



**Clackmannanshire
Council**

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2013 Air Quality Progress Report for Clackmannanshire Council

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

May, 2013

TSI Scotland

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Executive Summary

The Local Air Quality Management process as set out in Part IV of the Environment Act (1995) and the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 requires all local authorities to complete a Progress Report due for submission in April 2013 in accordance with technical guidance LAQM.TG(09) (Ref.1). The progress report is intended to maintain continuity in the Local Air Quality Management (LAQM) process, and fill in the gaps between the three-yearly cycle of Review and Assessment.

This is the 2013 Progress Report for Clackmannanshire Council which identifies all matters regarding impacts to local air quality that are new or have changed since the Updating and Screening Assessment Report in 2012 and whether further consideration of such changes is required.

The Air Quality Strategy (AQS) details objective concentrations for the following pollutants:

- Benzene
- 1,3-Butadiene
- Carbon Monoxide (CO)
- Lead
- Sulphur Dioxide (SO₂)
- Nitrogen Dioxide (NO₂)
- Particles (PM₁₀)

Examination of the previous 5 years of data show that there is no obvious trend in annual mean NO₂ concentrations across the diffusion tube network although the concentration has increased at 4 of the 5 comparable sites between 2011 and 2012.

Data from the particulate automatic monitoring station at South Ring Road, Alloa have shown an annual mean concentration of 15.8-17µg/m³ in recent years with an average of 16.26µg/m³. There was a decrease between 2011 and 2012 with the

latest annual mean concentration of PM₁₀ being 15µg/m³. Funding has been granted which will enable Clackmannashire Council to upgrade the TEOM to a reference method sampler during 2013.

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 review of planning applications submitted in 2012 showed that there were no new developments likely to result in any exceedences of the AQS objectives for any pollutant.

Consultation with SEPA has confirmed that there are no existing or new installations likely to cause an exceedence of the AQS objectives for any pollutant.

Clackmannanshire Council confirmed that there were no new roads constructed with the potential to result in an exceedence of the AQS objectives.

Since the completion of The Forth Valley College, Alloa in September 2011, traffic congestion has been observed on Auld Brig Road leading up to the Shillinghill Roundabout especially between 4pm – 6pm. A mini-roundabout at the junction with Devon Road controls flow to and from the College car park. There are residential properties within 3m of the roadside and the other side of the road is quite open. A traffic count survey has been commissioned for Auld Brig Road which is expected to take place in May/June 2013 in order that a screening assessment of the potential impact can be undertaken in a future report. In the meantime, an NO₂ diffusion tube has been located here since May 2012 to obtain some air quality data.

The traffic survey will also be undertaken on Clackmannan Road. The results of the traffic survey and the most recent monitoring will be used to undertake screening assessments in order to determine whether or not the automatic monitoring station should be relocated within Alloa to better represent worst case exposure.

Clackmannanshire Council

Data from the Transport Planning Department of Clackmannanshire Council and Transport Scotland were obtained in order to give an indication of the traffic growth across the area.

Most sites in the Clackmannanshire Council data show a small decrease in traffic flow between 2011 and 2012. The only notable increase is the A977 at Gartlove with a 13% increase. Traffic numbers have increased gradually as forecast and expected since the opening of the Clackmannanshire Bridge in 2008.

The AADT flows on the trunk roads have increased on all of the road links monitored by Transport Scotland between 2011 and 2012. The maximum increase is 19.7% on the A876 South of A977, which is the road linking to the Clackmannanshire Bridge. It is not expected that there will be any exceedences of the NAQS objectives at nearby receptors due to changes in traffic flow on the trunk roads.

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 2014.

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1 Introduction

1.1 Description of Local Authority Area

Clackmannanshire is the smallest local authority area in mainland Scotland with a population of approximately 50,000 people, of which half live in the main town of Alloa. It is a mainly rural area and shares borders with Falkirk, Perth and Kinross, Fife and Stirling Council areas. The Ochil Hills form the northern border of Clackmannanshire with the River Forth located on the southern border.

The majority of industrial and commercial developments are also located within Alloa and the predominant industries are now agriculture and small to medium sized enterprises.

The Clackmannanshire Council boundary is shown in Figure 1.1

Figure 1.1 Map of Clackmannanshire Council Area



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 $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	3.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.50 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particulate Matter (PM ₁₀) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2010
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

Table 1.2 summarises the Air Quality Review and Assessment reports submitted by Clackmannanshire Council since 2004 with the most recent report of 2012 listed first.

Table 1.2 Summary of Previous Air Quality Review and Assessment Reports 2004-2011

Report	Date Completed	Summary and Conclusions
Updating and Screening Assessment 2012 (Ref.2)	July 2012	<p>New monitoring data confirmed that there were no exceedences of the Air Quality Strategy (AQS) objectives for nitrogen dioxide (NO₂) and (PM₁₀) during 2011.</p> <p>Since the completion of The Forth Valley College, Alloa in September 2011, traffic congestion has been observed on Auld Brig Road leading up to the Shillinghill Roundabout. There are residential properties within 3m of the roadside. It was concluded that a traffic count survey would be commissioned for Auld Brig Road when staff and equipment resources became available in order that a screening assessment of the potential impact can be undertaken in a future report. The NO₂ diffusion tube from Fishcross Primary School was relocated to Auld Brig Road in May 2012 to obtain some air quality data.</p> <p>Further guidance is awaited regarding the impact on local air quality of intensive poultry farms before deciding to proceed to a Detailed Assessment for Cambusview Poultry Farm.</p> <p>It was also concluded that there was no risk of exceedences of any other AQS pollutant objectives.</p>
Progress Report 2011 (Ref.3)		<p>New monitoring data confirmed that there were no exceedences of the Air Quality Strategy (AQS) objectives for nitrogen dioxide (NO₂) and (PM₁₀) during 2010. Shillinghill/Bridge Terrace and Clackmannanshire Rd in Alloa were identified as having an annual mean concentration of NO₂ of 38ug/m³ (objective level is 40ug/m³). South Ring in Alloa also recorded an annual mean concentration</p>

		<p>of PM₁₀ of 17ug/m³ compared with the objective of 18ug/m³.</p> <p>5 NO₂ diffusion tube sites were decommissioned at the end of 2010 due to a history of low concentrations.</p> <p>Further guidance is awaited regarding the impact on local air quality of intensive poultry farms before deciding to proceed to a Detailed Assessment for Cambusview Poultry Farm.</p> <p>It was also concluded that there was no risk of exceedences of any other AQS pollutant objectives.</p>
Progress Report 2010 (Ref.4)	July 2010	<p>New monitoring data confirmed that there were no exceedences of the Air Quality Strategy (AQS) objectives for nitrogen dioxide (NO₂) and (PM₁₀) during 2009. However one site, Shillinghill/Bridge Terrace in Alloa was identified as having an annual mean concentration of NO₂ of 39ug/m³ (objective level is 40ug/m³). South Ring in Alloa also recorded an annual mean concentration of PM₁₀ of 17ug/m³ compared with the objective of 18ug/m³. The elevated concentrations were recorded during a period of construction close-by in August 2009 so may not be representative. It was recommended that monitoring at these locations should continue.</p> <p>Further guidance is awaited regarding the impact on local air quality of intensive poultry farms from monitoring studies carried out elsewhere in the UK, before deciding to proceed to a Detailed Assessment for Cambusview Poultry Farm.</p> <p>It was also concluded that there was no risk of exceedences of any other AQS pollutant objectives.</p>
Updating and Screening Assessment 2009 (Ref.5)	July 2009	<p>New monitoring data confirmed that there were no exceedences of the Air Quality Strategy (AQS) objectives for nitrogen dioxide (NO₂) and (PM₁₀) during 2008. It was also concluded that there was no risk of exceedences of any other AQS pollutant objectives.</p> <p>Intensive poultry farms were added to the updated Technical Guidance LAQM.TG(09) for assessment. One such farm, Cambusview Poultry Farm was identified as being recommended for Detailed Assessment to determine if there was a likelihood of exceedence of the PM₁₀ objectives in an area of relevant exposure.</p>
Progress Report	March 2008	New monitoring data confirmed that there were no

2008 (Ref.6)		exceedences of the AQS objectives for NO ₂ and during 2007. The PM ₁₀ objectives were exceeded at South Ring, Alloa but were attributed to construction of a new roundabout in the vicinity. Elevated concentrations were clearly identified during the construction period in the latter half of the year. It was recommended that Clackmannanshire Council should continue monitoring PM ₁₀ at this location for a further year before determining the need for a Detailed Assessment.
Progress Report 2007 (Ref.7)	May 2007	New monitoring data confirmed that there were no exceedences of the AQS objectives for NO ₂ and during 2006. The PM ₁₀ objectives were exceeded at South Ring, Alloa but were attributed to construction work being carried out in the vicinity. It was recommended that Clackmannanshire Council should continue monitoring PM ₁₀ at this location in order to verify the likelihood of exceedence of the objectives.
Updating and Screening Assessment 2006 (Ref.8)	August 2006	New monitoring data confirmed that there were no exceedences of the AQS objectives for NO ₂ and PM ₁₀ during 2005. It was also concluded using the methodology in the technical guidance to project forward that there was no risk of exceedence of any of the AQS objectives in future years.
Progress Report 2005 (Ref.9)	April 2005	New monitoring data confirmed that there were no exceedences of the AQS objectives for NO ₂ and PM ₁₀ during 2004. It was also concluded using the methodology in the technical guidance to project forward that that there was no risk of exceedence of any of the AQS objectives in future years.
Progress Report 2004 (Ref.10)	April 2004	New monitoring data confirmed that there were no exceedences of the AQS objectives for NO ₂ and PM ₁₀ during 2003. It was also concluded that there was no risk of exceedences of any of the AQS pollutants in future years based on a 58% data capture.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

Monitoring is carried out for NO₂ and PM₁₀ in Clackmannanshire. During 2012, Clackmannanshire Council monitored NO₂ at six locations using passive diffusion tubes and PM₁₀ at one location using a Tapered Element Oscillating Microbalance (TEOM) automatic analyser.

2.1.1 Automatic Monitoring Sites

The TEOM is located in a Groundhog unit in a car park immediately adjacent to South Ring Road, Alloa. It is a busy road with a pedestrian crossing and housing nearby. It is considered a busy pedestrian thoroughfare. The site is classified as a Roadside site and also records ambient temperature. The details of the site are shown in Table 2.1. A photograph of the unit and a map showing the location of the monitoring site are shown in Figures 2.1 and 2.2.

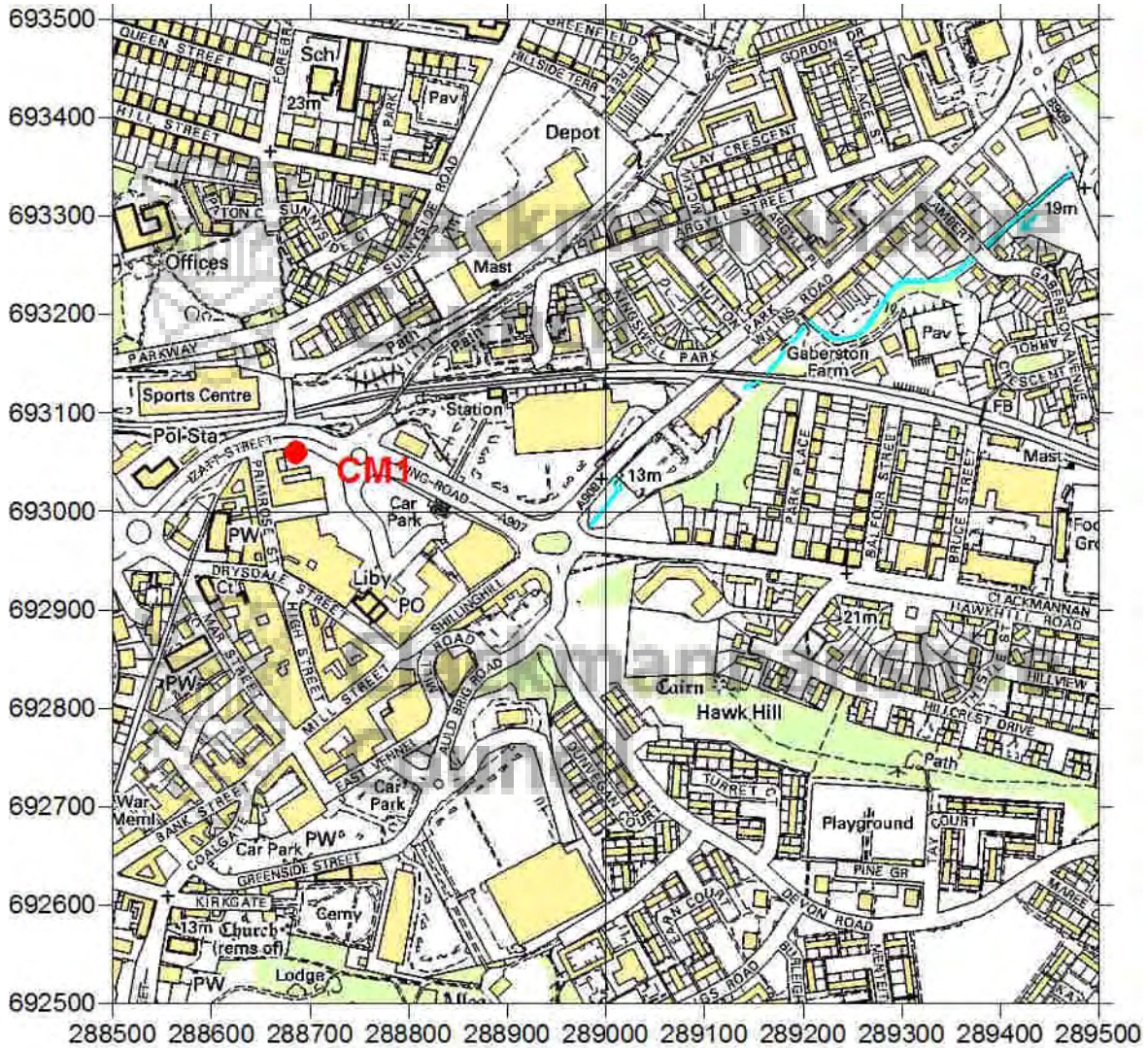
The data capture for the site was 96.9% for PM₁₀. Routine calibrations are carried out by Casella and 6 monthly site audits are carried out by AEA. The QA/QC procedures and data ratification reports are described in more detail in Appendix A.

All TEOM results from 2008-2012 have been corrected using the Volatile Correction Method (VCM) (latest version Ref.11). The VCM calculation for 2012 is included in Appendix A.

Figure 2.1 Photograph of Automatic Monitoring Site at South Ring Road, Alloa



Figure 2.2 Location Map of Automatic Monitoring Site at South Ring Road, Alloa



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Table 2.1 Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
CM1	South Ring Road, Alloa	Roadside	288685	693060	2.94m	PM ₁₀	N	TEOM	Y (8m)	8.5m	Y ¹

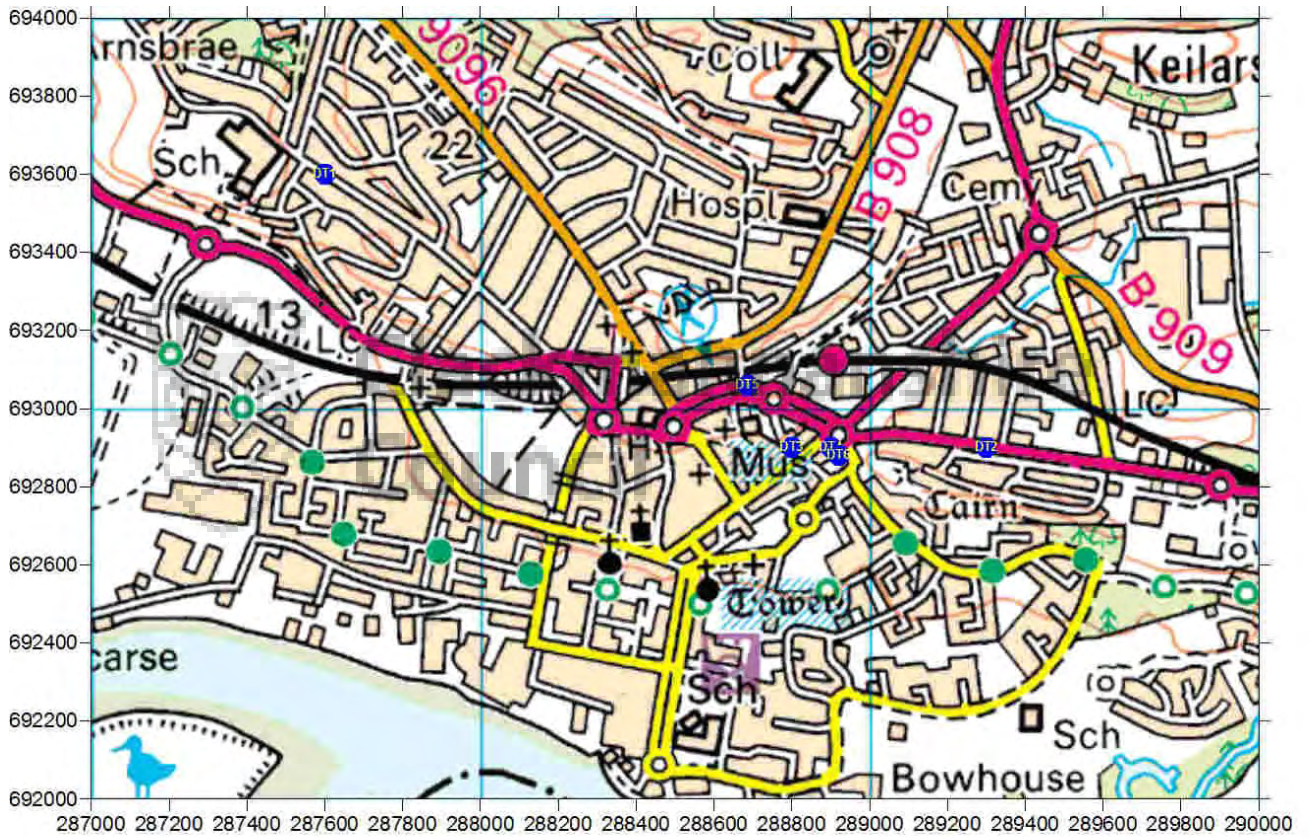
¹ This site has been used to represent worst case exposure since it was installed in 2004. It has been recognised that Auld Brig Road or Clackmannan Road in Alloa may be more relevant for public exposure. The site may be relocated when the equipment is being upgrade in 2013.

2.1.2 Non-Automatic Monitoring Sites

Non-automatic monitoring of NO₂ was undertaken at 6 locations within Clackmannanshire Council in 2012 using passive diffusion tubes. The location and description of each site is shown in Table 2.2. All sites are classified as kerbside sites except South Ring Road, Alloa, which is a roadside site. Maps showing the locations of the monitoring sites are shown in Figures 2.3 and 2.4.

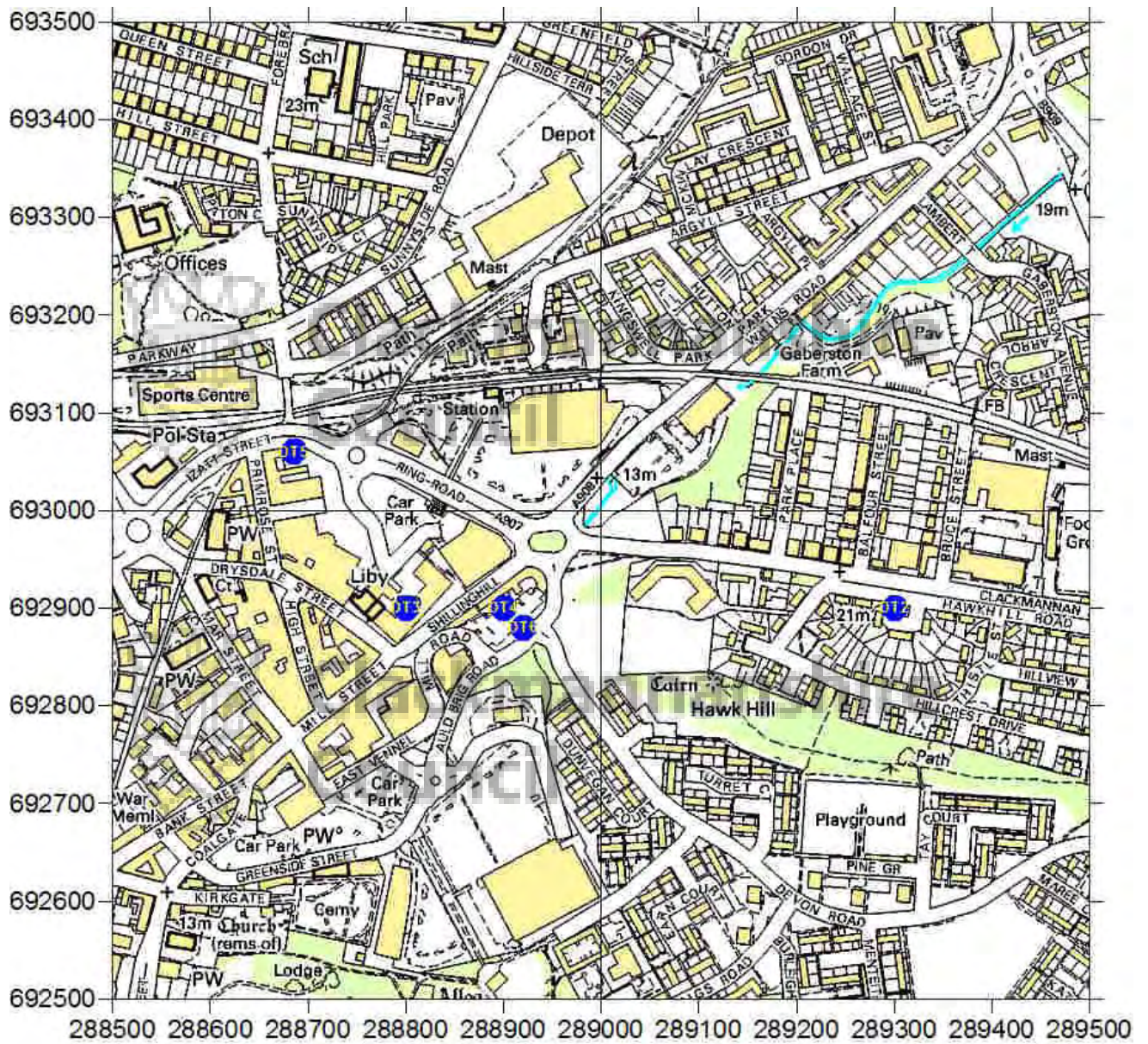
The tubes are provided and analysed by Glasgow Scientific Services using 20% TEA in Acetone and are changed on a monthly basis by Clackmannanshire Council personnel. The data capture was above 100% for 5 sites and 66% for Auld Brig Road as it was May before this new site was operational. The QA/QC for diffusion tube analysis is included in more detail in Appendix A.

Figure 2.3 Map of Non-Automatic Monitoring Sites



- DT1-Norwood Avenue, Alloa
- DT2-Clackmannan Road, Alloa
- DT3-Bus Station, Alloa
- DT4-Shillinghill/Bridge Terrace, Alloa
- DT5-South Ring Road, Alloa
- DT6-Auld Brig Road, Alloa

Figure 2.4 Detailed Map of Non-Automatic Monitoring Sites in Alloa



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Table 2.2 Details of Non- Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
DT1	Norwood Avenue	Kerbside	287600	693600	3.2	NO ₂	N	N	Y (2m)	1.7m	Y
DT2	Clackmannan Road	Kerbside	289300	692900	3.4	NO ₂	N	N	Y (2m)	2m	Y
DT3	Bus Station, Alloa	Kerbside	288800	692900	3.4	NO ₂	N	N	Y (2m)	1.3m	Y
DT4	Shillinghill/Bridge Terrace, Alloa	Kerbside	288900	692900	3.1	NO ₂	N	N	Y (2m)	1.4m	Y
DT5	South Ring Road, Alloa	Roadside	288685	693060	3	NO ₂	N	N	Y (8m)	8.5m	Y
DT6	Auld Brig Road	Kerbside	288920	692880	3.25	NO ₂	N	N	Y (3m)	1.8m	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide (NO₂)

Diffusion Tube Monitoring Data

A summary of the bias-adjusted annual mean diffusion tube concentrations of NO₂ across the monitoring network for 2012 is shown in Table 2.3. The raw monthly results are included in Appendix A. A summary of data for the last five years is shown in Table 2.4.

A trend graph is shown in Figure 2.5 which illustrates that there is no clear trend but that the annual mean NO₂ concentration has consistently remained below the limit concentration of 40µg/m³ during the last 5 years. There has been an increase at 4 out of 5 comparable sites between 2011 and 2012.

Table 2.3 Results of NO₂ Diffusion Tubes 2012

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2012 (Number of Months or %)	2012 Annual Mean Concentration ($\mu\text{g}/\text{m}^3$) - Bias Adjustment factor = 0.95
DT1	Norwood Avenue	Kerbside	N	N	11 ²	11.4
DT2	Clackmannan Road	Kerbside	N	N	11	32.8
DT3	Bus Station, Alloa	Kerbside	N	N	11	37.3
DT4	Shillinghill/Bridge Terrace, Alloa	Kerbside	N	N	11	30.6
DT5	South Ring Road, Alloa	Roadside	N	N	11	23.9
DT6	Auld Brig Road	Kerbside	N	N	8 ³	23.8

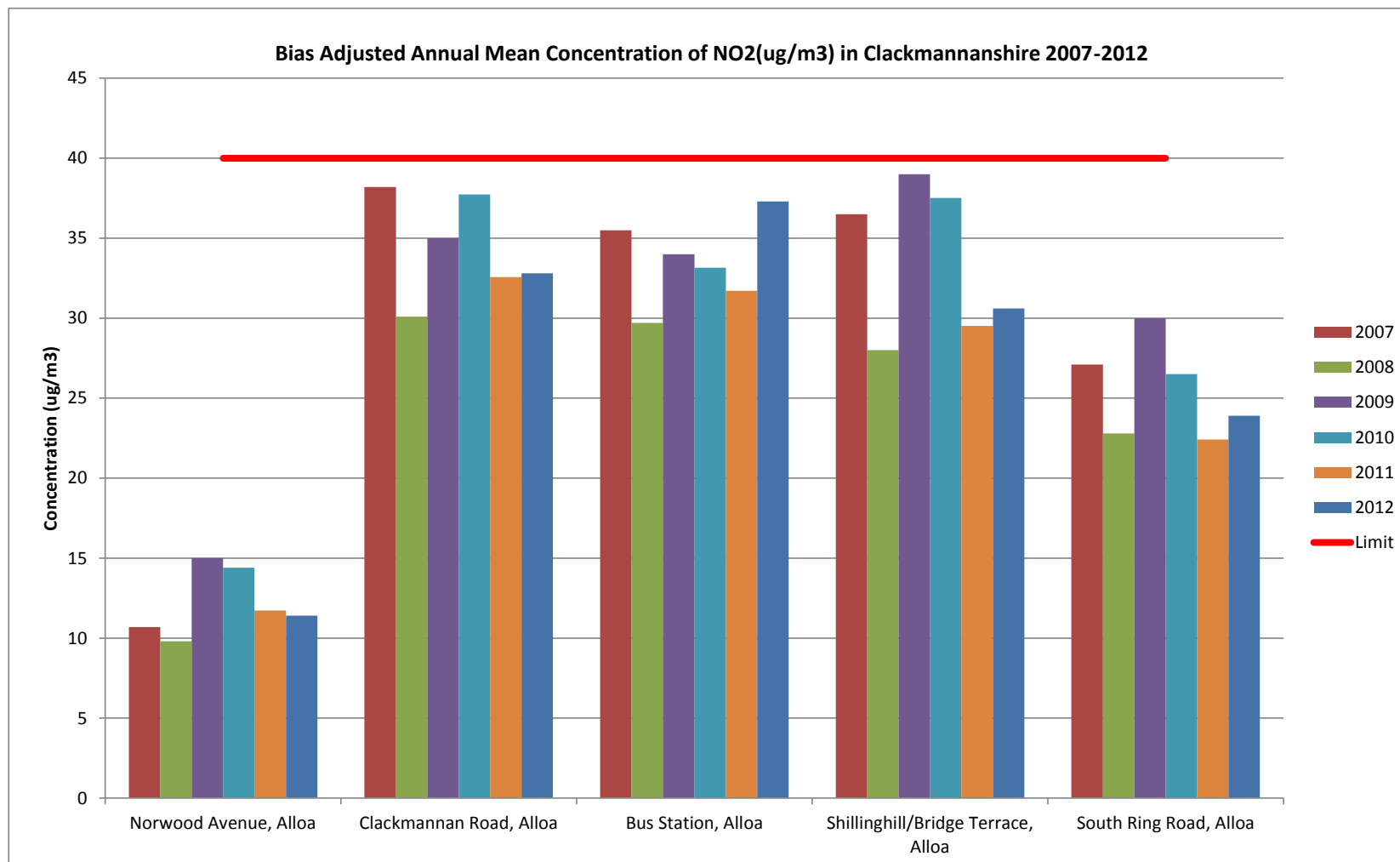
² February 2012 results were not accredited by the laboratory and have been discounted. Annual mean is therefore calculated for 11 months (91.6% data capture) for sites DT1-DT5

³ The Auld Brig Site (DT6) was only recording data from May-December. The period mean has been annualised in accordance with the methodology in Box 3.2 in LAQM.TG(09) (Ref.1). The calculations are shown in Appendix A.

Table 2.4 Results of NO₂ Diffusion Tubes (2008 to 2012)

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m ³) - Adjusted for Bias				
			2008 (Bias Adjustment Factor = 0.97)	2009 (Bias Adjustment Factor = 1.23)	2010 (Bias Adjustment Factor = 1.1)	2011 (Bias Adjustment Factor = 0.94)	2012 (Bias Adjustment Factor = 0.95)
DT1	Kerbside	N	10.7	9.8	15	11.7	11.4
DT2	Kerbside	N	38.2	30.1	30.1	32.6	32.8
DT3	Kerbside	N	35.5	29.7	34	31.7	37.3
DT4	Kerbside	N	36.5	28	39	29.5	30.6
DT5	Roadside	N	27.1	22.8	30	22.4	23.9

Figure 2.5 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites 2007-2012



2.2.2 Particulate Matter (PM₁₀)

Automatic Monitoring Data

A summary of the ratified monitoring data for PM₁₀ at the automatic site at South Ring Road, Alloa is shown in Tables 2.5 and 2.6.

A trend graph is shown in Figure 2.6. The annual mean concentration of PM₁₀ over the period 2008-2012 has ranged between 15.8-17µg/m³ with an average of 16.26µg/m³. There was a decrease each year between 2010 to 2012 with the latest annual mean being 15µg/m³.

The Gravimetric adjustment factor of 1.3 was applied to TEOM results up to 2007. All results from 2008-2012 have been corrected using the Volatile Correction Method (VCM) (latest version Ref.11). The VCM calculation for 2012 is included in Appendix A.

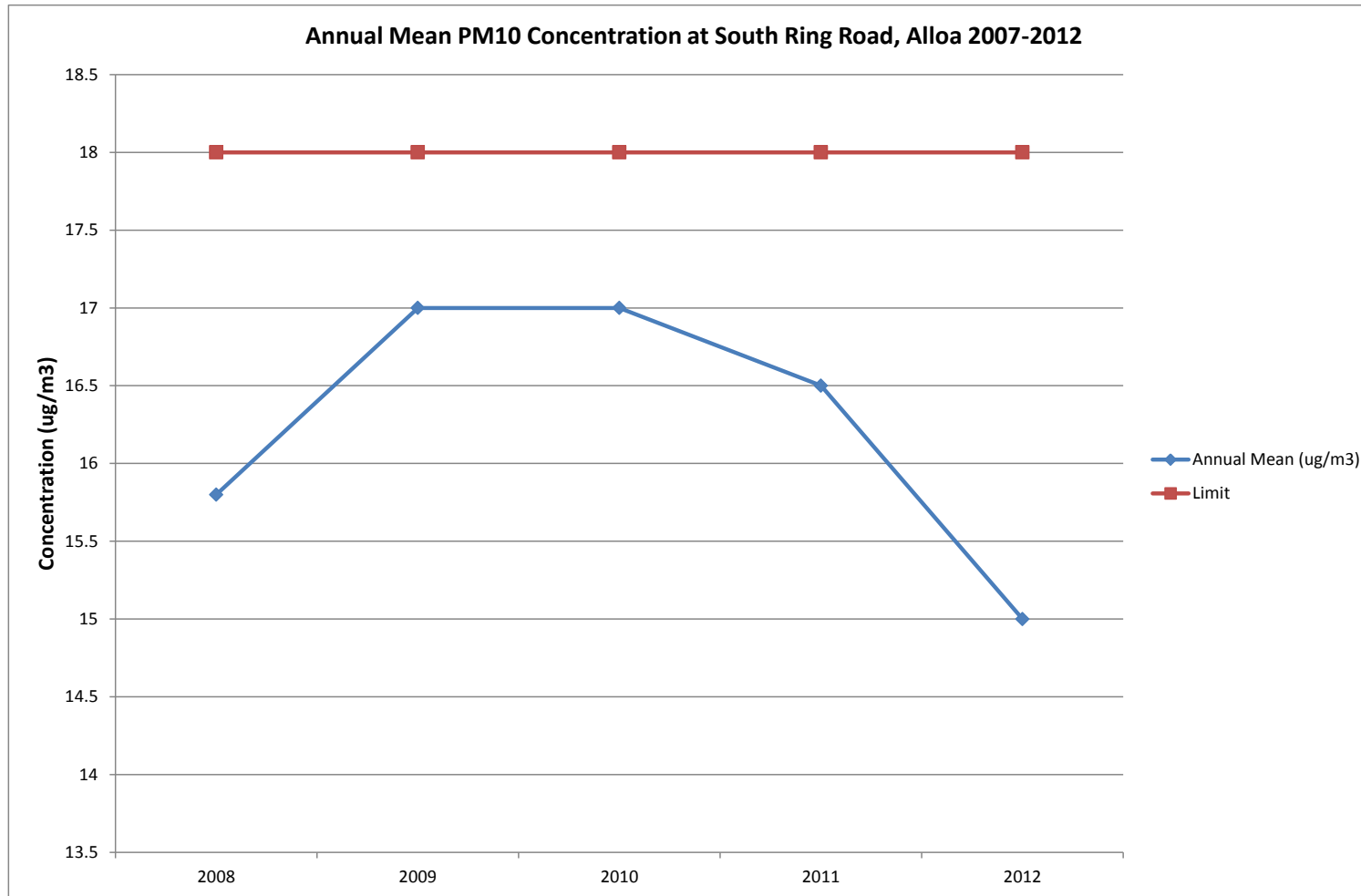
Table 2.5 Results of Automatic Monitoring for PM₁₀: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2012 %	Confirm Gravimetric Equivalent (Y or N/A)	Annual Mean Concentration (µg/m ³)				
						2008	2009	2010	2011	2012
CM1	Roadside	N	96.9	96.9	Y	15.8	17	17	16.5	15

Table 2.6 Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2012 % ^b	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m ³				
						2008	2009	2010	2011	2012
CM1	Roadside	N	96.9	96.9	Y	0	3	1	2	1

Figure 2.6 Trends in Annual Mean PM₁₀ Concentrations



2.2.3 Summary of Compliance with AQS Objectives

Clackmannanshire Council has examined the results from monitoring in the local authority area. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

This section examines any local development changes that have taken place since the last Updating and Screening Assessment (Ref.2) which may affect air quality.

The items included are:

- Road Traffic Sources;
- Other Transport Sources;
- Industrial Sources;
- Biomass Sources
- Commercial and Domestic Sources; and
- Fugitive and Uncontrolled Sources.

3.1 Road Traffic Sources

The Transport Planning Department of Clackmannanshire Council was consulted in order to check if there were any new potential road traffic sources or significantly changed traffic sources within the Clackmannanshire Council area that could result in exceedences of air quality standards.

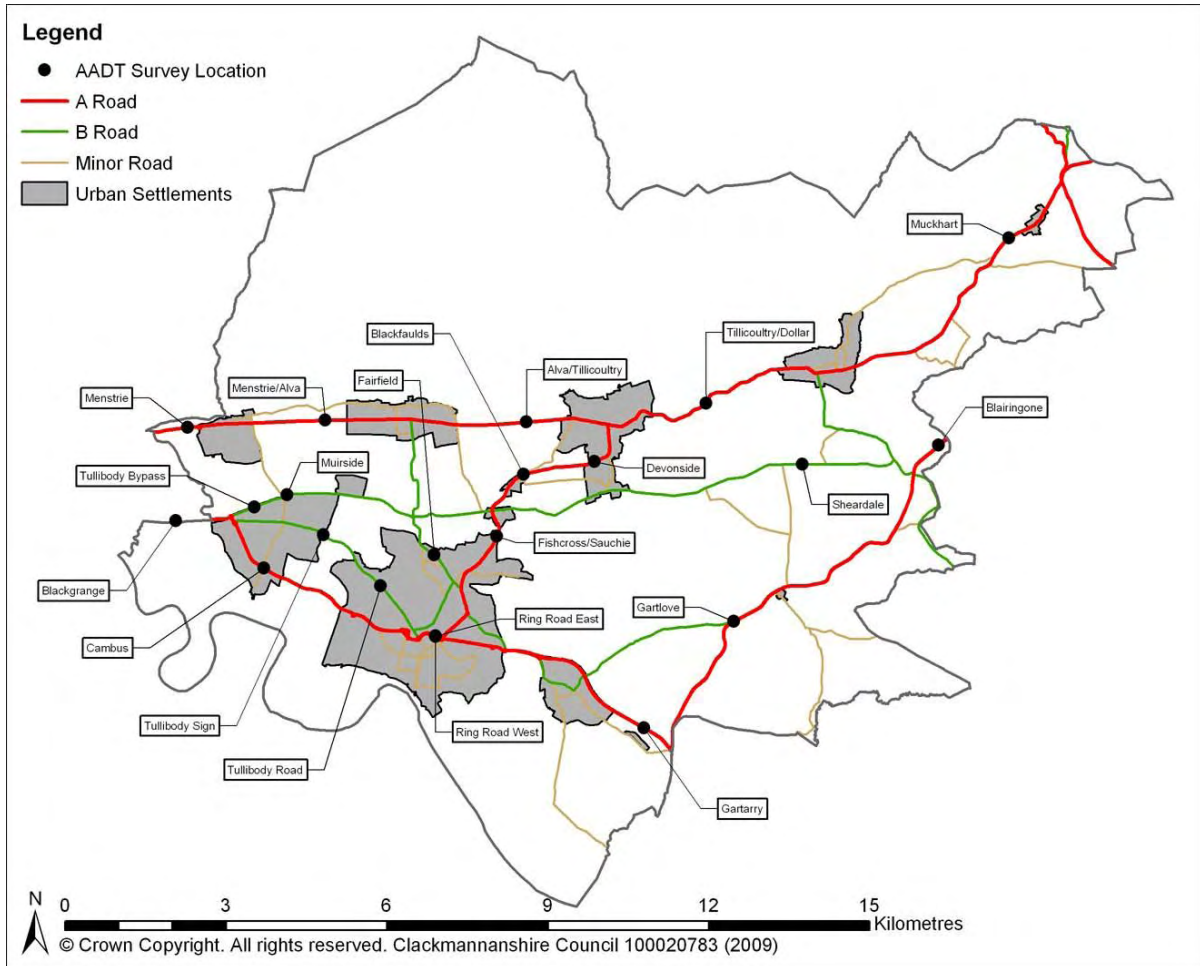
Data have been collected from 21 automatic traffic count sites in the Council area in recent years. The figures for 2008-2012 are summarised in Table 3.1. A location map of the monitoring sites is shown in Figure 3.1.

**Table 3.1 Summary of Traffic Survey Data for Clackmannanshire Council
2008-2012**

ID	Description	Speed	AADT					% Change 2011-2012
			2008	2009	2010	2011	2012	
49	A977 Gartlove	60	5325	5949	5437	5603	6334	13.0
287	A907 Blackgrange	60	22896	20768	20407	20036	19945	-0.5
288	A907 Cambus	40	10182	9027	8869	8548	N/A	
292	A907 Ring Road Westbound	30	12259	11915	11416	11151	N/A	
295	A907 Clackmannanshire Bypass	60	12431	14395	13302	14672	14617	-0.4
300	A908 Fishcross Primary School	30	12204	12341	12889	12452	12326	-1.0
301	A908 Blackfaulds	40	8574	9061	9167	9074	8886	-2.1
302	A908 Devonside	30	7274	7388	7649	7612	7481	-1.7
309	A91 Menstrie/Alva	60	10559	9758	9121	8815	8457	-4.1
311	A91 Menstrie Mains	60	10458	9760	9252	9016	8362	-7.3
314	A91 Tillicoultry	30	7641	7225	6513	6734	N/A	
321	A91 Muckhart	60	3543	3545	3346	3098	3123	0.8
50	A977 Blairingone	60	4631	5355	3957	4904	4759	-3.0
581	B908 Fairfield	30	5699	6178	6341	6368	6547	2.8
589	B9096 Tullibody Sign	30	10291	9517	9407	9459	9185	-2.9
590	B9096 Tullibody Road	30	11048	10746	10702	10343	10086	-2.5
625	B9096 Tullibody Bypass	60	8435	7567	7668	7789	7815	0.3
626	B9140 Muirside	60	8116	7739	8155	8267	N/A	
634	B9140 Sheardale	60	1874	1639	1677	1492	N/A	
317	A91 Tillicoultry/Dollar	60	5977	5652	5508	5163	N/A	

It can be seen that most sites show a small decrease in traffic flow between 2011 and 2012. The only notable increase is the A977 at Gartlove with a 13% increase. Traffic numbers have increased gradually as forecast and expected since the opening of the Clackmannanshire Bridge in 2008.

Figure 3.1 Clackmannanshire Council Traffic Survey Sites



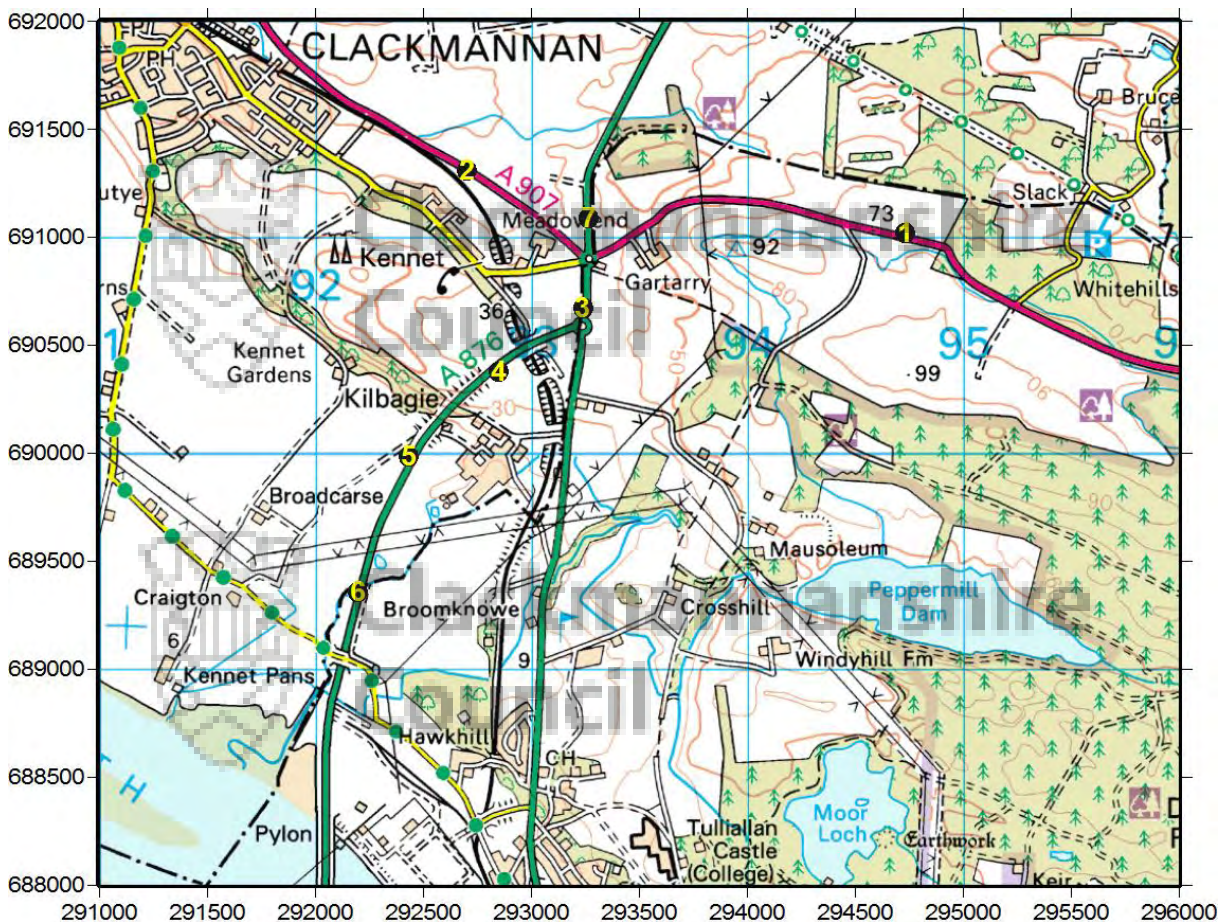
In addition to data collected by Clackmannanshire Council, data were also obtained from Transport Scotland for the trunk roads monitored within the Clackmannanshire Council area. A map showing the count locations is shown in Figure 3.2 and the data for 2009-2012 are summarised in Table 3.2.

Table 3.2 Summary of Transport Scotland Trunk Road Traffic Count Data for Clackmannanshire 2009-2012

ID	Description	AADT				% Change 2010-2011
		2009	2010	2011	2012	
1	A907 East of A977	3082	2874	3075	-	
2	A907 West of A977	14247	13934	14507	14683	1.2
3	A977 North of A876	17620	17795	18573	19762	6.4
4	A876 South of A977	14359	14281	14839	17762	19.7
5	A876 Clackmannanshire Bridge Approach	14387	14228	14598	14609	0.1
6	A876 North of Clackmannanshire Bridge	14428	14133	15349	15901	3.6
7	A977 North of Gartarry Roundabout	6009	5459	5475	6167	12.6

The AADT flows have increased on all of the road links between 2011 and 2012. The maximum increase is 19.7% on the A876 South of A977, which is the road linking to the Clackmannanshire Bridge. This is likely to be affected by traffic avoiding the roadworks and restricted speed limit leading to the Forth Road Bridge due to the ongoing construction works for the new Forth Crossing. It is not expected that there will be any exceedences of the NAQS objectives at nearby receptors due to changes in traffic flow on the trunk roads.

Figure 3.2 Location Map of Transport Scotland Automatic Traffic Counts in Clackmannanshire



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- 1-A907 East of A977
- 2-A907 West of A977
- 3-A977 North of A876
- 4-A876 South of A977
- 5-A876 Clackmannanshire Bridge Approach
- 6-A876 North of Clackmannanshire Bridge
- 7-A977 North of Gartarry Roundabout

3.2 Other Transport Sources

Clackmannanshire Council confirms that there are no new or newly identified transport sources which are likely to have an impact on air quality within the Local Authority area.

3.3 Industrial Sources

Clackmannanshire Council confirms that there are no new, planned or significantly changed industrial developments which may have an impact on air quality within the Local Authority area.

Clackmannanshire Council confirms Cambusview Poultry Farm was identified in the 2009 USA as having the potential to cause an adverse impact on air quality at a number of residential properties close to the unit. The LAQM helpdesk was consulted in April 2013 regarding the availability of new guidance for the assessment of such installations. It is understood that Detailed Assessments have been carried out at several Local Authorities in England to inform such guidance. Some of these studies are still in progress and the Council was advised that this installation should be assessed in the appropriate manner once UK-wide guidance is issued. This will be included in a future report. To date there have been no complaints regarding air quality in the vicinity of this site.

3.4 Commercial and Domestic Sources

Two small scale domestic biomass installations were granted planning permission in 2012. These are located in Dollar and Gartlove. Air quality impact was assessed during the planning process and neither installation was expected to result in poor local air quality.

Clackmannanshire Council will keep a record of all biomass installations for which planning permission is required in order that the potential for clusters of units can be examined in the next USA report.

The Council has been in receipt of some complaints regarding smoke from small domestic wood burning stoves which are investigated on a case by case basis. Such installations do not require planning permission and it is therefore difficult to track their numbers within the Council area. However, it is the intention of Clackmannanshire Council to log all units as they become aware of them.

Clackmannanshire Council confirms that there are no new, planned or significantly changed commercial or domestic developments which are expected to have an impact on air quality within the Local Authority area.

3.5 New Developments with Fugitive or Uncontrolled Sources

A residential development started at Claremont Park in 2012 which is still ongoing. There have been a few dust complaints from residents in this area relating to temporary increase in HGV traffic movements. The company have been notified and dust mitigation measures are being implemented. It is not expected that air quality standards will be breached in this location.

A major demolition is currently ongoing in the centre of Alloa with residential flats planned for the site. There is a construction method and traffic management plan in

Clackmannanshire Council

place that includes dust mitigation measures, which was required as a planning condition. This is in relatively close proximity to the existing automatic monitoring station and particulate concentrations at this site will be closely monitored.

Clackmannanshire Council confirms that there are no new or newly identified local developments with fugitive or uncontrolled sources which may have an impact on air quality within the Local Authority area.

4 Planning Applications

Clackmannanshire Council can confirm that there are no approved planning applications for development that could have an impact on local air quality. There are tentative proposals for a CHP plant to serve over 500 houses at a new Forestmill Village development but this is unlikely to progress for some years due to the economic climate. The appropriate air quality impact assessment will be undertaken if and when this application advances.

5 Local Transport Plans and Strategies

The Clackmannanshire Council Local Transport Strategy (LTS) 2010-2014 (Ref.13), sets out how the Council intends to reconcile international, national, regional and local objectives at the local level and outlines actions which will achieve these objectives. It contains a series of aims, objectives, policies and actions supporting the overall vision to meet the transport needs of all within Clackmannanshire.

As part of the preparation of the LTS, a Strategic Environmental Assessment (SEA) was undertaken identifying key environmental problems within Clackmannanshire and the relationship with other plans, policies and strategies.

The study recognised the environmental impact to all media of a number of proposed options for the LTS. Key environmental baseline information was gathered for the report. The baseline air quality data was obtained from the air quality monitoring carried out by the Council and was considered good as all pollutants are below the AQS objectives.

It was recognised that transport plays a key part in air quality and without the LTS, opportunities to improve air quality could be missed. Some of the key issues in the LTS related to air quality are summarised in Table 5.1.

The options that were accepted for inclusion in the LTS were deemed to have the most benefit for all considerations including the environment. It is recognised that as a result of the preferred strategy there may be negative impacts for noise and vibration as result of traffic management measures and increased use of the bus and rail network, however secondary and cumulative positive impacts have been identified for air quality and health by reducing the need to travel, promoting active and sustainable travel and removing transport from sensitive areas.

Table 5.1 Air Quality Considerations in the LTS

Environmental Issues	Implications for the LTS
Possibility of reduced air quality due to increasing traffic volumes and congestion	<p>Behavioural change is required to reduce the reliance on cars in favour of sustainable modes of transport.</p> <p>Integration with land use planning and improved public transport facilities are required. Improved management of town centre car parks and the introduction of the maximum parking standards. Implementation of travel plans in new and existing developments.</p> <p>Encouragement of walking and cycling as a mode of transport is required to improve physical health and air quality. May require infrastructure to facilitate.</p>
Greenhouse gas emissions contributing to Climate Change	Requires road traffic reduction and greater availability of sustainable transport choices.
Increase in air pollution due to traffic using unsuitable roads due to avoidance of declining conditions on main roads	Maintenance of the road network to a high standard

6 Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

The results of the NO₂ monitoring across Clackmannanshire Council during 2012 confirm that there are no exceedences of the AQS objectives for this pollutant.

Examination of the previous 5 years of data show that there is no obvious trend in annual mean NO₂ concentrations across the diffusion tube network although the concentration has increased at the 4 of the 5 comparable sites between 2011 and 2012.

Data from the particulate automatic monitoring station at South Ring Road, Alloa have shown an annual mean concentration of 15.8-17µg/m³ in recent years with an average of 16.26µg/m³. There was a decrease between 2011 and 2012 with the latest annual mean concentration of PM₁₀ being 15µg/m³.

The review of new monitoring data available for 2012 confirms that Clackmannanshire Council does not need to proceed to a Detailed Assessment for any pollutant.

6.2 Conclusions relating to New Local Developments

Clackmannanshire Council confirm that there are no new local developments that will require more detailed consideration in the next Updating and Screening Assessment.

6.3 Proposed Actions

Since the completion of The Forth Valley College, Alloa in September 2011, traffic congestion has been observed on Auld Brig Road leading up to the Shillinghill Roundabout especially between 4pm – 6pm. A mini-roundabout at the junction with Devon Road controls flow to and from the College car park. There are residential

properties within 3m of the roadside and the other side of the road is quite open. A traffic count survey has been commissioned for Auld Brig Road which is expected to take place in May/June 2013 in order that a screening assessment of the potential impact can be undertaken in a future report. In the meantime, an NO₂ diffusion tube has been located here since May 2012 to obtain some air quality data.

The traffic survey will also be undertaken on Clackmannan Road. The results of the traffic survey and the most recent monitoring will be used to undertake screening assessments in order to determine whether or not the automatic monitoring station should be relocated within Alloa to better represent worst case exposure.

7 References

- Ref.1 Local Air Quality Management Technical Guidance LAQM.TG(09),
Department for Environment, Food and Rural Affairs, 2009
- Ref.2 2012 Air Quality Updating and Screening Assessment Report for
Clackmannanshire Council, TSI Scotland Ltd, CLA-003-04-02
- Ref.3 2011 Air Quality Progress Report for Clackmannanshire Council, TSI Scotland
Ltd, CLA-001-03-03, April 2011
- Ref.4 2010 Air Quality Progress Report for Clackmannanshire Council, AEA
Technology plc, AEAT/ENV/R/3044/Issue1, 1st July 2010
- Ref.5 2009 Air Quality Updating and Screening Assessment for Clackmannanshire
Council, BMT Cordah Ltd, G_CLA_019, July 2009
- Ref.6 LAQM Progress Report 2008, BMT Cordah Ltd, G_CLA_018/04-02-01, 31st
March 2008
- Ref.7 Clackmannanshire Council LAQM Progress Report 2006/7, AEA,
AEAT/ENV/R/2458/Issue 2, 6th July 2007
- Ref.8 LAQM Updating and Screening Assessment 2006, BMT Cordah Ltd,
E_CLA_015, 31st August 2006
- Ref.9 LAQM Progress Report 2005, BMT Cordah Ltd, E_CLA_013, 28th April 2005
- Ref.10 LAQM Progress Report 2004, BMT Cordah Ltd, April 2004
- Ref.11 Volatile Correction Model, Environmental Research Group, King's College
London, SE1 9NH – <http://www.volatile-correction-model.info/>
- Ref.12 http://laqm.defra.gov.uk/documents/Diffusion_Tube_Factors_v04_11_v6.xls

Appendices

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

Appendix A: QA:QC Data

Table A1: Raw Unadjusted Monthly Diffusion Tube NO₂ Concentrations

ID	SITE	JAN	FEB ⁴	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN	Data Capture %
DT1	Norwood Avenue	15.9	20.1	8.8	10.7	9.3	6.9	6.4	10.9	9.6	15.7	17.8	19.9	11.99	91.6
DT2	Clackmannan Road	35.7	51.7	33	29.1	29.9	21.9	29.5	34.9	43.3	47	36.1	38.9	34.48	91.6
DT3	Bus Station, Alloa	38.3	57.3	32.2	48.7	35.2	30.1	33.8	35.8	43.4	41	45	47.8	39.21	91.6
DT4	Shillinghill/Bridge Terrace, Alloa	36.1	48.6	34.5	30.5	31.2	22.2	26.1	34.8	31.1	37.4	32.8	38	32.25	91.6
DT5	South Ring Road, Alloa	22.1	39.4	23.1	22.6	20.4	19.3	18.6	25.9	27.9	30.7	35.4	30.4	25.13	91.6
DT6	Auld Brig Road	-	-	-	-	17.5	19.6	14.4	29	2	31.4	39.4	40.2	24.19⁵	66.6

Table A.2 Short-Term to Long-Term Monitoring Data Adjustment

Site	Site Type	Annual Mean (µg/m ³)	Period Mean (µg/m ³)	Ratio
Norwood Avenue	Kerbside	12.67	12.06	1.05
Clackmannan Road	Kerbside	35.92	35.19	1.02
Bus Station, Alloa	Kerbside	40.72	39.01	1.04
Shillinghill/Bridge Terrace, Alloa	Kerbside	33.61	31.70	1.06
South Ring Road, Alloa	Roadside	26.32	26.08	1.01
			Average	1.04

⁴ February 2012 results were not accredited by the laboratory and so have been discounted from the calculation of annual mean.

⁵ The Auld Brig Site (DT6) was only recording data from May-December. The period mean has been annualised in accordance with the methodology in Box 3.2 in LAQM.TG(09) (Ref.1). Shown in Table A.2

Factor from Local Co-location Studies (if available)

There is no co-location study within Clackmannanshire Council.

Diffusion Tube Bias Adjustment Factors

The national bias adjustment factor spreadsheet v03_13

(<http://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html>) (Ref.12) was used to calculate the national bias adjustment factor for diffusion tubes analysed by Glasgow Scientific Services during 2012. The laboratory uses the method 20% TEA in Acetone. The bias adjustment factor was found to be 0.95.

PM Monitoring Adjustment

The VCM method (Ref.11) was used to correct data from the Alloa site and is ratified by AEA.



TEOM Data Correction Using the Volatile Correction Model - 2012

Introduction

Ricardo-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.

The VCM uses reference (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 (PM₁₀) from the TEOM. The TEOM measurements, without the applied USEPA correction factors of $1.03x+3$ (where x is the raw TEOM measurement), 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.

This is a short summary outlining the method used by Ricardo-AEA for correcting the 2012 Scottish TEOM data in the Scottish database.

Method

The following data have been used as inputs to the VCM:

- Hourly average temperatures (°C)
- Hourly average pressures (mbar)
- Hourly average TEOM concentrations ($\mu\text{g m}^{-3}$)
- Hourly average FDMS purge concentrations ($\mu\text{g m}^{-3}$)

For the 2012 corrections, temperature and pressure data from both Aberdeen Dyce Airport and Edinburgh Gogarbank meteorological monitoring stations were utilised. These two sites were selected as a good representation weather conditions in Aberdeen and the central belt of Scotland, respectively.

Hourly average purge measurements from all Scottish FDMS monitoring sites within the Scottish Government-run network (SAQD) and the UK national network (AURN) were used for the correction. Table 1 lists the sites used for correcting hourly TEOM data from Central Scotland and Aberdeen. A total of 3 FDMS sites were used for correcting Aberdeen TEOM data and 23 FDMS sites used for correcting data from TEOM sites located in the central belt of Scotland.

Any outliers in the FDMS purge measurements were identified using Grubbs' Test¹ on daily average data. All hourly data within a day identified as an outlier were then removed from the data set and the average of each hourly purge measurement from the FDMS sites was calculated and used in the VCM calculations.

¹ Grubbs' Test is a statistical method for identifying outliers within a dataset. For more information visit the Engineering Statistics Handbook at:

<http://www.itl.nist.gov/div898/handbook/eda/section3/eda35h.htm>



Table 1 FDMS Monitoring Sites used in VCM Correcting TEOM Data from Aberdeen and Central Scotland Monitoring Sites

TEOM Locations	FDMS Sites used in VCM	Monitoring Network
Aberdeen	Aberdeen	AURN
	Angus Forfar	SAGD
	Fife Cupar	SAGD
Central Scotland	Auchencorth Moss	AURN
	East Dunbartonshire Kirkintilloch	SAGD
	East Dunbartonshire Milngavie	SAGD
	Edinburgh Queensferry Road	SAGD
	Fife Cupar	SAGD
	Fife Dunfermline	SAGD
	Fife Kirkcaldy	SAGD
	Glasgow Abercromby Street	SAGD
	Glasgow Anderston	SAGD
	Glasgow Broomhill	SAGD
	Glasgow Burgher St	SAGD
	Glasgow Byres Road	SAGD
	Glasgow Centre	AURN
	Glasgow Kerbside	SAGD
	Glasgow Nithsdale Road	SAGD
	Grangemouth	AURN
	Paisley Gordon Street	SAGD
	Paisley St James St	SAGD
	South Lanarkshire Raith Interchange	SAGD
	South Lanarkshire Rutherglen	SAGD
West Lothian Broxburn	SAGD	
West Lothian Linlithgow High Street	SAGD	
West Lothian Newton	SAGD	

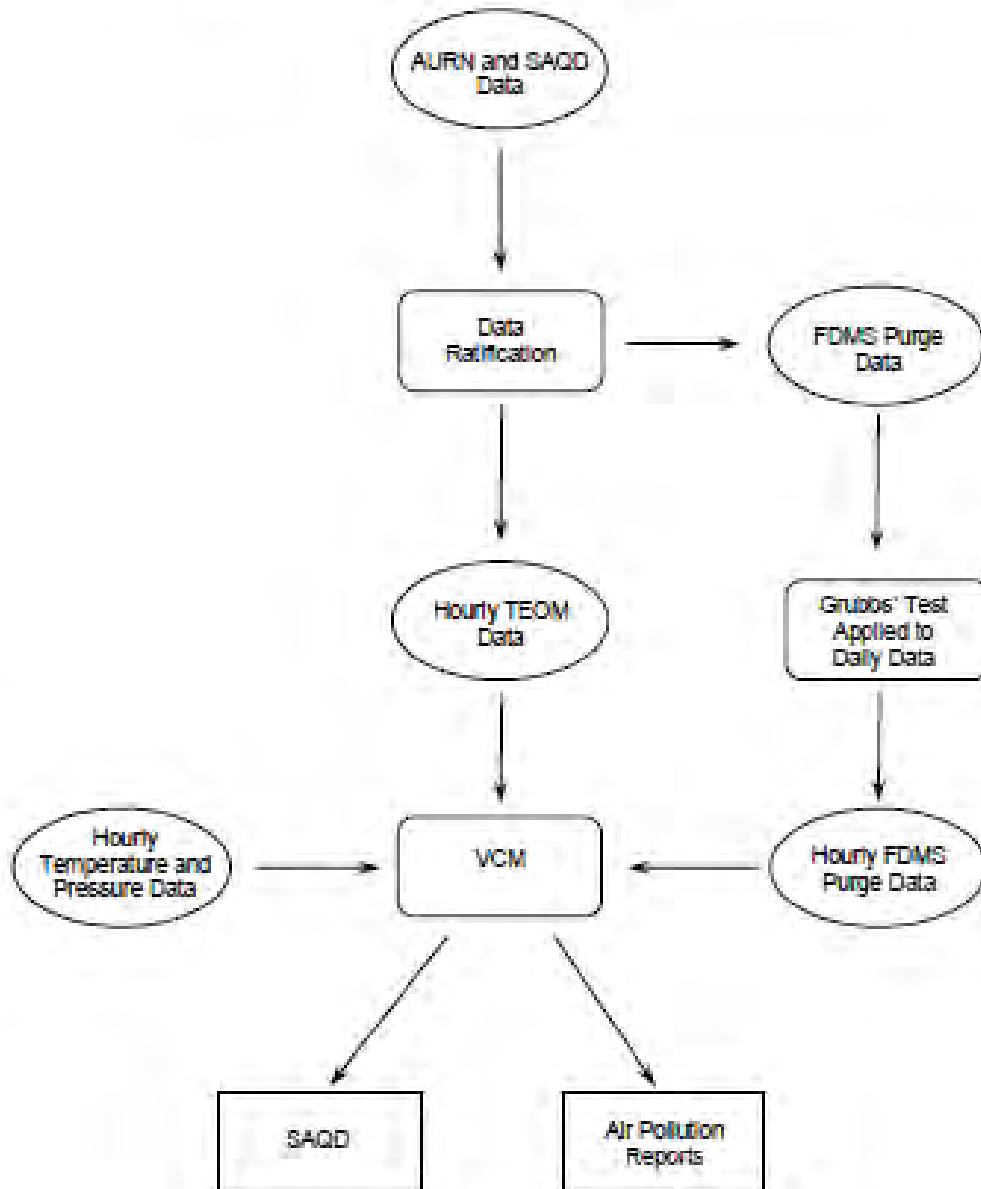
VCM and the SAGD

All 2012 VCM corrected data have been made available on the SAGD website via an additional selection option in the data download pages and in the individual site statistics tabs.

A flow chart showing the overall process employed for VCM correcting 2012 SAGD TEOM data is shown in Figure 1.



Figure 1 Process used for VCM Correcting SAQD TEOM Data



QA/QC of Automatic Monitoring

The automatic monitoring equipment is audited and calibrated every 6 months by Ricardo AEA, Glengarnock Technology Centre, Lochshore Business Park, Glengarnock. It is serviced bi-annually by Casella Measurement. Available reports are shown below.

RICARDO-AEA

CERTIFICATE OF CALIBRATION

Glenparnack Technology Centre, Caledonian Road, Lochshore Business Park, Glenparnack, Ayrshire, KA14 3DD. Telephone 0870 1905200 Fax 0870 1905151



0401

Approved Signatories: D. Hector S. Stratton

Signed: [Redacted] Date: 18th March 2013

Cert No: 2766 Page 1 of 2

Customer Name and Address: Scottish Government
Water, Air, Soils and Flooding Division
Environmental Quality Directorate
Scottish Government
Victoria Quay
Edinburgh
EH6 6QQ

Description: Calibration factors for Clackmannanshire Council's Alico air monitoring station.

Site / Date Test Carried Out	Species	Analyser Serial No.	Parameter	Specified Value	Measured Value	Deviation %
Alico 26 th Feb 2013	TEOM PM ₁₀	22458	Main Flow ^a	3.00	2.96	-1.3
			Aux Flow ^a	13.67	13.51	-1.1
			Total Flow ^a	16.67	16.47	-1.2
			k ₀ ^b	12791	12753	-0.3

Uncertainties:

TEOM PM ₁₀	Main Flow	+2.2%
	Total Flow	+2.2%
	Aux Flow	+2.2%
	k ₀	+1.0%

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor and providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and its units of measurement, realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may only be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Produced by AEA on behalf of the Scottish Government

ALLOA
1st January to 31st December 2012

These data have been fully ratified by Ricardo-AEA

POLLUTANT	PM ₁₀ *
Maximum hourly mean	88 µg m ⁻³
Maximum daily mean	54 µg m ⁻³
Average	15 µg m ⁻³
Data capture	96.9 %

* PM₁₀ as measured by a TEOM using the VCM for Gravimetric Equivalent concentrations.
 Particulate matter concentrations are reported at ambient temperature and pressure.

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	-

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

Service Report



Customer : Job No: Date:

Site: Period:

Reported Fault:

- Sample line changed Yes No (give reason below) N/A
- Follow Up site visit required to complete repair / callout Yes No
- Sample inlet cleaned Yes No
- Comms test passed Yes No

Action Taken:

I cleaned the team head and serviced the team. I checked the pump vaccum and then adjusted the flow s. I changed the filter before leaving.

Parts Required

Agresso No.	Manufacturer No.	Description	Qty

Parts Used

Agresso No.	Manufacturer No.	Description	Qty
SPA00349		DFU	1

travel time hrs date started

time on site hrs date finished

total

QA/QC of Diffusion Tube Monitoring

The NO₂ diffusion tubes used by Clackmannanshire Council were prepared and analysed by the Glasgow Council Scientific Services Laboratory (GSS) The Laboratory is UKAS accredited and has good performance in both WASP and NPL QA schemes. The laboratory demonstrated overall satisfactory performance in the Workplace Analysis Scheme for Proficiency (WASP) over the past four quarterly rounds with Z scores between -2 and 0.4 for 75% of measurements. Four scores (25%) are in the Warning classification.

WASP (4 tubes)

Round 117	Z-Scores	-0.9	-2.0	-2.1	-2.8
Round 118	Z-Scores	0.4	0	0.2	0.2
Round 119	Z-Scores	-0.8	-0.5	0.1	-1.6
Round 120	Z-Scores	-2.4	-2.1	-1.7	-1.4

The general classification of a Z-Score is:

$Z < \pm 2$	Satisfactory
$Z > \pm 2$ and $< \pm 3$	Warning
$Z > \pm 3$	Unsatisfactory

The results of the NPL Intercomparison Study are shown below. The overall survey had good precision and data capture.

Results of NPL Inter Comparison Study for GSS 2012

Checking Precision and Accuracy of Triplicate Tubes



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	04/01/2012	01/02/2012	127.0	116.0	120.0	121	5.6	5	13.8
2	01/02/2012	29/02/2012	122.0	119.0	94.1	112	15.3	14	38.0
3	29/02/2012	28/03/2012	121.0	120.0	113.0	118	4.4	4	10.8
4	28/03/2012	24/04/2012	76.9	93.8	103.6	91	13.5	15	33.6
5	24/04/2012	30/05/2012	78.7	48.7	76.5	68	16.7	25	41.5
6	30/05/2012	27/06/2012	103.0	79.0	86.6	90	12.3	14	30.5
7	27/06/2012	31/07/2012	133.0	130.0	138.0	134	4.0	3	10.0
8	31/07/2012	28/08/2012	102.0	95.9	107.0	102	5.6	5	13.8
9	28/08/2012	26/09/2012	117.0	118.0	141.0	125	13.6	11	33.7
10	26/09/2012	31/10/2012	82.0	90.7	100.0	91	9.0	10	22.4
11	31/10/2012	28/11/2012	126.0	127.0	116.0	123	6.1	5	15.1
12	28/11/2012	02/01/2013	114.0	100.0	99.7	105	8.2	8	20.3
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
93.6	87.0	Good	Good
92.1	92.6	Good	Good
92.7	97.3	Good	Good
90.7	97.7	Good	Good
80.4	94.4	Poor Precision	Good
90.3	97.5	Good	Good
100.2	96.7	Good	Good
88.0	97.7	Good	Good
89.4	86.2	Good	Good
92.7	97.3	Good	Good
108.2	76.2	Good	Good
88.6	89.5	Good	Good

Overall survey -->

Good precision	Good Overall DC
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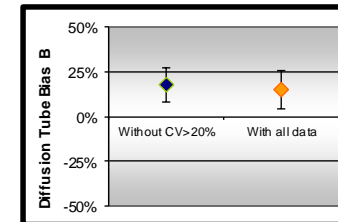
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision 11 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 11 periods of data	
Bias factor A	0.85 (0.78 - 0.92)
Bias B	18% (8% - 28%)
Diffusion Tubes Mean:	110 μgm^{-3}
Mean CV (Precision):	8
Automatic Mean:	93 μgm^{-3}
Data Capture for periods used:	92%
Adjusted Tubes Mean:	94 (86 - 101) μgm^{-3}

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.87 (0.79 - 0.95)
Bias B	16% (5% - 26%)
Diffusion Tubes Mean:	107 μgm^{-3}
Mean CV (Precision):	10
Automatic Mean:	92 μgm^{-3}
Data Capture for periods used:	93%
Adjusted Tubes Mean:	93 (84 - 101) 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