside	N	N	91.7	N	N	30.1
3	Craigs Roundabout (1)	Roadside	N	N	91.7	N	N	33.7
4	Craigs Roundabout (2) (automatic analyser)	Roadside	N	**Triplicate and Collocated Tube**	91.7	N	N	28.2
5	Lennox Avenue, Stirling	Urban background	N	N	91.7	N	N	27.3
6	Barnsdale Road, Stirling	Roadside	N	N	91.7	N	N	28.1
7	Main Street, Plean	Roadside	N	N	91.7	N	N	27.9
8	Alloa Road Roundabout	Roadside	N	N	91.7	N	N	15.8
9	Henderson Street, Bridge of Allan	Roadside	N	N	91.7	N	N	22.2
10	Stirling Road, Dunblane	Roadside	N	N	91.7	N	N	21.9

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2011)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m^3				
			2007 (Bias Adjustment Factor = 1.065)	2008 (Bias Adjustment Factor = 1.06)	2009 (Bias Adjustment Factor = 0.92)	2010 (Bias Adjustment Factor = 1.08)	2011 (Bias Adjustment Factor = 1.02)
1	Dumbarton Road, Stirling	N	38.6	38.6	34.9	39.6	31.8
2	Port Street, Stirling	N	34.3	37.7	29.8	30.1	30.1
3	Craigs Roundabout (1)	N	39.1	39.1	33.1	34.7	33.7
4	Craigs Roundabout (2) (automatic analyser)	N	31.4	28.6	26.0	28.4	28.2
5	Lennox Avenue, Stirling	N	22.2	22.2	17.4	17.8	27.3
6	Barnsdale Road, Stirling	N	21.6	29.0	24.4	20.0	28.1
7	Main Street, Plean	N	29.1	29.1	22.9	24.5	27.9
8	Alloa Road Roundabout	N	37.2	37.2	28.2	34.5	15.8
9	Henderson Street, Bridge of Allan	N	23.3	30.8	28.6	29.3	22.2
10	Stirling Road, Dunblane	N	25.3	25.3	18.6	22.3	21.9

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



2.2.2 PM_{10}

Automatic Monitoring Data

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 2007-2011 has 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.

The TEOM concentrations have been corrected using the Volatile Correction Method (VCM) (latest version Ref.8)

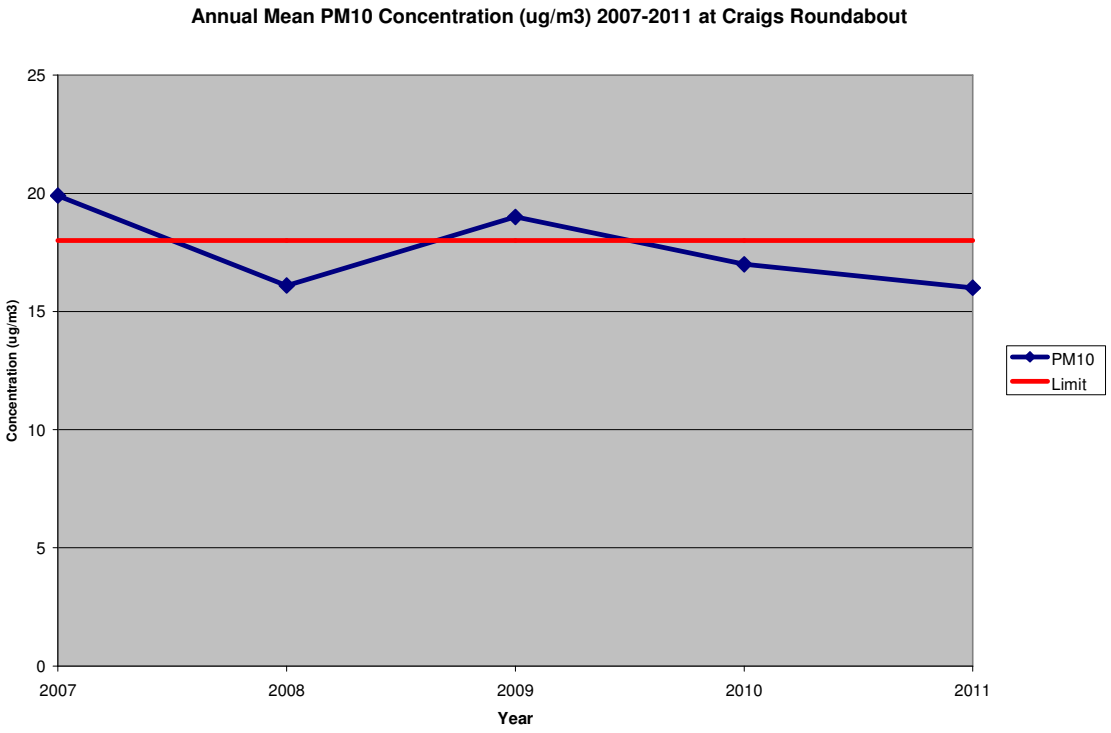
Table 2.7 Results of Automatic Monitoring of PM_{10}: Comparison with Annual Mean Objective of 18µg/m^2

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %	Valid Data Capture 2011 %	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration µg/m^3				
						2007	2008	2009	2010	2011
3-Craigs Roundabout	Roadside	N	88.8	88.8	Y	19.9	16.1	19	17	16

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 2011 %	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 µg/m^3)				
						2007	2008	2009	2010	2011
3-Craigs Roundabout	Roadside	N	88.8	88.8	Y	4	0	4	0	1

Figure 2.6 Trends in Annual Mean PM_{10} Concentration



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 the Council area. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 Road Traffic Sources

The Roads and Transport Services department of Stirling Council was consulted in order to check if there were any new potential road traffic sources or significantly changed traffic sources within the Stirling Council area that could result in exceedences of air quality standards. Traffic count data for trunk roads and motorways were obtained from Transport Scotland (www.transportscotland.gov.uk) and the Department for Transport (www.dft.gov.uk) in order to determine if there were any busy roads with a large increase in traffic flow. Data from the latter 2 web sites were only available up to 2010, so growth figures were calculated between 2009 and 2010. The results are discussed in the appropriate sections below.

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

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

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

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

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

Stirling Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

3.4 Junctions

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

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

A new junction to provide access to a new retail park will be constructed on Burghmuir Road in Stirling, opposite Colquhoun Street before 2015. The traffic impact of this development was assessed in an Air Quality Assessment (Ref.9) and is discussed in more detail in Section 3.6.

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

3.6 Roads with Significantly Changed Traffic Flows

Traffic count data from the Department for Transport (www.dft.gov.uk) were compared between 2009 and 2010 for major trunk roads and motorways within the Stirling Council area. For most road links the traffic flow was reduced with the average reduction being 0.4%. One road link, the A9, Henderson Street, through Bridge of Allan showed an increase in traffic flow of 32% from 9327 to 12,374. There were no specific changes in transport planning to cause this increase and the reason for the increase is not known.

There is an NO_2 diffusion tube located in Henderson Street which has recorded an annual mean concentration of between 23.3 and 30.8µg/m^3 over the last five years. A DMRB assessment was undertaken using background concentrations for 2010 with the increased traffic flow figures to check the predicted PM_{10} concentration at this location. The DMRB calculation is shown in Appendix B. The results showed a predicted annual mean concentration of 14.7µg/m^3. It is therefore concluded that it is not necessary to proceed to a Detailed Assessment for NO_2 or PM_{10} for this location, although diffusion tube monitoring will continue.

A new retail park comprising a foodstore, 2 retail units, car park, service yard and landscaping to be located at Burghmuir Industrial Estate, Stirling was given full planning permission in February 2012. The air quality assessment that was submitted with the application (Ref.9) considered a projected traffic increase on the A9 Burghmuir Road of 17%. The DMRB assessment predicted an annual mean concentration of 13.1µg/m^3 of PM_{10} and 26.8µg/m^3 of NO_2 at receptor locations 5m from the centre of Burghmuir road. The submitted assessment assumed a vehicle split of 99% LDV and 1% HGV and a speed of 30mph. For the purposes of LAQM, the DMRB assessment was repeated for 2012 with an estimated higher proportion of HGVs of 10% due to the type of development and a slower vehicle speed of 20mph (30km/hr). The results showed an annual mean concentration of 13.6µg/m^3 of PM_{10} and 29.8µg/m^3 of NO_2. It was therefore concluded that the development will be unlikely to result in an exceedence of the air quality limits for either pollutant.

The site entrance is approximately 50m from Craigs Roundabout monitoring site in Stirling where the annual mean PM_{10} concentration was 16µg/m^3 for 2011. It is likely that this monitoring site will record any influence of traffic increases on this section of the road on local air quality and it is therefore not necessary to undertake any additional monitoring at this time.

Stirling Council has assessed new/newly identified roads with significantly changed traffic flows, and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.7 Bus and Coach Stations

The Stirling Council Public Transport Co-ordinator confirmed that the total number of movements at Stirling Bus Station in the Thistle Centre was approximately 16,000 every 4 weeks, or <600 per day. The criterion for assessment where there is relevant exposure within 10m is 2,500 movements a day. It is therefore concluded that no DMRB assessment is required.

Stirling Council confirms that there are no relevant bus stations in the Local Authority area that require Detailed Assessment.

4 Other Transport Sources

4.1 Airports

There are no Airports within the Stirling Council area.

Stirling Council confirms that there are no airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

There are two train stations within Stirling Council at Stirling and Dunblane which have been assessed in previous rounds of Review and Assessment for the potential impact from stationary trains. There has been no increase in the number of stationary trains with engines running within relevant exposure and engines are generally switched off. No further assessment was therefore undertaken.

There has been no significant increase in the number of diesel passenger trains on the main train lines throughout the Stirling Council area since the last round of Review and Assessment. No further assessment was therefore undertaken.

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

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

4.3 Ports (Shipping)

There are no ports within the Stirling Council area.

Stirling Council confirms that there are no ports or shipping within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

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

Planning consent was granted in November 2011 for a wood-fired combined heat and power (CHP) plant at Acharn, Stirlingshire. A detailed air quality assessment which included dispersion modelling (Ref.10) was undertaken and submitted with the application. The scope of the study was agreed with Stirling Council and Loch Lomond and Trossachs National Park Authority prior to commencement. The study considered a range of stack heights and considered the potential impact on local air quality of emissions of NO_2, PM_{10}, $PM_{2.5}$, and CO. The assessment concluded that there would be no adverse air quality impacts as a result of the proposed development.

A proposed Waste to Energy facility which was discussed in the 2011 Progress Report (Ref.2) was refused planning permission in March 2012. No further assessment is required at this location.

Stirling Council has assessed new/proposed industrial installations, and concluded that it will not be necessary to proceed to a Detailed Assessment.

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

The Scottish Environment Protection Agency (SEPA) was contacted to obtain up to date information on regulated industrial processes within the Stirling Council area. It was confirmed that there are no existing installations where emissions have increased substantially or new relevant exposure has been introduced.

After consultation with SEPA, Stirling Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure within its area or nearby in a neighbouring authority.

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

After consultation with SEPA, it was confirmed that there are no new or significantly changed industrial installations with no previous air quality assessments within the Stirling Council area.

After consultation with SEPA, Stirling Council confirms that there are no new or significantly changed industrial installations for which planning approval has been granted with no previous air quality assessment within its area or nearby in a neighbouring authority.

5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

5.3 Petrol Stations

There are no new petrol stations with annual throughput of over 2000m^3 of petrol.

Stirling Council confirms that there are no petrol stations meeting the specified criteria**.**

5.4 Poultry Farms

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

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

The 2011 Progress Report (Ref.2) discussed an approved planning application for the erection of a new boilerhouse for a district heating scheme using a woodchip boiler at land some 30m south west of 5 Lyon Crescent, Bridge Of Allan. The development includes a ceramic filter to remove 99% of particulate emissions. The scheme was approved in September 2010 and was operational at the end of March 2011.

An application to install a Heizomat HSK-RA 150 (150kW) pellet and woodchip fired biomass boiler at Fintry Sports Centre was previously assessed and granted consent in May 2011. It is now operational.

An application which included the installation of a woodchip boiler at Duchray Castle, Aberfoyle was previously assessed and granted consent in March 2012. It is not yet operational.

Planning consent was granted in November 2011 for a wood-fired CHP plant at Acharn, Stirlingshire. A detailed air quality assessment which included dispersion modelling (Ref.10) was undertaken and submitted with the application. The assessment concluded that there would be no adverse air quality impacts as a result of the proposed development. The development is not yet operational.

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

6.2 Biomass Combustion – Combined Impacts

The locations of the previously assessed, new and proposed biomass installations are summarised in Table 6.1. There are no clusters of installations in 500 x 500 metre squares that could result in cumulative impacts of emissions of PM_{10}.

Table 6.1 Locations of Installed, Permitted and Proposed Biomass Combustion Plant in Stirling Council

Location	Planning Reference	Status	OS Grid Reference Easting	OS Grid Reference Northing
Fintry Sports Club (150kW)	10/00175/FUL	Operational	261495	686868
Land South of 5 Lyon Cres, Bridge of Allan, (220kW)	10/00360/FUL	Operational	279080	696987
Duchray Castle, Aberfoyle	2011/0108/DET	Permitted Not Yet Operational	248070	699799
Acharn CHP (5.4MW)	2011/0011/DET	Permitted Not Yet Operational	255500	731000

Stirling Council has assessed the potential cumulative impacts of biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.3 Domestic Solid-Fuel Burning

Previous reports concluded that there were no areas of domestic solid-fuel burning with a density of greater than 100 houses in a 500 x 500m area. There have been no new areas of development with significant solid-fuel burning and it is therefore not necessary to undertake any further assessment.

Stirling Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources

It is recognised that there is the potential for fugitive dust emissions during construction of the retail park development at Burghmuir Industrial Estate in Stirling. Construction is due to start before 2015. The development site is within 50m of the automatic monitoring station at Craigs Roundabout where the annual mean PM_{10} concentration was 16µg/m^3 in 2011. Concentrations of PM_{10} will be continuously monitored and regularly analysed to determine if there are any short term peaks that coincide with activity at the site. If elevated concentrations continue after the development is complete then it may be possible to temporarily locate the OSIRIS monitor in the vicinity of the development to check localised concentrations in a future Detailed Assessment. It is not considered necessary to proceed to a Detailed Assessment at this time.

SEPA confirmed that there were no new industrial sources of fugitive emissions within Stirling Council.

Stirling Council has identified a potential source of fugitive particulate matter that meets specified criteria. The source is the construction of a new retail park near Burghmuir Industrial Estate, Stirling. The potential is short-term and PM_{10} will be continuously monitored in the vicinity during and post-construction.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

During 2011, 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 met during 2011 at all monitoring locations. There are no existing AQMAs within the Council area and it is concluded that no Detailed Assessment is required because of monitoring data.

8.2 Conclusions from Assessment of Sources

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 emissions sources.

8.3 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 OSIRIS particulate monitor may be temporarily located in the vicinity of the Burghmuir Industrial Estate Retail Park development during and post construction if this is found to be necessary.

The next report to be submitted is the 2013 Progress Report.

9 References

Ref.1 Local Air Quality Management Technical Guidance LAQM.TG(09), Department for Environment, Food and Rural Affairs, 2009

Ref.2 2011 Progress Report

Ref.3 2010 Progress Report

Ref.4 2009 Updating and Screening Assessment, BMT Cordah Ltd Report Number G_STI_023, June 2009

Ref.5 2008 Progress Report

Ref.6 2007 Progress Report

Ref.7 2006 Updating and Screening Assessment

Ref.8 Volatile Correction Model, Environmental Research Group, King's College London, SE1 9NH – http://www.volatile-correction-model.info/

Ref.9 Stirling Development Agency, Burghmuir, Stirling Air Quality Assessment. A report by Hyder Consulting (UK) Ltd. Report No: 0005-UA003127-UTR-01

Ref.10 Air Quality Assessment of a Proposed CHP Plant in Acharn. A report for Northern Energy Developments Limited, BMT Cordah Ltd, Report Number G_NED_002_04_02_01_2, September 2009

Appendices

Appendix A: QA/QC Data

Appendix B: DMRB Calculations

Appendix A: QA:QC Data

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

Table A1: Raw Unadjusted Monthly Diffusion Tube NO_2 Concentrations

ID	SITE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN	Data Capture %
1	Dumbarton Rd, Stirling	-	41.7	35.5	34.9	26.6	33.4	37.0	33.0	28.5	20.9	16.9	35.0	31.2	91.7
2	Port Street, Stirling	-	40.1	34.6	30.9	23.8	28.8	26.6	28.8	26.5	19.9	32.1	33.0	29.6	91.7
3	Craigs Roundabout (1)	-	43.6	38.4	33.3	21.7	30.8	34.6	31.3	26.4	32.9	38.3	32.6	33.1	91.7
4a	Craigs Roundabout (2)	-	37.3	33.1	27.9	21.6	22.0	24.5	24.0	24.0	24.0	32.2	33.5	27.6	91.7
4b	Craigs Roundabout (2)	-	36.2	33.2	27.5	20.6	22.7	21.2	23.4	22.6	27.8	30.0	29.4	26.8	91.7
4c	Craigs Roundabout (2)	-	38.4	29.8	25.4	20.9	20.8	21.0	22.0	24.9	30.3	32.1	37.5	27.6	91.7
4	**Craigs Roundabout (2) Ave of triplicate**	**-**	**37.3**	**32.0**	**26.9**	**21.0**	**21.8**	**22.2**	**23.1**	**23.8**	**27.4**	**31.4**	**33.5**	**27.3**	**91.7**
5	Lennox Avenue, Stirling	-	24.8	21.3	14.4	12.1	12.2	11.2	11.7	11.8	11.1	22.0	17.8	15.5	91.7
6	Barnsdale Road, Stirling	-	32.6	24.2	20.4	13.0	18.4	16.2	25.5	24.6	13.9	28.7		21.8	83.3
7	Main Street, Plean	-	30.7	26.1	22.1	14.6	14.6	21.3	21.4	17.5	19.6	30.6	18.0	21.5	91.7
8	Alloa Road Roundabout	-	47.7	38.1	32.4	24.8	30.0	30.9	32.0	30.1	38.9	45.4	32.7	34.8	91.7
9	Henderson Street, Bridge of Allan	-	36.8	33.7	26.9	22.2	28.0	22.1		1.1	21.7	29.0	32.5	25.4	91.7
10	Stirling Road, Dunblane	-	29.2	23.4	20.7	14.2	16.1	15.0	18.3	17.1	17.6	22.3	28.2	20.2	91.7

Factor from Local Co-location Studies (if available)

A local co-location study was carried out at the automatic monitoring site at Craigs Roundabout, Stirling using triplicate NO_2 diffusion tubes. The calculation was carried out using the local bias adjustment spreadsheet tool (http://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html). The monthly results from the diffusion tube analysis were compared with the monthly averages calculated from the ratified hourly NO_2 data from the chemiluminescent analyser for matching exposure periods. The locally derived bias adjustment factor was found to be 1.02. The full calculation sheet is shown below.

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									
2	03/02/2011	01/03/2011	37.3	36.2	38.4	37	1.1	3	2.7
3	01/03/2011	30/03/2011	33.1	33.2	29.8	32	1.9	6	4.8
4	30/03/2011	27/04/2011	27.9	27.5	25.4	27	1.3	5	3.3
5	27/04/2011	31/05/2011	21.6	20.6	20.9	21	0.5	2	1.3
6	31/05/2011	28/06/2011	22.0	22.7	20.8	22	1.0	4	2.4
7	28/06/2011	03/08/2011	24.5	21.2	21.0	22	2.0	9	4.9
8	03/08/2011	07/09/2011	24.0	23.4	22.0	23	1.0	4	2.5
9	07/09/2011	30/09/2011	24.0	22.6	24.9	24	1.2	5	2.9
10	30/09/2011	31/10/2011	24.0	27.8	30.3	27	3.2	12	7.9
11	31/10/2011	31/11/11	32.2	30.0	32.1	31	1.2	4	3.1
12	31/11/11	31/12/2011	33.5	29.4	37.5	33	4.1	12	10.1
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
33.65	91.6	Good	Good
26	92.9	Good	Good
21	93.8	Good	Good
15	93.6	Good	Good
16	91.5	Good	Good
15	96.5	Good	Good
25	96.9	Good	Good
40	91.65	Good	Good
44	92.05	Good	Good
37	95.13	Good	Good
35.1	96.5	Good	Good
Overall survey -->		Good precision	Good Overall DC

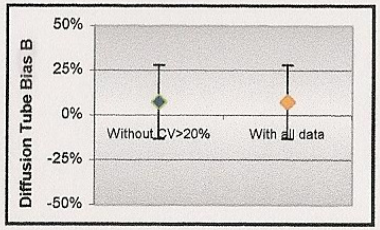
(Check average CV & DC from Accuracy calculations)

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 11 periods of data	
Bias factor A	1.02 (0.84 - 1.3)
Bias B	-2% (-23% - 18%)
Diffusion Tubes Mean:	27 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	28 μgm^{-3}
Data Capture for periods used:	94%
Adjusted Tubes Mean:	28 (23 - 36) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	1.02 (0.84 - 1.3)
Bias B	-2% (-23% - 18%)
Diffusion Tubes Mean:	27 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	28 μgm^{-3}
Data Capture for periods used:	94%
Adjusted Tubes Mean:	28 (23 - 36) μgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Diffusion Tube Bias Adjustment Factors

The national bias adjustment factor spreadsheet v03_12 (http://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html) was used to calculate the national bias adjustment factor for diffusion tubes analysed by Edinburgh Scientific Services during 2011. The factor was found to be 1.01.

Discussion of Choice of Factor to Use

It was decided to use the locally derived bias correction factor 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 2011.

PM Monitoring Adjustment

AEA has been 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 (Ref.8).

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 onto 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.

QA/QC of automatic monitoring

The automatic monitoring equipment is audited every 6 months by AEA, Glengarnock Technology Centre, Lochshore Business Park, Glengarnock. It is serviced and calibrated by Casella Measurement.

Air Pollution Report

Produced by AEA on behalf of the Scottish Government

STIRLING CRAIG'S ROUNDABOUT
1st January to 31st December 2011

These data have been fully ratified by AEA

POLLUTANT	NO_2	PM_{10}*
Maximum hourly mean	208 µg m^{-3}	105 µg m^{-3}
Maximum running 24-hour mean	84 µg m^{-3}	51 µg m^{-3}
Maximum daily mean	80 µg m^{-3}	51 µg m^{-3}
98.08th percentile of daily means	-	37 µg m^{-3}
Average	29 µg m^{-3}	16 µg m^{-3}
Data capture	93.9 %	88.8 %

* PM_{10} as measured by a TEOM using the VCM for Gravimetric Equivalent
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
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	1	1
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	-

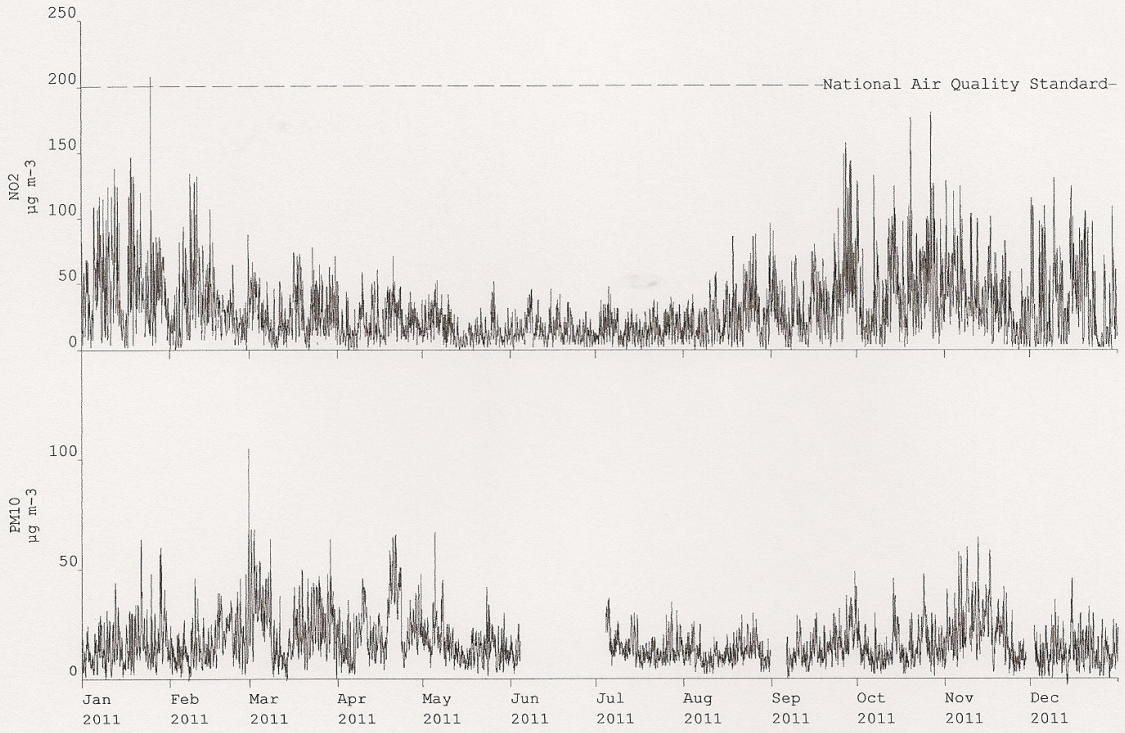
Note: For a strict comparison against the objectives there must be a data capture of >90% throughout the calendar year

AEA

Air Pollution Report

Produced by AEA on behalf of Scottish Government

Stirling Craig's Roundabout
Hourly Mean Data for 1st January to 31st December 2011



Date Created: 26/03/2012

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AEA

QA/QC of diffusion tube monitoring

The NO_2 diffusion tubes used by Stirling Council were prepared and analysed by the City of Edinburgh Council Scientific Services Laboratory using the harmonised method ED48673043 Issue 1a, Feb 2008, with a few minor changes which have been approved by AEA. The Laboratory is UKAS accredited and has good performance in both WASP and NPL QA schemes. The laboratory demonstrated satisfactory performance in the Workplace Analysis Scheme for Proficiency (WASP) over the past four quarterly rounds with Z scores between -0.5 and 0.6.

The results of the NPL Intercomparison Study are shown below. The overall survey had good precision and data capture with a bias correction factor of 0.97.

Results of NPL Inter Comparison Study for ESS

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

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	05/01/2011	02/02/2011	84.4	80.0	81.0	82	2.3	3	5.8	91.2	93.3	Good	Good
2	02/02/2011	02/03/2011	101.4	113.5	112.2	109	6.7	6	16.5	111.7	93.3	Good	Good
3	02/03/2011	30/03/2011	96.6	93.1	104.3	98	5.8	6	14.3	95.7	96.8	Good	Good
4	30/03/2011	27/04/2011	99.8	88.7	96.0	95	5.7	6	14.1	106.4	97.5	Good	Good
5	27/04/2011	01/06/2011	78.7	83.9	78.6	80	3.0	4	7.5	99.9	97.4	Good	Good
6	01/06/2011	29/06/2011	112.7	94.4	101.7	103	9.2	9	22.9	93.1	90.8	Good	Good
7	29/06/2011	03/08/2011	88.4	84.3	107.1	93	12.2	13	30.2	86.1	91.1	Good	Good
8	03/08/2011	31/08/2011	104.3	101.6	107.0	104	2.7	3	6.7	82.2	97.7	Good	Good
9	31/08/2011	28/09/2011	116.9	112.4		115	3.2	3	28.6	108.5	96.1	Good	Good
10	28/09/2011	31/10/2011	129.7	124.6	124.6	126	2.9	2	7.3	108.2	96.5	Good	Good
11	18/11/2011	14/12/2011	112.7	103.1	130.1	115	13.7	12	34.0	110.2	97.4	Good	Good
12	30/11/2011	04/01/2012	126.6	111.8	110.2	116	9.0	8	22.5	105.4	96.6	Good	Good
13													
										Overall survey -->		Good precision	Good Overall DC

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

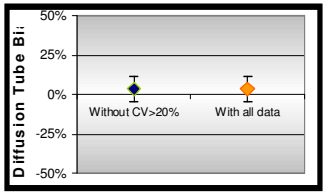
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

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

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.97 (0.9 - 1.05)
Bias B	3% (-5% - 11%)
Diffusion Tubes Mean:	103 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	100 μgm^{-3}
Data Capture for periods used:	95%
Adjusted Tubes Mean:	100 (93 - 108) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.97 (0.9 - 1.05)
Bias B	3% (-5% - 11%)
Diffusion Tubes Mean:	103 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	100 μgm^{-3}
Data Capture for periods used:	95%
Adjusted Tubes Mean:	100 (93 - 108) 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

Appendix B: DMRB Calculations

Input Data

Location/ Receptor	Grid Ref	Background Concentrations			
		Year	NOx	NO_2	PM_{10}
A9,Henderson St, Bridge of Allan		2010	8	5	12
Burghmuir Rd		2010	16.9	14.6	10.35

Location/ Receptor	Link number	Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition		
			AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	Total % LDV (<3.5t GVW)	Total % HDV (>3.5t GVW)
Henderson St	1	5	12,374	48	A	90	10
	2						
	3						
	4						
Burghmuir Rd	1	5	26,273	30	A	90	10
	2						
	3						
	4						

Verification

There was no verification of the DMRB results with monitoring data

Results

Location/ Receptor	Name	Year	Rd NO_x [1]	Verification Factor	Adj Rd NO_x [2]	Adj Total NO_x [3]	Total NO_2 [4]	PM_{10}	
			Annual mean µg/m^3		Annual mean µg/m^3	Annual mean µg/m^3	Annual mean µg/m^3	Annual mean µg/m^3	Days >50µg/m^3
1	Henderson St	2010	-	-	-	-	-	14.6	0
2	Burghmuir Rd	2012	33.03	-	-	47.63	29.82	13.6	0

[1] Rd NO_x = Road NO_x direct from DMRB local output sheet (following Box 1 from DMRB guidance note provided at http://laqm.defra.gov.uk/laqm-faqs/)
[2] Adj Rd NO_x = Rd NO_x x verification factor (state verification factor used)
[3] Adj Total NO_x = Adj Rd NO_x + Background NO_x
[4] Total NO_2 = from NO_x to NO_2 calculator (available at from LAQM Support website)

Maps of Locations

The location of the A9, Burghmuir Road and its proximity to Craigs Roundabout in Stirling is shown in Detail in Figure 2.2