



2010 Air Quality Progress Report for Fife Council

In fulfilment of Part IV of the Environment Act 1995


Local Air Quality Management

July 2010

Title	2010 Air Quality Progress Report for Fife Council
Customer	Fife Council
Customer reference	AEAT/ENV/FIFEPRG2010
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File reference	AEAT/ENV/R/2977
Reference number	ED56066

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Report Reference number	AEAT/ENV/R/2977
Date	23/07/10

Executive Summary

This Air Quality Progress Report has been prepared for Fife Council as part of the Local Air Quality Management (LAQM) system introduced in Part IV of the Environment Act 1995. The Local Air Quality Management Technical Guidance LAQM.TG (09) has been closely followed in the preparation of this report.

On the basis of this assessment, no further action is required in respect to pollutants:

- Nitrogen Dioxide;
- Particulate Matter;
- Carbon Monoxide;
- Benzene;
- 1-3, butadiene;
- Lead; and
- Sulphur Dioxide.

Analysis of the 2009 Nitrogen Dioxide (NO₂) and Particulate Matter (PM₁₀) monitoring data concluded that no further action is required, over and above that already in progress by Fife Council. The 2009 data supports conclusions made by Detailed Assessments carried out prior to this report at Bonnygate, Cupar (May 2008); Appin Crescent, Dunfermline (Jan 2009); and Admiralty Road, Rosyth (May 2009).

Bias adjusted data from additional diffusion tubes installed in 2009 at Appin Crescent have exceeded the annual mean concentrations. However, monitoring was only carried out for five months of the calendar year. As such, Fife Council should continue to monitor NO₂ at this location for a period of 12 months.

Should measured levels of NO₂ exceed the annual mean objective when 12 months diffusion tube data is available at this location Fife Council should proceed immediately to a Detailed Assessment.

Currently monitoring data has not identified the need to proceed to a Detailed Assessment for any pollutants outlined in this report.

Fife Council's next objective in the LAQM process will be to submit the 2011 Progress Report.

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1 Introduction

1.1 Description of Local Authority Area

Fife is an area in eastern Scotland bordered on the north by the Firth of Tay, on the east by the North Sea and the Firth of Forth to the south. The route to the west is partially blocked by the mass of the Ochil Hills. Almost all traffic into and out of Fife has to pass over one of four bridges, south on the Forth Road Bridge, west on the Kincardine Bridges or north east via the Tay Road Bridge, the exception being traffic headed north on the M90.

The coast has some small harbours, industrial docks in Burntisland and Rosyth and also fishing villages of the East Neuk such as Anstruther and Pittenweem. The large area of flat land to the north of the Lomond Hills, through which the River Eden flows, is known as the Howe of Fife. North of the Lomond Hills can be found villages and small towns in a primarily agricultural landscape. The areas in the south and west of Fife, including the towns of Dunfermline, Glenrothes, Kirkcaldy and the Levenmouth region are much more industrial and densely populated.

1.2 Purpose of Progress Report

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) and the Air Quality (Scotland) (Amendment) Regulations 2002 (Scottish SI 2002 No 297). They are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (for carbon monoxide the units used are milligrammes per cubic metre mg/m^3). Table 1.1 includes the number of permitted exceedences in any given year (where applicable).

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

Pollutant			Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	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	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	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
Particles (PM ₁₀) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	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

This Section will summarise conclusions made by the previous three rounds of air quality review and assessments.

The First Round of Review and Assessment reports concluded that additional assessment was not necessary for any pollutants in the strategy, and that Fife Council did not need to declare any Air Quality Management Areas (AQMAs).

The second round of Review and Assessment reports (2003 USA and 2004 & 2005 Progress reports) concluded that the Air Quality Objectives for sulphur dioxide, carbon monoxide, 1,3-butadiene, benzene and lead are unlikely to be exceeded.

The 2003 USA identified that high NO₂ concentrations were recorded at kerbside locations in North Approach Road, Kincardine, Carnegie Drive, Dunfermline and Admiralty Road, Rosyth. As this was based on kerbside data it was recommended that further diffusion tube monitoring be undertaken at the façade of the buildings in order to improve the assessment of potential exposure.

Furthermore, the 2005 Progress Report recommended that automatic monitoring of NO₂ be undertaken at Admiralty Road, Rosyth and Bonnygate, Cupar. Additionally, it was recommended that automatic monitoring continue at North Approach Road, Kincardine.

PM₁₀ monitoring also commenced at Admiralty Road, Rosyth and Bonnygate, Cupar.

The 2006 USA recommended that monitoring of NO₂ and PM₁₀ continue at Bonnygate, Cupar and recommence at Admiralty Road, Rosyth to better assess concentrations of each pollutant.

Automatic monitoring of NO₂ was discontinued at North Approach Road, Kincardine in May 2007 as the relevant Air Quality Objectives were met at this location. As a result of a new bridge crossing and northern bypass road further reductions of NO₂ have been realised at this location.

Monitoring data for 2006 and 2007 (automatic and diffusion tubes) indicated that it was likely the NO₂ and PM₁₀ Air Quality Objectives would not be met in Bonnygate, Cupar. The 2007 Progress Report concluded that a Detailed Assessment should be carried out at this location. Additionally, the 2008 Progress Report concluded that a Detailed Assessment should be carried out for Appin Crescent, Dunfermline (NO₂) and Admiralty Road, Rosyth (PM₁₀).

The Detailed Assessment (2007/2008) for Bonnygate, Cupar considered NO₂ and PM₁₀. The report concluded that an AQMA should be declared for both NO₂ and PM₁₀.

The Detailed Assessment (2008) for Appin Crescent, Dunfermline advised that increased monitoring of NO₂ should be carried out to enable improved characterisation of ambient NO₂ concentrations before any further decisions are made.

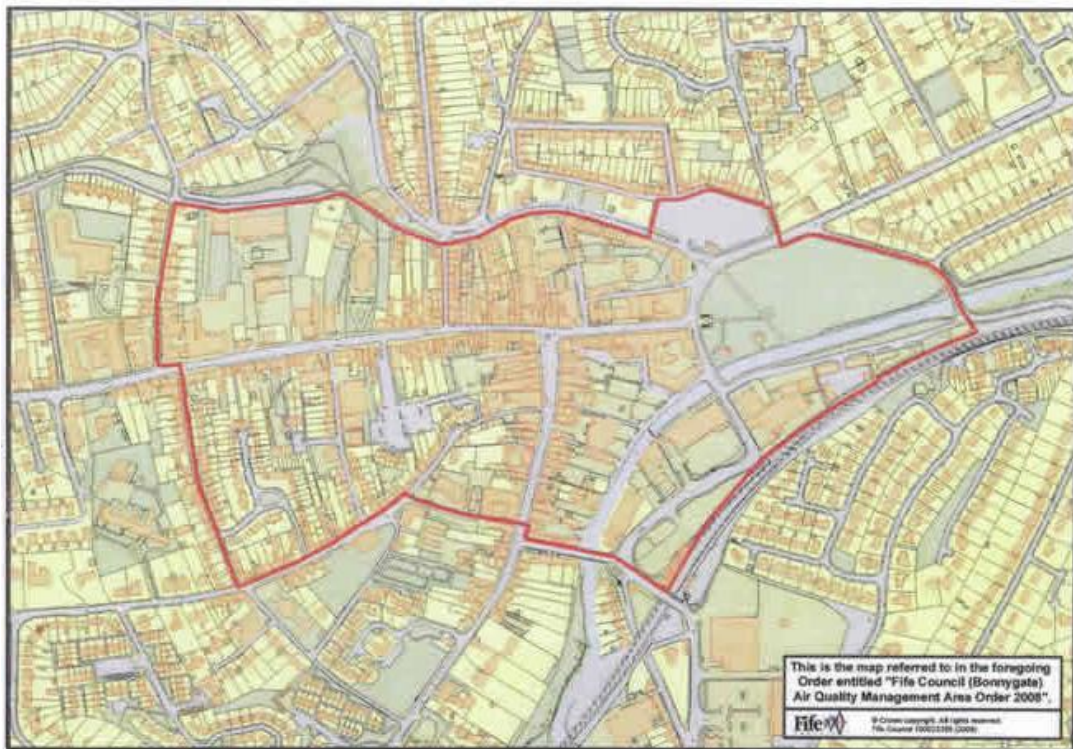
The Detailed Assessment (2009) for Admiralty Road, Rosyth considered PM₁₀ concentrations in the area and concluded that no further action was required.

The Further Assessment (2010) for Bonnygate, Cupar concluded that the AQMA was still required and that its boundary was appropriate (see Figure 1.1). The source apportionment found that heavy and light goods vehicles contributed broadly similar NO_x emissions and that action planning should therefore focus on both vehicle types.

An Air Quality Action Plan is currently being developed for Bonnygate, Cupar.

Previous Review and Assessments have concluded that concentrations of lead are well below its respective objective at all locations in Fife. There has been no change in sources of these pollutants so they are not considered further in this report.

Figure 1.1 Map of Bonnygate AQMA Boundary



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2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

New monitoring data for 2009, for the following pollutants, have become available since the 2009 USA and are reviewed for this report:

- Carbon Monoxide (CO);
- Benzene;
- 1,3 Butadiene;
- Nitrogen Dioxide (NO₂);
- Sulphur Dioxide (SO₂); and
- PM₁₀.

Fife Council carried out automatic monitoring for NO₂ and PM₁₀ during 2009. This included extensive NO₂ measurements using diffusion tubes.

Additionally, measurements of benzene and other hydrocarbon compounds in the vicinity of Hound Point are available from BP Exploration Operating Company Ltd (ref 12).

Automatic SO₂ data are also available from Scottish Power Generation Ltd from a monitoring site close to Longannet Power Station (ref 13). The station's PPC permit from SEPA requires that air quality impacts around Longannet Power Station be assessed with respect to the AQS objectives.

A summary of the Mossmorran and Braefoot Bay Independent Air Quality Monitoring Review Group Report 2008 is also provided in this Progress Report. The report was commissioned by ExxonMobil to assess concentrations of 1,3 butadiene, benzene and particulate matter. Results are summarised in section 2 of this Progress Report.

No new monitoring data are presented for Ineos Grangemouth oil refinery as their annual monitoring report for 2009 was not available at the time of producing this report.

2.1.1 Automatic Monitoring Sites

Fife Council operated three automatic air quality monitoring stations during 2009. Full details of these monitoring stations are provided in Appendix A and are summarised in Table 2.1. Maps of the locations can be seen in Figures 2.1, 2.2, and 2.3.

No site has closed down since the previous report. During 2009 the Bonnygate, Cupar automatic site was out of service from the end of January until early July. This was due to road traffic flow improvement works (new Urban Traffic Management and Control System and changes to pedestrian crossings) being undertaken at this time. The opportunity was taken during this period to upgrade the monitoring equipment from a TEOM to FDMS. As such, there is now no requirement to correct data from this automatic analyser using the VCM.

The automatic monitoring site located in Bonnygate, Cupar was operational between July and December, 2009. As such, data collected during this period has been period mean adjusted using the process outlined in Box 3.2 of LAQM TG(09).

Short-period CO monitoring has also been undertaken by Fife Council Transportation Department.

SO₂ monitoring is also undertaken on behalf of Longannet Power Station at Blair Mains (Grid Reference NS972864) to the north east of the power station. This is at the area identified by modelling as likely to experience the maximum impact of the power station plume.

AEA undertook quality control of the automatic data for Fife Council monitoring sites during 2009.

The QA/QC procedures follow the requirements of the Technical Guidance (09) and are equivalent to those used at UK level for the National Network (AURN) monitoring sites. This gives a high degree of

confidence in the data obtained, both for measured concentrations at the automatic sites and for establishing robust bias correction factors for diffusion tubes.

In order to satisfy the requirement outlined in the Technical Guidance (09), the following QA/QC procedures were implemented:

- 3-weekly calibrations of the NO_x analyser;
- 6-monthly audits and servicing of the monitoring site;
- Data ratification.

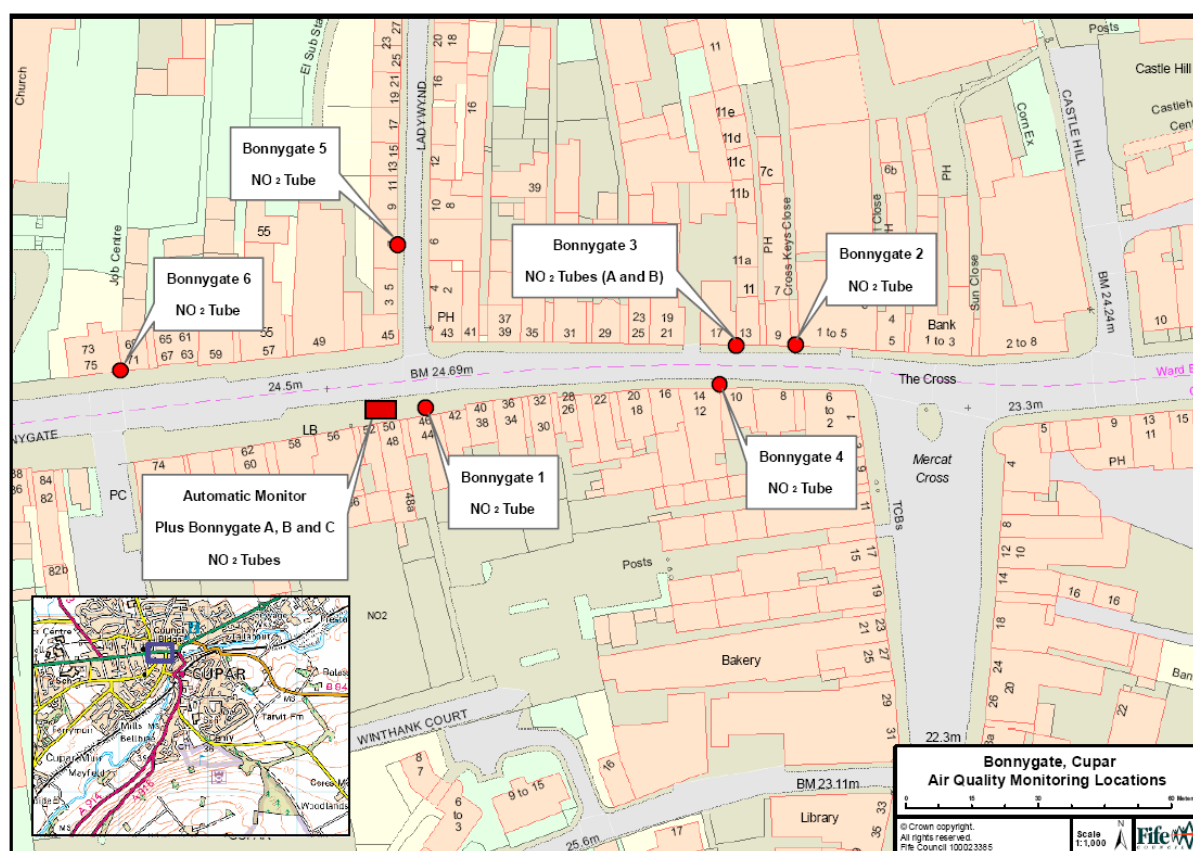
Calibrations of the NO_x analyser were carried out using certified compressed gas standards (ISO17025). This ensured that the calibration gas was traceable to national and international standards. In addition to the calibration, sample filters were changed for NO_x and TEOM analysers and any faults were identified thus minimising data loss.

Audits of the monitoring sites consisted of a number of performance checks to identify any faults with the equipment. The calibration cylinder was also checked against another gas standard in order to confirm the gas concentration. Any identified faults were forwarded on to the service unit for repair.

The final stage of the QA/QC process was to ratify the data. During ratification, all calibration, audit and service data are collated and the data are appropriately scaled. Any suspect data identified are deleted therefore ensuring that the data are of a high quality.

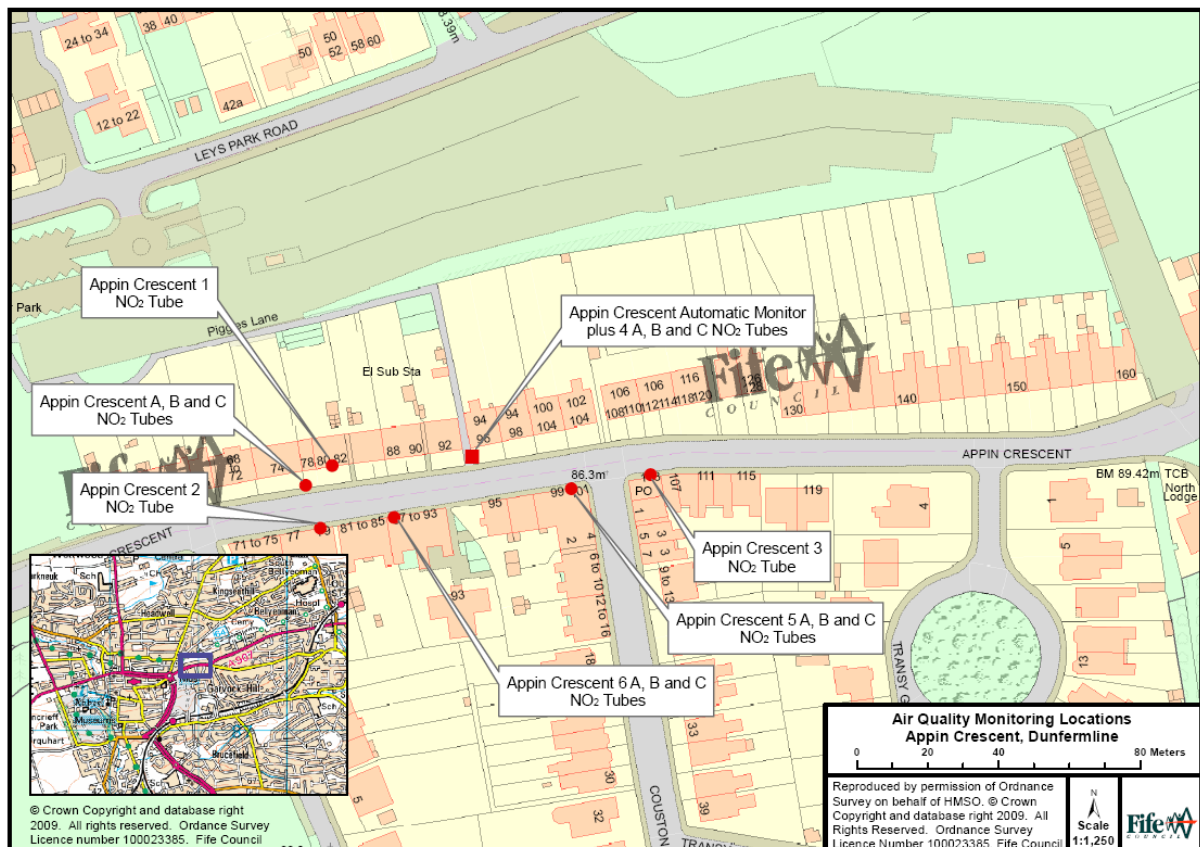
Casella Measurement carried out QA/QC procedures at the SO₂ automatic monitoring site at Blair Mains. These procedures were also to a standard equivalent to the AURN.

Figure 2.1 Bonnygate, Cupar, Automatic Monitoring Location



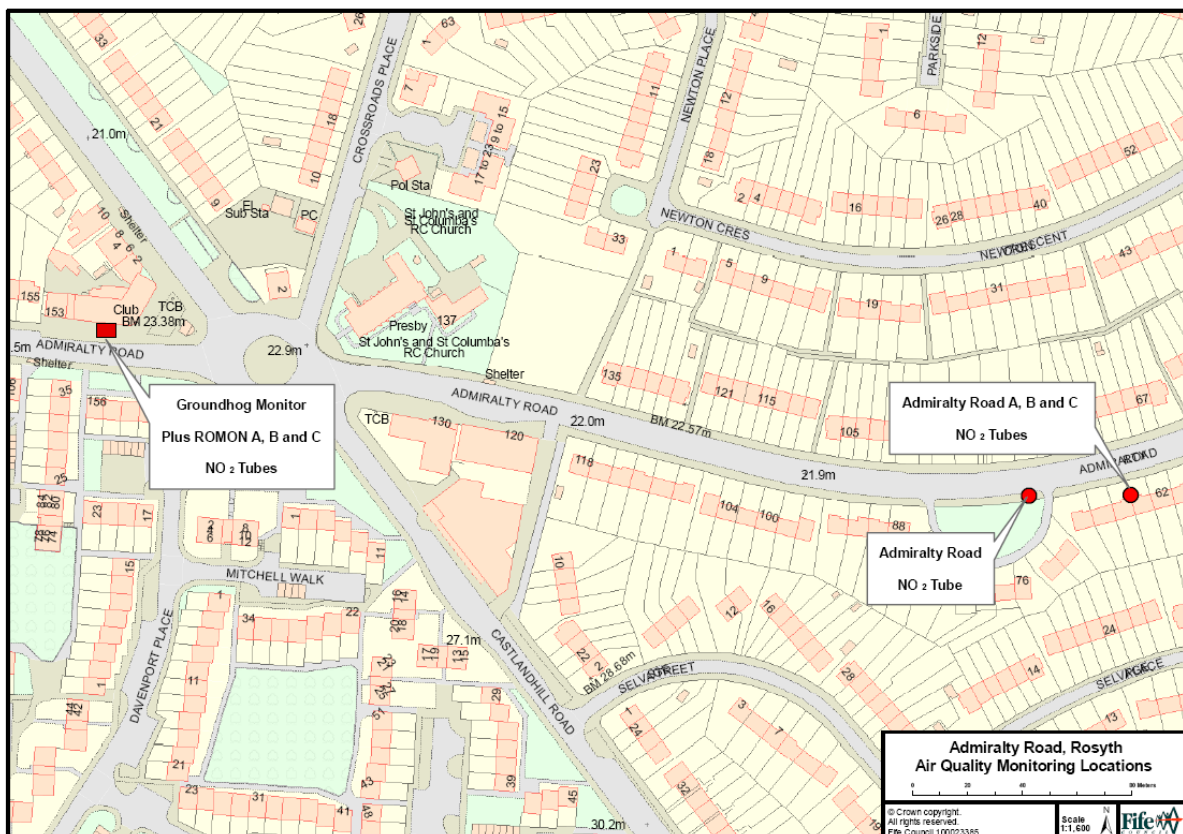
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Figure 2.2: Appin Crescent, Dunfermline, Automatic Monitoring Location



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Figure 2.3: Admiralty Road, Rosyth, Automatic Monitoring Location



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Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Bonnygate, Cupar	Kerbside	X337406	Y714574	NO ₂ , PM ₁₀	TEOM-FDMS , NO _x Analyser	Y	N (5m)	< 0.5m	Y
Appin Crescent, Dunfermline	Roadside	X309926	Y687722	NO ₂	NO _x Analyser	N	Y	4m	Y
Admiralty Road, Rosyth	Roadside	X311755	Y683503	NO ₂ , PM ₁₀	TEOM-FDMS, NO _x Analyser	N	Y	6m	Y

2.1.2 Non-Automatic Monitoring

Fife Council operates an extensive NO₂ diffusion tube monitoring survey with monitoring sites in East, West and Central Fife. In total there are 64 NO₂ diffusion tubes located at 45 sites throughout the local area. Of these, ten sites are triplicate sites, with three of these co-located with the automatic analysers.

Fife Council also undertake SO₂ diffusion tube monitoring with a triplicate tube site at Markinch, close to Tullis Russell Papermakers and at long running monitoring sites at High Valleyfield and Culross, both situated near Longannet Power Station. Details of all diffusion tube monitoring sites are provided in Table 2.3.

Although SO₂ diffusion tube data are not considered sufficiently accurate for inclusion in the Review and Assessment process, they are included for completeness and to provide a broad indication of air quality.

Measurements of benzene and other hydrocarbon compounds are also undertaken by NPL on behalf of BP Exploration Operating Company Ltd in the vicinity of Hound Point. The reports in which the data were received do not provide detailed information on site locations.

Diffusion Tube QA/ QC Process

Diffusion tubes used by Fife Council are supplied and analysed by Tayside Scientific Services (formerly Dundee City Council Scientific Services). The laboratory participates in three schemes which ensure that the NO₂ tube results meet acceptable standards.

1. The WASP scheme is run by the Health and Safety Laboratory. Each month one tube is sent for testing. Results are compared with other participating labs and feedback on performance provided.
2. Every three months three tubes and a blank (for analysis) are supplied for exposure at an intercomparison site operated as part of the Support to Local Authorities for Air Quality Management contract funded by the Scottish Government, Defra and the other Devolved Authorities. Again, results are compared with other participating labs and feedback on performance provided.
3. Each month a QC NO₂ solution is also provided via this contract. This solution is run as an internal check for NO₂ tubes in the laboratory. The solution is tested after every 21 NO₂ tube samples.

Tayside Scientific Services also use in-house quality assurance standards. The tube preparation method is 20%TEA in water.

Bias Correction for Diffusion Tubes

Diffusion tube samplers are a simple and cost effective method of measuring NO₂. However, they are classed as an indicative method and are known to have a systematic bias compared to more accurate results obtained from calibrated automatic analysers.

The degree of systematic bias depends on the laboratory preparing and analysing the tubes, and also includes the methodology employed for that analysis. Therefore, it is necessary to determine a bias adjustment factor appropriate for the particular diffusion tubes used in Fife. The methodology for determining the appropriate bias adjustment factor is outlined in LAQM TG (09), and several online tools are also available to assist with this process.

The local bias factor is calculated using sites where a triplicate set of diffusion tubes are co-located with a chemiluminescence analyser. The national bias adjustment factor is derived using the national database co-location studies.

Fife Council has three co-location sites that can be used to calculate the local bias adjustment factor. The local bias adjustment factor for each individual location was calculated using the “LAQM Tool” described in section A1.191 of LAQM TG (09). The results are shown in Table 2.2 below. Calculations are shown in Appendix C.

Table 2.2 Bias correction factors for 2009 for NO₂ diffusion tubes in Fife

Source	Bias adjustment Factor 2009
Appin Crescent, Dunfermline	0.75
Bonnygate, Cupar	0.79 (July – December)
Admiralty Road, Rosyth	0.82

Table 2.2 shows that the bias adjustment factors are similar at all automatic sites throughout Fife. As the Bonnygate site only collected data for a six month period the bias adjustment factor for this site has been discounted.

The only available national database co-location studies presented in the most up to date version (Feb 2010) of the spreadsheet were those submitted by Fife Council for Appin Crescent and Admiralty Road. These studies cover 11 months and 10 months respectively. In this case it is more appropriate to use the locally derived bias adjustment factors from Appin Crescent and Admiralty Road as both studies are based on 12 months data sets.

The average of the bias adjustment factors from Appin Crescent and Admiralty Road is **0.79**, which is similar to the bias adjustment factor (**0.77**) derived from the national database of co-location studies (National Bias Adjustment Factor Spreadsheet version number 02/2010, shown in Appendix C). The national bias adjustment factor was used in the 2009 USA.

It should also be noted that the bias adjustment factor for Bonnygate, Cupar has decreased significantly from that quoted in the 2009 USA. The reason for this is not clear although traffic conditions at this location have changed considerably- traffic no longer queues at this point due to road reconfiguration.

For this Progress Report the locally derived bias adjustment factor has been applied due to the following factors, as per Box 3.3 of LAQM TG (09):

- The Review and Assessment Helpdesk spreadsheet contains data from fewer than five other studies using the same laboratory and preparation;
- The co-location sites generally show “good” precision for the diffusion tubes with high quality chemiluminescence results; and
- It is the more conservative of the two bias adjustment factors available.

Note that the national database result incorporates the data for the Fife co-location studies.

Table 2.3 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
NO ₂ Diffusion Tubes West Area								
St Leonards Primary School, Dunfermline	R(F)	X 309770	Y 686895	NO ₂	N	Y	10.6	Y
Carnegie Drive (A,B,C), Dunfermline*	R(F)	X 309019	Y 687632	NO ₂ *	N	Y	2.3	Y
Rumblingwell, Dunfermline (5N)	R	X 307866	Y 688231	NO ₂	N	N (6.3)	1.7	Y
Aytoun Grove, Dunfermline (6N)	UB	X 308328	Y 688426	NO ₂	N	N (7.7)	6.1	N
Admiralty Road, Rosyth (AQM 5)	K	X 312103	Y 683439	NO ₂	N	N (12.3)	0.5	Y
Admiralty Road (A,B,C), Rosyth*	R(F)	X 312140	Y 683439	NO ₂ *	N	Y	9.0	Y
Admiralty Road (A,B,C) ROMON*	R(F)	X 311755	Y 683503	NO ₂ *	N	Y	6.5	Y
Barrie Street, Dunfermline (8N)	UB	X 308379	Y 688249	NO ₂	N	N (6.3)	0.5	N
Appin Crescent (A)(B)(C), Dunfermline (9N)*	R	X 309897	Y 687713	NO ₂	N	N (5.1)	1.6	Y
Appin Crescent (1) Dunfermline	R(F)	X 309891	Y 687716	NO ₂	N	Y	6.5	Y
Appin Crescent (2) Dunfermline	R(F)	X 309975	Y 687716	NO ₂	N	Y	1.5	Y
Appin Crescent (3) Dunfermline	R(F)	X 309975	Y 687716	NO ₂	N	Y	1.8	Y
Appin Crescent 4(A)(B)(C) Dunfermline*	R(F)	X 309926	Y 687722	NO ₂ *	N	Y	3.9	Y
Appin Crescent 5(A)(B)(C)*	R(F)	X 309974	Y 687716	NO ₂	N	Y	1.5	Y
Appin Crescent 6(A)(B)(C)*	R(F)	X 309904	Y 687704	NO ₂	N	Y	1.5	Y
High Street, Cowdenbeath	K	X 316523	Y 691740	NO ₂	N	N (3.5)	0.5	Y
North Approach Road (A, B) Kincardine	K	X 293182	Y 687549	NO ₂	N	N (11.0)	0.5	Y
Pittencrieff St, Dunfermline	R(F)	X 308743	Y 687549	NO ₂	N	Y	0.5	Y
NO ₂ Diffusion Tubes Central Area								
St Clair Street (1), Kirkcaldy	R(F)	X 329105	Y 692992	NO ₂	N	Y	1.3	Y
St Clair Street (2), Kirkcaldy	R(F)	X 329185	Y 693055	NO ₂	N	Y	1.8	Y

St Clair Street (3), Kirkcaldy	R(F)	X 329173	Y 693069	NO ₂	N	Y	2.0	Y
Wedderburn Road, Kirkcaldy	UB	X 325228	Y 693086	NO ₂	N	N (8.6)	0.5	N
Lovat Road, Glenrothes	K	X 328600	Y 699470	NO ₂	N	N (7.7)	0.5	Y
Dunnikier Rd, Kirkcaldy	R(F)	X 328152	Y 692350	NO ₂	N	Y	3.4	Y
Victoria Rd, Kirkcaldy	R(F)	X 328152	Y 692325	NO ₂	N	Y	2.5	Y
Glenlyon Road, Levenmouth	K	X 337357	Y 701318	NO ₂	N	N (26.8)	1.0	Y
Leslie High St	R(F)	X 325111	Y 701806	NO ₂	N	Y	3	Y
Queensway, Glenrothes	K	X 327849	Y 701114	NO ₂	N	N (17.0)	1.0	Y
Adsa Roundabout, Kirkcaldy	K	X 328735	Y 694053	NO ₂	N	N (28.0)	1.0	Y
NO₂ Diffusion Tubes East Area								
City Road (1,2), St Andrews	R	X 350586	Y 716580	NO ₂	N	N (1.0)	1.5	Y
Bell Street (1,), St Andrews	R(F)	X 350708	Y 716716	NO ₂	N	Y	1.6	Y
Bell Street (2) St Andrews	R(F)	X 350716	Y 716669	NO ₂	N	Y	2.1	Y
Windsor Gdns, St Andrews (4N)	UB	X 349122	Y 715313	NO ₂	N	N (15.6)	1.4	N
Crossgate, Cupar	K	X 337536	Y 714537	NO ₂	Y	N (3.0)	0.5	Y
South Road, Cupar	R	X 337513	Y 713616	NO ₂	N	N (17.0)	1.8	Y
Cupar Road, Auchtermuchty	R(F)	X 324186	Y 711801	NO ₂	N	Y	1.8	Y
Millfield, Cupar (4N)	UB	X 336867	Y 713878	NO ₂	N	N (17.0)	8.0	N
Bonnygate, Cupar (1N), Bonnygate 1	R(F)	X 337409	Y 714570	NO ₂	Y	Y	5.3	Y
Bonnygate, Cupar, Bonnygate 2	R(F)	X 337493	Y 714586	NO ₂	Y	Y	1.7	Y
Bonnygate, Cupar, Bonnygate 3 (A, B)	R(F)	X 337480	Y 714586	NO ₂	Y	Y	1.6	Y
Bonnygate, Cupar, Bonnygate B4	R(F)	X 337471	Y 714575	NO ₂	Y	Y	1.9	Y
Ladywynd, Cupar, Ladywynd B5	R(F)	X 337405	Y 714596	NO ₂	Y	Y	1.0	Y
Bonnygate West, Cupar, Bonnygate B6	R(F)	X 337342	Y 714579	NO ₂	Y	Y	3.2	Y
Bonnygate, Cupar, Monitor BA, BB, BC *	K	X 337406	Y 714574	NO ₂ *	Y	N (4.8)	0.6	Y
4 East Road, Cupar	R(F)	X 337915	Y 714721	NO ₂	Y	Y	14.0	Y
SO₂ Diffusion Tubes								
Main Street, Culross	UB	X 297860	Y 685299	SO ₂	N	N/A	N/A	N/A
Valleyfield, Dunfermline	UB	X 300920	Y 686848	SO ₂	N	N/A	N/A	N/A
Mount Frost Drive, Markinch (1,2,3)	UB	X 328627	Y 701992	SO ₂	N	N/A	N/A	N/A

* Triplicate sites

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

Table 2.4a shows 2009 statistics for automatic NO₂ measurements at the three locations in Fife. It shows that Appin Crescent, Dunfermline, Bonnygate, Cupar and Admiralty Road, Rosyth have no exceedences for the annual mean NO₂ objective.

Table 2.4b shows the results of automatic monitoring measured against the 1 hour NO₂ objective. Admiralty Road measured two occasions where the hourly mean was greater than 200µg/m³, while Bonnygate and Appin Crescent did not measure any. Although Admiralty Road measured exceedences of the 1 hour objective this is less than the permitted 18 exceedences during any one year period.

Due to the poor data capture at Bonnygate during 2009 a calculation was carried out to estimate an annual mean for the entire year. This was achieved using the methodology stated in Box 3.2 of LAQM TG (09). The non period mean adjusted mean concentration is shown in brackets in table 2.4a. The period mean calculation can be found in Appendix C.

NO₂ measured in Bonnygate, Cupar reduced from 46µg/m³ in 2008 to 32µg/m³ in 2009. This can be explained by the measures introduced during 2009 to improve traffic flow throughout Bonnygate. This included a new Urban Traffic Management and Control System and changes to pedestrian crossings.

No new NO₂ monitoring data are presented for Ineos Grangemouth oil refinery as their annual monitoring report for 2009 was not available at the time of producing this report.

Table 2.4a Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective (40 µg/m³)

Location	Within AQMA?	Data Capture 2009 %	Annual mean concentrations (µg/m ³)		
			2007	2008	2009
Appin Crescent, Dunfermline	N	99	31*	30	30
Bonnygate, Cupar	Y	57	52	46	(33) 32**
Admiralty Road, Rosyth	N	99	N/A	26***	29

* Appin Crescent, Dunfermline started monitoring August 2007.

** Bonnygate, Cupar started monitoring December 2005. Bonnygate Cupar did not monitor between February and early July. Period Mean adjustment of 0.95 applied.

*** Admiralty Road, Rosyth started monitoring March 2008.

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

Location	Within AQMA?	Data Capture 2009 %	Number of Exceedences of hourly mean (200 µg/m ³) <i>If the period of valid data is less than 90% of a full year, include the 99.8th percentile of hourly means in brackets.</i>		
			2007	2008	2009
Appin Crescent, Dunfermline	N	99	0*	0	0
Bonnygate, Cupar	Y	57	2	3	0 (170)**
Admiralty Road, Rosyth	N	99	N/A	0***	2

* Appin Crescent started monitoring August 2007.

** Bonnygate, Cupar started monitoring December 2005. Bonnygate Cupar did not monitor between February and early July.

*** Admiralty Road, Rosyth started monitoring March 2008.

Diffusion Tube Monitoring Data

Table 2.5 gives the annual diffusion tube data (bias adjusted using local factor 0.79) for 2009, comparing data for 2008 and 2007. All monthly diffusion tube results are found within Appendix D. As shown in Table 2.5, a total of nine diffusion tubes at four locations exceeded the NO₂ annual mean objective of 40µg/m³. These sites are:

- Appin Crescent 5(A), 5(B) and 5(C), Dunfermline;
- Appin Crescent 6(A), 6(B) and 6(C), Dunfermline;
- Bonnygate, Cupar 2; and
- Bonnygate, Cupar 3(A) and 3(B).

Diffusion tube data from Appin Crescent, Dunfermline and Bonnygate, Cupar continue to show high concentrations, which have previously resulted in Detailed Assessments.

The Detailed Assessment (2007/2008) for Bonnygate, Cupar considered NO₂ and PM₁₀. The report concluded that an AQMA should be declared for both NO₂ and PM₁₀.

The Detailed Assessment (2008) for Appin Crescent, Dunfermline advised that increased monitoring of NO₂ should be carried out to enable improved characterisation of ambient NO₂ concentrations before any further decisions are made. At the time of reporting, five months of additional diffusion tube monitoring had been collected. It is recommended that Fife Council continue monitoring NO₂ at all locations in Appin Crescent for an extended period of time and assess the situation when there is 12 months data available.

If measured levels of NO₂ continue to exceed the annual mean objective at the above diffusion tube locations then in accordance with the appropriate technical guidance Fife Council should proceed with a Detailed Assessment at this location as soon as 12 months data is available.

All four sites with exceedences are located on the façade of buildings and are considered to be locations of relevant exposure to the general public. Of the areas where the exceedences were measured, only Cupar is currently designated an AQMA.

Monitoring of NO₂ at the automatic sites in Fife showed that concentrations at Appin Crescent Bonnygate and Admiralty Road were below the annual mean objective during 2009. Concentrations of diffusion tubes sited at the Bonnygate automatic analyser have reduced significantly since 2008. This can be explained by the measures introduced during 2009 to improve traffic flow throughout Bonnygate.

Diffusion tubes in the canyon area of Bonnygate continue to be high, which is consistent with previous information presented in previous rounds of review and assessments. An AQMA has been declared for this area.

All automatic sites met the annual hourly mean objective.

It was suggested in the 2009 USA that the diffusion tubes at St Clair Street, Kirkcaldy should be closely assessed and further monitoring carried out. The results of these tubes for 2009 suggest that diffusion tube monitoring should continue in this area. Fife Council should continue to closely assess the results. In addition to this, Fife Council intends to install an automatic monitor for the assessment of NO₂ and PM₁₀ (FDMS).

It should also be noted that NO₂ concentrations recorded by diffusion tubes close to the North Approach Road, Kincardine have decreased since 2008.

Diffusion tubes for Appin Crescent 5 (A, B and C), Appin Crescent 6 (A, B and C) and Bonnygate (BA, BB and BC) all required period mean adjustments applied. The correction factors and associated working is shown in Appendix C.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture 2009 %	Annual mean concentrations (AM Objective 40µg/m³) Adjusted for bias		
				2007	2008	2009
West Area						
DRM5	Rumblingwell	N	92	23	26	21
DRM6	Aytoun Grove	N	100	13	15	13
DRM8	Barrie Street	N	100	13	15	12
DRM9A	Appin Crescent (A, B & C)	N	100	35	39	34
C'BEATH	High Street	N	100	23	28	25
K'DINE1	N. Approach Rd. A	N	83	37	40	20
K'DINE2	N. Approach Rd. B	N	92	37	40	20
AQM3	St Leonards School	N	75	19	22	20
AQM5	Admiralty Road	N	100	36	38	32
C'GIE DR	Carnegie Drive (A, B & C)	N	100	31	38	35
ADM RO	Admiralty Road (A, B & C)	N	100	33	33	31
ROMON	Admiralty Road	N	92	N/A	26	26
APP CR1	Appin Crescent 1	N	100	27	32	28
APP CR2	Appin Crescent 2	N	92	40	49	39
APP CR3	Appin Crescent 3	N	100	37	40	37
PITT ST	Pittencreeff Street	N	92	22	25	22
APP CR4	Appin Crescent 4 (A, B & C)	N	100	30	34	30
APP CR5	Appin Crescent 5 (A, B & C)	N	33	N/A	N/A	42*
APP CR6	Appin Crescent 6 (A, B & C)	N	33	N/A	N/A	56*
East Area						
N/A	Bonnygate 1, Cupar	Y	100	30	31	31
N/A	Bonnygate 2, Cupar (11)	Y	100	36	45	42
N/A	Bonnygate 3A, Cupar (13A)	Y	92	52	50	46
N/A	Bonnygate 3B, Cupar (13B)	Y	92	52	50	46
N/A	Bonnygate B4 Cupar	Y	100	41	38	32
N/A	City Road 1	N	92	24	30	29
N/A	City Road 2	N	92	24	30	29
N/A	Bell Street 1	N	100	29	32	33
N/A	Bell Street 2	N	100	26	32	29
N/A	Windsor Gardens	N	90	6	7	7
N/A	Cupar Road, Auchtermuchty	N	90	27	31	30
N/A	Millfield, Cupar	N	100	9	10	11
N/A	South Road, Cupar	N	90	14	16	21
N/A	Crossgate, Cupar	N	100	23	26	25
N/A	Ladywynd B5	Y	100	19	22	21

Site ID	Location	Within AQMA?	Data Capture 2009 %	Annual mean concentrations (AM Objective 40µg/m ³) Adjusted for bias		
				2007	2008	2009
N/A	Bonnygate West B6 Cupar	Y	90	30	26	25
N/A	Monitor B (A, B & C) Cupar	Y	55	34	39	33**
N/A	4 East Road	Y	100	15	17	16
Central Area						
N/A	St Clair Street 1	N	100	34	41	38
N/A	St Clair Street 2	N	100	34	41	39
N/A	St Clair Street 3	N	100	31	35	33
N/A	Wedderburn Road	N	100	12	13	13
N/A	Lovat Road	N	100	18	19	18
N/A	Dunnikier Road	N	100	29	33	30
N/A	Victoria Road	N	100	30	36	34
N/A	Glenlyon	N	92	27	30	27
N/A	Leslie High Street	N	83	20	24	24
N/A	ASDA R/B	N	100	26	33	33
N/A	Queensway	N	100	20	26	24

* Period Mean Adjustment of 1.10 applied to non bias corrected data.

** Period Mean Adjustment of 0.95 applied to non bias corrected data.

2.2.2 PM₁₀

PM₁₀ concentrations are monitored at automatic FDMS sites in Bonnygate, Cupar and Admiralty Road, Rosyth. Details of these sites are given in Table 2.1 and Appendix A. Table 2.6a compares PM₁₀ data against the annual mean air quality objectives set for Scotland (18µg/m³). Data collected for 2009 shows that the both Bonnygate and the Admiralty Road sites did not exceed the annual mean or 24-hour mean objectives.

Table 2.6a below gives a comparison of PM₁₀ annual mean concentrations over the past three years. Table 2.6a shows that PM₁₀ concentrations have consistently exceeded the objective at Bonnygate, Cupar during 2007 and 2008. Fife Council introduced measures (new Urban Traffic Management and Control System and changes to pedestrian crossings) in Bonnygate during 2009 to improve traffic flow. It is expected that this has led to the reduction in concentrations of PM₁₀ around the automatic monitoring site. However PM₁₀ levels are still expected to be high in the canyon area.

Although the monitored PM₁₀ concentrations are below the annual mean objective around the automatic monitor, Fife Council is advised to continue monitoring for PM₁₀ at this location.

Table 2.6b presents the results of PM₁₀ monitoring compared against the 24-hour objective. The Bonnygate site did not exceed the 24-hour mean objective during 2009. The Admiralty Road site exceeded the 24-hour mean objective twice during 2009. This is within the seven times permitted by the objective.

A period mean adjustment calculation was carried out for PM₁₀ at the Bonnygate site as this site was not operational between February and July 2009. Calculations are shown in Appendix C. The non period mean adjusted concentration is shown in brackets.

Table 2.6a Results of PM₁₀ Automatic Monitoring: Comparison with Annual Mean Objective (18 µg/m³)

Location	Within AQMA?	Data Capture 2009 %	Annual mean concentrations (µg/m ³)		
			2007	2008	2009
Bonnygate, Cupar	Y	57	23	19	(16) 17*
Admiralty Road, Rosyth	N	99	N/A	15**	16

* Bonnygate Cupar did not monitor between February and early July. Period Mean Adjustment of 1.04 applied.

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

Location	Within AQMA?	Data Capture 2009 %	Number of Exceedences of daily mean objective (50 µg/m ³) <i>If data capture < 90%, include the 90th percentile of daily means in brackets.</i>		
			2007	2008	2009
Bonnygate, Cupar	Y	57	5	1	0 (41)*
Admiralty Road, Rosyth	N	99	N/A	0 (39)**	2

* Bonnygate Cupar did not monitor between February and early July.

PM₁₀ monitoring was also carried out by NPL on behalf of ExxonMobil in the area of Mossmorran and Braefoot Bay. Had the operations of the plant contributed significantly to PM₁₀ concentrations in the area, increased levels of pollution would have been detected by the monitoring device that was located downwind of the plant at the time. The study found that monitors at all locations measured similar concentrations over the same time period, thus suggesting that the material is likely to have been carried in from areas outside Fife.

There is no evidence to indicate that the activities on the Mossmorran site were making a measurable contribution to the levels of particulate matter in the residential areas.

2.2.3 Sulphur Dioxide

Automatic Monitoring Data

SO₂ monitoring is undertaken on behalf of Longannet Power Station at Blair Mains (Grid Reference NS972864) to the north east of the power station. In 2009 Longannet operated with an average load factor of 41% (32% in 2008) and burned fuel with average sulphur content of approximately 0.5% (0.45% in 2008). The station emitted ~32.2kT of SO₂ during the year. Emissions were well below the short-term authorisation limit for SO₂ of 2000 mg/m³ at all times.

Results for 2009 for this site are provided along with 2006, 2007 and 2008 data in Table 2.7 (ref 13).

No new SO₂ monitoring data are presented for Ineos Grangemouth oil refinery as their annual monitoring report for 2009 was not available at the time of producing this report.

Table 2.7 Automatic SO₂ Monitoring for Blair Mains (µg/m³)

Period	Data Capture (%)	Max 15 Minute Mean (µg/m ³)	Max 1 Hour Mean (µg/m ³)	Max 24 Hour Mean (µg/m ³)
AQS Objective	-	266 (max. 35 exceedences)	350 (max. 24 exceedences)	125 (max. 3 exceedences)
2006	N/A	166	88	N/A
2007	N/A	138	N/A	N/A
2008	N/A	423	N/A	N/A
2009	99.9	150 (0)	70 (0)	N/A (0)

According to the Longannet Power Station Report, the measured concentrations at Blair Mains indicate that there were no exceedences of the 15-minute mean objective. Measured concentrations also indicated that there were no exceedences of the hourly or the daily SO₂ thresholds. Although maximum 24-hour mean data are not available, the 99.18th percentile daily value was 23µg/m³ (compliance value 125µg/m³), and the 99.73th percentile was 58µg/m³ (compliance value 350µg/m³). The annual mean for 2009 was 5.4µg/m³.

The measurements indicate that the area around Longannet Power Station was in compliance with all relevant SO₂ objectives during 2009.

Diffusion Tube Data

Although SO₂ diffusion tube data are not considered sufficiently accurate for inclusion in the Review and Assessment process, the following are included for completeness and to provide a broad indication of air quality. Diffusion tubes were deployed by Fife Council at Culross, High Valleyfield and Markinch.

The Mount Frost, Markinch sites operated by Fife Council (Table 2.8) are close to the Tullis Russell paper mill and helped assess emissions from the coal fired plant at the mill.

The Air Quality Strategy includes an objective of 20µg/m³ for the annual and winter mean SO₂ concentration, for protection of ecosystems, which is applicable only in rural areas. This may be applicable to the shoreline site at Culross. The 12-month mean at all sites is well within the AQS objective.

Table 2.8 Fife Council SO₂ Diffusion Tubes (µg/m³)

Period	Main St, Culross	Valleyfield, Dunfermline	Mount Frost Drive (1, 2 & 3)
2006	4	4	12
2007	3	4	11
2008	3	5	14
2009	3	5	11

The Council SO₂ diffusion tube monitoring network is to cease from next year for two reasons. Firstly, recent technical guidance indicates that these tubes provide only a broad indicator of the levels of this pollutant. Secondly, in relation to the triplicate SO₂ tube set at Mount Frost Markinch, the coal fired plant at Tullis Russell is to be replaced by a biomass plant and for the SO₂ tubes at High Valleyfield and Culross, the annual monitoring data provided by Longannet Power Station is now considered sufficient to assess the levels of this pollutant.

2.2.4 Benzene

The average concentrations of benzene measured at all of the monitoring locations during the BP Hound Point survey were below the current AQS objective (for the running annual mean) of $16.25\mu\text{g}/\text{m}^3$ for the end of 2003 and $3.25\mu\text{g}/\text{m}^3$ for 2010. Ambient benzene concentrations do not appear to be increasing.

A summary of the results for benzene taken from the NPL network around BP Hound Point is shown in Table 2.9.

Table 2.9 Benzene Diffusion Tube Annual Mean Concentrations ($\mu\text{g}/\text{m}^3$) from the NPL network around BP Hound Point

Site Code	Location	2005	2006	2007	2008	2009
1	Carlowrie Cr, Dalmeny	1.0	0.7	1.0	1.0	1.0
2	Near Whitehouse Point	1.0	1.0	1.0	1.0	1.6
3	Carmolite Road	1.0	1.0	1.0	1.0	1.3
4A	Queensferry Lodge Hotel	1.3	1.0	1.0	1.0	1.6
4B	Near The Old Battery	1.3	1.0	1.0	1.0	2.3
5	Breakers Way	1.0	1.0	1.0	1.0	1.3
6	Hopewood Mews	1.0	1.0	1.0	1.0	1.6
6R	Hopewood Mews (duplicate)	-	0.7	0.7	1.0	1.3
9	Aberdour/ Burntisland	1.0	0.7	0.7	0.7	1.0
10	Brigg's Yard	0.7	0.7	0.7	1.3	1.6
11	Belvedere Hotel	1.0	0.7	0.7	0.7	1.0
13	Forth View Hotel	0.7	0.7	0.7	0.7	1.0
16	Braefoot Point	0.7	0.7	0.7	1.0	1.6

ExxonMobil recently commissioned a study of air quality around the Mossmorran complex before, during and after a period of planned maintenance and related flaring activity. The study assessed the quality of the air at 8 different locations, including three residential areas. The assessment was carried out by the National Physical Laboratory between 21 August and 1 October 2008.

Measured concentrations of benzene in the residential areas when flaring was underway were almost identical to those that were obtained when there was no flaring in progress. There was no evidence to show that flaring activity increased the concentrations of benzene at the residential areas.

The measured concentrations of benzene at the residential areas were consistently lower than the maximum permitted level that has been introduced to protect human health.

On the basis of this monitoring data, Fife Council is not required to carry out a Detailed Assessment for benzene.

2.2.5 Carbon Monoxide

As in previous years, short periods of CO monitoring have been undertaken by Fife Council Transportation Services at a number of roadside locations. Measurements were undertaken with Marksmann 660 street monitors. The results are summarised in Table 2.10. The results have been converted from ppm into mass units at 20°C and 1 atmosphere.

Table 2.10 Fife Council CO Monitoring Results

Site Number/ Location	Monitoring Period	Max 8-Hour Concentration (mg/m ³)
Bothwell Gardens	09/04/2009 – 15/04/2009	0.3
	16/07/2009 – 22/07/2009	0.3
	21/10/2009 – 27/10/2009	0.5
Carnegie Drive/ Pilmuir Street	09/04/2009 – 15/04/2009	1.6
	16/07/2009 – 22/07/2009	1.0
	21/10/2009 – 27/10/2009	1.8
Appin Crescent	09/04/2009 – 15/04/2009	0.6
	16/07/2009 – 22/07/2009	1.8
	21/10/2009 – 27/10/2009	3.3
Glenlyon Road	27/05/2009 – 02/06/2009	0.9
	13/08/2009 – 19/08/2009	1.6
Dunnikier Road/ Victoria Road	26/06/2009 – 02/07/2009	1.0
	18/09/2009 – 24/09/2009	3.1
Admiralty Road/ Queensferry Road	26/06/2009 – 02/07/2009	1.2
	18/09/2009 – 24/09/2009	1.6
Bonnygate	22/05/2009 – 28/05/2009	1.4
	13/08/2009 – 18/08/2009	1.4
St Clair Street/ Junction Road	26/06/2009 – 02/07/2009	0.3
	18/09/2009 – 24/09/2009	0.7

Whilst none of these monitoring periods are sufficiently long to permit a full assessment of CO concentrations over a full annual period, they all indicate that all concentrations are likely to be below the AQS objective of 10mg/m³ for the running 8-hour mean concentration.

2.2.6 Additional Pollutants

As part of the ExxonMobil study of air quality around the Mossmorran complex 1,3 butadiene was monitored. These concentrations were generally so low, that they could not be detected by the monitoring equipment.

2.2.7 Summary of Compliance with AQS Objectives

Fife Council has examined the results from monitoring in the area. The majority of measured concentrations outside of the Bonnygate, Cupar AQMA are below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

In the case of Appin Crescent the diffusion tube measurements will be continually monitored and a decision on the requirement of a Detailed Assessment will be made once 12 months monitoring data has been collected.

3 New Local Developments

3.1 Road Traffic Sources

Fife Council confirms that there are no new relevant road sources in the local area.

3.2 New Industrial Installations

Based on experience from studies carried out by the Environment Agency, the Department for Environment Northern Ireland and a number of local authorities, poultry farming has the potential to exceed PM₁₀ objectives. Fife Council has identified one farm (Mill View Farm formerly Diddlum Farm) which meets the specified criteria stated within Technical Guidance (09).

Mill View Farm, Strathore Road, Thornton (326876, 697373) is owned by Deans Food Limited (PPC/A/1008780) and will have approximately 432, 000 laying hens housed in 6 naturally ventilated (supplemented by a mechanical system) poultry sheds. The farm is designed to replace 7 older, and smaller farms within the area, which are considered to have much poorer environmental performance. These sheds will be located within 100 metres of the nearest relevant exposure to the general public, situated north east of the site. Due to the number of hens and distance to the nearest relevant exposure a Detailed Assessment should be carried out for this site when the farm is fully operational, with a hen population of over 400, 000. This is currently not the case. Further details of the PPC permit application can be obtained through the SEPA website. The Detailed Assessment should commence with at least 12 months of monitoring (or over the period when emissions are likely to be highest) at locations of relevant exposure to the general public.

As Mill View Farm is still under construction and there is no information on when the farm will be fully operational, Fife Council will reassess the situation and report the findings within the 2011 Air Quality Review and Assessment Progress Report.

Fife Council has identified the above new industrial development which is likely to have an impact on air quality. However, a Detailed Assessment is not required at this stage and will be considered once the installation is operational.

3.3 New Biomass Boilers

Fife Council confirms that no new biomass boilers have been granted planning permission since the last report.

It should be noted that a Detailed Assessment was carried out for a biomass installation at Kinghorn Primary School. The Detailed Assessment concluded that no breaches of the annual mean or short term objectives are expected, and that Fife Council is not required to declare an AQMA for NO₂ or PM₁₀ in the vicinity of Kinghorn Primary School.

3.4 New Developments with an impact on air quality

Tesco Development

Tesco Stores Limited have been granted planning permission (08/01079/EFULL) to demolish and redevelop their existing class 1 retail unit (situated at South Road, Cupar, Fife, KY15 5JE) along with a derelict engineering workshop/warehouse.

The redevelopment includes an extended petrol station, car park, and new access and ancillary works. Details of this application can be found on the Fife Council Development Services Planning Applications website. The proposed redevelopment is located at the south east edge of the

Bonnygate AQMA in Cupar and may impact upon traffic flow, and in turn air quality, within the allocated area.

Fife Council Environmental Services are unaware of any air quality assessment having been produced at present. Tesco are in the final stages of signing the legal agreement relating to securing funding for transport infrastructure works, travel plan and local labour agreement.

Rosyth International Container Terminal

Babcock Marine Rosyth is currently in the process of developing a design for an international container terminal at the former RD57 site to the west of the main basin at Rosyth, Fife.

Existing air quality is estimated as generally good although levels of PM₁₀ are elevated in the vicinity.

Significant impacts may result from vehicle and shipping emissions associated with the transport of cargo to and from the Scheme, and a DMRB (Design Manual for Roads and Bridges) screening assessment is recommended to ascertain the scale of impacts and requirement for further assessment.

The scoping documentation outlines the potential for dust impacts and nuisance, primarily during construction. An appraisal of dust impacts and suggested mitigation will also be included within the Air Quality Assessment. The findings will be presented in the 2011 Progress Report and further assessed in the 2012 Updating and Screening Assessment.

Rosyth Renewable Energy Plant

Forth Energy is proposing to construct and operate a Renewable Energy Plant at the Port of Rosyth. The total renewable electrical output for the site will be of the order of 120 MWe. The plant will also be capable of exporting renewable heat to nearby users. The Renewable Energy Plant will generate renewable electricity from sustainably-sourced biomass fuel.

Forth Energy will submit an application to the Scottish Government for Consent (under Section 36 of the Electricity Act 1989) for the proposed Renewable Energy Plant.

Within the Environmental Statement to be prepared by Forth Energy the air quality impact assessment will comprise the identification of baseline air quality levels, dispersion modelling of operational emissions, optimisation of stack height and the assessment of impact on air quality.

The nearest potentially sensitive receptors are located in the vicinity of the proposals are:

- Housing to the north of Hilton Road some 900 m to the north west of the proposed site; and
- Housing to the north of Ferry Toll Road, some 500 m to the north and north east of the site.

The atmospheric dispersion modelling study of operational emissions will be undertaken using the Atmospheric Dispersion Modelling System (ADMS), Version 4.1 to optimise the stack height and determine the process contribution of substances released from the plant.

Fife Council will take into consideration all the above air quality issues and will further assess the situation in the forthcoming 2011 Progress Report and 2012 Updating and Screening Assessment.

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

- Tesco Stores Limited – South Road, Cupar
- Rosyth International Container Terminal
- Rosyth Renewable Energy Plant

These will be taken into consideration in the next Updating and Screening Assessment, scheduled for 2012.

3.5 Landfill Sites and Quarries

Fife Council confirms that there are no new landfill sites, quarries or similar operations that have been granted planning permission since the last report.

St Ninians Surface Mine, Kelty, Fife

The site operator has applied and been granted an extension of current operations to allow further extraction of coal and potentially other minerals by opencast methods with associated engineering works and final restoration to agriculture, woodland and wetlands habitat.

Fife Council has advised that the Environmental Statement should include further detail on proposed mitigation measures and air quality monitoring methodology, to ensure operations on site do not prejudice the achievement of National Air Quality Objectives for NO₂, PM₁₀ and PM_{2.5} particulates.

Fife Council will take into consideration these air quality issues and will further assess the situation in the forthcoming 2011 Progress Report.

4 Implementation of Action Plans

Where an authority identifies that a given air quality objective is likely to be exceeded at a relevant location, it is obliged to declare an Air Quality Management Area (AQMA) and undertake a Further Assessment of existing and likely future air quality. The Authority must then develop an Air Quality Action Plan (AQAP), setting out the local actions that will be implemented to improve air quality and work towards meeting the objectives.

Fife Council declared an AQMA for Bonnygate, Cupar in October 2008 which came into force in December 2008. The findings of the Further Assessment indicate that road traffic is the principal source responsible for the local exceedences of NO₂ and makes a significant contribution to local PM₁₀ concentrations. Background sources constitute the principal sources of PM₁₀ within the Bonnygate AQMA, however, background sources are difficult to address at the local level.

A steering group including key representatives from relevant services of Fife Council was formed to develop the draft AQAP. The steering group considered the findings of the Further Assessment and the wide range of potential options for improving air quality within the Bonnygate AQMA. Subsequently the steering group undertook an assessment of each of these options. The options were assessed against the following criteria:

- How much support was there initially within the steering group for the option?
- Potential air quality impact;
- Potential costs;
- Overall cost-effectiveness;
- Potential co-environmental benefits, risk factors, social impacts and economic impacts;
- Feasibility and Acceptability.

The assessments were then considered in total to place the options in a prioritised order. This then became the draft AQAP.

The AQAP aims to work towards reducing transport emissions of NO_x and PM₁₀ in the AQMA by approximately 53% and 33% respectively. The required improvements appear to be quite onerous, however, it should be noted that these represent the ambient concentrations required to meet the objectives, not the reduction in mass emissions, as a result of the canyon effect within the Bonnygate AQMA. It is anticipated that a reduction of this scale will lead to the achievement of the annual mean NO₂ air quality standard (40 µg/m³) and Scottish annual mean objective for PM₁₀ (18 µg/m³) within the Bonnygate AQMA in future years. Fife Council will continue to review and assess air quality to monitor the situation and success of the plan (Ref 18).

Fife Council is now consulting the public and other statutory consultees on its intention to implement this plan. Consultation responses will be considered in the production of the final action plan that will be adopted during 2010.

5 Local / Regional Air Quality Strategy

5.1 Fife Council Carbon Emissions Reduction Plan

Fife Council is committed to reduce its carbon emissions by 80% by 2050. The Carbon Emissions Reduction Plan (2009) was developed to provide managers within the Council with the tools to build carbon emission reductions into day-to-day service delivery and long term planning. In addition to helping the Council meet its own carbon emission reduction targets, the Plan has been designed to support the achievement of the Scottish Government's national climate change targets. The vision of the plan is to enable Fife Council to thrive in a low carbon economy, facilitating the transition to a low carbon organisation whilst maintaining quality services. Through embedding carbon emissions reduction, environmental awareness and efficiency in the use of our assets and operations, Fife Council will be a Leading Green Council. The plan includes the commitment to consider the carbon emissions and environmental impact of all services and projects.

The plan aims to deliver through:

- Setting carbon emissions reduction targets to meet or exceed government legislation;
- Embedding carbon emissions reduction into the culture and governance of the Council; and,
- Developing management tools to embed carbon emissions reduction and carbon efficiency into the Council systems, processes and operations.

The Plan targets reductions in 'direct emissions' from Council buildings, infrastructure energy, transport fleet fuel and commercial waste. Some of these measures may link with the draft AQAP, for Bonnygate Cupar, particularly the targeted reduction in emissions from the Council transport fleet; these will be explored further in the finalisation of the AQAP.

6 Air Quality Planning Policies

6.1 Fife Community Plan – A Stronger Future for Fife

Fife Council's Community Plan, "A Stronger Future for Fife" is the overarching strategic plan for Fife. It provides a framework for every other strategy and plan that the Council put in place.

The Community Plan sets goals of achieving an Inclusive and Sustainable Fife whilst delivering Best Value and Excellence. Community planning is a way of working that brings together key organisations within Fife with the communities they serve, ensuring that everyone is working together to deliver a shared vision for improving the quality of life. Fife's community planning partners, Fife Council, NHS Fife, Fife Constabulary, CVS Fife, Scottish Enterprise Fife, Communities Scotland and Fife's further and higher education sector have all signed up to the shared vision set out in this plan.

The Council's vision is of a confident, ambitious and caring Fife that is a great place to live, work and visit. The plan outlines the Council's aim to deliver the shared vision of a Stronger Future for Fife by:

- Building a stronger, more flexible and diverse economy;
- Improving health and wellbeing in Fife;
- Creating a well-educated and skilled Fife;
- Sustaining and improving our environment; and,
- Making Fife's communities safer.

6.2 Fife Council Plan 2007-2011

Fife Council's Plan 2007-2011 is intrinsically linked to the Council's Community Plan and outlines the Council's commitment to make a difference to the people of Fife and provide top performing public services. In order to achieve this, the plan outlines the following key priorities for the Council and how these ambitions will be achieved and progress measured:

1. Improve educational achievement and education for all;
2. Make Fife the Leading Green Council;
3. Increased access to housing;
4. Improved local conditions for economic development;
5. Improved sport, leisure and cultural opportunities;
6. Targeted support to vulnerable people;
7. Improved community safety; and,
8. Become a top performing Council.

Many of the objectives introduced by Fife Council through the Council Plan offer the potential to improve local air quality across Fife, most notably the objective of making Fife the Leading Green Council. This priority objective includes initiatives aimed at:

- Promoting sustainable transportation options and encouraging better travel habits;
- Ensuring that environmental awareness is promoted as part of the education curriculum; and,
- Reducing Council energy use and promoting sustainable procurement.

6.3 State of Environment Report

Fife Council's State of the Environment Report provides an overview and basic analysis of environmental baseline information to support the Strategic Environmental Assessment (SEA) of future plans. The report also provides a summary of progress towards achieving environmental targets set by the 'Take A Pride in Fife Environmental Network' (TAPFEN) known as Theme Measures and Community Plan Milestones.

The Report includes a Chapter on the atmosphere which relates directly to air quality and climate change. A summary of relevant local air quality information is presented in the report. Information contained in this report includes measured concentrations of air quality pollutants, objectives for improving air quality and reducing emissions, and assessing the vulnerability of the local area to climate change.

6.4 The Fife Structure Plan

The Fife Structure Plan (2006-2026) gained final Scottish Government approval on the 24th May 2009 and represents the strategic element of the development plan for Fife. The Plan sets out the development strategy and strategic land use policies and proposals. It establishes the context for local plans that translate these strategies and policies into site-specific guidance. Together, the Structure Plan and Local Plans will form the Fife Development Plan. The principal aims of the plan are to support the growth of Fife's economy and population, whilst addressing the affordability and quality of housing, ensuring sustainable communities and safeguarding and improving Fife's environment.

The Structure Plan outlines that Dunfermline, Kirkcaldy and St Andrews town centres will constitute the key centres of focus for development, but recognises the need to support other towns and villages in order to achieve balanced and sustainable growth throughout Fife. In order to achieve this, the plan outlines that development will be focused primarily in existing urban areas and in locations that are best placed to support sustainable travel. In particular reference to Cupar, the plan outlines the intention to support the revitalisation of the Town Centre through the proposed delivery of a new relief road which will come forward as part of a new strategic land allocation to the north of the town. The relief road is considered as a long-term goal within the scope of the Bonnygate Cupar AQAP.

7 Local Transport Plans and Strategies

Numerous existing policies and strategies adopted at a local, regional and national level can exert significant effects, both positive and negative, on air quality in Fife. The most significant plans that may have an effect on air quality in the local area are summarised below.

7.1 The National Transport Strategy

The National Transport Strategy for Scotland was published in December 2006. The Strategy identified the need to provide an efficient, integrated and reliable transport network that successfully promotes economic growth, protection of the environment, health and social inclusion, and introduced three key strategic objectives:

- To reduce journey times between Scotland's towns/ cities and global markets, tackle congestion and provide access to key markets;
- To reduce emissions to tackle climate change;
- To improve the quality, accessibility and affordability of transport, to give people the choice of public transport as an alternative to the car.

These key objectives have been designed to support the role of Government and respond to the strategic objectives, namely a Wealthier, Fairer, Smarter, Healthier, Safer, Stronger and Greener Scotland.

The plan includes a wide range of commitments aimed at tackling each of the key strategic objectives.

In order to improve journey times and connections, tackle congestion and the lack of integration and connections in transport, the strategy outlines the following commitments:

- Investing to tackle congestion from the School Run;
- Promoting SMART2 measures on all journeys, focusing especially on the commute to work through developing travel awareness and marketing campaigns;
- Exploring with key partners towns across Scotland that promote sustainable travel by reducing car use and promoting cycling/ walking;
- Promoting and encouraging new vehicle technologies;
- Supporting sustainable distribution strategies through the Scottish Road Haulage Association;
- Publishing a Bus Action Plan to help achieve a step change in the quality of bus service provision;
- Introducing integrated ticketing pilots to enhance the passenger journey.

The Strategy clearly states that regional transport partnerships, local authorities and transport operators will be key partners in delivering the strategic outcomes.

7.2 Regional Transport Strategy (2008-2023)

Fife Council is a member of the South East of Scotland Transport Partnership (SEStran). The SEStran Regional Transport Strategy was developed to compliment the objectives of the National Transport Plan and includes 17 sub-objectives that stem from the four high level objectives of economy, accessibility, environment and safety and health.

The Strategy Framework comprises three different types of projects and initiatives:

1. **Region-wide initiatives:** Region wide initiatives that affect the area measures affecting the whole SEStran area e.g. travel behaviour/ planning, integrated ticketing, regional freight initiatives, awareness campaigns and frameworks for parking (standards and management).
2. **Initiatives for specific areas and groups:** Initiatives targeting accessibility and providing minimum levels of service to specific localities and groups, and rural areas.

- 3. Network-based initiatives** Covering specific infrastructure schemes and public transport services on principal travel corridors. These include a wide range of measures proposed for movements of strategic importance to the SEStran area. The Regional Strategy makes specific reference to the increasing importance of local air quality, its affects on human health and the role that transport plays in air quality issues in urban areas.

7.3 Fife Council Local Transport Strategy (2006-2026)

This Local Transport Strategy 2006 (LTS) sets the 5-year (short term) programme, 10-year (medium term) plan and 20-year (longer term) vision and objectives for transport delivery in Fife. In order to achieve success at a local level, the strategy has adopted a de-centralised approach to service delivery, with teams in West, Central and East areas of Fife having developed local area transport plans through consultation with local communities and stakeholders.

The Strategy has been designed to complement Fife Council's Community Plan, Development Plan and other supporting policies, particularly Fife's Environmental Strategy. The strategy provides an overview of the region's transportation services, pertinent transport issues, visions and objectives together with a list of priorities, policies and projects for future transport provision in Fife. The key vision of Fife's LTS is: *"an integrated and sustainable transport system which is accessible to all and contributes towards a strong economy, strong community and healthy environment."*

Improving links with air quality policies and the Fife Council LTS has already been considered during the production of the recently published Bonnygate Cupar AQAP (Ref 18).

8 Conclusions and Proposed Actions

This Progress Report has followed the guidance set in Part IV of the Environment Act 1995 Local Air Quality Management Technical Guidance LAQM. TG(09) to ensure continuity in the LAQM process. The following conclusions arise from the findings in this report:

8.1 Conclusions from New Monitoring Data

Fife Council undertakes extensive automatic and diffusion tube air quality monitoring throughout the local area. This monitoring is carried out to the high standard required for the review and assessment process.

Nitrogen Dioxide

Monitoring of NO₂ at the three automatic sites in Fife showed that concentrations at Appin Crescent, Dunfermline, Bonnygate, Cupar and Admiralty Road, Rosyth were below the annual mean objective.

NO₂ measured in Bonnygate, Cupar reduced from 46µg/m³ in 2008 to 32µg/m³ in 2009. This can be explained by the measures introduced during 2009 to improve traffic flow throughout Bonnygate.

Bias adjusted diffusion tube data from Appin Crescent, Dunfermline and Bonnygate, Cupar have continued to show exceedences during 2009 supporting conclusions made in respective Detailed Assessments.

No other exceedences were measured at any of the other locations where diffusion tube monitoring was carried out by Fife Council.

Particulate Matter

PM₁₀ is monitored at Admiralty Road, Rosyth and Bonnygate, Cupar. Measured concentrations show that for 2009, Admiralty Road and Bonnygate did not exceed the annual or daily mean objectives.

Sulphur Dioxide

Results for SO₂ monitoring in Fife in 2009 indicate that AQS objectives for SO₂ are unlikely to be exceeded. There are no new industrial processes, road or other developments that require detailed assessment with respect to this pollutant. Hence, new information in 2009 confirms the conclusion of previous reports that a Detailed Assessment is not required for SO₂.

Carbon Monoxide

Short-term monitoring undertaken by Fife Council's Transportation Services department in 2009 indicates that the AQS objective for CO is likely to be met. There are no new industrial processes, roads or other developments that require detailed assessment with respect to this pollutant. Hence, new information in 2009 confirms the conclusion of previous reports that a Detailed Assessment is not required for CO.

Benzene

Results of the ongoing air quality monitoring study for BP Hound Point indicate that ambient concentrations of benzene in Fife during 2009 met the AQS objective. There are no new industrial processes, roads, petrol stations or other developments that require detailed assessment for this pollutant. Hence, new information in 2009 confirms the conclusion of previous reports that a Detailed Assessment is not required for benzene.

8.2 Conclusions relating to New Local Developments

Mill View Farm, Strathore Road, Thornton is still under construction and there is no information on when the farm will be fully operational. Fife Council will reassess the situation and report the finding within the 2011 Air Quality Review and Assessment Progress Report.

8.3 Other Conclusions

Fife Council has developed a draft AQAP for Bonnygate Cupar, setting out the local actions that will be implemented to improve air quality and work towards meeting the objectives.

Fife Council is now consulting the public and other statutory consultees on its intention to implement this plan. Consultation responses will be considered in the production of the final action plan that will be adopted during 2010.

An update on the progress of implementing the AQAP will be presented in the 2011 Progress Report.

8.4 Proposed Actions

New monitoring data has not identified the need to proceed to a Detailed Assessment for any pollutant outlined in this report.

Fife Council should continue to monitor the results of the automatic analyser and diffusion tube study currently undertaken in the area of Appin Crescent and assess the situation when 12 months of diffusion tube monitoring is available from Appin Crescent 5(A, B, C) and Appin Crescent 6(A, B, C).

Should measured levels of NO₂ exceed the annual mean objective when 12 months diffusion tube data is available Fife Council should proceed immediately to a Detailed Assessment at this location.

Fife Council's next objective in the LAQM process will be to submit the 2011 Progress Report.

9 References

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Appendices

Appendix A Automatic Monitoring Sites

Appendix B QA/ QC Data

Appendix C Diffusion Tube Bias Calculations and Period Mean Adjustments

Appendix D Diffusion Tube Data

Appendix A: Automatic Monitoring Sites

Appin Crescent, Dunfermline



Station Name:	Appin Crescent, Dunfermline
Site Owner/operator:	Fife Council
Easting:	309926
Northing:	687722
Distance to kerb and road name/number	3m + (A907)
Zone/agglomeration:	
Site Classification:	Roadside
Manifold type and height:	Single Teflon tube, inlet height 1.7m
Network affiliation:	None
Quality control procedures:	UKAS calibration by AEA with Air Liquide gas cylinder
Pollutants measured on site:	NO _x , NO NO ₂
Instrument manufacturer:	Monitor Europe ME 9841 B
Calibration procedure and frequency:	3-weekly manual calibration and autocalibration every 3 days.
Site service arrangements:	6-monthly service by air monitors
Co-located passive sampler	Triplicate NO ₂ tubes installed

Bonnygate Cupar, Fife



Station Name:	Bonnygate, Cupar
Site Owner/operator:	Fife Council
Easting:	337406
Northing:	714574
Altitude:	
Zone/agglomeration:	
Site Classification:	Kerbside (<1m from Kerb)
Distance to kerb and road name/number	0.5m to Bonnygate (A91)
Distance to nearest junction and joining road name/number	Opposite the junction with Ladywynd
Start date of monitoring	19 December 2005
Manifold type and height:	Single Teflon tube, Inlet height 1.7m
Network affiliation:	None
Quality control procedures:	UKAS calibration by AEA with Air Liquide gas cylinder
Pollutants measured on site:	PM ₁₀ (TEOM) NO _x , NO, NO ₂
Instrument manufacturer:	FDMS NO _x – Teco i-series
Calibration procedure and frequency:	2-weekly manual calibration
Site service arrangements:	6-monthly service by Air Monitors
Co-located passive sampler	Triplicate NO ₂ tubes installed

Admiralty Road, Rosyth



Station Name:	Admiralty Road, Rosyth
Site Owner/operator:	Fife Council
Easting:	311755
Northing:	683503
Altitude:	
Zone/agglomeration:	
Site Classification:	Roadside
Distance to kerb and road name/number	6m (A985(T))
Start date of monitoring	March 2008
Manifold type and height:	Single Teflon tube, Inlet height 2m
Network affiliation:	None
Quality control procedures:	UKAS calibration by AEA with Air Liquide gas cylinder
Pollutants measured on site:	PM ₁₀ (FDMS) NO _x , NO, NO ₂
Instrument manufacturer:	FDMS– R and P NO _x – Thermo 42i
Calibration procedure and frequency:	3-weekly manual calibration and autocalibration every 3 days.
Site service arrangements:	6-monthly service by air monitors
Co-located passive sampler	Triplicate NO ₂ tubes installed

Appendix B – QA/ QC Data

QA/QC of automatic monitoring

The QA/QC procedures follow the requirements of the Technical Guidance (09) and are equivalent to those used at UK level for the National Network (AURN) monitoring sites. This gives a high degree of confidence in the data obtained, both for measured concentrations at the automatic sites and for establishing robust bias correction factors for diffusion tubes.

In order to satisfy the requirement outlined in the Technical Guidance (09), the following QA/QC procedures were implemented:

- 3-weekly calibrations of the NO_x analyser;
- 6-monthly audits and servicing of the monitoring site;
- Data ratification.

Calibrations of the NO_x analyser were carried out using certified compressed gas standards (ISO17025). This ensured that the calibration gas was traceable to national and international standards. In addition to the calibration, sample filters were changed for NO_x and TEOM analysers and any faults were identified thus minimising data loss.

Audits of the monitoring sites consisted of a number of performance checks to identify any faults with the equipment. The calibration cylinder was also checked against another gas standard in order to confirm the gas concentration. Any identified faults were forwarded on to the service unit for repair.

The final stage of the QA/QC process was to ratify the data. During ratification, all calibration, audit and service data are collated and the data are appropriately scaled. Any suspect data identified are deleted therefore ensuring that the data are of a high quality.

Casella Measurement carried out QA/QC procedures at the SO₂ automatic monitoring site at Blair Mains. These procedures were also to a standard equivalent to the AURN.

QA/QC of diffusion tube monitoring

Diffusion tubes used by Fife Council are supplied and analysed by Tayside Scientific Services (formerly Dundee City Council Scientific Services). The laboratory participates in three schemes which ensure that the NO₂ tube results meet acceptable standards.

1. The WASP scheme is run by the Health and Safety Laboratory. Each month one tube is sent for testing. Results are compared with other participating labs and feedback on performance provided.
2. Every three months three tubes and a blank (for analysis) are supplied for exposure at an intercomparison site operated as part of the Support to Local Authorities for Air Quality Management contract funded by the Scottish Government, Defra and the other Devolved Authorities. Again, results are compared with other participating labs and feedback on performance provided.
3. Each month a QC NO₂ solution is also provided via this contract. This solution is run as an internal check for NO₂ tubes in the laboratory. The solution is tested after every 21 NO₂ tube samples.

Tayside Scientific Services also use in-house quality assurance standards. The tube preparation method is 20%TEA in water.

Appendix C – Diffusion Tube Bias Calculations and Period Mean Adjustments

Diffusion Tube Bias Adjustment Factors

Diffusion tubes may systematically under or over-read NO₂ concentrations when compared to the reference chemiluminescence analyser. This is described as bias and can be corrected for to improve the accuracy of the diffusion tube results, using a suitable bias adjustment factor.

Fife Council's diffusion tubes are prepared and analysed by Tayside Scientific Services. The tubes are prepared by applying solution of 20% TEA in water to the metal grid within the tube end cap. The tubes are then assembled. Tubes are prepared monthly prior to dispatch.

Factors from Local Co-location and National Studies

Figure 1. Local Factor from Appin Crescent, Dunfermline.

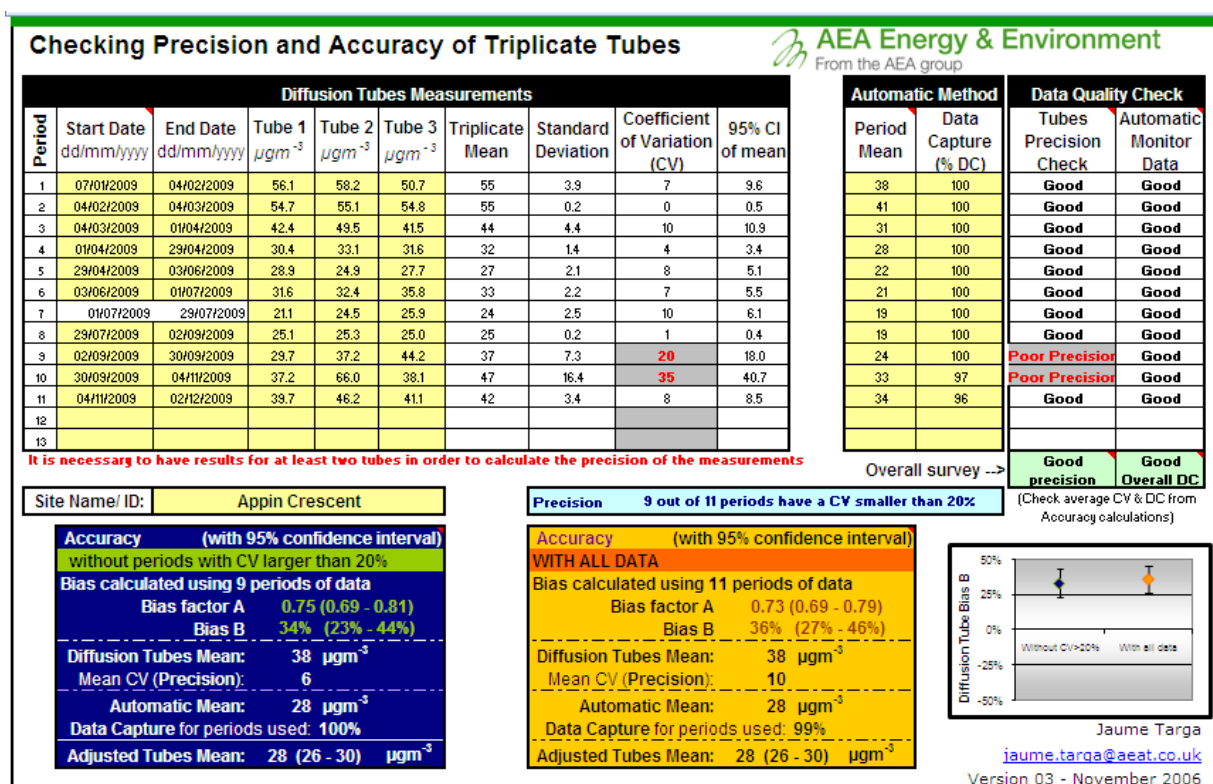


Figure 2. Local Factor from Admiralty Road, Rosyth

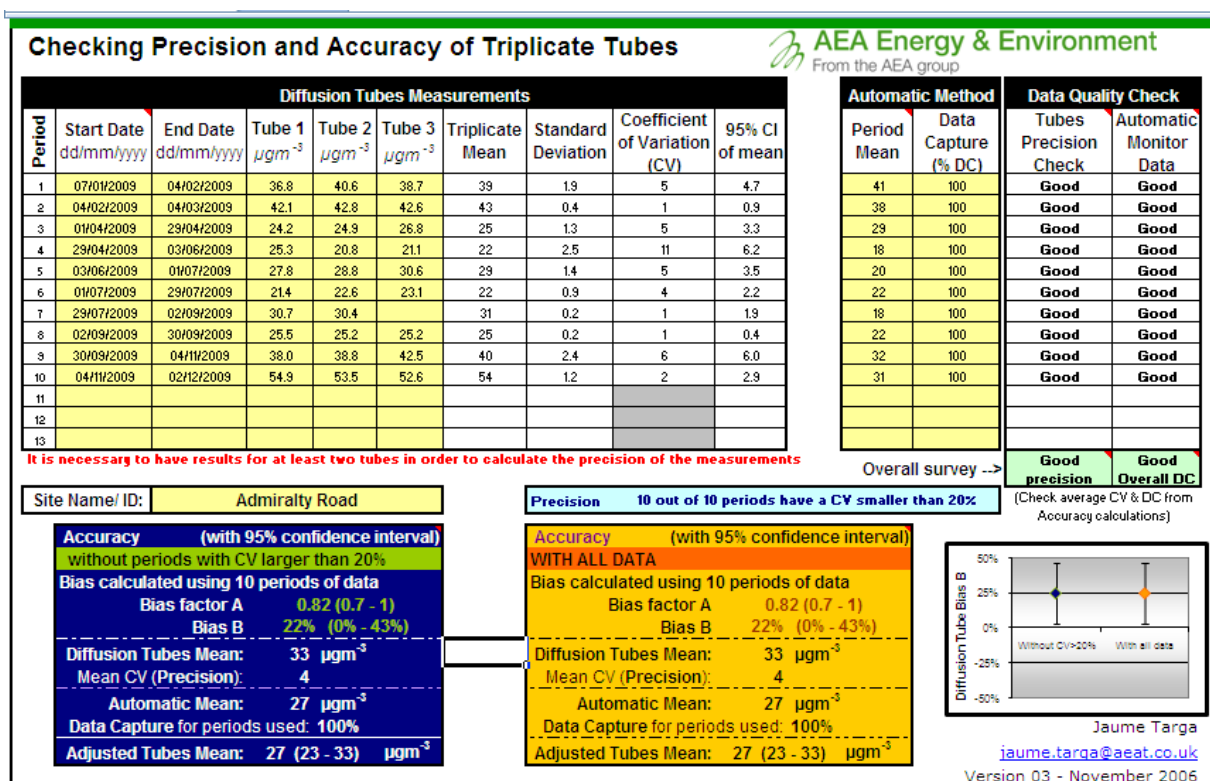


Figure 3. Local Factor from Bonnygate, Cupar

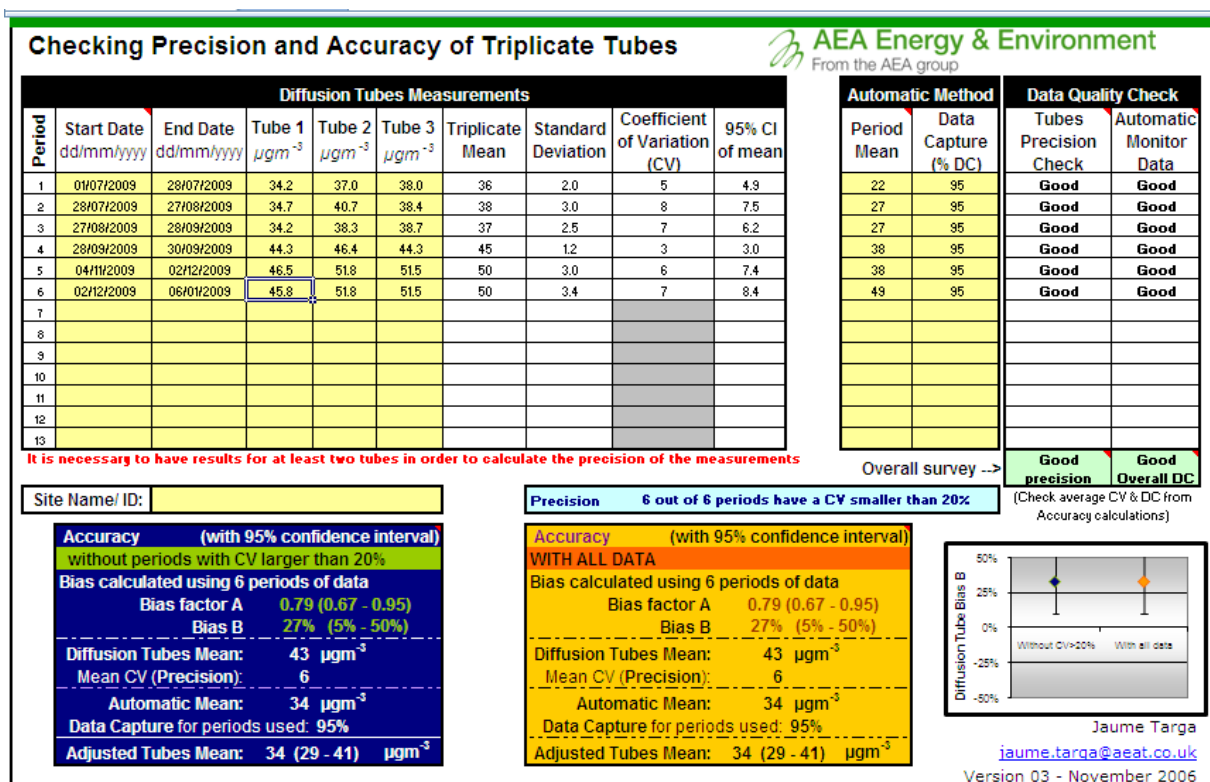


Figure 4. National Factor

Follow the steps below in the correct order to show the results of relevant co-location studies						Spreadsheet Version Number: 02/10				
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods						This spreadsheet will be updated in late March 2010 on the R&A website				
Whenever presenting adjusted data, you should state the adjustment factor used						This spreadsheet will be updated every few months; the factors may therefore be subject to change. This should not discourage their immediate use.				
Published by Air Quality Consultants Ltd on behalf of Defra, the Welsh Assembly Government, the Scottish Government and the Department of the Environment Northern Ireland										
Step 1:	Step 2:	Step 3:	Step 4:							
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor ³ shown in blue at the foot of the final column.							
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this	If a year is not shown, we have no data ²	If you have your own co-location study then see footnote ⁴ . If uncertain what to do then contact the Review and Assessment Helpdesk: 0117 328 3668 aqm-review@uwe.ac.uk.							
Analysed By ¹	Method To undo your selection, choose (All) from the pop-up list	Year ² To undo your selection, choose (All)	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (ug/m3)	Automatic Monitor Mean Conc. (Cm) (ug/m3)	Bias (B)	Tube Precision ⁵	Bias Adjustment Factor (A) (Cm/Dm)
Tayside SS	20% TEA in Water	2009	R	Fife Council	11	38	28	37.1%	G	0.73
Tayside SS	20% TEA in Water	2009	R	Fife Council	10	33	26	24.4%	G	0.80
Tayside SS	20% TEA in Water	2009		Overall Factor ³ (2 studies)					Use	0.77

Discussion of Choice of Factor to Use

The methodology for determining the appropriate bias adjustment factor is outlined in LAQM TG (09), and several online tools are also available to assist with this process.

Fife Council has three co-location sites that can be used to calculate the local bias adjustment factor. The local bias adjustment factor for each individual location was calculated using the “LAQM Tool” described in section A1.191 of LAQM TG (09). The results are shown in Section 2, Table 2.2. Calculations can be seen in the Figures 1, 2 and 3 above.

The local bias adjustment factors are similar at all automatic sites throughout Fife. As the Bonnygate site only collected data for a six month period the bias adjustment factor for this site has been discounted.

The only available national database co-location studies presented in the most up to date version (Feb 2010) of the spreadsheet were those submitted by Fife Council for Appin Crescent and Admiralty Road. These studies cover 11 months and 10 months respectively, which explains the difference in bias adjustment factors compared to the locally derived bias adjustment factors. In this case it is more appropriate to use the locally derived bias adjustment factors from Appin Crescent and Admiralty Road as both studies are based on 12 months data sets.

The average of the bias adjustment factors from Appin Crescent and Admiralty Road is **0.79**, which is similar to the bias adjustment factor (**0.77**) derived from the national database of co-location studies. The National Bias Adjustment Factor Spreadsheet is shown in Figure 4 above.

For this Progress Report the locally derived bias adjustment factor has been applied due to the following factors, as per Box 3.3 of LAQM TG (09):

- The Review and Assessment Helpdesk spreadsheet contains data from fewer than five other studies using the same laboratory and preparation;
- The co-location sites generally show “good” precision for the diffusion tubes with high quality chemiluminescence results; and
- It is the more conservative of the two bias adjustment factors available.

Period Mean Monitoring Adjustment

Period mean adjustment factors were applied to the automatic analyser in Bonnygate, Cupar, and the co-located diffusion tubes in Bonnygate, and diffusions tubes 5 (A to C) and 6 (A to C) in Appin Crescent.

See the period mean adjustment figures below.

Bonnygate Automatic Analyser

NO₂				
	Am	Pm	Ratio	
Appin		30.0	31.0	0.968
Admiralty		29.0	30.9	0.940
				0.954

PM₁₀				
	Am	Pm	Ratio	
Alloa		20.2	19.7	1.025
Admiralty		16.0	15.1	1.057
Perth		19.3	19.0	1.016
				1.041

Bonnygate Triplicate Diffusion Tubes

NO₂				
	Am	Pm	Ratio	
Appin		30.0	29.8	1.006
Admiralty		29.0	29.2	0.994
				1.000

Appin Crescent Diffusion Tubes Sites 5 (A to C) and 6 (A to C)

NO₂				
	Am	Pm	Ratio	
Appin		30.0	27.5	1.091
Admiralty		29.0	25.8	1.126
				1.109

Appendix D – Nitrogen Dioxide Diffusion Tube Data

	DRM5 Rumblingwell Dunfermline	DRM6 Aytoun Grove Dunfermline	DRM8 Barrie Street Dunfermline	DRM9A Appin Crescent A Dunfermline	DRM9B Appin Crescent B Dunfermline	DRM9C Appin Crescent C Dunfermline
07/01/09 - 04/02/09	29.8	22.4	20.2	53.2	56.8	51
04/02/09 - 04/03/09	17.9	34.7	26.4	68.8	63.1	N/A
04/03/09 - 01/04/09	28.6	15	15.9	43.5	50.4	48.8
01/04/09 - 29/04/09	25.4	12.9	13.7	45.7	40.2	48.4
29/04/09 - 03/06/09	23.2	8.9	10.6	32.4	33.2	33.5
03/06/09 - 01/07/09	22.9	11.5	11.2	32.6	39.9	40.6
01/07/09 - 29/07/09	18.2	8.6	8.9	31.2	33.2	30.2
29/07/09 - 02/09/09	N/A	12.4	11.8	37.3	35.8	34.8
02/09/09 - 30/09/09	36.6	22.4	18.7	40.2	39.2	36.6
30/09/09 - 04/11/09	31	20.4	18.4	50	40.5	47.8
04/11/09 - 02/12/09	33.4	19.5	17.3	49	49.8	49
02/12/09 - 08/01/10	50.6	32	33.9	65	70.8	69.3

	High Street Cowdenbeath	N. Approach Rd. A Kincardine	N. Approach Rd. B Kincardine	St Leonards Pri Sch Dunfermline	Admiralty Road Rosyth
07/01/09 - 04/02/09	37.8	41.3	43.6	39.5	53.7
04/02/09 - 04/03/09	49.5	N/A	N/A	38.4	58
04/03/09 - 01/04/09	30	45.6	47.1	23.7	43.7
01/04/09 - 29/04/09	31.9	23.2	20.8	19.6	39.8
29/04/09 - 03/06/09	32.2	16.9	18.1	N/A	33.4
03/06/09 - 01/07/09	36.7	N/A	18.6	N/A	31.9
01/07/09 - 29/07/09	20.9	14.1	14.1	14.9	30.4
29/07/09 - 02/09/09	21.9	17.9	17.4	17.5	33.9
02/09/09 - 30/09/09	26.4	23.3	23.8	22.6	31.1
30/09/09 - 04/11/09	37.4	24.2	24.7	28	46.8
04/11/09 - 02/12/09	28.8	26.9	25.2	N/A	42.4
02/12/09 - 08/01/10	57.6	44.2	48.1	63.8	58.9

	C'GIE DR.A Carnegie Drive A Dunfermline	C'GIE DR.B Carnegie Drive B Dunfermline	C'GIE DR.C Carnegie Drive C Dunfermline	ADM RO.A Admiralty Road A Rosyth	ADM RO.B Admiralty Road B Rosyth	ADM RO.C Admiralty Road C Rosyth
07/01/09 - 04/02/09	52.8	56.8	51.7	51.2	56.3	50.7
04/02/09 - 04/03/09	61.8	49.4	N/A	54.5	52.1	49.4
04/03/09 - 01/04/09	35.6	37	40.2	38.6	46.3	49.2
01/04/09 - 29/04/09	49.6	48.1	49.1	40.4	43	45.2
29/04/09 - 03/06/09	42.5	39.7	43.4	27.2	29	28.4
03/06/09 - 01/07/09	48.1	47	48.2	32.1	36.6	38.2
01/07/09 - 29/07/09	29.9	29.5	29	27.4	27.6	26.6
29/07/09 - 02/09/09	49.9	47	46.3	28.6	31	27.6
02/09/09 - 30/09/09	46.5	47	45.8	33	30.8	31.4
30/09/09 - 04/11/09	41.5	44.5	44.2	46.1	46.4	43.8
04/11/09 - 02/12/09	50	N/A	N/A	48.2	38.6	45.9
02/12/09 - 08/01/10	56.5	60.6	61.3	45.7	48.4	52.4

	ROMON A Admiralty Road Rosyth	ROMON B Admiralty Road Rosyth	ROMON C Admiralty Road Rosyth	APP CR1 Appin Crescent 1 Dunfermline	APP CR2 Appin Crescent 2 Dunfermline	APP CR3 Appin Crescent 3 Dunfermline	PITT ST Pittencreeff Street Dunfermline
07/01/09 - 04/02/09	36.8	40.6	38.7	40.4	50.6	54.4	42.7
04/02/09 - 04/03/09	42.1	42.8	42.6	49.7	65.8	66.2	40.3
04/03/09 - 01/04/09	N/A	N/A	N/A	38	46.3	49.2	22.3
01/04/09 - 29/04/09	24.2	24.9	26.8	35.2	43.5	45.6	20.7
29/04/09 - 03/06/09	25.3	20.8	21.1	27.6	N/A	38.9	25.9
03/06/09 - 01/07/09	27.8	28.8	30.6	31.6	32.4	35.8	27.4
01/07/09 - 29/07/09	21.4	22.6	23.1	27.3	41.7	35.1	N/A
29/07/09 - 02/09/09	30.7	30.4	N/A	27.4	53.5	44	23.7
02/09/09 - 30/09/09	25.5	25.2	25.2	30.9	51.1	45	25.9
30/09/09 - 04/11/09	38	38.8	42.5	39.5	52.7	52	28.3
04/11/09 - 02/12/09	54.9	53.5	52.6	39.8	60.7	56	28.5
02/12/09 - 08/01/10	50.5	47.9	47.1	54.5	62.9	N/A	46.9

	APP CR4A Appin Crescent 4A Dunfermline	APP CR4B Appin Crescent 4B Dunfermline	APP CR4C Appin Crescent 4C Dunfermline	APP CR5A Appin Crescent 5A Dunfermline	APP CR5B Appin Crescent 5B Dunfermline	APP CR5C Appin Crescent 5C Dunfermline
07/01/09 - 04/02/09	56.1	58.2	50.7	N/A	N/A	N/A
04/02/09 - 04/03/09	54.7	55.1	54.8	N/A	N/A	N/A
04/03/09 - 01/04/09	42.4	49.5	41.5	N/A	N/A	N/A
01/04/09 - 29/04/09	30.4	33.1	31.6	N/A	N/A	N/A
29/04/09 - 03/06/09	28.9	24.9	27.7	N/A	N/A	N/A
03/06/09 - 01/07/09	31.6	32.4	35.8	N/A	N/A	N/A
01/07/09 - 29/07/09	21.1	24.5	25.9	N/A	N/A	N/A
29/07/09 - 02/09/09	25.1	25.3	25	49.1	48.3	45.4
02/09/09 - 30/09/09	29.7	37.2	44.2	31.5	52.8	45.5
30/09/09 - 04/11/09	37.2	66	38.1	50.4	35.9	N/A
04/11/09 - 02/12/09	39.7	46.2	41.1	58.6	55.2	58.2
02/12/09 - 08/01/10	62.1	59.4	60.8	N/A	72.1	76.7

	APP CR6A Appin Crescent 6A Dunfermline	APP CR6B Appin Crescent 6B Dunfermline	APP CR6C Appin Crescent 6C Dunfermline
07/01/09 - 04/02/09	N/A	N/A	N/A
04/02/09 - 04/03/09	N/A	N/A	N/A
04/03/09 - 01/04/09	N/A	N/A	N/A
01/04/09 - 29/04/09	N/A	N/A	N/A
29/04/09 - 03/06/09	N/A	N/A	N/A
03/06/09 - 01/07/09	N/A	N/A	N/A
01/07/09 - 29/07/09	N/A	N/A	N/A
29/07/09 - 02/09/09	29.3	61.6	66.6
02/09/09 - 30/09/09	59.7	55	64.1
30/09/09 - 04/11/09	74.9	61	68.4
04/11/09 - 02/12/09	83	76.3	77.3
02/12/09 - 08/01/10	N/A	78.7	84.7

	BONNYGATE 1, CUPAR	BONNYGATE 2, CUPAR(11)	BONNYGATE 3A, CUPAR(13A)	BONNYGATE 3B, CUPAR (13B)	BONNYGATE B4 CUPAR	CITY RD 1, ST ANDREWS	CITY RD 2, ST ANDREWS	BELL ST 1, ST ANDREWS	BELL ST 2, ST ANDREWS	WINDSOR GDNS, ST ANDREWS
07/01/09 - 04/02/09	48.3	58.7	61.2	64.7	46.0	42.5	42.0	50.9	44.7	18.3
04/02/09 - 05/03/09	46.4	66.9	73.3	69.8	47.0	38.5	37.1	56.9	51.2	12.0
31/03/09 - 29/04/09	43.2	53.2	62.7	62.1	39.0	44.00	42.00	48.8	41.9	10.1
29/04/09 - 02/06/09	40.9	55.5	59.9	57.1	38.0	33.00	33.4	40.4	34.4	5.2
02/06/09 - 30/06/09	35.2	51.5	56.5	59.9	46.3	41.8	43.6	31.6	30.7	4.6
01/07/09 - 28/07/09	32.0	48.5	52.4	51.1	33.9	31.2	30.3	35.9	30.0	0
28/07/09 - 27/08/09	33.7	41.8	43.9	43.8	24.2	25.1	26.2	31.5	27.4	4.8
27/08/09 - 28/09/09	32.1	45.5	28.9	44.2	44.4	-	-	35.3	31.3	6.8
30/09/09 - 04/11/09	45.2	55.2	57.5	55.2	42.1	40.0	40.8	45.5	38.6	10.8
04/11/09 - 02/12/09	46.7	51.5	-	-	44.2	34.4	36.8	47.7	38.8	9.6
02/12/09 - 06/01/10	45.7	58.5	64.9	61.0	46.6	45.3	43.9	48.9	41.8	11.1

	CUPAR RD, A'MUCHTY	MILLFIELD, CUPAR	SOUTH RD, CUPAR	CROSSGATE, CUPAR	LADYWYND B5, CUPAR	BONNYGATE WEST B6 CUPAR	MONITOR BA CUPAR	MONITOR BB CUPAR	MONITOR BC CUPAR	4 EAST ROAD
07/01/09 - 04/02/09	47.5	24.2	30.3	39.7	35.5	37.3				28.6
04/02/09 - 05/03/09	50.8	18.7	31.1	32.6	34.4	35.2				27.8
31/03/09 - 30/04/09	33.6	13.4	0.0	39.5	25.4	31.2				17.4
29/04/09 - 02/06/09	0.0	8.9	14.4	29.9	23.3	26.9				15.1
02/06/09 - 30/06/09	28.2	7.6	12.8	37.8	18.1	33.8				11.8
01/07/09 - 28/07/09	33.0	8.5	24.7	26.0	19.4	25.0	34.2	37.0	38.0	13.6
28/07/09 - 27/08/09	27.4	8.4	23.3	19.3	20.2	0.0	34.7	40.7	38.4	14.1
27/08/09 - 28/09/09	33.8	10.5	23.9	20.2	19.8	22.5	34.2	38.3	38.7	15.5
30/09/09 - 04/11/09	41.4	15.8	28.1	31.9	28.4	31.8	44.3	46.4	44.3	21.0
04/11/09 - 02/12/09	39.0	18.1	37.3	35.5	30.9	32.8	46.5	51.8	51.5	23.4
02/12/09 - 06/01/10	40.8	18.7	36.6	39.8	35.0	39.0	45.8	47.1	46.8	28.7

	ST CLAIR ST 1	ST CLAIR ST 2	ST CLAIR ST 3	WEDDERBURN RD	LOVAT RD	DUNNIKIER RD
06/01/09 - 03/02/09	55.2	54.0	50.5	29.0	33.5	46.6
03/02/09-04/03/09	52.8	67.3	46.5	24.5	27.4	38.8
04/03/09-30/03/09	42.6	55.1	36.8	16.6	17.4	33.1
30/03/09-27/04/09	58.8	48.4	51.5	16.0	23.3	45.5
27/04/09-01/06/09	46.8	45.5	41.7	11.4	17.1	36.7
01/06/09-30/06/09	48.4	31.8	45.7	8.8	19.3	41.3
30/06/09-28/07/09	46.3	43.4	41.8	10.6	16.4	34.0
28/07/09-27/08/09	39.0	44.0	14.5	10.4	19.8	33.3
27/08/09-30/09/09	41.1	47.3	35.8	13.2	15.9	31.3
30/09/09-03/11/09	48.1	50.5	45.6	18.2	25.1	38.6
03/11/09-02/12/09	46.2	51.4	44.8	18.0	25.9	40.3
30/11/09-06/01/10	51.9	56.2	41.2	21.0	29.3	41.6

	VICTORIA RD	GLENLYON	LESLIE HIGH ST	ASDA R/B	QUEENSWAY
06/01/09 - 03/02/09	47.4		39.8	54.6	30.7
03/02/09-04/03/09	49.6	41.9	36.0	51.9	39.0
04/03/09-30/03/09	36.0	34.9	25.2	36.2	31.0
30/03/09-27/04/09	48.9	35.3	28.9	41.6	26.5
27/04/09-01/06/09	39.0	30.5	23.8	41.2	24.6
01/06/09-30/06/09	46.2	30.5	25.2	41.6	26.4
30/06/09-28/07/09	38.4	31.1	25.2	34.2	25.6
28/07/09-27/08/09	33.7	27.9		33.7	40.9
27/08/09-30/09/09	37.5	32.4		37.8	21.7
30/09/09-03/11/09	43.9	33.3	31.8	41.2	31.8
03/11/09-02/12/09	46.6	38.3	31.6	47.5	35.6
30/11/09-06/01/10	47.8	40.9	35.6	41.5	39.1