

Report

Air Quality Review and Assessment Progress Report for Fife Council 2004/2005

A Report Produced for Fife Council

AEAT/ENV/R/1955 Issue 2
Jun 2005

UNRESTRICTED

Title	Air Quality Review and Assessment Progress Report for Fife Council – 2004/2005
Customer	Fife Council
Customer reference	
Confidentiality, copyright and reproduction	Unrestricted "Copyright AEA Technology plc All rights reserved Enquiries about copyright and reproduction should be addressed to the Commercial Manager, AEA Technology plc"
File reference	netcen/ED49328001
Reference number	AEAT/ENV/R/1955/Issue 2
Address for Correspondence	AEA Technology - netcen Glengarnock Technology Centre Caledonian Rd Glengarnock Ayrshire KA14 3DD Telephone 0870 190 6574 Facsimile 0870 190 5151 ken.stevenson@aeat.co.uk netcen is a operating division of AEA Technology plc netcen is certificated to ISO9001 & ISO 14001

	Name	Signature	Date
Author	K Stevenson		
Reviewed by	J McGinlay		
Approved by	K Stevenson		

Executive Summary

Fife Council is undertaking the second round of air quality review and assessment, in which sources of air pollutant emissions are reassessed to identify whether the situation has changed since the first round, and if so, what impact this may have on the likelihood of compliance with Air Quality Strategy objectives.

The second round of review and assessment comprises two steps. The first step is an Updating and Screening Assessment, which updates the Stage 1 and 2 review and assessment previously undertaken for all pollutants identified in the Air Quality Regulations. Where a significant risk of exceedance is identified for a pollutant it will be necessary for the local authority to proceed to a Detailed Assessment, equivalent to the previous Stage 3 assessments. Where a local authority does not need to undertake a Detailed Assessment, a progress report is required instead.

Fife Council completed the first of these two steps, the Updating and Screening Assessment, in August 2003 and a first Progress Report was produced in July 2004

This second Progress Report reviews all new monitoring data and monitoring locations and provides an update on any other significant developments during 2004.

During 2004, Fife Council undertook some changes to the nitrogen dioxide diffusion tube monitoring sites, following recommendation of the previous reports. Some sites were re-located from kerbside locations to the façade of buildings in order to obtain data more representative of exposure and at others, the number of diffusion tubes was increased from one to two or three.

Additional automatic monitoring of nitrogen dioxide, carbon monoxide, sulphur dioxide and PM10 at Admiralty Road, Rosyth has also commenced. This monitoring will operate for a 6-month period and will address the previous recommendation for additional PM10 monitoring in Fife. In addition, the Council has applied for funding for an additional automatic nitrogen dioxide and PM10 monitor to further assess concentrations of these pollutants, initially in the Bonnygate, Cupar area.

The new data and information confirms the conclusions of the previous reports that a Detailed Assessment is not required for any pollutant. However, in the case of NO₂ and PM10, the additional monitoring data currently being collected will need to be reviewed in the Updating and Screening Report next year.

Contents

1	Introduction	1
1.1	PURPOSE OF THE PROGRESS REPORT	1
1.2	AIR QUALITY STRATEGY OBJECTIVES	1
1.3	SUMMARY OF CONCLUSIONS OF THE UPDATING AND SCREENING ASSESSMENT AND FIRST PROGRESS REPORT3	
2	New Monitoring Data	4
2.1	SUMMARY OF MONITORING UNDERTAKEN	4
2.1.1	Automatic Monitoring Sites	4
2.1.2	Fife Council Nitrogen Dioxide Diffusion Tube Monitoring Sites	5
2.1.3	Benzene and 1,3-Butadiene Monitoring	7
2.1.4	SO ₂ Monitoring	7
2.1.5	Carbon Monoxide Monitoring	7
2.1.6	PM ₁₀ Monitoring	8
2.2	CARBON MONOXIDE (CO)	8
2.3	BENZENE	9
2.4	1,3-BUTADIENE	9
2.5	LEAD	10
2.6	NITROGEN DIOXIDE (NO ₂)	10
2.6.1	Automatic NO ₂ Monitoring at North Approach Road, Kincardine	10
2.6.2	Automatic NO ₂ Monitoring at Admiralty Road, Rosyth	10
2.6.3	NO ₂ Diffusion Tube Monitoring Data	11
2.7	SULPHUR DIOXIDE (SO ₂)	16
2.7.1	Automatic SO ₂ Data	16
2.7.2	Data from the National Smoke and SO ₂ Network	16
2.7.3	SO ₂ Diffusion tubes	17
2.7.4	SO ₂ monitoring undertaken by Scottish Power Generation UK	18
2.8	PM ₁₀	18
2.8.1	Automatic PM ₁₀ Data from Admiralty Rd, Rosyth	18
2.9	SUMMARY OF MONITORING RESULTS AND COMPARISON WITH AQS OBJECTIVES	19
3	New Developments – Industrial Processes	20
3.1	PART A INDUSTRIAL PROCESSES	20
3.2	PART B PROCESSES	20
3.3	NEW LANDFILL, QUARRYING AND MINERAL PROCESSES	20
3.4	DISCONTINUING INDUSTRIAL PROCESSES	20
3.5	RE-ASSESSMENT OF PROCESSES	20
4	New Developments – Transport	21
4.1	NEW ROAD DEVELOPMENTS	21
4.1.1	Assessment of New Road Developments	21
4.2	ROADS WITH SUBSTANTIALLY INCREASED TRAFFIC FLOWS	21
4.3	OTHER TRANSPORT SOURCES	22
4.3.1	Trains	22
4.3.2	Airports	22
4.3.3	Bus Stations	22
4.3.4	Shipping	22
4.3.5	Petrol Stations on Busy Roads	22
5	New Developments – Residential, Commercial and Public	22
5.1	RESIDENTIAL	22
5.2	COMMERCIAL	23

6	Conclusions	23
7	References	25
8	Acknowledgments	25

Appendices

APPENDIX 1	DIAGRAMS OF NEW SITE LOCATIONS
APPENDIX 2	DETAILED INFORMATION ON AUTOMATIC MONITORING LOCATIONS

1 Introduction

This Air Quality Progress Report has been prepared for Fife Council to comply with the Local Air Quality Management (LAQM) system introduced in Part IV of the Environment Act 1995. The report conforms to the Progress Report Guidance, LAQM.PRG(03)¹ which is a supplement to the policy guidance, LAQM.PG(S)(03) and technical guidance, LAQM TG(03)² issued under Section 88(1) of the Environment Act 1995. Pursuant to Section 88(2) of the Environment Act 1995 Fife Council and the author of this report have had due regard to the relevant guidance.

1.1 PURPOSE OF THE PROGRESS REPORT

The Local Authority should produce an annual progress report to provide continuity of assessment between the 3-yearly Updating and Screening Assessments of local air quality.

The purpose of the progress report is to:

- Provide both a review and update on air quality issues;
- Provide information on new and proposed developments that might affect air quality and the results of the monitoring;
- Identify changes in circumstances early on, that might require a detailed assessment;
- Assist with Local Air Quality Management (LAQM) process;
- Help Local Authorities implement Local Air Quality Management;
- Identify overall improvements in air quality.

1.2 AIR QUALITY STRATEGY OBJECTIVES

The Air Quality Strategy's standards and objectives are shown in Table 1.1. The table shows the standards in $\mu\text{g m}^{-3}$ (mg m^{-3} for CO) with the number of exceedences that are permitted (where applicable).

Table 1.1 Objectives included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene			
All authorities	16.25 $\mu\text{g m}^{-3}$	running annual mean	31.12.2003
Authorities in England and Wales only	5.00 $\mu\text{g m}^{-3}$	annual mean	31.12.2010
Authorities in Scotland and Northern Ireland only	3.25 $\mu\text{g m}^{-3}$	running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g m}^{-3}$	running annual mean	31.12.2003
Carbon monoxide			
Authorities in England, Wales and Northern Ireland only	10.0 mg m^{-3}	maximum daily running 8-hour mean	31.12.2003
Authorities in Scotland only	10.0 mg m^{-3}	running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g m}^{-3}$ 0.25 $\mu\text{g m}^{-3}$	annual mean annual mean	31.12.2004 31.12.2008
Nitrogen dioxide^a	200 $\mu\text{g m}^{-3}$ not to be exceeded more than 18 times a year 40 $\mu\text{g m}^{-3}$	1 hour mean annual mean	31.12.2005 31.12.2005
Particles (PM₁₀) (gravimetric)^b	50 $\mu\text{g m}^{-3}$ not to be exceeded more than 35 times a year 40 $\mu\text{g m}^{-3}$	24 hour mean annual mean	31.12.2004 31.12.2004
Authorities in Scotland only ^c	50 $\mu\text{g m}^{-3}$ not to be exceeded more than 7 times a year 18 $\mu\text{g m}^{-3}$	24 hour mean annual mean	31.12.2010 31.12.2010
Sulphur dioxide	350 $\mu\text{g m}^{-3}$ not to be exceeded more than 24 times a year 125 $\mu\text{g m}^{-3}$ not to be exceeded more than 3 times a year 266 $\mu\text{g m}^{-3}$ not to be exceeded more than 35 times a year	1 hour mean 24 hour mean 15 minute mean	31.12.2004 31.12.2004 31.12.2005

a. These objectives are provisional.

b. Measured using the European gravimetric transfer sampler or equivalent.

c. These 2010 Air Quality Objectives for PM₁₀ apply in Scotland only, as set out in the Air Quality (Scotland) Amendment Regulations 2002.

In Scotland, the PM₁₀ objective for 2010 has been adopted into regulation and hence, assessment against this objective is required.

In England, Wales and Greater London the 2010 objectives for PM₁₀ are not currently included in Regulations for the purpose of LAQM. The Government and the Welsh Assembly Government however intends that the new particles objectives will be included in Regulations as soon as practicable after the review of the EU's first air quality daughter directive, which is due to be completed in 2004. The new particles objectives for England, Wales and Greater London are shown in Table 1.2. Whilst authorities have no obligation to review and assess against them, they may find it helpful to do so, in order to assist with longer-term planning, and the assessment of development proposals in their local areas.

Table 1.2 Proposed new particles objectives for England, Wales and Greater London (not included in Regulations)

Region	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
London	50 $\mu\text{g.m}^{-3}$ not to be exceeded more than 10 times a year	24 hour mean	31.12.2010
London	23 $\mu\text{g.m}^{-3}$	annual mean	31.12.2010
London	20 $\mu\text{g.m}^{-3}$	annual mean	31.12.2015 ^a
Rest of England and Wales	50 $\mu\text{g.m}^{-3}$ not to be exceeded more than 7 times a year	24 hour mean	31.12.2010
Rest of England and Wales	20 $\mu\text{g.m}^{-3}$	annual mean	31.12.2010

^a this objective is provisional.

1.3 SUMMARY OF CONCLUSIONS OF THE UPDATING AND SCREENING ASSESSMENT AND FIRST PROGRESS REPORT

Carbon Monoxide – data reported in the Updating and Screening Report and the first Progress Report indicate that the Air Quality Objective for carbon monoxide is unlikely to be exceeded.

Benzene – data reported in the Updating and Screening Report and the first Progress Report indicate that the Air Quality Objective for benzene is unlikely to be exceeded.

1,3-butadiene - data reported in the Updating and Screening Report and the first Progress Report indicate that the Air Quality Objective for 1,3-butadiene is unlikely to be exceeded.

Lead – the Updating and Screening Report concluded that industrial emissions of lead were unlikely to lead to any exceedence of the Air Quality Objective for lead. No further monitoring has been undertaken.

Nitrogen Dioxide – high concentrations were recorded at kerbside locations in North Approach Road, Kincardine, Carnegie Drive, Dunfermline and Admiralty Road, Rosyth. However, this was based on data from kerbside diffusion tube monitoring sites and the Progress Report recommended that monitoring be undertaken at the façade of buildings for a better assessment of likely exposure. This adjustment to the monitoring programme has been carried out during 2004 (by Fife Council) and is reported in this report. In addition, the Progress Report recommended that automatic monitoring should be undertaken for at least 6-months duration. The new automatic site at Admiralty Road, Rosyth has now been established and will operate for 6-months. The first 2-months of data are reported in the report.

Sulphur Dioxide - data reported in the Updating and Screening Report and the first Progress Report indicate that the Air Quality Objective for sulphur dioxide is unlikely to be exceeded.

PM10 – the progress report recommended that longer duration PM10 monitoring be undertaken. This is being addressed by the current monitoring at Admiralty Road. The Progress Report recommended that further PM10 monitoring also be carried out at Tulliallan School – this site will be considered for monitoring in the future.

Industrial Process – the Updating and Screening Report and the first Progress Report mentioned possible re-assessment required for EPR Scotland Ltd, Fife Power and Tullis Russell. Updated information on these re-assessments is provided in this report.

2 New Monitoring Data

2.1 SUMMARY OF MONITORING UNDERTAKEN

New monitoring data for 2004, for the following pollutants have become available since the Updating and Screening Assessment³ and the Air Quality Review and Assessment Progress Report for Fife Council⁴ and have been reviewed for this progress report:

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

Fife Council have carried out monitoring during 2004 for CO, NO₂, SO₂, and PM₁₀. Additional NO₂, SO₂, benzene and 1,3-butadiene data are available from a study of air quality around the BP Grangemouth Plant, which will be discussed in the relevant sections.

2.1.1 Automatic Monitoring Sites

Two mobile monitoring stations were used during 2004; one is permanently located at a roadside site in Kincardine and the other was moved from Tulliallan Primary School to Admiralty Road, Rosyth during 2004.

The "Rollalong" monitoring unit has remained at the North Approach Road in Kincardine-on-Forth (grid reference 293191 687518). Monitoring at this site with the NO_x analyser and triplicate diffusion tubes continued at this site throughout 2004.

The "Groundhog" mobile monitoring unit was relocated from Tulliallan primary school in Kincardine to Admiralty Road, Rosyth as indicated in the previous progress report⁴. The priority for this site is to determine PM10 concentrations in Fife as only short-term measurements of this important pollutant are available to date. The monitoring site was selected on the basis of the relatively high volume of traffic and associated elevated NO₂ diffusion tube readings experienced at this location. This mobile monitoring facility is shared with other Local Authorities, and so is not available exclusively for use by Fife Council. The unit was installed in November 2004 and hence, only 2-months of data (Dec 2004 and Jan 2005) are available for this progress report. However, following the recommendations of the previous progress report, the unit will be deployed for a full 6-month period to obtain an assessment of concentrations for comparison with the annual Air Quality Strategy Objectives.

Table 2.1 summarizes details of the automatic monitoring sites in Fife.

Table 2.1 Automatic Monitoring Locations

Location	Site Type	Monitoring Equipment	Pollutants Measured
North Approach Road, Kincardine (grid reference 293191 687518)	Roadside	Rollalong – NO _x Analyser (with diffusion tubes in triplicate)	NO _x , NO & NO ₂
Admiralty Road, Rosyth (grid reference 311752, 683515)	Roadside	Groundhog mobile monitoring unit (with diffusion tubes in triplicate)	Nitrogen Dioxide (NO ₂), Sulphur Dioxide (SO ₂), Carbon Monoxide (CO) and PM ₁₀ .

The automatic analysers are automatically calibrated every 24 hours, using standard calibration gases supplied by BOC.

2.1.2 Fife Council Nitrogen Dioxide Diffusion Tube Monitoring Sites

Fife Council operates an extensive NO₂ monitoring survey with monitoring sites in East, West and Central Fife.

As discussed in the previous Progress Report, Fife Council has made a number of changes to the NO₂ monitoring sites. Some sites have been re-located, and at others the number of diffusion tubes has been increased from one to two or three. In particular, some tubes have been re-sited at the facades of buildings, to better represent public exposure. Table 2.1.2 lists NO₂ diffusion tube monitoring sites operating during all or part of 2004. The table shows existing sites that have been discontinued or relocated and new sites that have been installed during the year.

Table 2.1.2 Location of NO₂ Diffusion Tubes in 2004

Site Location	Site Code	Type	Start Date	End Date	East	North	Comments
West area							
Halbeath Bypass	D8	K	1999	2003	312883	688584	Discontinued
Bothwell Street, Dunfermline	AQM3	K	1999	2003	309513	686895	Moved to building façade
St Leonards Primary School, Dunfermline		R(F)	2004	-			Replaces Bothwell St site
Carnegie Drive, Dunfermline	AQM4	K	1999	-	309467	687625	
Carnegie Drive (A), Dunfermline	C'GIE DR A	R (F)	2004	-			Triplicate tube
Carnegie Drive (B), Dunfermline	C'GIE DR B	R (F)	2004	-			Triplicate tube
Carnegie Drive (C), Dunfermline	C'GIE DR C	R (F)	2004	-			Triplicate tube
Rumblingwell, Dunfermline (5N)*	DRM5	R	1996	-	307866	688231	* In UK NO ₂ Network
Aytoun Grove, Dunfermline (6N)*	DRM6	UB		-	308328	688426	* In UK NO ₂ Network
Admiralty Road, Rosyth	AQM5	K	1999	-	312103	683439	
Admiralty Road (A), Rosyth	ADM RO A	R (F)	2004	-	312140	683439	Triplicate tube
Admiralty Road (B), Rosyth	ADM RO B	R (F)	2004	-	312140	683439	Triplicate tube
Admiralty Road (C), Rosyth	ADM RO C	R (F)	2004	-	312140	683439	Triplicate tube
Barrie Street, Dunfermline (8N)*	DRM8	UB		-	308379	688249	* In UK NO ₂ Network
Appin Crescent (A), Dunfermline (9N)*	DRM9A	R	1999	-	309882	687713	In UK NO ₂ Network Triplicate tube
Appin Crescent (B), Dunfermline (9N)*	DRM9B	R	2004	-	309882	687713	Triplicate tube
Appin Crescent (C), Dunfermline (9N)*	DRM9C	R	2004	-	309882	687713	Triplicate tube
Appin Crescent (1) Dunfermline	APP CR1	R (F)	2004	-			
Appin Crescent (2) Dunfermline	APP CR2	R (F)	2004	-			
High Street, Cowdenbeath	C'BEATH	K	1996	-	316523	691740	
North Approach Road (1) Kincardine	K'DINE1	K	1996	-	293182	687530	
North Approach Road (2) Kincardine	K'DINE2	K	1996	-	293182	687530	
North Approach Road (A) Kincardine	ROLLALONG A	R	2004	-	293191	687518	Co-location study Triplicate tube
North Approach Road (B) Kincardine	ROLLALONG B	R	2004	-	293191	687518	Co-location study Triplicate tube
North Approach Road (C) Kincardine	ROLLALONG C	R	2004	-	293191	687518	Co-location study Triplicate tube
Main Street, Carnock	D12	K	1999	2003	304221	689064	discontinued
Central Area							
Esplanade, Kirkcaldy	ESPLANADE	K	1996	2003	327863	690262	discontinued
St Clair Roundabout Kirkcaldy		K	1996	2003	329084	692612	discontinued
St Clair Street (1), Kirkcaldy	ST CLAIR 1	R(F)	2004	-	329105	692992	
St Clair Street (2), Kirkcaldy	ST CLAIR 2	R(F)	2004	-	329185	693055	
Wedderburn Road, Kirkcaldy	WEDDERBURN	UB		-	325288	693086	
Redhouse Roundabout, Kirkcaldy	REDHOUSE R/B	K	1996	2003	329198	695281	discontinued
Lovat Road, Glenrothes	LOVAT RD	K	1996	-	328600	699470	
North Street, Glenrothes		I		2003	327062	701115	discontinued
Dunnikier Rd, Kirkcaldy	DUNNIKIER	R (F)	2004	-	328152	692350	

Site Location	Site Code	Type	Start Date	End Date	East	North	Comments
Victoria Rd, Kirkcaldy	VICTORIA	R (F)	2004	-	328152	692325	
Glenlyon Road, Levenmouth	GLENLYON	K	1998	-	337357	701318	
Bawbee Bridge, Levenmouth	BAWBEE BR	K	1998	2003	337787	700402	discontinued
Chapel Roundabout, Kirkcaldy	CHAPEL R/B	K	1998	2003	325023	694405	discontinued
Leslie Roundabout, Glenrothes	LESLIE R/B	K	1998	2003	326350	701938	discontinued
Leslie High St	LESLIE HIGH ST	R(F)	2004	-	325111	701806	
Queensway, Glenrothes	QUEENSWAY	K	1999	-	327849	701114	
Adsa Roundabout, Kirkcaldy	ASDA R/B	K		-	328735	694053	
East area							
City Road (1), St Andrews (1N)* (A)	-75	R	1996	-	350586	716580	In UK NO ₂ Network Duplicate tube
City Road (2), St Andrews (B)	-76	R	2004	-	350586	716580	Duplicate tube
Bell Street (1), St Andrews	-77	R	1997	-	350708	716716	
Bell Street (2) St Andrews	-78	R(F)	2004	-	350716	716669	
Market Street, St Andrews	-84	R	1997	2003	350899	716744	discontinued
South Street, St Andrews	-85	K	1997	2003	351060	716642	discontinued
Windsor Gdns, St Andrews (4N)*	-79	UB		-	349122	715313	* In UK NO ₂ Network
Crossgate, Cupar	-83	K		-	337538	714527	
South Road, Cupar	-82	R		-	337513	713616	
Cupar Road, Auchtermuchty	-80	R		-	324186	711801	
Millfield, Cupar (4N)*	-81	UB		-	336867	713878	* In UK NO ₂ Network
Bonnygate, Cupar (1N)* Bonnygate 1	-73	R	1996	-	337411	714572	* In UK NO ₂ Network
Bonnygate, Cupar Bonnygate 2	-74	R(F)	2004	-	337250	714750	
Bonnygate, Cupar Bonnygate 3 (A)		R(F)	2005	-	337455	714605	Duplicate tube
Bonnygate, Cupar Bonnygate 3 (B)		R(F)	2005	-	337455	714605	Duplicate tube
Bonnygate, Cupar Bonnygate 4		R(F)	2005	-	337440	714560	

K = Kerbside, 0-1m from the kerb of a busy road

R = Roadside, 1-5m from the kerb

R(F) = façade of buildings on street

I = Intermediate, 20-30m from the kerb

UB = Urban Background, >50m from any busy road

- = site operation ongoing

The locations of all newly established diffusion tube monitoring sites are presented in map format in Figures A1 to A9 in Appendix 1 this report. The locations of all previously operational diffusion tube monitoring sites were provided in the Fife Council report entitled, "Local Air Quality 2nd Stage Review and Assessment January 2001".

2.1.2.1 Discontinued Monitoring Sites

Fife Council decided that the following sites would be discontinued, either because of the relatively low nitrogen dioxide concentrations recorded at these locations, or in some cases because the type of location is no longer relevant.

- Halbeath, Dunfermline
- Bothwell St, Dunfermline
- Main Street, Carnock
- Esplanade, Kirkcaldy
- St Clair Roundabout, Kirkcaldy
- Redhouse Roundabout, Kirkcaldy
- North St, Glenrothes
- Bawbee Roundabout, Levenmouth
- Chapel Roundabout, Kirkcaldy
- Leslie Roundabout, Glenrothes
- Market Street, St Andrews
- South Street, St Andrews

2.1.2.2 New Monitoring sites

Fife Council have selected the following new monitoring sites because the predicted annual mean NO₂ concentration for 2005 was >30 µg m⁻³, based on the 2003 data.

- St Leonards Primary School (building façade) (relocated from Bothwell Street)
- Carnegie Drive (building façade) (triplicate tube) Figure A1
- Admiralty Rd, Rosyth (building façade) (triplicate tube) Figure A2
- Appin Crescent, Dunfermline existing site upgraded to triplicate tubes
+ 2 new sites (building façade) Figure A3
- North Approach Road, Kincardine (co-location study) (triplicate tube)
- St Clair St, Kirkcaldy Figure A4
- Dunniker Rd, Kirkcaldy (building façade) Figure A5
- Victoria Road, Kirkcaldy (building façade) Figure A5
- Leslie High Street (building façade) Figure A6
- City Rd, St Andrews upgraded to duplicate tube Figure A7
- Bell Street, St Andrews (2) (building façade) Figure A8
- Bonnygate, Cupar 3 sites (2 single, 1 duplicate)(building façade) Figure A9

2.1.3 Benzene and 1,3-Butadiene Monitoring

As part of BP Oil's commitment to monitor any potential environmental impact from its Grangemouth oil refinery on the surrounding area, the National Physical Laboratory conducts an ongoing ambient air quality survey over a wide area around the Firth of Forth⁵. Measurements are made monthly at 22 sites using passive diffusion tube techniques. NO₂, SO₂ and a range of organic pollutants including benzene and 1,3-butadiene are monitored using diffusive samplers, with analysis being conducted by Analytical Data Services Ltd on behalf of NPL. The latest data available are for the 12-month period July 2003 to July 2004. (The results from this study are only available for 12-month periods starting and ending July, not calendar years). The NPL survey covers a wide area, and four of the sites are situated in Fife. These are as follows (grid references are not available):

- Ford View, Cairneyhill
- Shoreline near Charlestown Harbour
- Mercer Road, Kincardine
- Shoreline, Culross

Results from these sites are included in Sections 2.3 and 2.4 of this Progress Report.

2.1.4 SO₂ Monitoring

There are currently two sites in Fife that monitor SO₂ using the net acidity technique, as part of the UK Smoke and SO₂ network. These are at Broad Street Primary School, Cowdenbeath (COWDENBEATH 1) and at Templehall Community Centre, Kirkcaldy (KIRKCALDY 6).

Sulphur dioxide diffusion tube monitoring has been discontinued at Victoria Road, Leven, East Toll, Burntisland and Derran Drive, Cardenen. To replace these locations, a triplicate tube site has been established at Markinch, close to Tullis Russell Papermakers. Sulphur dioxide diffusion tube monitoring continues at the Valleyfield site close to Longannet Power Station and at the site in Culross High Street.

The Groundhog monitoring facility at Admiralty Rd, Rosyth also includes monitoring of sulphur dioxide.

2.1.5 Carbon Monoxide Monitoring

As noted in the previous Progress Report, Fife Council Transportation Department have re-commenced carbon monoxide monitoring at a selection of sites across Fife, using "Marksman 660" street monitors. The monitoring has been undertaken for short periods only at:

- Site 1 A985T/A977/A876 Junction, Kincardine
- Site 13 Carnegie Drive/Pilmuir Street, Dunfermline
- Site 34 Bonnygate, Cupar (Crossgate Traffic Lights)
- Site 35 Appin Crescent
- Site 93a Bonnygate, Cupar
- Site 919 Bell Street, St Andrews

In addition, the Groundhog monitoring facility at Admiralty Rd, Rosyth also includes monitoring of carbon monoxide.

The results for carbon monoxide monitoring during 2004/5 are summarised in Section 2.2

2.1.6 PM10 Monitoring

It was recognised in the previous Progress Report that insufficient data on PM10 concentrations Fife were currently available. To address this issue, Fife Council has established PM10 monitoring with a TEOM analyser within the Groundhog monitoring facility at Admiralty Road, Rosyth. Monitoring commenced in November 2004, so only 2-months of data are available for this report (see Section 2.8) but the monitoring will continue for a 6-month period. In addition, Fife Council has applied for funding for an additional PM10 monitor.

2.2 CARBON MONOXIDE (CO)

Carbon monoxide monitoring commenced during November 2004 at the roadside at Admiralty Road, Rosyth (as part of the "Groundhog" monitoring facility). Hence, monitoring data for the month of December 2004 and January 2005 only are available for this report. However, Fife Council propose to operate this site for a six-month period. The monitoring facility is operated by Dundee Scientific Services on behalf of Fife Council.

During the first two months of operation, the maximum 8-hour running mean was well within the AQS Objective of 10 mg m⁻³. However, a reliable assessment can only be made on completion of the planned 6-month monitoring programme.

Table 2.2.1 Automatic CO Monitoring data – Admiralty Rd, Rosyth

Period	Maximum 8 – hour running mean (mg m ⁻³)
December 2004	1.9
January 2005	3.1

As noted in Section 2.1.5, short periods of carbon monoxide monitoring have also been undertaken by Fife Council Transportation Services at a number of roadside locations. The results are summarised in Table 2.2.2.

Table 2.2.2 Roadside Carbon Monoxide Monitoring

Site Number and Location	Monitoring Period	average 8-hour concentration mg m ⁻³
Site 1 A985T/A977/A876 Junction, Kincardine	28/01 – 03/02/2005	1.3
Site 13 Carnegie Drive/Pilmuir Street, Dunfermline	28/01 – 03/02/2005	3.0
Site 34 Bonnygate, Cupar (Crossgate Traffic Lights)	19/02 – 25/02/2005	1.3
Site 35 Appin Crescent	08/03 – 14/03/2005	1.1
Site 93a Bonnygate, Cupar	20/09 – 26/09/2004 (10.00 – 18.00 only)	1.5
Site 919 Bell Street, St Andrews	20/09 – 26/09/2004 (10.00 – 18.00 only)	4.3

Whilst none of these monitoring periods are sufficiently long to permit a full assessment on carbon monoxide concentrations over a full annual period, they all indicate that concentrations are likely to be well below the Air Quality Strategy Objective of 10.0 mgm⁻³ for the maximum running 8-hour mean concentration.

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

2.3 BENZENE

Fife Council carried out no new benzene monitoring. However, data are available from the ambient air quality survey, undertaken by NPL, for BP Oil in the area surrounding its Grangemouth oil refinery in Falkirk District⁵ (see section 2.1.3). Results for the four sites within Fife for the 12-month period July 2003-July 2004 are shown in Table 2.3. The results have been converted from ppb into mass units at 20°C and 1 atmosphere.

Table 2.3 Benzene Diffusion Tube Annual Mean Concentrations ($\mu\text{g m}^{-3}$) from the NPL network (sites in Fife only)

NPL Tubes	Year				
	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004
Ford View, Cairneyhill	0.98	0.98	0.65	0.98	0.98
Shoreline nr. Charlestown Harbour	0.98	1.30	0.65	0.98	0.98
Mercer Road, Kincardine	1.30	0.98	0.98	0.65	0.65
Near Shoreline, Culross	0.98	0.98	0.98	0.98	0.98

As in previous years, annual mean benzene levels, for the 12-month period July 2003 – July 2004, were well below the AQS objective (for the running annual mean) of $16.25\mu\text{g m}^{-3}$ for the end of 2003, and within the AQS objective of $3.25\mu\text{g m}^{-3}$ for 2010. Ambient benzene concentrations do not appear to be increasing.

The BP Grangemouth oil refinery (which is not within Fife), has been shown to have no impact on the air quality in the Fife region.

The report of the Mossmorran and Braefoot Bay Independent Air Quality Monitoring Review Group report for 2003⁽⁶⁾ concluded that “the work undertaken in 2003 demonstrates that the facilities at Mossmorran and Braefoot Bay continue to pose no significant risk to the health of the local community”.

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

2.4 1,3-BUTADIENE

The Updating and Screening assessment concluded that Fife Council is not required to carry out a Detailed Review and Assessment for 1,3-butadiene. Fife Council carried out no new monitoring for this pollutant in 2004. The BP Oil ambient air quality survey, undertaken by NPL, in the vicinity of Grangemouth refinery⁵ included 1,3-butadiene. Results for the four sites within Fife for the 12-month period July 2003-July 2004 are shown in Table 2.4. The results have been converted from ppb into mass units at 20°C and 1 atmosphere.

Table 2.4 1,3-Butadiene Diffusion Tube Annual Mean Concentrations ($\mu\text{g m}^{-3}$) from the NPL network (sites in Fife only)

NPL Tubes	Year				
	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004
Ford View, Cairneyhill	0.25	0.14	0.11	0.16	0.09
Shoreline nr. Charlestown Harbour	0.32	0.18	0.14	0.14	0.14
Mercer Road, Kincardine	0.23	0.11	0.11	0.14	0.11
Near Shoreline, Culross	< 0.23	0.18	0.11	0.14	0.18

All sites in Fife appear to meet the AQS running annual mean objective of $2.25\mu\text{g m}^{-3}$ set for 31st December 2003.

The report of the Mossmorran and Braefoot Bay Independent Air Quality Monitoring Review Group report for 2003⁽⁶⁾ concluded that “the work undertaken in 2003 demonstrates that the facilities at

Mossmorran and Braefoot Bay continue to pose no significant risk to the health of the local community”.

On the basis of this monitoring data, Fife Council is not required to carry out a Detailed Assessment for 1,3-butadiene.

2.5 LEAD

There are no new data to report. The Updating and Screening assessment concluded that emissions of lead from industrial processes in Fife are not likely to exceed the objectives for lead to be achieved in 2004 and 2008.

Fife Council is not required to carry out a Detailed Assessment for lead.

2.6 NITROGEN DIOXIDE (NO₂)

2.6.1 Automatic NO₂ Monitoring at North Approach Road, Kincardine

Fife Council have been taking continuous measurements of NO_x (NO, NO₂ and NO_x) at a roadside site on the North Approach road in Kincardine-on-Forth (grid reference 293191 687518). Data capture for the calendar year 2004 was 96%. The annual mean NO₂ concentration measured by this system was 31µg m⁻³ for 2004. This is within the AQS objective of 40 µg m⁻³ for the annual mean and lower than the 2003 annual average at this site of 38µg m⁻³.

There were no exceedences of the 1-hour air quality objective of 200µg m⁻³ indeed even the maximum 15min average did not exceed this threshold. One hour of exceedence was recorded in 2003 and up to 18 are permitted in any calendar year.

Using the 2004 annual mean NO₂ concentration, it is possible to predict annual means for future years using the approach set out in the Guidance LAQM TG (03), Box 6.6. Estimated concentrations for 2005 and 2010 are shown in Table 2.6.1.

Table 2.6.1 Data from Kincardine Roadside Automatic NO_x Monitoring Site

Site	Year	Data Capture	Max. 1-hour mean NO ₂ , µg m ⁻³	No. of 1-hour means > 200 µg m ⁻³	99.8 th %ile of 1-hour mean NO ₂ , µg m ⁻³	Annual Mean NO ₂ , µg m ⁻³	Predicted 2005 Annual Mean NO ₂ , µg m ⁻³	Predicted 2010 Annual Mean NO ₂ , µg m ⁻³
North Approach Road, Kincardine	2003	86%	248	1	-	38	36	30
	2004	96%	135	0	-	31	30	26

The measured annual mean for 2004, and the predicted annual means for 2005 and 2010, are all within the AQS objective of 40 µg m⁻³.

In addition, traffic on this section of road reduced considerably in October 2004 with the opening of the Kincardine Eastern Link Road (see Section 4.1). Hence, it is anticipated that NO₂ concentrations will reduce in 2005 – and should reduce further after 2008 when the planned new bridge crossing and the northern approach bypass road are completed.

A Detailed Assessment is not required for NO₂ on the basis of monitoring data from the North Approach Road site.

2.6.2 Automatic NO₂ Monitoring at Admiralty Road, Rosyth

During 2004 a new roadside monitoring location was established at Admiralty Road, Rosyth. Unfortunately it was not possible to install this site until November 2004 and hence data are only available for the month of December 2004 and January 2005. However, NO₂ data at this site appear to be unreliable and are currently under further investigation.

2.6.3 NO₂ Diffusion Tube Monitoring Data

2.6.3.1 QA/QC of Diffusion Tubes

The Dundee City Council Scientific Services laboratory participates in 3 schemes which ensure that the NO₂ tube results meet acceptable standards.

1. The WASP scheme which is run by the Health and Safety Laboratory in Sheffield. Each month one tube is sent for testing. Results are compared with other participating labs and feedback on performance provided.
2. Every three months the NETCEN/NO₂ network send 3 tubes and a blank for analysis. Again, results are compared with other participating labs and feedback on performance provided.
3. Each month a QC NO₂ solution is provided from DEFRA (UK Nitrogen Dioxide Network Analytical Performance Testing Scheme). This solution is run as a standard when for NO₂ tubes in the laboratory. The solution is tested after every 21 NO₂ tube samples.

Dundee also use in-house quality assurance standards.

2.6.3.2 Bias Correction for Diffusion tubes: Co-location Study at Kincardine

At the Kincardine North Approach Road roadside site, triplicate NO₂ tubes were co-located with the chemiluminescence analyser throughout 2004. Fife Council is using the data in an ongoing intercomparison of the diffusion tubes with the continuous analyser. Using the approach set out in Box 6.4 of the Guidance, the annual mean from the continuous analyser was used, together with the annual mean of the triplicate diffusion tube results, to determine the bias of the diffusion tubes relative to the reference chemiluminescence analyser.

Using the nomenclature of Box 6.4,

$C_m = 31$

$D_m = 36.96$ (average of triplicate tubes 36.4, 37.3, 37.2)

Hence, $A = 0.84$

A bias adjustment factor ("A") of 0.84 was calculated for these diffusion tubes.

The Review and Assessment Helpdesk bias adjustment spreadsheet contains the Fife intercomparison data, but no other intercomparison data for Dundee Scientific Services for comparison. Hence, the factor calculated has been used to adjust the annual mean results from all diffusion tubes deployed in the Fife area. A new spreadsheet has recently been provided by netcen to better assess the reliability of the calculation of the bias adjustment factor. It is recommended that this tool be used in future. Fife Council note and accept this recommendation.

2.6.3.3 Fife Council Diffusion Tube Results

The annual mean nitrogen dioxide concentrations for 2004 are provided in Table 2.6.3 for Fife Council's diffusion tube sites. Predictions for 2005 and 2010 have been based on forward projection of the results for 2004.

**Table 2.6.3 Annual Mean Nitrogen Dioxide Concentrations
from Fife Council Monitoring Sites ($\mu\text{g}\text{m}^{-3}$)**

West Area	Halbeath Bypass	Bothwell Street, Dunfermline	St Leonards Primary School Dunfermline	Carnegie Drive, Dunfermline	Carnegie Drive (A), (B), (C). Dunfermline (triplicate)			Rumblingwell Dunfermline (DUN5N)*	Aytoun Grove, Dunfermline (DUN6N)*
					A	B	C		
Type [†]	K	K	R(F)	K	R(F)			R	UB
Easting	312883	309513		309467				307866	308328
Northing	688584	686895		687625				688231	688426
2000 (U)	26	31		39				25	14
2001 (U)	31	35		41				27	17
2002 [‡]	27	31		40				23	15
2003 (U)	36	46		53				35	20
2003 [‡]	29	37		43				28	16
2004(U)	discontinued	discontinued	26¹	47	36¹	36¹	37¹	31	18
2004[‡]			22	39	30	30	31	26	15
Predicted 2005			21	38	29	29	30	25	15
Predicted 2010			18	31	24	24	25	21	13

[†] Defra classification K – Roadside, R – Roadside, UB – urban background. I – Intermediate sites are no longer used in the National network but are useful for additional local information, R(F) refers to roadside sites at the façade of buildings.

U Unbiased data

[‡] Bias adjusted data using a Bias A of 0.78 for 2002 data 0.81 for 2003 and 0.84 for 2004 .

*Sites which are also part of the UK NO2 Network

¹ monitoring commenced on 30/03/04 (9-months)

**Table 2.6.3 Annual Mean Nitrogen Dioxide Concentrations
from Fife Council Monitoring Sites ($\mu\text{g}\text{m}^{-3}$) continued.**

West Area	Admiralty Road, Rosyth	Admiralty Road (triplicate)			Barrie Street, Dunfermline (DUN 8N)*	Appin Crescent, Dunfermline (DUN 9N)* (triplicate)			Appin Crescent Dunfermline (1)	Appin Crescent Dunfermline (2)	High Street, Cowdenbeath
		A	B	C		A	B	C			
Type [†]	K	R(F)			UB	R			R(F)	R(F)	K
Easting	312103	312103			308379	309882					316523
Northing	683439	683439			688249	687713					691740
2000 (U)	38				15	33					24
2001 (U)	42				15	35					27
2002 [‡]	36				14	34					22
2003 (U)	52				22	49					31
2003 [‡]	42				18	40					25
2004(U)	46	23¹	24¹	24¹	17	42	40¹	39¹	36²	45³	27
2004[‡]	37	19	20	20	14	35	34	33			23
Predicted 2005	36	19	20	20	14	34	33	32			22
Predicted 2010	30	15	16	16	12	28	27	26			18

[†] Defra classification K – Roadside, R – Roadside, UB – urban background. I – Intermediate sites are no longer used in the National network but are useful for additional local information, R(F) refers to roadside sites at the façade of buildings.

U Unbiased data

[‡] Bias adjusted data using a Bias A of 0.78 for 2002 data 0.81 for 2003 and 0.84 for 2004 .

*Sites which are also part of the UK NO2 Network

¹ monitoring commenced on 30/03/04 (9-months)

² monitoring commenced on 03/08/04 (<6-months)

³ monitoring commenced on 31/08/04 (<6-months)

**Table 2.6.3 Annual Mean Nitrogen Dioxide Concentrations
from Fife Council Monitoring Sites ($\mu\text{g}\text{m}^{-3}$) continued.**

West Area	North Approach Road Kincardine (1)	North Approach Road Kincardine (2)	North Approach Road Kincardine (triplicate)			Main Street, Carnock
			A	B	C	
Type [†]	K	K	Co-location			K
Easting	293182	293182				304221
Northing	687530	687530				689064
2000 (U)	41					26
2001 (U)	51	52				26
2002 [‡]	47	49				25
2003 (U)	63	60				31
2003 [‡]	51	49				25
2004(U)	51	50	36	37	37	Discontinued
2004[‡]	43	42	30	31	31	
Predicted 2005	42	41	29	30	30	
Predicted 2010	34	34	24	25	25	

[†] Defra classification K – Roadside, R – Roadside, UB – urban background. I – Intermediate sites are no longer used in the National network but are useful for additional local information, R(F) refers to roadside sites at the façade of buildings.

U Unbiased data

[‡] Bias adjusted data using a Bias A of 0.78 for 2002 data 0.81 for 2003 and 0.84 for 2004 .

*Sites which are also part of the UK NO2 Network

**Table 2.6.3 Annual Mean Nitrogen Dioxide Concentrations
from Fife Council Monitoring Sites ($\mu\text{g}\text{m}^{-3}$) continued**

Central Area	Esplanade Kirkcaldy	St Clair St Round-about	St Clair Street, Kirkcaldy (1)	St Clair Street, Kirkcaldy (2)	Wedderburn Road, Kirkcaldy	Redhouse Round-about, Kirkcaldy	Lovat Road, Glenrothes	North Street (Rothesay Place)	Dunnikier Rd Kirkcaldy
Type [†]	K	K	R(F)	R(F)	UB	K	K	I	R(F)
Easting	327863	329084			325288	329198	328600	327062	328152
Northing	690262	692612			693086	695281	699470	701115	692350
2000 (U)	19	25			13	26	17	15	
2001 (U)	22	26			14	32	18	19	
2002 [‡]	20	23			13	30	18	18	
2003 (U)	27	34			19	42	24	25	
2003 [‡]	22	28			15	34	19	20	
2004 (U)	Discontinued	discontinued	39⁴	42⁴	16	discontinued	21	discontinued	35⁴
2004[‡]			33	35	13		18		29
Predicted 2005			32	34	13		18		28
Predicted 2010			26	28	11		14		23

[†] Defra classification K – Roadside, R – Roadside, UB – urban background. I – Intermediate sites are no longer used in the National network but are useful for additional local information, R(F) refers to roadside sites at the façade of buildings.

U Unbiased data

[‡] Bias adjusted data using a Bias A of 0.78 for 2002 data 0.81 for 2003 and 0.84 for 2004 .

*Sites which are also part of the UK NO2 Network

⁴ monitoring commenced on 01/04/04 (9-months)

Table 2.6.3 Annual Mean Nitrogen Dioxide Concentrations from Fife Council Monitoring Sites ($\mu\text{g}\text{m}^{-3}$) continued

Central Area	Victoria Rd Kirkcaldy	Glenlyon Road, Leven	Bawbee Bridge, Leven	Chapel Roundabout Kirkcaldy	Leslie Roundabout Glenrothes	Leslie High Street	Queensway Glenrothes	Adsa Roundabout, Kirkcaldy
Type [†]	R(F)	K	K	K	K	R(F)	K	K
Easting	328152	337357	337787	325023	326350	325111	327849	328735
Northing	692325	701318	700402	694405	701938	701806	701114	694053
2000 (U)		26	21	21	19		22	24
2001 (U)		32	25	24	20		26	27
2002 [‡]		28	20	24	21		23	28
2003 (U)		38	29	30	29		31	39
2003 [‡]		31	23	24	23		25	32
2004 (U)	38⁴	32	discontinued	discontinued	discontinued	29⁴	27	34
2004[‡]	32	27				24	23	29
Predicted 2005	31	26				23	22	28
Predicted 2010	26	21				19	18	23

[†] Defra classification K – Roadside, R – Roadside, UB – urban background. I – Intermediate sites are no longer used in the National network but are useful for additional local information, R(F) refers to roadside sites at the façade of buildings.

U Unbiased data

[‡] Bias adjusted data using a Bias A of 0.78 for 2002 data 0.81 for 2003 and 0.84 for 2004 .

*Sites which are also part of the UK NO2 Network

⁴ monitoring commenced on 01/04/04 (9-months)

Table 2.6.3 Annual Mean Nitrogen Dioxide Concentrations from Fife Council Monitoring Sites ($\mu\text{g}\text{m}^{-3}$) continued

East Area	City Road, St Andrews (1N)* (duplicate)		Bell Street, St Andrews (1)	Bell Street St Andrews (2)	Market Street St Andrews	South Street, St Andrews	Windsor Gardens St Andrews (4N)*	Crossgate, Cupar
	A	B						
Type [†]	R		R	R(F)	R	K	UB	K
Easting	350586		350708	350716	350899	351060	349122	337538
Northing	716580		716716	716669	716744	716642	715313	714527
2000 (U)	24		27		17	19	7	23
2001 (U)	26		28		17	23	8	28
2002 [‡]	26		30		17	19	8	27
2003 (U)	36		39		24	24	10	33
2003 [‡]	29		32		19	19	8	27
2004 (U)	28	31⁵	29	33⁵	discontinued	discontinued	11	28
2004[‡]	24	26	24	28			9	24
Predicted 2005	28	25	23	27			9	23
Predicted 2010	23	21	19	22			8	19

[†] Defra classification K – Roadside, R – Roadside, UB – urban background. I – Intermediate sites are no longer used in the National network but are useful for additional local information, R(F) refers to roadside sites at the façade of buildings.

U Unbiased data

[‡] Bias adjusted data using a Bias A of 0.78 for 2002 data 0.81 for 2003 and 0.84 for 2004 .

*Sites which are also part of the UK NO2 Network

⁵ monitoring commenced on 02/03/04 (10-months)

Table 2.6.3 Annual Mean Nitrogen Dioxide Concentrations from Fife Council Monitoring Sites ($\mu\text{g}\text{m}^{-3}$) continued

<u>East Area</u>	South Road, Cupar	Cupar Road, Auchtermuchty	Millfield, Cupar (4N)*	Bonnygate Cupar (1N)*	Bonnygate Cupar (2)	Bonnygate Cupar (3) (duplicate)		Bonnygate Cupar (4)
						A	B	
Type [†]	R	R	UB	R	R(F)	R(F)		R(F)
Easting	337513	324186	336867	337411	337250	337455		337440
Northing	713616	711801	713878	714572	714750	714605		714560
2000 (U)			10	30				
2001 (U)	17	27	11	29				
2002 [‡]	15	25	12	31				
2003 (U)	21	33	16	38				
2003 [‡]	17	27	13	31				
2004 (U)	17	32	13	34	49¹	Monitoring not yet started		
2004[‡]	14	27	11	28	41			
Predicted 2005	14	26	11	27	40			
Predicted 2010	11	22	9	22	33			

[†] Defra classification K – Roadside, R – Roadside, UB – urban background. I – Intermediate sites are no longer used in the National network but are useful for additional local information, R(F) refers to roadside sites at the façade of buildings.
U Unbiased data

[‡] Bias adjusted data using a Bias A of 0.78 for 2002 data 0.81 for 2003 and 0.84 for 2004 .

*Sites which are also part of the UK NO₂ Network

¹ monitoring commenced on 30/03/04 (9-months)

After bias adjustment, NO₂ concentrations at 2 locations – North Approach Road, Kincardine (2 sites) and Bonnygate, Cupar exceeded 40 $\mu\text{g}\text{m}^{-3}$ in 2004. Both of these locations are also predicted to exceed 40 $\mu\text{g}\text{m}^{-3}$ in 2005. In addition, Carnegie Drive, Dunfermline and Admiralty Road, Rosyth are very close to the 40 $\mu\text{g}\text{m}^{-3}$ threshold.

All of these locations were highlighted in the previous Progress Report and the Council has been proactive in initiating a programme of further investigations.

At North Approach Road, Kincardine the two sites with concentration greater than 40 $\mu\text{g}\text{m}^{-3}$ are both kerbside sites. The roadside automatic monitor, which is more likely to reflect levels to which the public are exposed, records lower concentrations - 31 $\mu\text{g}\text{m}^{-3}$ annual average in 2004. In addition, as noted in Section 2.6.1, traffic has already reduced on this road since October 2004 (due to the opening of the Kincardine Eastern Link Road) and hence, it is anticipated that the 2005 annual average will be lower than currently predicted.

At Bonnygate Cupar, Fife Council has already installed additional NO₂ diffusion tube monitors and more are to be installed shortly. The Council has also applied for funding for the purchase of a roadside automatic analyser unit (NO₂ and PM₁₀) and first priority for deployment of this unit is to Bonnygate.

High concentrations at Carnegie Drive, Dunfermline were recorded at the kerbside site. Following discussions in the previous Progress Report, the Council has now installed a triplicate site at a building façade in Carnegie Drive. This site has operated for 9-months and indications are that annual average concentrations will be well below 40 $\mu\text{g}\text{m}^{-3}$.

At Admiralty Road, Rosyth, again the high concentrations were recorded at a kerbside site and lower concentrations (well below 40 $\mu\text{g}\text{m}^{-3}$) are currently being recorded at the newly established triplicate tube at the building façade in Admiralty Road.

Appin Crescent was noted as a relatively high concentration site in the previous Progress Report. Fife council has increased monitoring at this site to triplicate tubes and installed two additional sites in this street. Concentrations at the original site were below 40 $\mu\text{g}\text{m}^{-3}$ in 2004. There are insufficient data from the new sites at present, but initial concentrations from the Appin Crescent Site 2 are relatively high and the situation needs to be checked as more data become available.

2.6.3.4 Grangemouth NO₂ Diffusion Tube Results

NPL's ambient air quality survey for BP Oil in the vicinity of Grangemouth refinery⁵ included NO₂. Measurements were made monthly at four sites in Fife using passive diffusion tube techniques, with analysis being conducted by Analytical Data Services Ltd on behalf of NPL. The latest data available are for the 12-month period July 2003 to July 2004. (Results from this study are only available as 12-month means starting and ending July). The results have been converted from ppb into mass units at 20°C and 1 atmosphere. *No data were available to enable bias correction of tubes analysed by this laboratory, so the results are presented uncorrected.*

Table 2.6.3.4 NO₂ Diffusion Tube Annual Mean Concentrations (µg m⁻³) from the NPL network

NPL Tubes	Year				
	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004
Ford View, Cairney Hill	11	10	11	13	15
Shoreline nr. Charlestown Harbour	10	10	10	17	17
Mercer Road, Kincardine	13	11	11	15	19
Near Shoreline, Culross	8	8	10	13	13

The 12-month mean concentrations at these sites remain well within the AQS Objective of 40 µg m⁻³.

2.7 SULPHUR DIOXIDE (SO₂)

The following new monitoring data are available for sulphur dioxide in Fife:

- Results for December 2004 and January 2005 for the continuous monitoring site at Admiralty Rd, Rosyth
- 2004 data from the two Defra Smoke and SO₂ Network sites.
- 2004 data from the SO₂ diffusion tube sites operated by Fife Council and an additional four sites operated by NPL in support of the continuing BP Environmental monitoring.
- 2002 and 2003 data from an automatic monitoring study in the vicinity of Longannet Power Station undertaken for Scottish Power Generation UK and made available for this report.

2.7.1 Automatic SO₂ Data

Results for December 2004 and January 2005 for the continuous monitoring site at Admiralty Rd, Rosyth are provided in Table 2.7.1.

Table 2.7.1 Automatic Monitoring Data from Admiralty Rd, Rosyth (µg m⁻³)			
Period	Max. 15 minute Mean (ug m ⁻³)	Max. 1-hour Mean (ug m ⁻³)	Max. 24-hour Mean (ug m ⁻³)
December 2004	51	29	8
January 2005	59	47	8
AQS Objective	266 (max. 35 exceedences)	350 (max. 24 exceedences)	125 (max. 3 exceedences)

The maximum 15-minute, 1-hour, and 24-hour mean SO₂ concentrations at Admiralty Rd, Rosyth for December 2004 and January 2005 were well within the relevant AQS objectives. However, the monitoring period is too short to reach any firm conclusions at present. Monitoring at this site will continue for 6 months.

2.7.2 Data from the National Smoke and SO₂ Network

There are currently 2 sites in Fife that are part of the Smoke and SO₂ network, these are at Broad Street Primary School, Cowdenbeath (COWDENBEATH 1) and at Templehall Community Centre, Kirkcaldy (KIRKCALDY 6). These sites monitor net acidity as SO₂ equivalent.

The maximum measured daily mean during 2004 were $34\mu\text{g m}^{-3}$ at Cowdenbeath and $31\mu\text{g m}^{-3}$ at Kirkcaldy. The net acidity method typically overestimates SO_2 concentrations: however, it is understood that at high concentrations it may be subject to increased uncertainty: to allow for this, the maximum daily concentration should be multiplied by a factor of 1.25 when comparing with objectives. These non-automatic sites produce 24-hour mean results, so the data are not directly comparable with AQS objectives relating to the 1-hour or 15-minute mean. However, following the guidance document LAQM TG(03)¹ chapter 7, it is possible to estimate the 99.7th percentile of one hour means, and 99.9th percentile of 15 minute means, for comparison with the air quality objectives. As stated in The Guidance these are based on an empirical relationship between the maximum daily mean. These data are given in Table 2.7.2.

Table 2.7.2 SO_2 Concentrations for 2004 from Smoke and SO_2 sampling stations in Fife ($\mu\text{g m}^{-3}$)

	Broad Street, Cowdenbeath	Templehall Community Centre
Data Capture	98%	88%
Annual Mean	15	7
Maximum Daily Value	34	31
Corrected Maximum daily value (use of uncertainty factor)	43	39
Estimated 99.9 th percentile of 15-minute means	82	74
Estimated 99.7 th percentile of 1-hour means	59	53

The maximum daily values at both sites were well below the AQS objective for the 24-hour mean. The estimated 99.9th percentile of 15-minute means was well below the AQS objective of $266\mu\text{g m}^{-3}$, and the estimated 99.7th percentile of 1-hour means was well below the AQS objective of $350\mu\text{g m}^{-3}$. It is evident that the air quality objectives are unlikely to be exceeded in the vicinity of these monitoring sites.

2.7.3 SO_2 Diffusion tubes

Although SO_2 diffusion tube data are not considered sufficiently accurate for inclusion in Progress Reports, the following are included for completeness. They cannot be used to assess the three short term AQS objectives, but do provide a broad indication of air quality. Diffusion tubes were deployed by both Fife Council, and by NPL as part of their survey on behalf of BP Oil. The NPL averaging period is from July to July.

Table 2.7.3 Fife Council SO_2 Concentration ($\mu\text{g m}^{-3}$) by Diffusion tube 2004/5

	Main Street, Culross	Victoria Road, Leven	East Toll, Burntisland	Derran Drive Cardenen	Valleyfield, Dunfermline
2003	4	3	5	6	-
2004	4	-	-	-	4*
2004 – to 2/6/04	-	4	7	6	-
	Mount Frost Drive Markinch (1)	Mount Frost Drive Markinch (2)	Mount Frost Drive Markinch (3)		
2004 from 3/8/04	16	11	9		

* 03/08/04 to 30/11/04 only

Table 2.7.4 NPL SO_2 Concentration ($\mu\text{g m}^{-3}$) by Diffusion tube 2003/2004

	Ford View, Cairney Hill	Shoreline nr. Charlestown Harbour	Mercer Road, Kincardine	Near Shoreline, Culross
Jul 2002 – Jul 2003	3	8	5	5
Jul 2003 – Jul 2004	3	8	3	3

The Air Quality Strategy includes an objective of $20 \mu\text{g m}^{-3}$ for the annual and winter mean SO_2 concentration, for protection of ecosystems, which is applicable only in rural areas. This may be applicable to NPL's two shoreline sites at Charlestown and Culross. The 12-month mean at all sites is well within this objective.

2.7.4 SO_2 monitoring undertaken by Scottish Power Generation UK

As part of an ongoing monitoring and modelling programme for the assessment of emissions from Longannet Power Station, an automatic SO_2 monitoring station is operated by Scottish Power Generation UK at Blair Mains. The results from this study showed that SO_2 concentrations at this site were within the requirements of the Air Quality Strategy for 15min, 1 hour and 24hour SO_2 concentrations in both 2002 and 2003.

2.8 PM_{10}

2.8.1 Automatic PM_{10} Data from Admiralty Rd, Rosyth

PM_{10} monitoring commenced during November 2004 at Admiralty Road, Rosyth (as part of the "Groundhog" monitoring facility). Hence, monitoring data for the month of December 2004 and January 2005 only are available for this report. Fife Council propose to operate this site for 6-months. The monitoring facility is operated by Dundee Scientific Services on behalf of Fife Council.

Results for December 2004 and January 2005 are shown in Table 2.8.1 for indicative purposes only. Mean PM_{10} concentrations were within the AQS annual mean objective of $40 \mu\text{g m}^{-3}$ but close to the $18 \mu\text{g m}^{-3}$ annual mean objective for 2010. There were no exceedences of the 24-hour mean objective of $50 \mu\text{g m}^{-3}$ during December or January. With only 2-months of data available at present it is not considered appropriate to apply a scaling factor to assess compliance with the 2010 Objective. Further analysis will be undertaken when 6-months of data are available.

Table 2.8.1 Automatic PM_{10} Monitoring data (Gravimetric Equivalent) – Admiralty Rd, Rosyth

Period	Mean Period Concentration ($\mu\text{g m}^{-3}$)	Exceedences of 24-hour objective	Max. 24-hour mean ($\mu\text{g m}^{-3}$)
December 2004	18	None	39
January 2005	17	None	37

The DMRB screening modelling carried out for the USA report in 2003 indicated that the annual mean objective of $40 \mu\text{g m}^{-3}$ for PM_{10} would be met in 2004. However it did conclude that there was still a small risk of exceedence along the A907, Dunfermline, Carnegie Drive between the A823 (Pilmuir Street) and Chalmers Street and the A876 North Approach Road in Kincardine. Hence, though Fife Council commenced the PM_{10} monitoring programme at Admiralty Rd, Rosyth, the intention is to relocate the monitoring facility to the site of highest priority during next year.

The previous Progress Report recommended that further PM_{10} monitoring at Tulliallan, for a minimum period of six months, be undertaken. However, monitoring at the sites mentioned above is considered as higher priority.

Fife Council has applied for funding for the purchase of an additional PM_{10} monitor to extend the measurement of PM_{10} in Fife. Should this application be granted, it is anticipated the new PM_{10} monitor will initially be deployed at Bonnygate, Cupar, co-located with the additional NO_2 monitoring planned for this location.

2.9 SUMMARY OF MONITORING RESULTS AND COMPARISON WITH AQS OBJECTIVES

The following table summarises the 2004 monitoring data against the air quality objectives.

Table 2.9 Summary of 2004 monitoring data against the air quality objectives.

		Air Quality Objective	Non-Automatic Sites ⁽¹⁾			Automatic Sites	
			West Area	Central Area	East Area	Admiralty Road Rosyth ⁽²⁾	North Approach Road ⁽³⁾
NO ₂	Annual Mean	40 µg m ⁻³	14-43 ⁽⁴⁾	13-35 ⁽⁴⁾	9-41 ⁽⁴⁾		31
	1-hour mean	200 µg m ⁻³	-	-	-		135
SO ₂	<i>Annual Mean (ecosystems)</i>	20 µg m ⁻³	15.1 ⁽⁵⁾	-	7.1 ⁽⁵⁾		
	24-hour mean	125 µg m ⁻³	34 ⁽⁵⁾	-	31 ⁽⁵⁾	8 ⁽²⁾	
	1-hour mean	350 µg m ⁻³	(59) ⁽⁷⁾	-	(53) ⁽⁷⁾	47 ⁽²⁾	
	15-minute Mean	266 µg m ⁻³	(82) ⁽⁷⁾	-	(74) ⁽⁷⁾	59 ⁽²⁾	
CO	Running 8-hour mean	10 mg m ⁻³	1.1 – 3.0 ⁽⁶⁾	-	1.3 – 4.3 ⁽⁶⁾	3.1 ⁽²⁾	
PM10	Annual Mean	40 µg m ⁻³	-	-	-	17.5 ⁽²⁾	
	24-hour mean	50 µg m ⁻³	-	-	-	39 ⁽²⁾	

(1) The data quoted give the range of the lowest to highest measured results in the applicable areas.

(2) Data only available for Dec 2004 and Jan 2005.

(3) Rollalong NOx analyser run in conjunction with diffusion tubes in triplicate.

(4) Diffusion tubes.

(5) Smoke and SO₂ National network sites, West Area is at Broad Street, Cowdenbeath and Central area is at Templehall Community Centre.

(6) Data from short (1-week) CO surveys on a selection of roads

(7) Values in brackets are estimated values (see Section 2.7.2)

3 New Developments – Industrial Processes

The Scottish Environment Protection Agency (SEPA) has provided up to date information on new industrial processes since the Progress Report of July 2004.

3.1 PART A INDUSTRIAL PROCESSES

SEPA are not aware of any changes to any Part A industrial processes which will result in positive or negative impacts on local air quality specifically relating to the priority pollutants.

3.2 PART B PROCESSES

SEPA are not aware of any changes to any Part B industrial processes which will result in positive or negative impacts on local air quality specifically relating to the priority pollutants.

3.3 NEW LANDFILL, QUARRYING AND MINERAL PROCESSES

There are no new mineral extraction processes that are likely to have any significant impact on the local air quality.

3.4 DISCONTINUING INDUSTRIAL PROCESSES

No Part A or B processes have ceased to operate since May 2003.

3.5 RE-ASSESSMENT OF PROCESSES

SEPA have provided an update on the three industrial premises in Fife that are in the process of re-assessment:

Fife Power - This Company will need to apply for a PPC Permit between 1st January and 31st March 2006. Air dispersion modelling will form part of the application.

Tullis Russell – Tullis Russell are currently using coal fired and gas boilers. There is a proposal to install a biomass plant to replace these boilers and it is expected that the PPC application will be submitted in April this year. This will include air dispersion modelling for the new plant.

Energy Power Resources (EPR) are at present working on an application for a PPC Permit for the plant in Fife, which must be submitted by 31st March this year. This application will include air dispersion modelling.

4 New Developments – Transport

4.1 NEW ROAD DEVELOPMENTS

During 2004, the Kincardine Eastern Link Road was opened. Assessment of this development is discussed in Section 4.1.1, along with a further update on the B981 dual carriageway development at Chapel Level, Kirkcaldy.

Fife's Local Transport Strategy (LTS) is currently undergoing revision, and is due to be published in Summer 2005. There is nothing in the draft of the revised LTS which will adversely impact air quality in Fife. There is significant emphasis in the new document on accessibility, use of more sustainable methods of travel and travel planning.

Transportation Services' Transportation Development Guidelines is also undergoing significant revision at present, and should also be published by Summer 2005. New sections in this document include chapters on Maximum Parking Standards (applicable to all developments other than residential properties) and Travel Planning, both of which advocate use of more sustainable forms of travel to developments, which should have a positive impact on air quality.

4.1.1 Assessment of New Road Developments

The following is based on data received direct from the Scottish Executive for A985 trunk road. The newly opened section of road (Kincardine Eastern Link Road) has an AADT of around 12000. It does not appear to have generated any more traffic on the A985 further east at the Torryburn Bypass, which has an AADT of around 13500. At Longannet Cottages, the route of the previous A985, the AADT has reduced to about 2500 from around 16000 previously, resulting from the re-routing/new section of trunk road, which now has AADT about 12000. The prediction from the Scottish Executive of an 80% reduction of traffic using Toll Road/Longannet Cottages section of the old A985 made prior to the new Eastern Link Road opening is reasonably accurate.

Short-term air quality measurements of carbon monoxide have been undertaken to assess the impact of the new road (see section 2.3). These data indicate that CO concentrations in Kincardine have reduced significantly from previous values recorded in 1997. Long-term monitoring of nitrogen oxides continues at the North Approach Road site in Kincardine.

Data for the new section of road at Chapel Level, Kirkcaldy on the B981 (between Broom Rd and Hendry Rd) was also checked. This gave an AADT of approx 16000, with a 9.5% HGV level. No air quality impact assessment was undertaken prior to the works. An increase of less than 5% was noted from a previous survey prior to upgrading in 2001.

4.2 ROADS WITH SUBSTANTIALLY INCREASED TRAFFIC FLOWS

No further roads with a AADT flow greater than 10,000 vehicles per day or roads with HDV flows greater than 2,000 veh/day have been identified since the last Updating and Screening Assessment report and the previous Progress Report.

No roads with a AADT flow greater than 10,000 vehicles per day experienced an increase in flow greater than 25% since the last Updating and Screening Assessment report and the previous Progress Report.

4.3 OTHER TRANSPORT SOURCES

4.3.1 Trains

No new locations have been identified where trains are stationary with engines running for more than 15 mins.

ScotRail has specific instructions related to diesel locomotive emissions. There is a "no idling policy" whereby, if the driver is informed by the signaller that the train is to remain stationary for more than 15 minutes the locomotive engine shall be shut down. The signaller will then phone the driver 5 minutes prior to the departure time so the driver can restart the locomotive. In addition, ScotRail's DMU fleet is designed to save fuel by closing down engines automatically if they are idling for more than fifteen minutes

It is also ScotRail's policy (Engineering Document MP/DMU/SC/0017) to test the exhaust emissions of all its DMU fleet on an annual basis to ensure engine efficiency (using a Sun ASA 200 Diesel Engine Exhaust Emission Test Unit). Records of any work done and emission test results are formally retained for each vehicle. All new or reconditioned engines being purchased by ScotRail shall comply with the emission test. Every opportunity is taken to remove any non-compliant engine from the supply line.

No other train operator (i.e. Virgin, GNER) have engines stationary for 15 mins, within Fife

4.3.2 Airports

There are no significant changes to report since the last Updating and Screening Assessment report of August 2003 and the Progress Report of July 2004.

4.3.3 Bus Stations

There are no significant changes to report since the last Updating and Screening Assessment report of August 2003 and the Progress Report of July 2004.

4.3.4 Shipping

There are no significant changes to report since the last Updating and Screening Assessment report of August 2003 and the Progress Report of July 2004.

4.3.5 Petrol Stations on Busy Roads

The Updating and Screening assessment concluded that there are no sections of major roads in Fife that can be classified as 'very busy' according to the criteria in the guidance. There are no petrol stations with a throughput greater than 2 million litres and with relevant exposure within 10m of the pumps. This remains the case.

5 New Developments – Residential, Commercial and Public

5.1 RESIDENTIAL

The East Dunfermline Expansion Area, which includes most of the land between Dunfermline and the M90, is identified as the main focus for growth over the next 10 to 15 years. When complete, more than 4,000 houses, 131 hectares of employment land and a commercial leisure park will be linked by an integrated transport network. At its heart is the Duloch Park District Centre which already incorporates the Tesco superstore adjacent to the new District Park. Schools and other community facilities will complement a high quality environment, including the protected Calais Muir Wood.

Other large housing sites identified in the Plan are at Bellyeoman and Sheephouswell to the north east of the Town and at Pitreavie Castle to the south.

This development and the commercial development discussed in Section 5.2 may impact on traffic volumes in East Dunfermline in the future. However, in the Council's view, the current NO₂ monitoring locations in Dunfermline will suitably assess any air quality issues arising and the impact of the development will be considered in future reports, as appropriate.

5.2 COMMERCIAL

Employment land is concentrated at the eastern and southern approaches to Dunfermline, with major sites at Calais Muir, Dover Heights, Pitreavie and Halbeath. The Plan retains a commitment to the completion of Motorola's microprocessor development at East Dunfermline

6 Conclusions

This progress report has followed the guidance set in Part IV of the Environment Act 1995 Local Air Quality Management LAQM.PRG(03) to ensure continuity in the LAQM process. The following conclusions arise from the findings in this report:

1. Initial results of the carbon monoxide monitoring at Admiralty Road, Rosyth and the short-term monitoring undertaken by the Transportation Department indicate that the Air Quality Strategy Objectives for CO are likely to be met. There are no new industrial processes, road or other developments that require detailed assessment with respect to this pollutant. Hence, new information in 2004 confirms the conclusion of previous reports that a Detailed Assessment is not required for CO.
2. Results of the ongoing air quality monitoring study for BP Oil indicate that ambient concentrations of benzene in Fife during 2004 met the Air Quality Strategy Objective. There are no new industrial processes, roads, petrol stations or other developments that require detailed assessment for this pollutant. Hence, new information in 2004 confirms the conclusion of previous reports that a Detailed Assessment is not required for benzene.
3. Results of ongoing air quality monitoring study for BP Oil also indicate that ambient concentrations of 1,3-butadiene in Fife during 2004 met the Air Quality Strategy Objective. There are no new industrial processes, roads, or other developments that require detailed assessment for this pollutant. Hence, new information in 2004 confirms the conclusion of previous reports that a Detailed Assessment is not required for 1,3-butadiene.
4. No ambient monitoring of lead was carried out in 2004. There are no new industrial processes or other developments that require detailed assessment for this pollutant. A Detailed Assessment is not required for lead.
5. Measurements of NO₂ at the automatic monitoring site at Kincardine North Approach Road during 2004 indicate that the Air Quality Strategy Objective for NO₂ is likely to be met at this site. Traffic levels have reduced at this location following the opening of the Kincardine Eastern Link Road in October 2004.

The NO₂ diffusion tube monitoring network in Fife has been modified during 2004 to concentrate monitoring more on building façade locations, rather than kerbside locations. This is so that the concentrations can be assessed in areas relevant to public exposure. Where diffusion tube measurements are close to or show a possible exceedence of the Air Quality Strategy Objective for NO₂ (North Approach Road, Kincardine, Bonnygate, Cupar, Carnegie Drive, Dunfermline, and Admiralty Road, Rosyth) these are all recorded at kerbside locations, with the exception of Bonnygate, Cupar where there is not a full year of monitoring data. At each of these locations Fife Council has instigated further investigations

by installing additional tubes at the façade of buildings, installation of automatic monitoring or planned automatic monitoring in future.

At North Approach Road, Kincardine, Carnegie Drive, Dunfermline and Admiralty Road, Rosyth measurements at building facades do not indicate an exceedence of the Air Quality Strategy Objective for NO₂. At Bonnygate, Cupar, additional NO₂ diffusion tube monitors are being installed and the Council has applied for funding to procure and install an automatic monitor. Additional diffusion tubes have also been installed at Appin Crescent, Dunfermline where results from the kerbside monitoring site in 2003 were close to the Air Quality Strategy Objective for NO₂.

Hence, new information in 2004 confirms the conclusion of previous reports that a Detailed Assessment is not required for NO₂. However, this will need to be reviewed in the Updating and Screening Report next year when the results of the recently installed and planned additional NO₂ monitoring are available.

6. Results for 2004 from the two non-automatic Smoke and SO₂ Network sites at Cowdenbeath and Kirkcaldy indicate that Air Quality Strategy 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 2004 confirms the conclusion of previous reports that a Detailed Assessment is not required for SO₂.
7. Fife Council has installed a PM10 monitor at Admiralty Road, Rosyth for a 6-month period in response to comments in previous report on the general lack of PM10 data in the area. Only 2-month of data are available at present and hence no conclusions can be drawn in this report. The decision on the requirement for a Detailed Assessment for PM10 should be reviewed in the Updating and Screening Report next year when the results of the recently installed monitoring are available
8. There were no changes to industrial processes and no new industrial processes during 2004. Progress on re-assessments of industrial processes at Fife Power, Tullis Russell and Energy Power Resources are provided in the report.
9. During 2004 the Kincardine Eastern Link Road was opened. This has had the effect of reducing traffic on the Northern Approach Road in Kincardine where NO₂ concentrations were of concern.
10. Plans for residential and commercial expansion within the East Dunfermline Expansion Area may lead to increase traffic volumes but current NO₂ monitoring in Dunfermline will suitably assess any possible air quality issues arising.
11. Fife Council are not required to proceed to a Detailed Assessment for any pollutant.
12. Fife Council accepts the above conclusions and will implement any recommendations.

7 References

- [1] Part IV of the Environment Act 1995. Local Air Quality Management – Progress Report Guidance LAQM.PRG(03).
- [2] Part IV of the Environment Act 1995. Local Air Quality Management. LAQM.TG(03) January 2003.
- [3] Air Quality Updating and Screening Assessment for Fife Council. AEAT/ENV/R/1494. August 2003.
- [4] Air Quality Review and Assessment Progress Report for Fife Council. AEAT/ENV/R/1678 Issue 2. July 2004
- [5] KC Blakeley et al, "Ambient Atmospheric Survey in the Vicinity of Grangemouth for 2003-04", NPL report reference 105266/QT01E221 January 2005.
- [6] Mossmorran and Braefoot Bay Independent Air Quality Monitoring Review Group – 2004 Annual Report. September 2004.

8 Acknowledgments

The author would like to acknowledge the help of Kenny Bisset, Environmental Health Officer, Fife Council Environmental Services and Blyth Berwick, Lead Officer, Fife Council Transportation Services for their contributions to this report.

Appendices

CONTENTS

Appendix 1	DIAGRAMS OF NEW SITE LOCATIONS
Appendix 2	DETAILED INFORMATION ON AUTOMATIC MONITORING LOCATIONS

Appendix 1

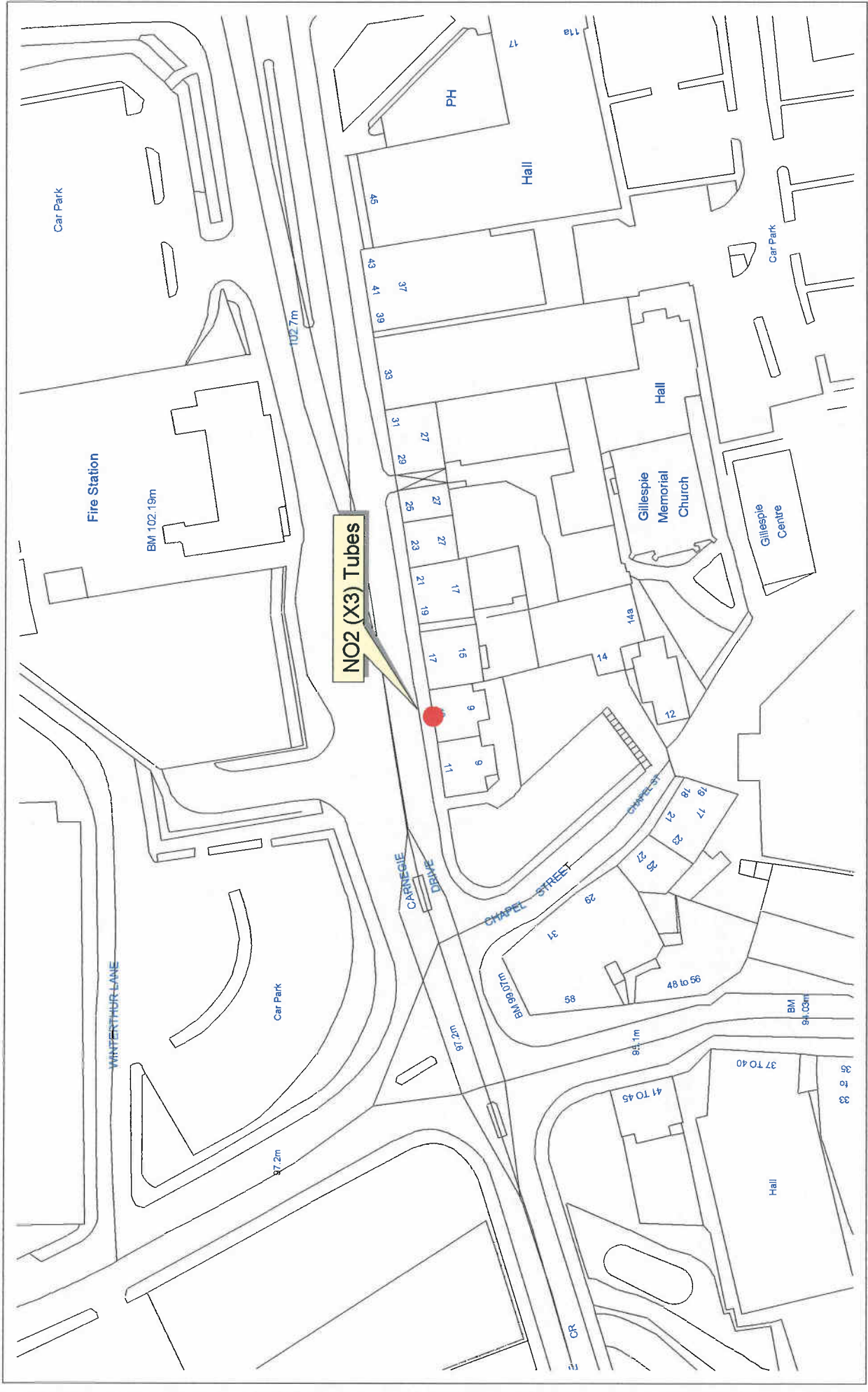
DIAGRAMS OF NEW SITE LOCATIONS

CONTENTS

Figure A1	Air Quality Strategy Revised Monitoring Scheme – Carnegie Drive, Dunfermline
Figure A2	Air Quality Strategy Revised Monitoring Scheme – Admiralty Road, Rosyth
Figure A3	Air Quality Strategy Revised Monitoring Scheme – Appin Crescent, Dunfermline
Figure A4	Air Quality Strategy Revised Monitoring Scheme – St Clair St, Kirkcaldy
Figure A5	Air Quality Strategy Revised Monitoring Scheme – Dunniker Road and Victoria Road, Kirkcaldy
Figure A6	Air Quality Strategy Revised Monitoring Scheme – High Street, Leslie
Figure A7	Air Quality Strategy Revised Monitoring Scheme – City Road, St Andrews
Figure A8	Air Quality Strategy Revised Monitoring Scheme – Bell St, St Andrews
Figure A9	Air Quality Strategy Revised Monitoring Scheme – Bonnygate, Cupar

Maps reproduced within this document

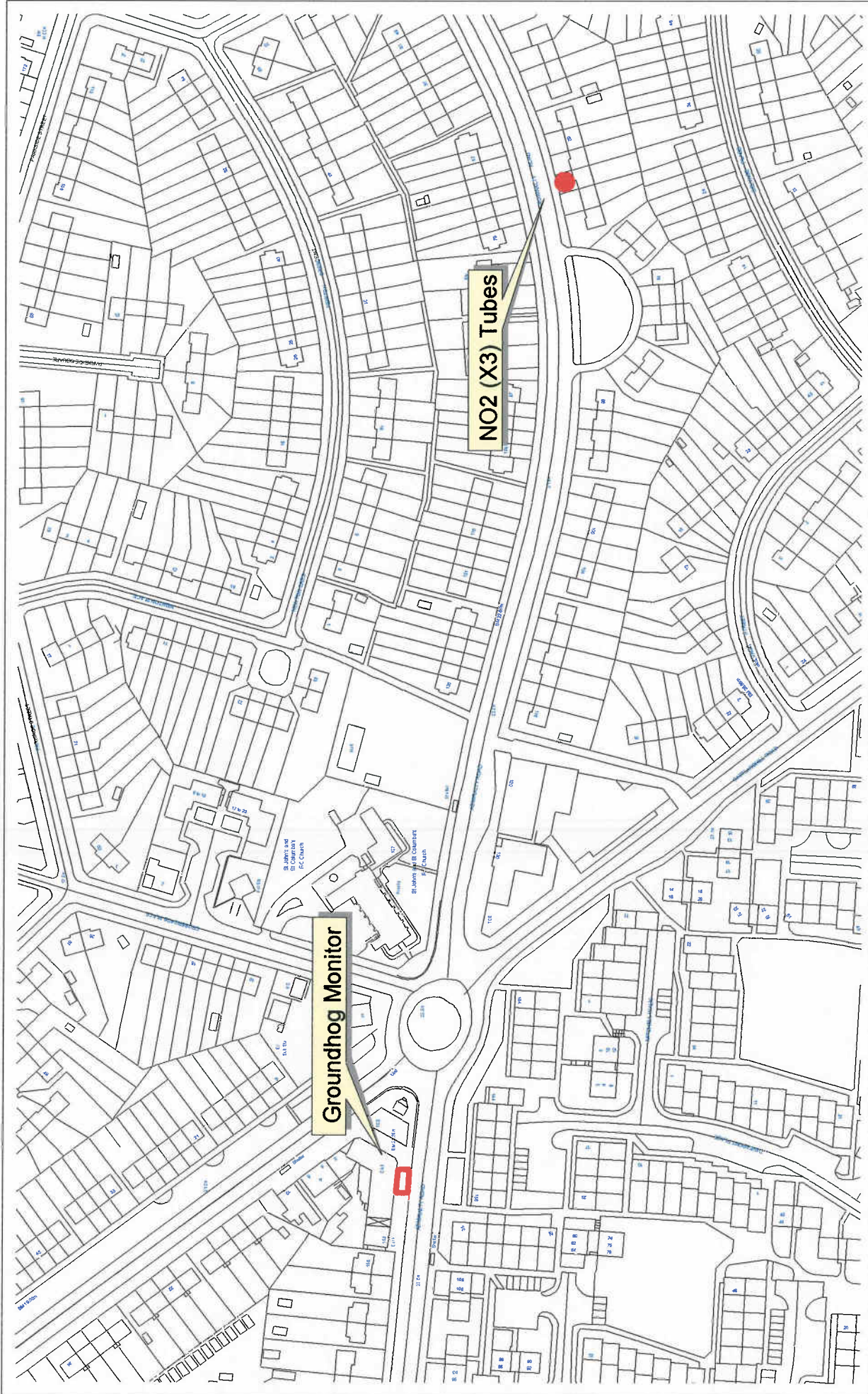
All maps in this document are reproduced from Ordnance Survey material with permission of Her Majesty's Stationery Office © Crown Copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Fife Council 100023385 (2004).



This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Fife Council 100023385 (2004)

**Air Quality Strategy Revised Monitoring Scheme
Carnegie Drive, Dunfermline**

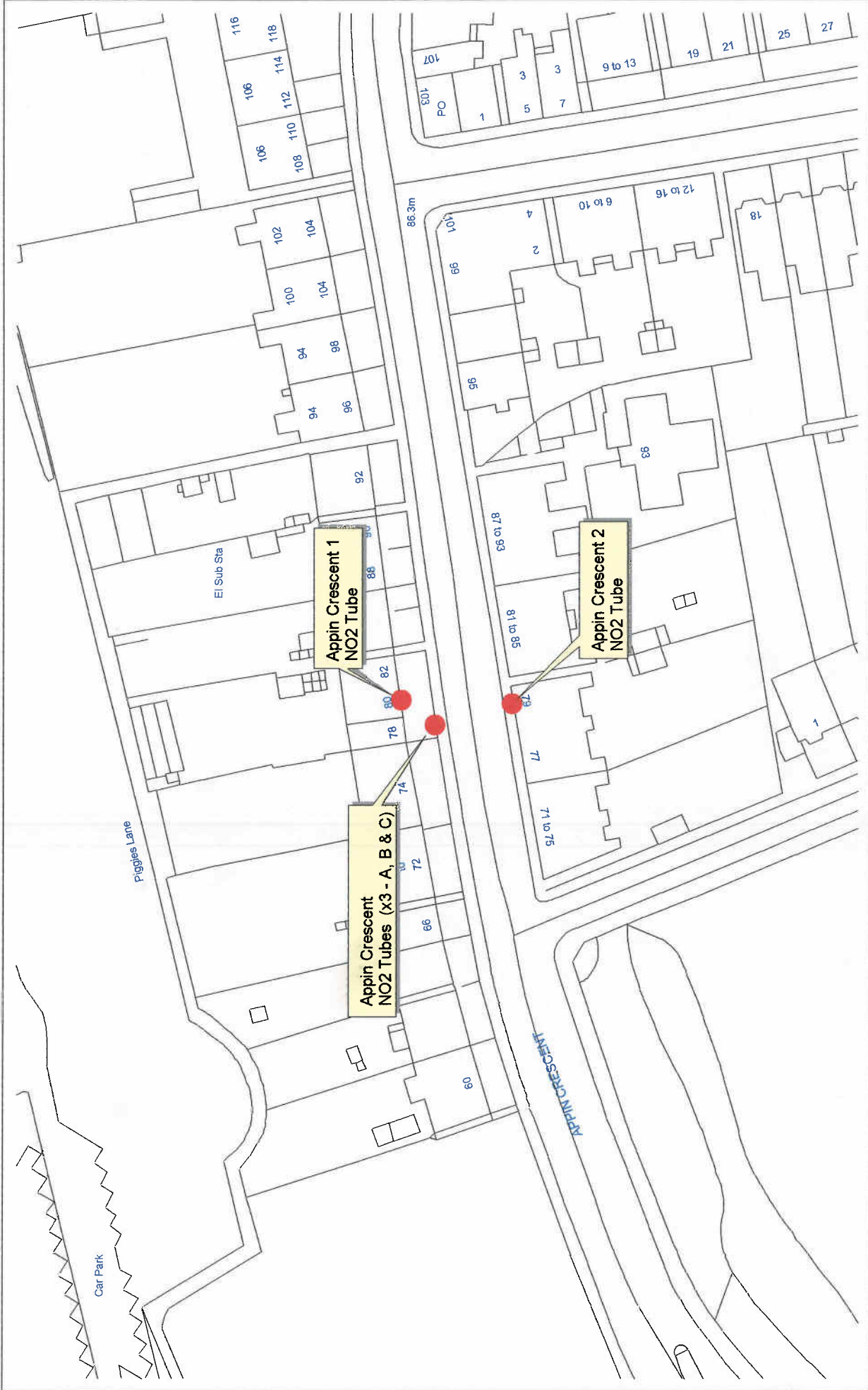
Figure A1



This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Fife Council 100023385 (2004)

Air Quality Strategy Revised Monitoring Scheme
Admiralty Road, Rosyth

Figure A2



This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Fife Council 100023385 (2004)

Air Quality Strategy Revised Monitoring Scheme Appin Crescent, Dunfermline

Figure A3

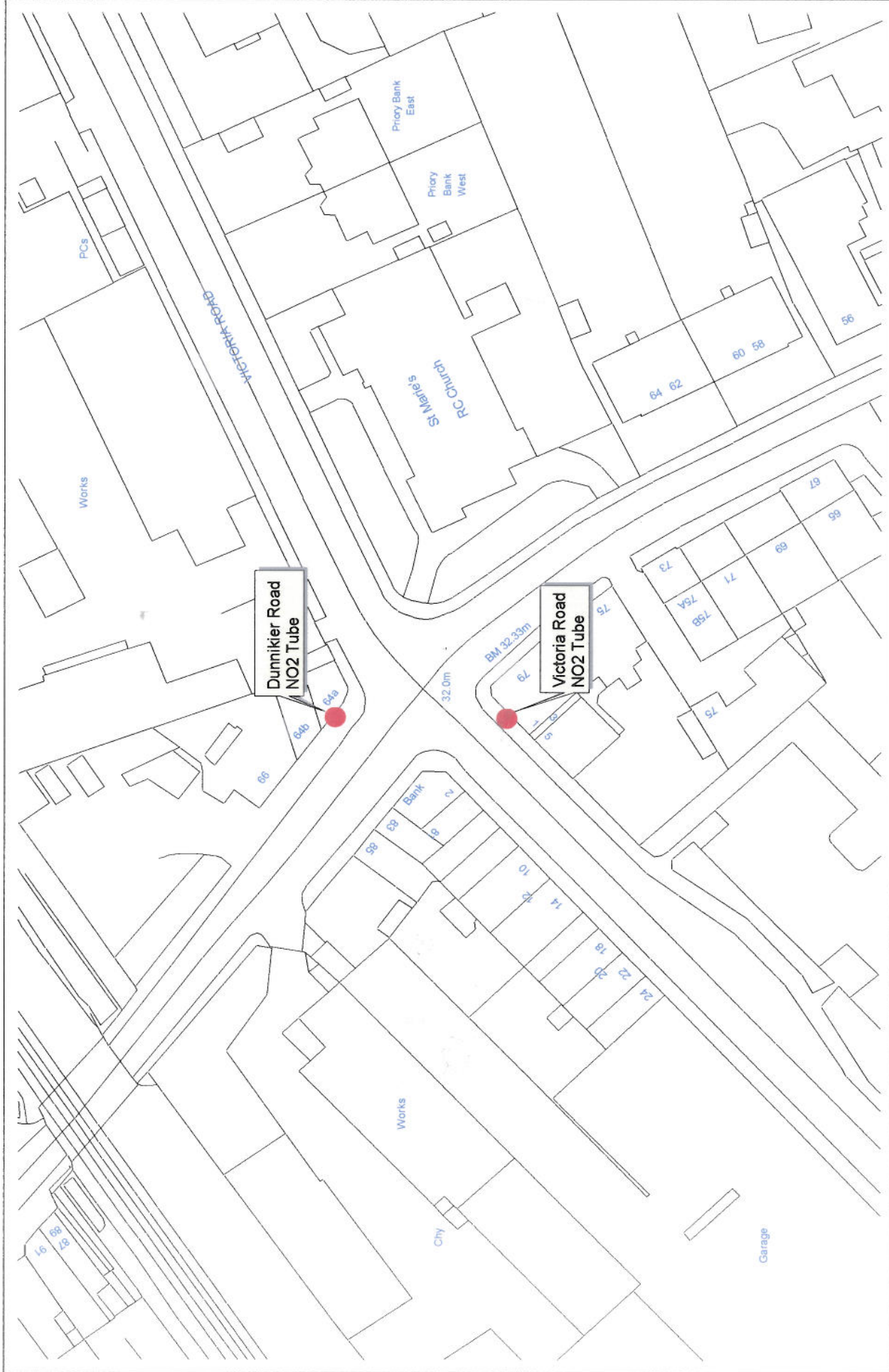


Environmental Services



This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Fife Council 100023385 (2004)

Air Quality Strategy Revised Monitoring Scheme
St Clair Street, Kirkcaldy
Figure A4



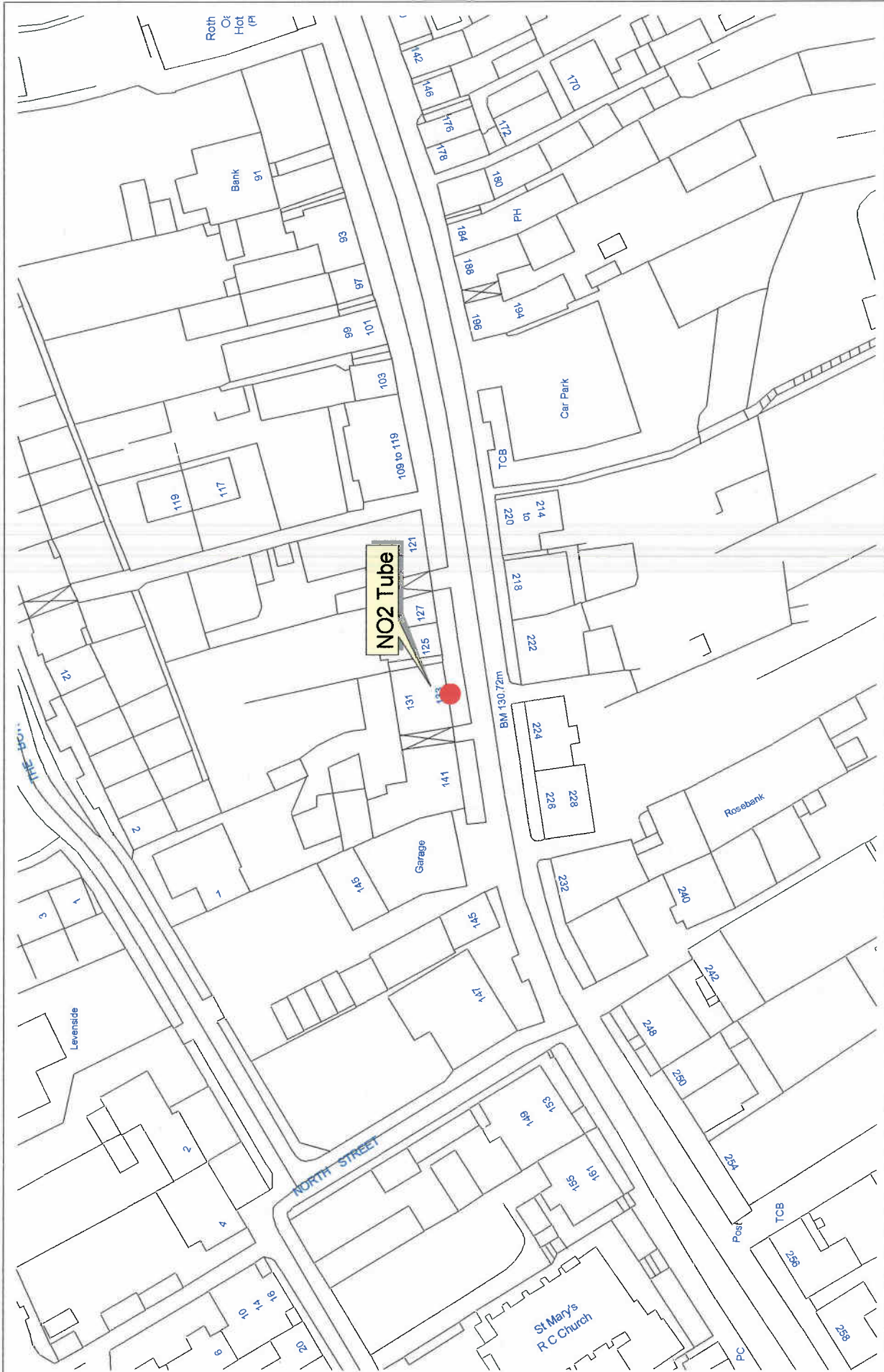
This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Fife Council 100023385 (2004)

Air Quality Strategy Revised Monitoring Scheme Dunnikier Road and Victoria Road, Kirkcaldy

Figure A5



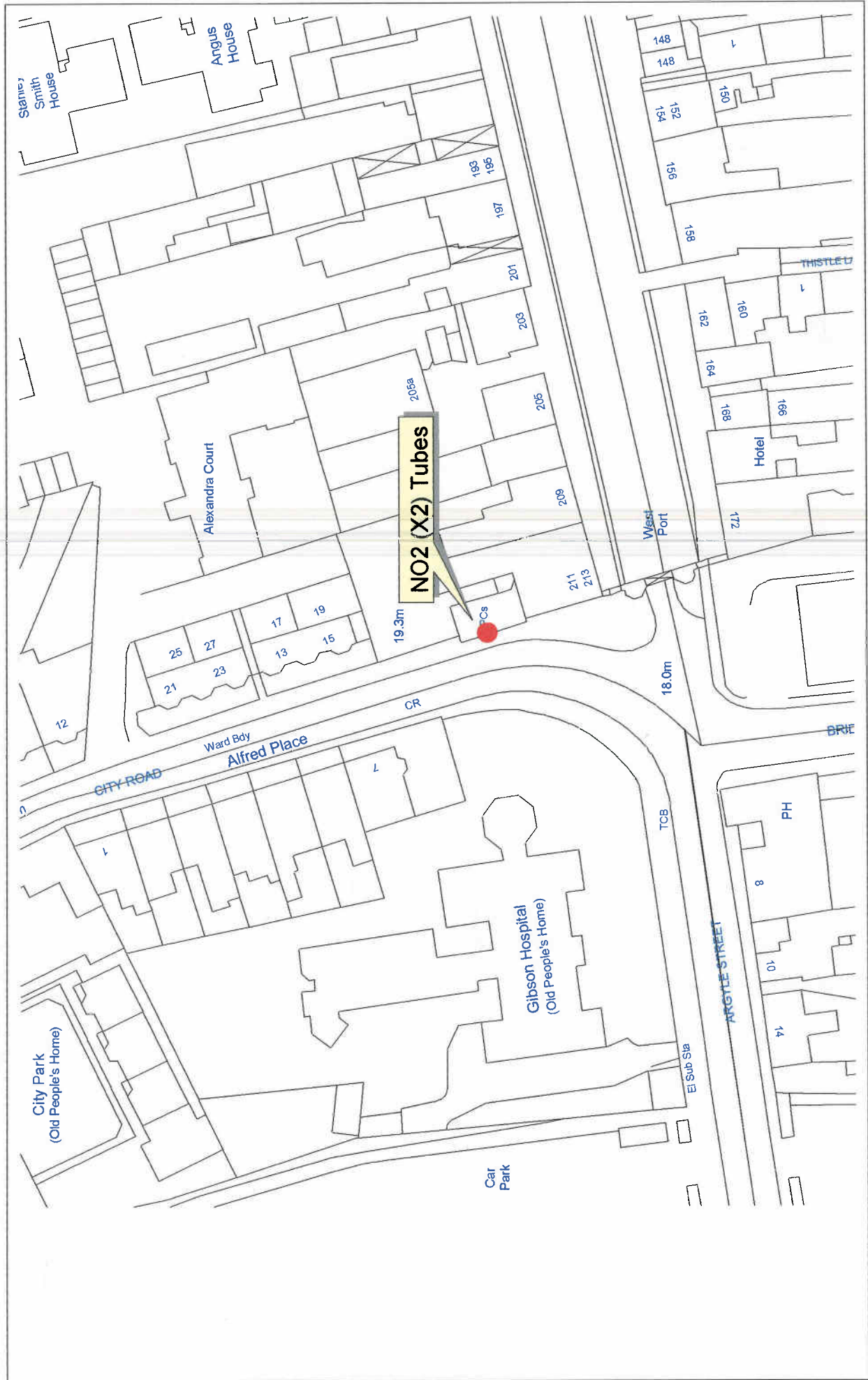
Environmental Services



This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Fife Council 100023385 (2004)

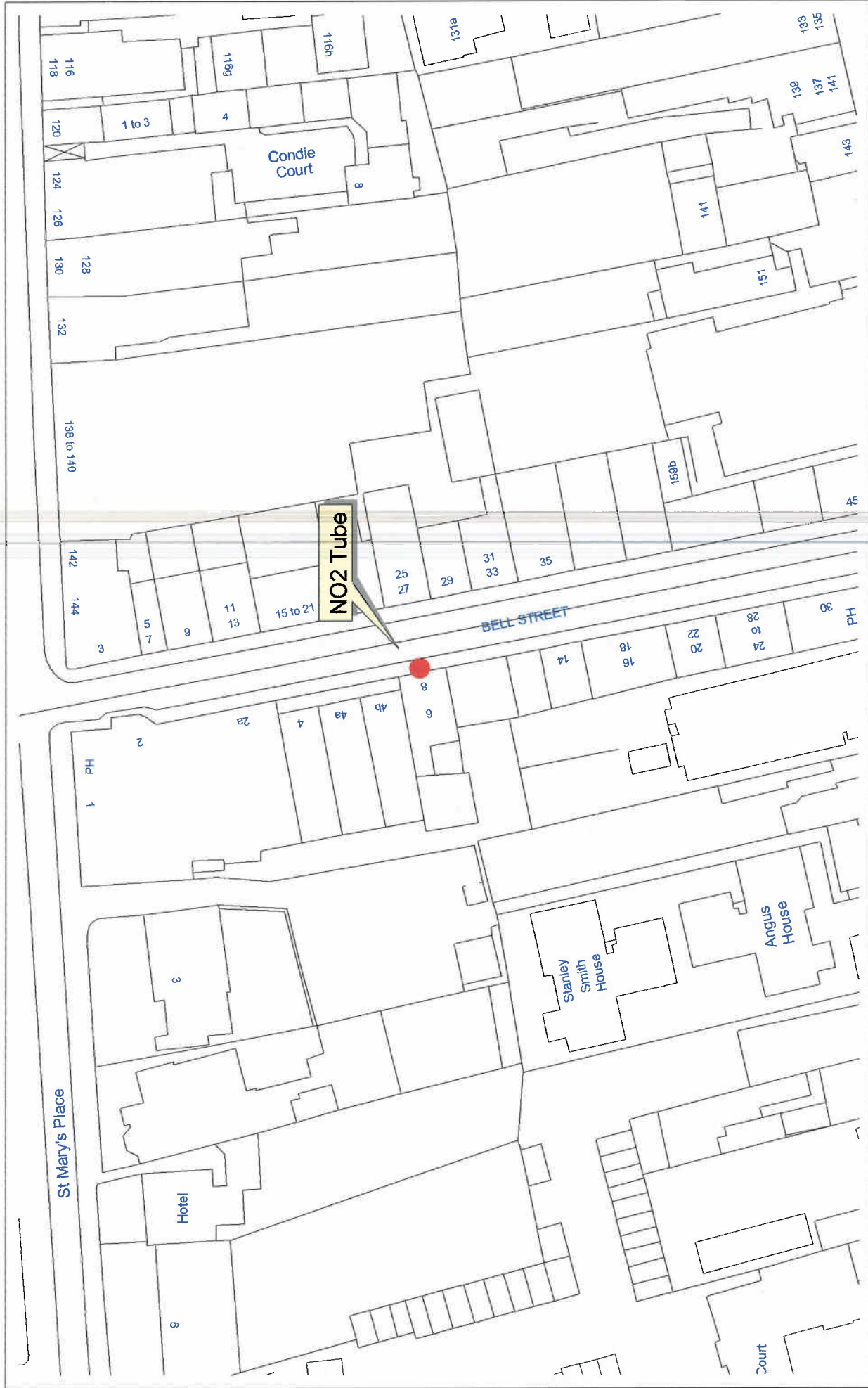
Air Quality Strategy Revised Monitoring Scheme High Street, Leslie

Figure A6



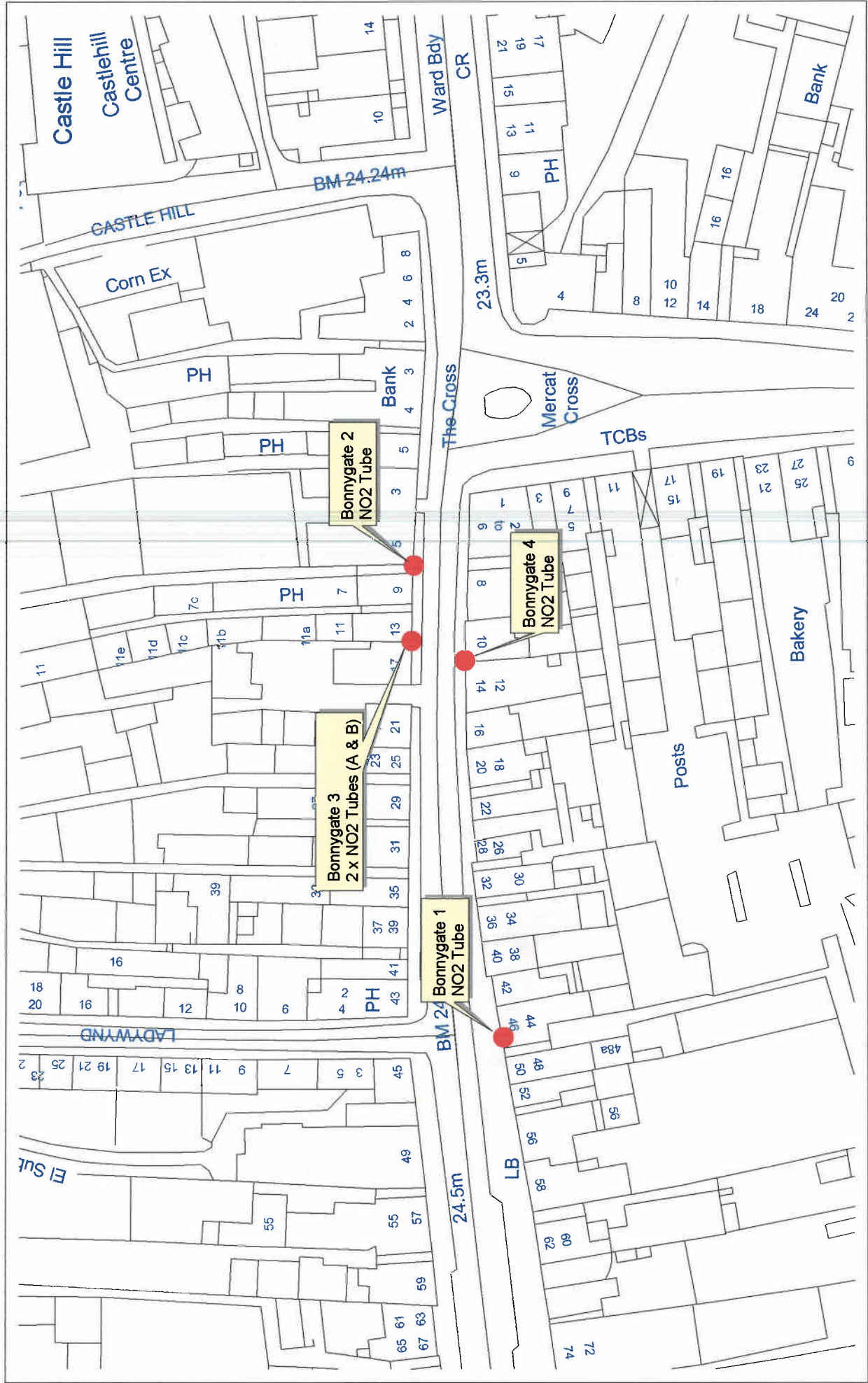
This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Fife Council 100023385 (2004)

Air Quality Strategy Revised Monitoring Scheme
City Road, St Andrews **Figure A7**



This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Fife Council 100023385 (2004)

Air Quality Strategy Revised Monitoring Scheme
Bell Street, St Andrews **Figure A8**



This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Fife Council 100023385 (2004)

Air Quality Strategy Revised Monitoring Scheme Bonnygate, Cupar

Figure A9

Appendix 2

DETAILED INFORMATION ON AUTOMATIC MONITORING LOCATIONS

CONTENTS

North Approach Road, Kincardine
Admiralty Road Rosyth

North Approach Road, Kincardine:



Station Name:	North Approach Rd, Kincardine
Site Owner/operator:	Fife Council/Dundee Scientific Services
Northing:	293191
Easting:	687518
Zone/agglomeration:	
Site Classification:	Roadside (4m from kerb)
Manifold type and height:	Fan manifold, 3m
Network affiliation:	None
Quality control procedures:	Daily calibration with BOC cylinders
Pollutants measured on site:	NO _x , NO, NO ₂
Instrument manufacturer:	Monitor Europe ME 9841B
Calibration procedure and frequency:	Daily calibration with BOC Spectaseal cylinders (450ppb NO)
Site service arrangements:	Casella
Comments:	

Admiralty Road, Rosyth



Station Name:	Groundhog, Admiralty Road, Rosyth
Site Owner/operator:	Fife Council/Dundee Scientific Services
Northing:	311752
Easting:	683515
Zone/agglomeration:	
Site Classification:	Roadside (7/8m from kerb) Inlet at building facade
Manifold type and height:	Fan manifold, 3m
Network affiliation:	None
Quality control procedures:	Daily calibration with BOC cylinders
Pollutants measured on site:	NO _x , NO, NO ₂ SO ₂ CO PM ₁₀ Met
Instrument manufacturer:	NO _x – ME 9841B SO ₂ – ME9850B CO – ME9830B PM ₁₀ – TEOM 1400a
Calibration procedure and frequency:	Daily calibration with BOC Spectaseal cylinders (NO 450ppb, SO ₂ 450ppb, CO 20ppm, zero air)
Site service arrangements:	Casella
Comments:	50yds from road junction