



2012 Air Quality Updating and
Screening Assessment for
The City of Edinburgh Council

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

October 2012

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Executive Summary

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in Part IV of the Environment Act 1995 and the National Air Quality Strategy 2007. The report has been completed in accordance with Technical Guidance LAQM.TG (09) document produced by DEFRA and the Devolved Administrations.

Monitoring Data 2011

Nitrogen Dioxide

Nitrogen dioxide monitoring data for 2011 shows that the majority of monitoring locations within each of the Air Quality Management Areas (AQMA) continue to exceed the air quality objectives, therefore the AQMA remain valid.

A number of locations outwith the AQMA also show exceedences of the annual mean nitrogen dioxide objective. Of these; London Road, Easter Road, Bernard Street (Leith), Glasgow Road, Commercial Street/Portland Place, Grassmarket and Cowgate are to be included in the proposed extensions to the Central and Great Junction Street AQMA and the declaration of the Glasgow Road/Newbridge AQMA. The Orders to ensure the changes to the AQMA are being progressed.

Other exceedences outwith AQMA are noted at Portobello Road, Inverleith Row, Queensferry Road and Angle Park Terrace.

Additional monitoring for Detailed Assessment relating to Portobello High Street has shown that there is no breach of the objective and therefore an AQMA would not be required for this area. The monitoring however highlighted an exceedence at the junction of Portobello Road/Sir Harry Lauder Road. A Detailed Assessment will be required here to consider the extent of concern at this junction.

Detailed Assessment work at Inverleith Row shows that the exceedence is likely to be localised to the Ferry Road junction. An AQMA is required for this area.

A number of passive diffusion sites on Queensferry Road and the automatic monitoring station data all show compliance with the annual mean objective. An AQMA is not required in this area. One site however, exceeds and further investigation is necessary. Agreement has been sought from a local resident to locate monitoring on the facade of their residential property.

Potential exceedences of the nitrogen dioxide annual mean objective have been identified at the following locations: Slateford Road, Fountainbridge/Tollcross, Hope Park Terrace, Hillhouse Road, Salamander Street/Baltic Street, Salamander Street/Bath Road and Ferry Road.

On-going Detailed Assessment work at Hope Park Terrace/Clerk Street, Hillhouse Road, Slateford Road, Fountainbridge/Tollcross and Angle Park Terrace is expected to be completed in April 2013.

PM₁₀

2011 data from all monitoring locations met the PM₁₀ EU limit value and the UK National Objective. The background site at St Leonard's, Currie and roadside locations at Roseburn and Queen Street met the Scottish Air Quality Objective of 18µg/m³.

Queensferry Road and Salamander Street did not meet the annual mean Scottish Air Quality Objective. Salamander Street also did not meet the permitted number of daily exceedences. It is likely that fugitive emission sources from an adjacent scrap metal yard and cement batching process contribute to the exceedences. These sources will be investigated in conjunction with Edinburgh Scientific Services and the Scottish Environment Protection Agency (SEPA). The seasonality of exceedences will also be investigated.

The city-wide Detailed Assessment of PM₁₀ is expected to be completed in 2013 when it is anticipated that sufficient data will be collected.

A poultry farm at Gogarburn and Hillwood quarry will also be included in the study. Further details will be required of Millerhill Zero Waste Plant on the boundary of City of Edinburgh and Midlothian Council areas.

Trend Data – NO₂ & PM₁₀

Due to disruptions to normal traffic flows arising from construction works associated with Edinburgh Tram and other projects it is difficult to formulate reliable assumptions on data trends for both NO₂ and PM₁₀. However, hourly exceedences of the nitrogen dioxide objective continue to fall at St John's Road, from 166 in 2008 to 60 in 2010 to 52 in 2011.

Sources

Industrial - Biomass Plant

Proposals to develop a 200MWe biomass power station at Leith Docks have been withdrawn. The new Council administration has pledged to oppose industrial biomass installation in Edinburgh.

A city-wide Local Development Plan is currently being devised by the Local Authority. Changes to the transport network in the 'Southern Arc' Area Development Framework also required to be further assessed.

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1 Introduction

1.1 Description of Local Authority Area

Edinburgh is the capital city of Scotland and the seat of the Scottish Parliament. It is the second largest city in Scotland and the seventh most populous in the United Kingdom. Located in the south east of Scotland's central belt it is bounded by the Firth of Forth to the North and the Pentland Hills to the South. The latter comprises 20 miles of farming and recreational land. The peripheral areas of the city to the West and South West are predominately semi-rural. The city is a financial, commercial and tourist centre and attracts over one million visitors annually.

The resident population was estimated to be 495,360 in 2011 with an overall population density of 1,853 people per square kilometre. This is projected to increase by 26% by 2035¹. In Edinburgh, a large number of people live within the core of the city centre.

Approximately 55% of Edinburgh's population live in tenements or high-rise flats, compared to the Scottish average of 33%. The majority of tenement properties are located in the central and northern areas of the city. There has been a substantial growth of residential flats within these locations due to the development of many former industrial sites. The southern and western peripheral areas of the city have predominantly detached and semi detached housing.

Many of Edinburgh's main streets and the major radial routes into the city are narrow, with tenement buildings four to five stories high on either side of the road carriageway, which form street canyons. In many instances, the distances from the edge of the road to the façade of residential properties can be as little as two metres.

As a major employment centre, Edinburgh attracts a substantial amount of road and rail commuter traffic. The main means of transport within Edinburgh is via the road network. In 2011 30% of the population used the bus and train, 25% walked and 7% cycled. The main UK East Coast rail line is routed through the city centre and there are further rail links to Glasgow, Fife and the major centres of the north.

Smoke Control Orders cover the entire Edinburgh Council area and significant improvements in air quality have been achieved since their introduction due to use of natural gas in the domestic and commercial sectors.

A major cause of poor air quality in certain parts of Edinburgh, as in many urban environments, can be related to road traffic. Approximately 1 per cent of the city is covered by Air Quality Management Area's with up to a further 1 per cent under investigation. At least 98 per cent of the city met strict air quality standards.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities regularly to review and assess air quality in their areas, and to determine whether air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the air quality objectives.

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

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in Scotland are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland)

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

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

Air Quality Objectives			
Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	3.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 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 7 times a year	24-hour mean	31.12.2010
	18 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2010
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

The UK Review and Assessment process of Local Air Quality Management (LAQM) commenced in 1997.

A summary of the City of Edinburgh's findings and description of the three AQMAs are detailed in Tables 1.2 and 1.3. Maps of the boundaries of the AQMAs are presented in Figures 1.1 to 1.4.

Table 1.2 Summary of previous Review and Assessments

City of Edinburgh Council Key Documents		
Round / Report	Date	Outcome
1 Review and Assessment of Air Quality in the City of Edinburgh Stages 1&2	1998	Potential exceedences of NO ₂ and PM ₁₀
1 City of Edinburgh Council Review Stage 3	2000	Exceedences of NO ₂ annual mean objective. Attributed to traffic emissions AQMA declared for City Centre 31.12.2000
1 City of Edinburgh Review and Assessment of Air Quality Stage 4	2002	Source apportionment identified that buses were the major contributors of NO ₂
2 Air Quality Action Plan	2003	
2 Updating & Screening Assessment LAQM Phase 2	2003	Detailed Assessment required city-wide for PM ₁₀ due to high background concentrations and tightening of air quality objectives for Scotland. Detailed Assessment for NO ₂ St John's Road.
2 Detailed Assessment Report	2004	Partisol co-location study with TEOM gave local gravimetric conversion factor of 1.14 AQMA not required for PM ₁₀ using 1.14 AQMA required for NO ₂ at St John's Road.

City of Edinburgh Council Key Documents			
Round / Report		Date	Outcome
2	Progress Report	2005	<p>Potential exceedences of NO₂ at West Port and Great Junction Street</p> <p>Four locations in Central AQMA likely to fail EU limit value – West Maitland St, Torphichen PI, Princes St and Roseburn Terrace. Concerns were raised with respect to density of development in city centre and North Edinburgh Waterfront.</p>
3	Updating and Screening Assessment Report	2006	<p>Exceedences of NO₂ within Central AQMA & St John's Road</p> <p>AQMA declared for St John's Rd 31.12.2006</p>
3	Detailed Assessment for Nitrogen Dioxide at Gt Junction St and West Port	2007	<p>AQMA required for NO₂ at Gt Junction Street and West Port. West Port also likely to not meet hourly NO₂ objective.</p> <p>Council to explore various options to extend existing Central AQMA to cover both areas or West Port. Declare two separate AQMAs. Preferred option to extend Central AQMA.</p>
3	Air Quality Progress Report.	2008	<p>NO₂ exceedences within AQMAs. Number of locations also did not meet hourly mean objective.</p> <p>Based on 2007 data predictions EU limit values are likely to be exceeded within AQMAs</p> <p>Exceedences of NO₂ at Bernard St, Commercial St, Ferry Rd, Easter Rd, London Rd, Hope Park Terrace, Glasgow Rd. Detailed Assessment required.</p> <p>City-wide Detailed Assessment required for PM₁₀ due to exceedences of Scottish Air Quality Objectives using 1.14 local gravimetric factor.</p> <p>AQMA declared for Gt Junction Street 09.03.2009 to include area of exceedence on Ferry Road.</p> <p>Central AQMA amended to include West Port and</p>

City of Edinburgh Council Key Documents			
Round / Report		Date	Outcome
			<p>exceedences of hourly mean NO₂ objective.</p> <p>St John's Rd AQMA amended to include exceedence of hourly mean NO₂</p>
3	Air Quality Action Plan	2008	Revised
4	Updating and Screening Assessment	2009	<p>NO₂ exceedences within AQMAs. Existing AQMAs remain valid.</p> <p>City-wide Detailed Assessment for PM₁₀ required, which will address the four biomass installations and poultry farm complex at Gogarburn.</p> <p>Most congested main roads in city centre are likely to exceed Scottish annual objective for PM₁₀ based on monitoring at Queen Street, Haymarket and DMRB modelling</p> <p>NO₂ annual exceedences noted at Glasgow Rd, Easter Rd, London Rd, Bernard St, Grassmarket, Cowgate, Queensferry Rd/ Barnton and Hillhouse Rd.</p> <p>Potential exceedences of NO₂ at Hope Park Terrace, Broughton Rd and Commercial Street.</p>
4	Progress Report	2010	<p>NO₂ exceedences within all 3 AQMAs</p> <p>AQMAs remain valid.</p> <p>Exceedences of NO₂ at, Portobello High St, Inverleith Row, Bernard Street, Glasgow Road, Easter Road, London Road, Queensferry Road, Grassmarket</p> <p>Potential exceedences at, Broughton Rd, Commercial St, Hope Park Terrace, Cowgate, Hillhouse Road.</p>
4	Further Assessment: St John's Road West Port (extension of Central AQMA) Great Junction Street	2011	<p>NO₂ exceedence within 3 AQMAs which remain valid</p> <p>Source apportionment -</p> <p>Within local vehicle fleet, buses contribute the greatest percentage of the measured NO₂ at St Johns Rd and Gt Junction St, whilst at West Port the greatest</p>

City of Edinburgh Council Key Documents														
Round / Report	Date	Outcome												
		<p>contribution is attributed to cars.</p> <p>% Range of roadside NO_x reduction required to meet NO₂ Annual Mean Objective (40µg/m³). Using both UK and Scottish background maps.</p> <table> <tr> <td></td><td>(UK)</td><td>(SG)</td></tr> <tr> <td>Gt Junction St</td><td>40.7%</td><td>49.9%</td></tr> <tr> <td>St Johns Rd</td><td>70.6%</td><td>76.8%</td></tr> <tr> <td>West Port</td><td>74.9%</td><td>86.4%</td></tr> </table>		(UK)	(SG)	Gt Junction St	40.7%	49.9%	St Johns Rd	70.6%	76.8%	West Port	74.9%	86.4%
	(UK)	(SG)												
Gt Junction St	40.7%	49.9%												
St Johns Rd	70.6%	76.8%												
West Port	74.9%	86.4%												
4 Progress Report	2011	<p>NO₂ exceedences in all 3 AQMAs.</p> <p>All AQMAs remain valid</p> <p>NO₂ exceedences outwith existing AQMAs – London Road, Easter Road, Grassmarket, Cowgate, Bernard Street, Hope Park Terrace, Queensferry Road, Glasgow Road, Inverleith Row, Hillhouse Road Angle Park Terrace, Slateford Road, Fountainbridge / Tollcross and Gorgie Road / Delhaig.</p> <p>NO₂ potential exceedences identified at Broughton Road, Ferry Road, Commercial Street, Salamander Street/Bath St and Portobello High St.</p> <p>NO₂ Detailed Assessment work being progressed at Queensferry Road, Portobello, Inverleith Row and required for Hope Park Terrace / Clerk Street junction, Hillhouse Road, Slateford Road, Fountainbridge / Tollcross and Angle Park Terrace</p> <p>Extend Central AQMA and & Great Junction St AQMA for exceedences of NO₂</p> <p>Declare Glasgow Road/Newbridge for exceedences of NO₂</p> <p>PM₁₀ citywide Detailed Assessment progressing</p>												

LAQM (Review and Assessment) Developments since 2011 Progress Report

Nitrogen Dioxide

In relation to nitrogen dioxide, the 2011 Progress Report concluded that it was necessary to extend the Central AQMA to include exceedences at Easter Road, London Road, Gorgie/Delhaig and Grassmarket/Cowgate and the Great Junction AQMA, to include Bernard Street (Leith). Detailed Assessment work relating to Glasgow Road/Newbridge indicated localised exceedences which required an AQMA to be declared. The Orders have been drafted by the Local Authority's solicitor. Maps detailing these changes are shown in Figures 1.1 to 1.4.

Additional monitoring was established in 2012 at the following locations in order to progress Detailed Assessment work: Hope Park Terrace/Clerk Street, Hillhouse Road, Slateford Road, Fountainbridge/Tollcross and Angle Park Terrace. The expected completion of this work is April 2013.

A full set of annual data has now been obtained for the Queensferry Road real-time monitoring station. This data coupled with diffusion tube monitoring on the façade of residential properties indicates that it is unlikely that the objective would be exceeded in this area and hence an Air Quality Management Area (AQMA) is not anticipated.

However, as previously highlighted in the 2011 Progress Report, one passive diffusion tube site continues to show anomalous results and further work was being carried out in an attempt to understand the reasons (q.v. information under Detailed Assessments).

The findings of other Detailed Assessment work at Inverleith Row, Portobello High Street and Cowgate are described in the content of this report.

Particulate Matter 10 μ m (PM₁₀)

The city-wide detailed assessment for PM₁₀ is progressing. However, issues with the FDMS unit at Queensferry Road led to poor data capture in 2011.

The Roseburn automatic monitoring station was relocated to Glasgow Road in 2011. It was anticipated that data obtained from this site will support the city-wide study. However, re-commissioning of the station has been delayed due to damage sustained to the equipment and analysers during the heavy storms of December 2011/January 2012. It is expected to be operational late summer 2012.

Table 1.3 Descriptions of AQMAs

Description AQMA / Declaration	Pollutant/ Source	Amendments
<p>Central AQMA 31/12/2000</p> <p>Includes area of City Centre and main arterial routes leading into the city centre. Exceedences mostly in locations where there are street canyons, high percentage of bus movements and congested traffic. Residential properties at basement, ground, first, second, third, and fourth level, 2 to 4 metres from road edge. Busy shopping areas include Princes Street, George Street, Dalry/Gorgie Road, Roseburn Terrace, Leith Walk and North Bridge. Upward road gradient Leith Walk/North Bridge (south bound).</p>	<p>NO₂</p> <p>Traffic</p>	<p>09/03/2009</p> <p>Extended to include West Port</p> <p>Amended to cover hourly breach as well as annual breach of NO₂ air quality objective</p> <p>2011 – Progressing AQMA extension</p>

Description AQMA / Declaration	Pollutant/ Source	Amendments
<p>St John's Road 31/12/2006</p> <p>Part of the A8 route at Corstorphine area. Residential properties at ground, first, second, third and fourth floor level within 2m of kerb edge. Street canyon effect in part. Busy shopping area. Congested road with high percentage of bus movements. Road flat.</p>	<p>NO₂ Traffic</p>	<p>09/03/2009</p> <p>Amended to cover hourly breach as well as annual breach of NO₂</p>
<p>Great Junction Street 09/03/2009</p> <p>The full length of road to the depth of the building facades, including the Ferry Road Junction area. Residential properties at first, second, third and fourth floor level. Street canyon, congested traffic and busy shopping area. Receptors close to road edge. High percentage of bus movements.</p>	<p>NO₂ Traffic</p>	<p>N/A</p> <p>2011 – Progressing AQMA extension</p>
<p>Newbridge Roundabout to Ratho Station (Glasgow Road)</p> <p>Part length of A8, between Newbridge Roundabout and Ratho Station, to the depth of the building facades.</p>	<p>NO₂ Traffic</p>	<p>N/A</p> <p>Declaration of this AQMA is being progressed</p>

Figure 1.1 Map of Central AQMA with Extension to Boundaries

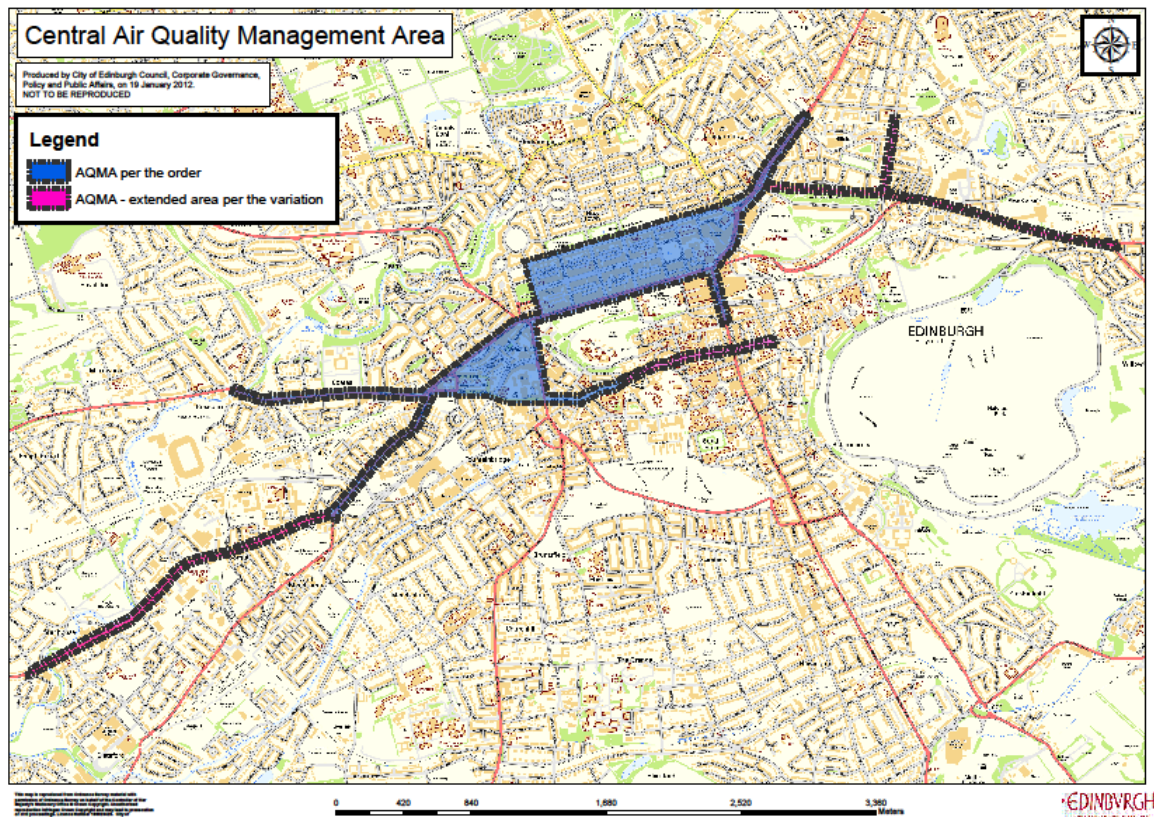


Figure 1.2 Map of St John's Road AQMA

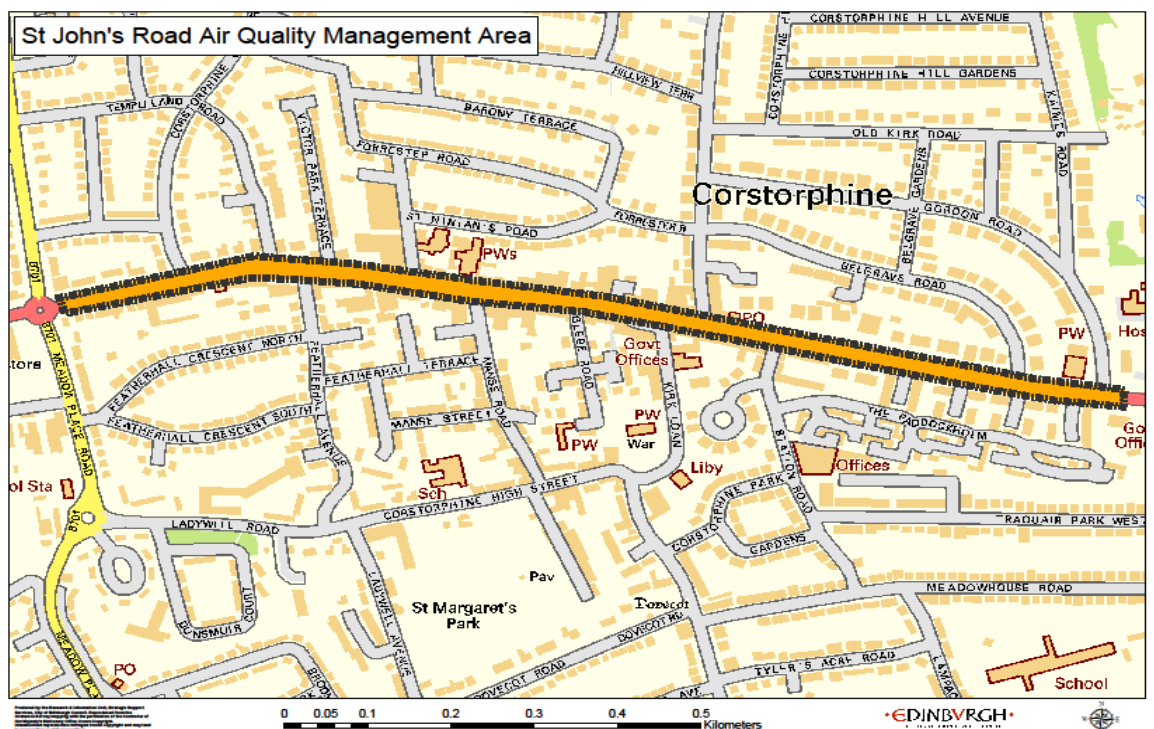


Figure 1.3 Map of Great Junction Street AQMA with Extension to Boundaries

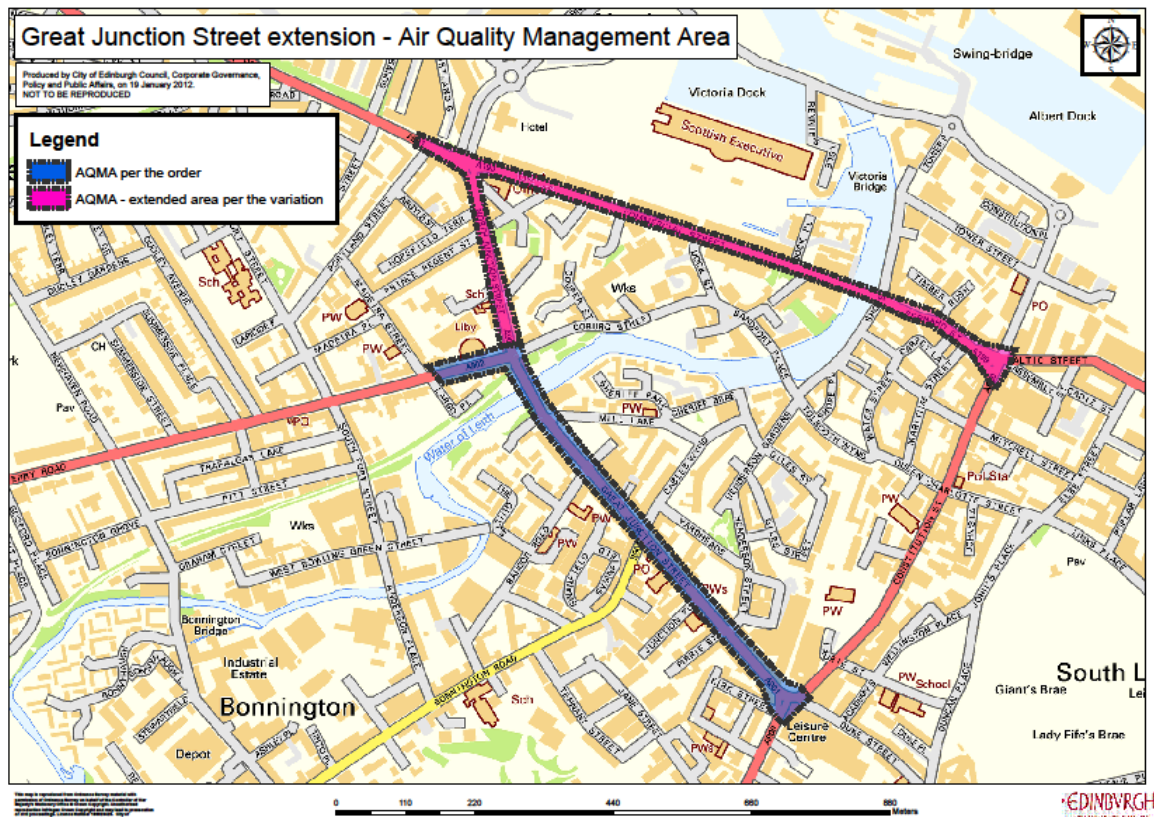
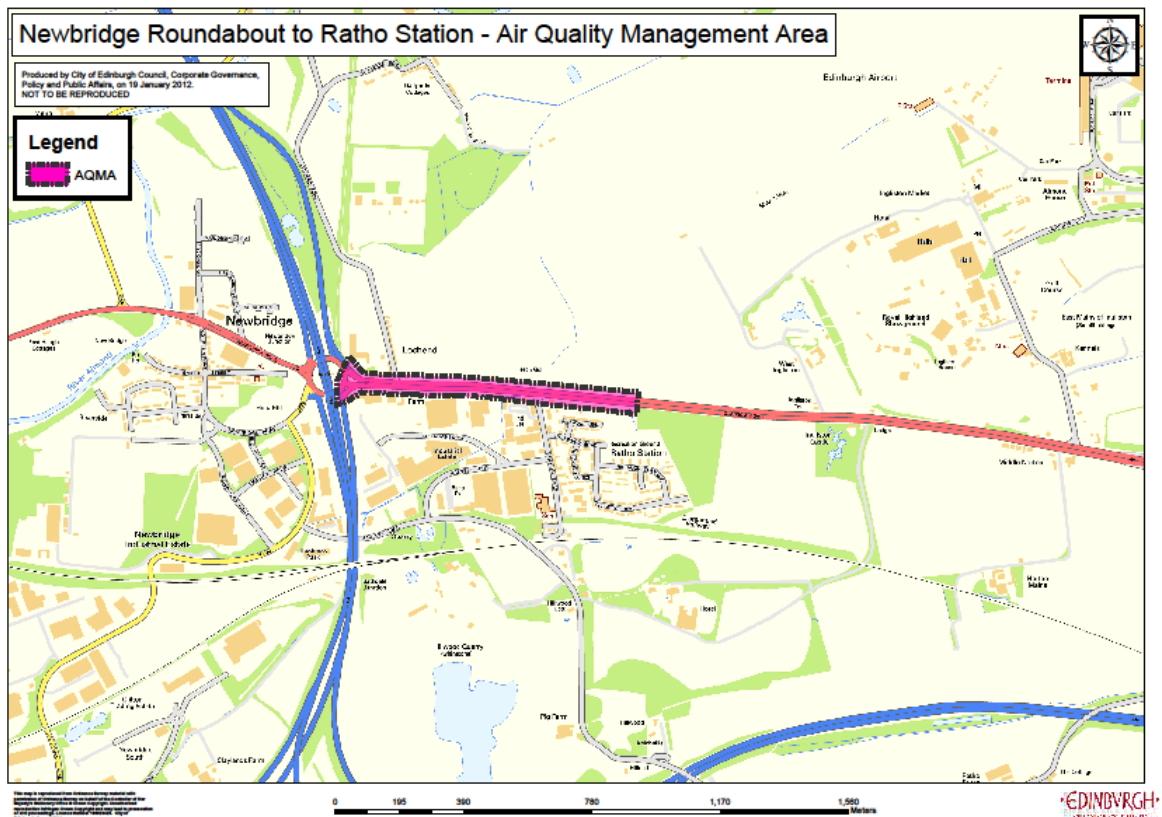


Figure 1.4 Map of Glasgow Road/Newbridge AQMA Boundaries



2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Edinburgh has eight automatic monitoring stations. One of the stations at St Leonard's is part of the UK Automated Urban and Rural National Network (AURN). The Roseburn station was decommissioned in August 2011 and relocated to a site on the A8 Glasgow Road, at Ratho Station. Operation of the station has been delayed due to a severe weather incident and is now due for commissioning in summer 2012. All other stations were operational during 2011.

Details and description of automatic monitoring sites for 2011 are shown in Figure 2.1 and Tables 2.1 and 2.1a. QA/QC procedures on the automated monitoring sites are shown in Appendix A.

Figure 2.1 Map of Automatic Monitoring Sites

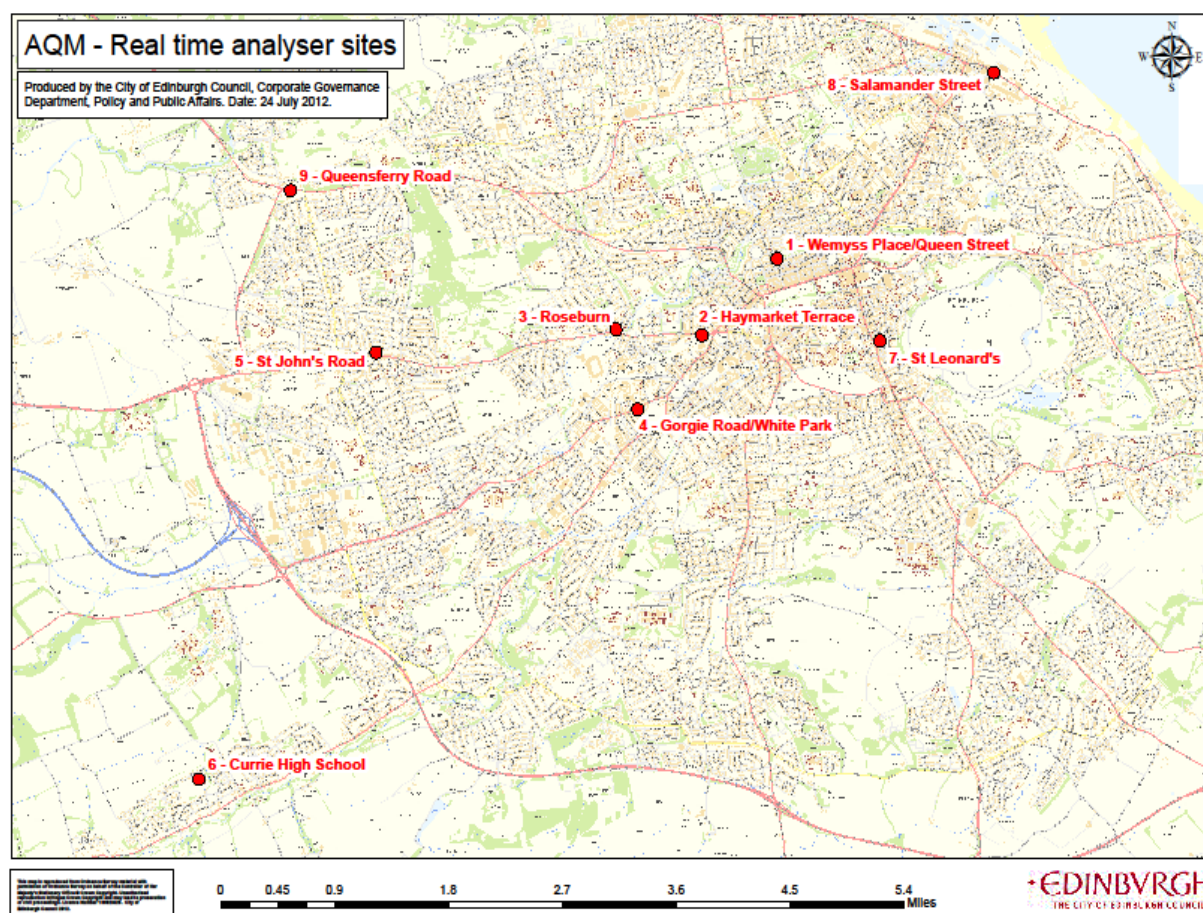


Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y 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?
St Leonard's	Urban back- ground AURN	326265	673129	NO ₂ PM ₁₀ PM _{2.5} O ₃ CO SO ₂ PAH	Chemilum FDMS FDMS UV absorp IR absorp UV absorp Digitalsamp	No	Y 29.0m	45.0m	N/A
Queen St / Wemyss PI	Roadside	324826	674078	NO ₂ PM ₁₀	Chemilum TEOM	Yes	Y façade	5.2m	Y
Gorgie Road	Roadside	323121	672314	NO ₂	Chemilum	Yes	Y façade	2.5m	Y (not in canyon)
Roseburn	Roadside	322939	673233	NO ₂ PM ₁₀	Chemilum TEOM	Yes	Y 4.9m	7.6m	N

Site Name	Site Type	X OS Grid Ref	Y 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?
St John's Rd	Kerbside	320101	672907	NO ₂	Chemilum	Yes	Y 1.35m	0.5m	Y
Salamander Street #	Roadside	327615	676333	NO ₂ PM ₁₀	Chemilum TEOM	No	Y (façade)*	2.13m	Y
Currie High School	Suburban background	317595	667909	NO ₂ PM ₁₀	Chemilum TEOM	No	Y (rear of school)	N/A	N/A
Queensferry Road	Roadside	318736	674930	NO ₂ PM ₁₀	Chemilum TEOM/FDMS	No	Y (6.5m)	1.7m	Y

Previously Haymarket

*Adjacent residential properties noted which are same distance from roadside as the monitoring station

Table 2.1a Description of Automatic Monitoring Locations

Location/Site ID	Description of automatic monitoring location
Queen Street/Wemyss PI ID 1	Pavement in line with residential property located 5.2m from road edge. No buildings at rear of monitoring unit. Relevant exposure.
Haymarket ID 2	Located in a car parking bay at Haymarket Station distance from the main road is 9.2m The location is set back from the façade of residential property. Not in street canyon. Decommissioned (2009)
Roseburn ID 3	Located on footbridge over the water of Leith 7.6m from kerb edge. Set back from line of residential property. Does not take account of canyon at Roseburn Terrace.
Gorgie Road ID 4	Located in line with façade of adjacent residential flats on edge of children's play park. Within 2.5m of kerb edge. Not located in canyon area of street. Relevant exposure.
St John's Road ID 5	Pavement (kerbside) of busy shopping street. Residential properties within 2.1m of kerb edge. Takes account of junction and street canyon. Relevant exposure and worst-case location.
Currie High School ID 6	Located adjacent to school building at rear of school. Representative of suburban / semi-rural exposure.
St Leonard's ID 7	Located in small park area adjacent to Medical centre 45.0m from nearest main road. Representative of urban exposure.
Salamander Street ID 8	Located on pavement 2.13m from road edge, in line with adjacent residential property.
Queensferry Road ID 9	Located on pavement 1.7m from busy road edge and adjacent bus stop. 6.5m in front of residential property

2.1.2 Non-Automatic Monitoring Sites

Edinburgh has an extensive network of passive diffusion tube samplers located throughout the city, which monitor nitrogen dioxide. These are within and outwith the AQMAs. The majority of the locations are in street canyons where tenement-style residential properties are within 2 to 3 metres of the road edge. Most of the passive diffusion tubes are sited at the building facades of residential properties. Details are provided in Table 2.2.

Additional monitoring commenced at the following locations in January 2011: Glasgow Road, Portobello High Street, Grassmarket, London Road, Piersfield Terrace, Bernard Street and Inverleith Row, previously having been identified as areas of concern in the 2010 Progress Report.

Following additional guidance from DEFRA in 2010, where deemed necessary parking bays have now been taken into account in the Distance Correction Tool.

Subsequent to a review of the passive diffusion tube network, the following sites were discontinued at the end of 2010 (Site Identification in brackets),

Queensferry Rd (ID50)	Glasgow Road (ID56a)	Ferry Road (ID45a),
Maybury Road (ID60)	Inverleith Gardens (ID54)	Telford Road (ID59)
Pier Place (ID12)	Salamander Street (ID51a)	George St (ID74a,b,c&d)

The following passive diffusion tubes were retained, but re-sited in close proximity and with similar site conditions;

West Port (ID25)	Grassmarket (ID45)	Easter Road (ID23D)
London Road (ID72)	Wolseley Terrace (ID72D)	

QC/QA work associated with passive diffusion tube method of monitoring is contained in the following Appendices:

- A1 Diffusion tube bias adjustment factors
- A2 Factor from local co-location studies
- A3 Discussion of factor of choice
- A5 Short-term to Long-term data adjustment
- A7 QA/QC of diffusion tube monitoring.

A map illustrating the network of non-automatic monitoring locations for NO₂ across the city is shown in Figure 2.1a. Individual maps are too detailed to be included in this report, but can be provided on request.

Figure 2.1a Map of Non-Automatic Monitoring sites

City-wide Nitrogen Dioxide Diffusion Tube Locations

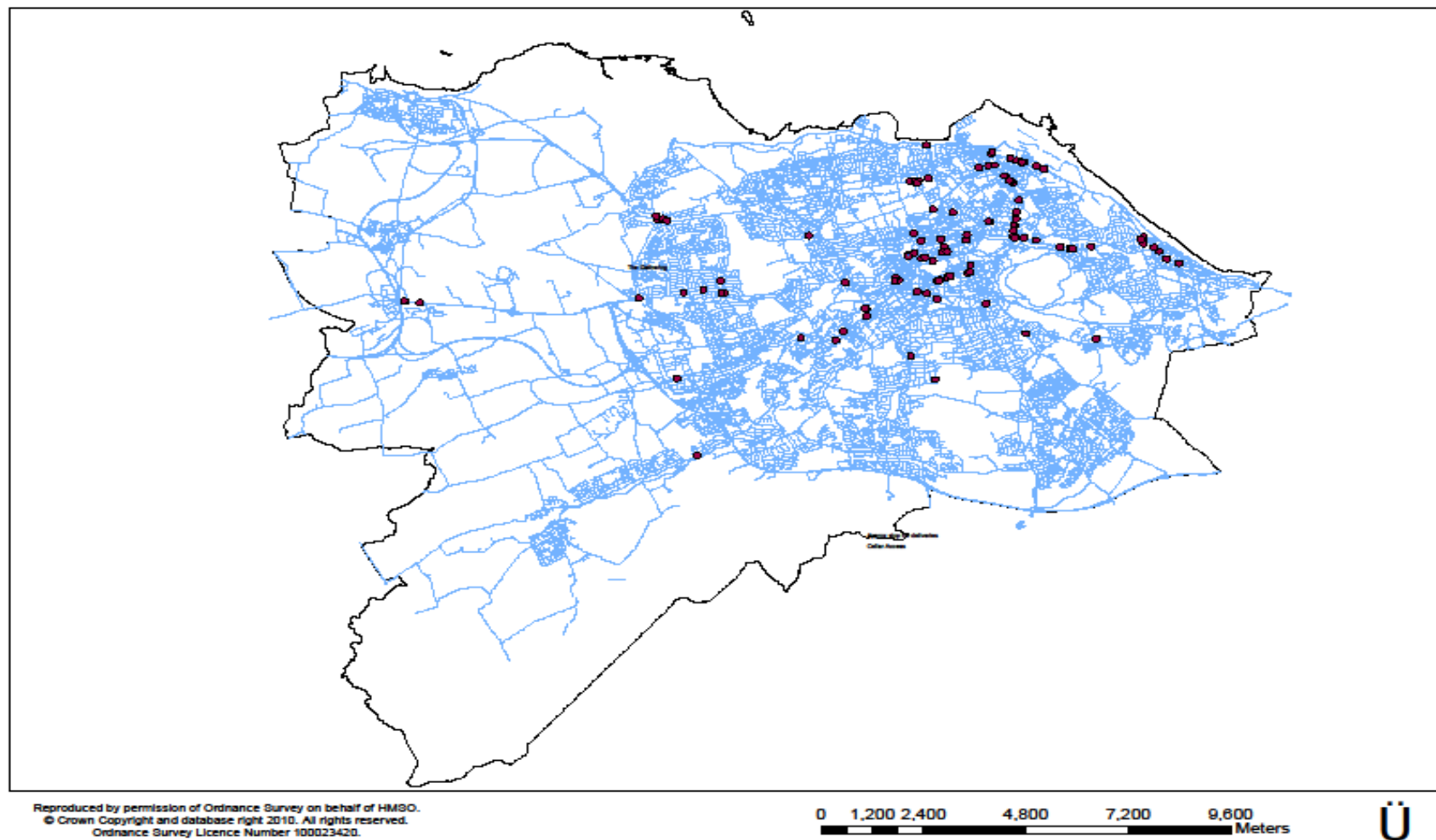


Table 2.2 Details of Non-Automatic Monitoring Sites

Details of Passive Diffusion Tube Sites								
Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (m) (N/A if not applicable)	Worst-case Location?
		X	Y					
St John's Road	Kerbside	320122	672917	1	Yes	Y (1.8)	0.54	Y
St John's Road	Roadside	320154	672911	1b	Yes	Y façade	2.0	Y
St John's Road	Roadside	320096	672907	1d	Yes	Y façade	2.1	Y
St John's Road	Roadside	319677	672991	39	Yes	Y (9.0)	1.7	Y
West Maitland Street	Kerbside	324192	673332	2	Yes	N (4.2)	0.65	Y
Torphichen Place	Roadside	324260	673270	3	Yes	N (1.55)	0.73	Y
Princes Street/Mound	Kerbside	325397	673869	24	Yes	N (10.2)	1.0	Y
Princes Street	Roadside	325049	673791	47	Yes	Y façade	9.0	Y
Roseburn Terrace	Kerbside	323007	673198	23	Yes	N (2.3)	0.23	Y
North Bridge – south	Roadside	325944	673670	27	Yes	Y façade	3.5	Y
Gorgie Road	Kerbside	323484	672478	5	Yes	N (4.9)	0.3	Y
Gorgie Road	Roadside	323477	672476	18	Yes	Y façade	2.4	Y
Queen St/Hanover St	Roadside	325310	674186	33	Yes	Y façade	6.0	Y
York Place	Roadside	325828	674362	36	Yes	Y (2.7)	5.5	Y
LeithWalk/BrunswickRd	Roadside	326366	674872	21	Yes	Y (3.4)	1.16	Y
LeithWalk/Mcdonald Rd	Kerbside	326365	674878	20	Yes	Y (4.6)	1.0	Y
West Port ^a	Roadside	325221	673263	28	Yes	Y façade	1.9	Y
West Port	Roadside	325166	673242	28b	Yes	Y façade	1.4	Y
West Port	Roadside	325184	673261	28c	Yes	Y façade	3.0	Y
West Port	Roadside	325203	673250	28d	Yes	Y façade	2.7	Y
Gt Junction Street	Roadside	326884	675997	30	Yes	Y façade	2.8	Y
Gt Junction Street	Roadside	326740	676138	30b	Yes	Y façade	2.9	Y

Details of Passive Diffusion Tube Sites								
Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (m) (N/A if not applicable)	Worst-case Location?
		X	Y					
Gt Junction Street	Roadside	326925	675949	30c	Yes	Y façade	2.8	Y
Gt Junction Street	Roadside	326757	676144	30d	Yes	Y façade	2.8	Y
Gt Junction Street	Roadside	326845	676015	30e	Yes	Y façade	2.7	Y
Morrison Street	Roadside	324167	673249	49	Yes	Y (2.4)	2.2	Y
Easter Road	Roadside	326934	674503	25	No	Y façade	2.3	Y
Easter Road	Roadside	326950	674624	25b	No	Y façade	3.3	Y
Easter Road	Roadside	326958	674770	25c	No	Y façade	3.25	Y
Easter Road ^a	Roadside	326974	674780	25d	No	Y façade	2.8	Y
Easter Road	Roadside	326999	674940	25e	No	Y façade	3.95	Y
Easter Road	Roadside	327010	675149	25f	No	Y façade	2.8	Y
Easter Road	Roadside	327071	675467	25g	No	Y façade	3.0	Y
London Rd	Roadside	326944	674472	46	No	Y façade	5.6	Y
London Rd/Cadzow PI ^a	Roadside	327468	674362	66	No	Y façade	2.04 + 2.0 ^b	Y
London Rd/Earlston PI	Roadside	327190	674433	67	No	Y façade	2.7	Y
Parsons Green Terrace	Roadside	328049	674174	68	No	Y façade	2.7	Y
London Rd/Wolseley PI	Roadside	328272	674143	69	No	Y façade	2.62	Y
London Rd/Wolseley Tr ^a	Roadside	328337	674129	70	No	Y façade	4.6	Y
Whitehouse Rd/Barnton	Roadside	318571	675028	50a	No	N (1.57)	3.5	Y
Maybury Rd/Barnton	Roadside	318612	674924	61	No	N (12.5)	2.8	Y
Queensferry Rd No 561	Roadside	318810	674903	62	No	Y façade	16.9	Y
Queensferry Rd No 544	Roadside	318723	674963	63	No	Y façade	13.6	Y
Queensferry Rd No 550	Roadside	318698	674955	64	No	N (9.2)	1.49	Y
Broughton Road	Roadside	325513	675134	43	No	Y façade	2.0	Y
Broughton Street	Roadside	325855	674527	44	No	Y façade	4.5	Y
Trinity Crescent	Roadside	324896	676991	14	No	N (4.0)	2.0	Y

Details of Passive Diffusion Tube Sites								
Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (m) (N/A if not applicable)	Worst-case Location?
		X	Y					
Commercial Street	Roadside	327009	676565	7	No	Y façade	2.47	Y
Commercial Street	Roadside	326879	676626	9	No	Y façade	2.6	Y
Glasgow Road	Roadside	312664	672672	15	No	N (4.5)	1.6	Y
Glasgow Road	Roadside	313028	672633	16	No	N (4.4)	1.8	Y
Glasgow Road No 18-20	Kerbside	319212	672921	56	No	N (4.6)	0.57	Y
Glasgow Road No 158	Roadside	318185	672756	57	No	N (8.5)	3.6	Y
Glasgow Rd GFC No319	Roadside	312693	672670	58	No	N (4.9)	2.8	Y
Morningside Road	Kerbside	324538	671166	8	No	Y (2.8m)	0.7	Y
Home Street	Roadside	324905	672893	10	No	Y façade	2.8	Y
Deanhaugh Street	Kerbside	324603	674555	13	No	N (5.1)	0.6 + 2.1 ^b	Y
Calder Road	Roadside	319062	670543	4	No	Y (25)	1.6	Y
Dalkeith Road	Roadside	327231	671782	31	No	N (4.9)	1.8	Y
Dundas Street	Kerbside	325243	674400	35	No	N (7.3)	0.3 + 2.1 ^b	Y
Niddrie Main Road	Kerbside	328889	671649	32	No	N (4.7)	0.2 + 2.4 ^b	Y
Lanark Road	Roadside	319527	668420	11	No	N (3.7)	1.5	Y
Baileyfield Road	Roadside	329997	674274	19	No	N (3.5)	2.0 + 2.1 ^b	Y
Melville Drive	Roadside	325141	672733	38	No	N (10.0)	2.8	Y
India Street	Backgrnd	324790	674341	34	No	N (6.6)	0.4 + 2.1 ^b	Y
Hillhouse Road	Roadside	322144	674497	40	No	Y façade	2.0	Y
Hillview Terrace	Backgrnd	320081	673232	41	No	N (9.0)	1.0	N
Midmar Drive	Backgrnd	325105	670511	42	No	N (9.0)	1.4	N
Ferry Road	Roadside	326136	676361	45	No	Y façade	3.7	Y
Ferry Road	Roadside	326359	676420	45b	No	Y façade	7.5	Y
Ferry Road	Roadside	326503	674436	45d	No	Y façade	3.1	Y
Ferry Road No 268	Roadside	324946	676070	52	No	N (4.6)	1.65	Y

Details of Passive Diffusion Tube Sites								
Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (m) (N/A if not applicable)	Worst-case Location?
		X	Y					
Bowhill Terrace No 6	Roadside	324726	676004	53	No	N (1.57)	1.75 + 2.85 ^b	Y
FerryRd/Inverleith Row	Roadside	324638	675993	55	No	Y façade	4.65	Y
Bernard Street Leith	Roadside	327148	676507	29	No	Y façade	2.2	Y
Bernard Street Leith	Roadside	327137	676529	29a	No	Y façade	2.1	Y
Bernard St Leith	Roadside	327192	676513	29b	No	Y façade	2.2	Y
Bernard St Leith	Roadside	327135	676515	29c	No	Y façade	2.1	Y
Salamander St/BathSt	Roadside	327665	676331	51b	No	Y façade	1.8	Y
Salamander St/Baltic	Roadside	327476	676418	51c	No	Y façade	2.25	Y
Commercial St/PortlandPl	Roadside	326430	676754	9a	No	Y 3.90	1.47	Y
Ocean Drive	Roadside	326455	676805	9b	No	Y façade	4.2	Y
Portobello High St W	Roadside	330533	673850	71	No	Y façade	3.0	Y
Seafield Rd East	Roadside	329993	674457	72	No	Y façade	4.5	Y
Portobello High St E	Roadside	330366	674057	73	No	Y façade	3.1	Y
George Street No 41	Roadside	325273	674030	74c	No	Y (4.3)	0.54	Y
George St/Charlotte Sq	Kerbside	324783	673868	74e	No	Y (5.2)	0.3	Y
George Street No 112	Roadside	324880	673891	74f	No	Y façade	6.8	Y
St Colme Street	Kerbside	324624	674012	75a	No	N (5.1)	0.6	Y
Gt Stuart Street	Kerbside	324488	673978	75b	No	N (6.14)	0.4 + 2.1 ^b	Y
Grassmarket ^a	Roadside	325427	673371	37	No	Y (5.0)	2.0 + 2.1 ^b	Y
Grassmarket	Roadside	325401	673340	37a	No	Y façade	3.4	Y
Cowgate	Roadside	325881	673471	48	No	Y façade	4.5	Y
Cowgate	Roadside	325929	673490	48a	No	Y façade	3.2	Y
Angle Park Terrace	Roadside	323498	672263	76	No	Y façade	2.20	Y
Slateford Road	Roadside	322960	671846	77	No	Y façade	2.67	Y
Slateford Rd/ Maltings	Roadside	322772	671606	78	No	Y façade	2.2	Y

Details of Passive Diffusion Tube Sites								
Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (m) (N/A if not applicable)	Worst-case Location?
		X	Y					
Fountainbridge/Tollcross	Roadside	324682	672939	79	No	Y façade	3.3	Y
Gorgie Rd / Delhaig	Roadside	321967	671666	80	No	Y façade	2.6	Y
Hope Park Terrace	Roadside	326312	672614	17a	No	Y façade	5	Y

Table 2.2a Details of New Non-Automatic Monitoring Sites 2011

Details of New Passive Difusion Sites in 2011								
Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (m) (N/A if not applicable)	Worst-case Location?
		X	Y					
Grassmarket	Roadside	325471	673369	37b	No	Y façade	5.0	Y
London Rd/ENorton PI	Roadside	326980	674446	81	No	Y façade	2.5	Y
Piersfield Terrace	Roadside	328771	674190	82	No	Y façade	4.0 + 2.1 ^b	Y
Portobello Road/Ramsay	Roadside	329923	674389	73a	No	N (1.98)	2.8	Y
Portobello High St No 23	Roadside	330242	674162	73b	No	Y façade	3.8	Y
Portobello High St No 288	Roadside	330830	673726	73c	No	Y façade	2.3	Y
Inverleith Row/SummerPI	Roadside	325052	675217	55b	No	Y façade	6.1	Y
Inverleith Row/Montague	Roadside	324686	675941	55c	No	Y (1.06)	2.28 + 2.0 ^b	Y
Gt Stuart St/Randolph Cr	Kerbside	324473	673920	75c	No	N (6.9)	0.36 + 2.4 ^b	Y

^a Site re-located in 2011 in close proximity to previous site^b Distance to nominal kerb due to parking bay in front of monitoring location

2.2 Comparison of Monitoring Results with AQ Objectives

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

Data from a number of the automatic monitoring stations has been corrected using DEFRA's Distance Correction Calculator Tool to account for the relevant exposure. At Queensferry Road the monitoring station is set 6.5m to the front of residential facades; hence measured concentrations are likely to overestimate exposure. The Roseburn and Haymarket stations were setback from residential properties, so the tool was used to calculate exposure closer to the roads, in line with the properties.

Other than at St John's Road, the automatic monitoring data for 2011, corrected where necessary, complies with the annual and hourly objectives.

Automatic data is shown in Tables 2.3a and 2.3b.

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

Nitrogen Dioxide Automatic Monitoring Data – Annual Mean							
Site ID	Location	Within AQMA?	Data Capture 2011 %	Annual mean concentrations ($\mu\text{g}/\text{m}^3$)			
				2008	2009	2010	2011
1	Queen St/Wym Pl	Y	99	32	33	37	29
2	Haymarket	Y	N/A	41 (49)	-	-	-
3	Roseburn	Y	61.7	28 (31)	26 (28)	30 (33)	24 ^a
4	Gorgie Rd	Y	92.7	42	38	41	37
5	St John's Rd	Y	90.9	75	70	71	65
6	Currie ^b	N	98.0	-	-	10	6
7	St Leonard's	N	98.4	31	24	31	25
8	Salamander St	N	97.5	-	30	30	29
9	Queensferry Rd	N	92.7	-	-	-	41 (29)

Annual mean exceedences are highlighted in bold red.

Data in brackets represents the estimated annual concentration at relevant receptor using the NO₂ reduction with distance calculator (DEFRA website, LAQM, Tools, 2011).

Unable to provide estimated concentration at relevant receptor for data (annualised) 2011 at Roseburn, due to high background concentrations (Scottish background maps $26\mu\text{g}/\text{m}^3$ / St Leonard's background site $25\mu\text{g}/\text{m}^3$).

^a Mean is annualised (Box 3.2, TG09), as monitoring was not carried out for the full year (Ref. A5 Appendix).

^b Currie air quality monitoring station is not supported by the Scottish Government's data ratification programme undertaken by AEA Technology. The NO_2 data for this site has therefore not been ratified. See Appendix A6 for further information.

Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Nitrogen Dioxide Automatic Monitoring Data – 1 Hour Mean							
Site ID	Location	Within AQMA?	Data Capture 2011 %	Number of Exceedences of hourly mean ($200\mu\text{g}/\text{m}^3$) If the period of valid data is less than 90% of a full year, include the 99.8 th percentile of hourly means in brackets.			
				2008	2009	2010	2011
1	Queen St/W PI	Y	99	0	0	0	0
2	Haymarket	Y	N/A	1	-	-	-
3	Roseburn	Y	61.7	0	0	1	0 (101)
4	Gorgie Rd	Y	92.7	0	0 (130)	0 (122)	0
5	St John's Rd	Y	90.9	166	114	60	52
6	Currie	N	98.0	-	-	0	0
7	St Leonard's	N	98.4	0	0	0	0
8	Salamander St	N	97.5	0	0 (141)	0	0
9	Queensferry Rd	N	92.7	-	-	-	0

1-hourly exceedences are highlighted in red bold (Maximum number permitted 18).

Where the period of valid data is less than 90% of a full year, the 99.8th percentile of the hourly mean data that has been collected is described in brackets.

Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Automatic Monitoring Sites

Trend analysis has been undertaken at monitoring locations with five or more years of valid data. Annual mean nitrogen dioxide concentrations have been plotted for successive years at St Leonard's, Queen Street, Gorgie Road and St John's Road

and trend lines have been drawn using an Excel simple regression statistical program.

Monitoring ceased at Haymarket in 2009 and Roseburn during late 2011. The monitoring stations at Salamander Street, Currie and Queensferry Road have not been operational for the required number of years to assess data trends.

Data trends are shown in Figures 2.3a, 2.3b, 2.3c and 2.3d and are summarised in Table 2.3c.

Table 2.3c Summary of Annual Mean Nitrogen Dioxide trends measured at Automatic Monitoring Sites

Nitrogen Dioxide Automatic Monitoring Data – Annual Trend			
Monitoring Location	Site Type	Trend in annual mean NO ₂ (years included)	Concentrations of NO ₂
St Leonard's	Urban background	↑ (2004 to 2011)	Slight increase
Queen Street	Roadside	↓ (2006 to 2011)	Decreasing
Gorgie Road	Roadside	-- (1999 to 2011)	No change
St John's Road	Kerbside	↓ (2007 to 2011)	Decreasing

The annual mean concentrations at the urban background site at St Leonard's show a slight upward trend. It is noted the NO₂ level was 25µg/m³ in 2004 and also in 2011. The years 2008 to 2010 show some fluctuation. Queen Street AQMS shows a downward trend with no exceedence of the objective, whereas Gorgie Road AQMS shows a flat tendency around the 40µg/m³ objective.

The hourly exceedences of nitrogen dioxide have significantly reduced at St John's Road AQMS from 166 in 2008 to 52 in 2011. There is a significant 22 per cent fall in the annual mean measured over the five year period. This may be attributed to improvements in the emissions standards of the bus fleet operating along St John's Road corridor. However, there may also be influences from changes in traffic flows in the measurement period; confirmation of this is still required (see 2011 Progress Report).

Figure 2.2a Trend in Annual Mean Nitrogen Dioxide Concentrations ($\mu\text{g}/\text{m}^3$) measured at St Leonard's AURN

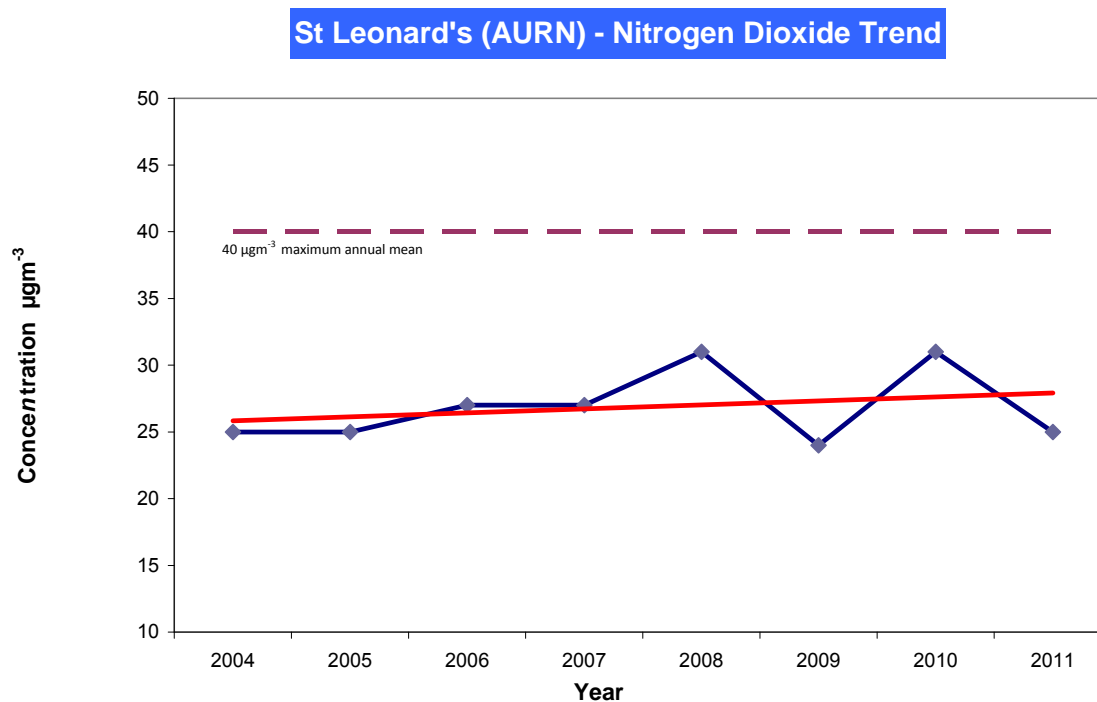


Figure 2.2b Trend in Annual Mean Nitrogen Dioxide Concentrations ($\mu\text{g}/\text{m}^3$) measured at Queen Street

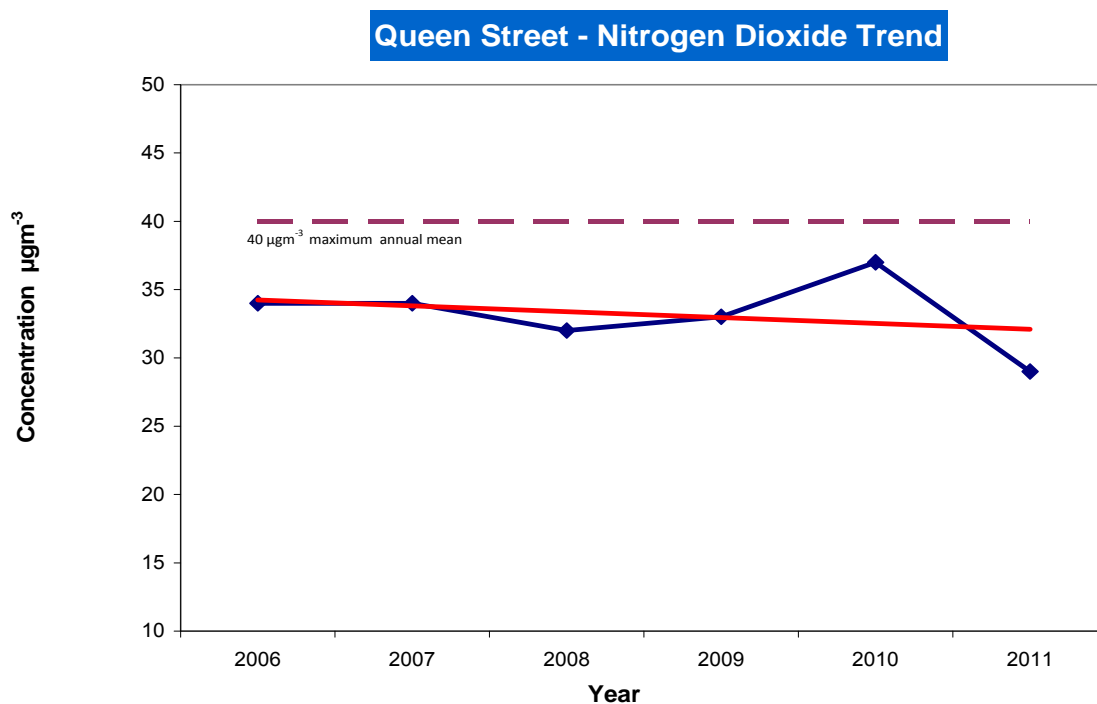


Figure 2.2c Trend in Annual Mean Nitrogen Dioxide Concentrations ($\mu\text{g}/\text{m}^3$) measured at Gorgie Road

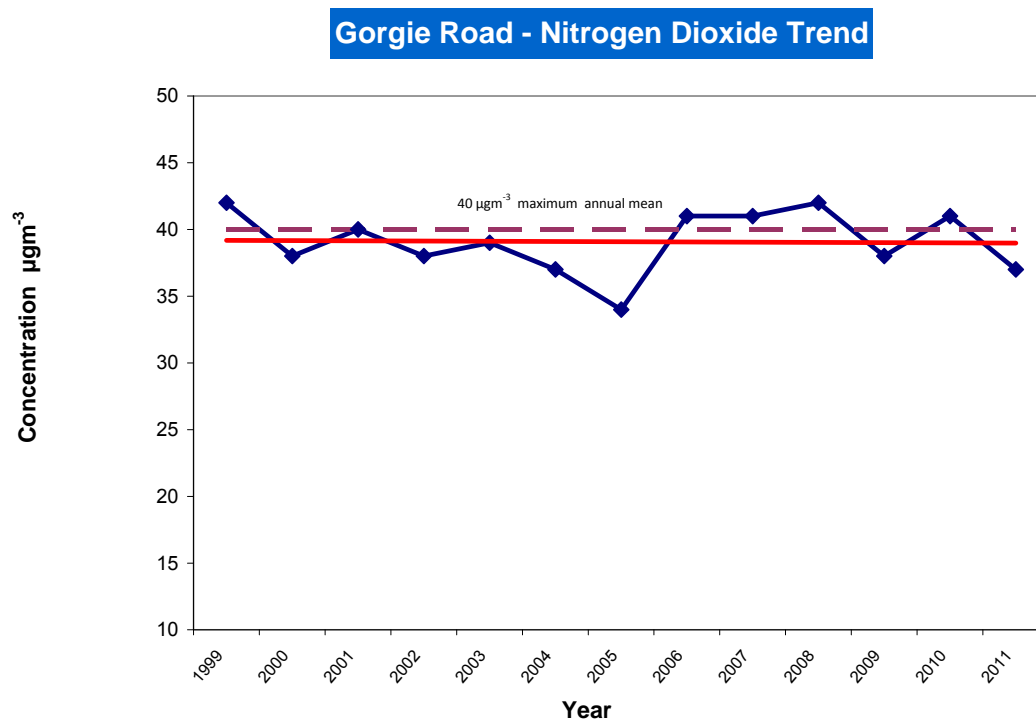


Figure 2.2d Trend in Annual Mean Nitrogen Dioxide Concentrations ($\mu\text{g}/\text{m}^3$) measured at St John's Road

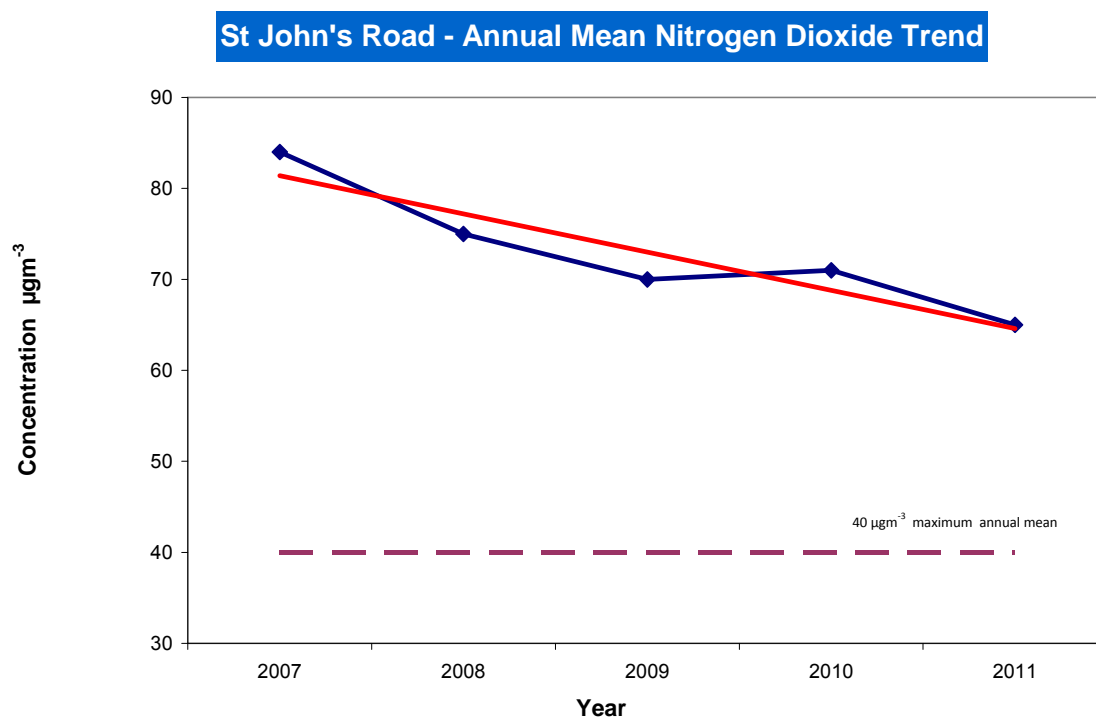
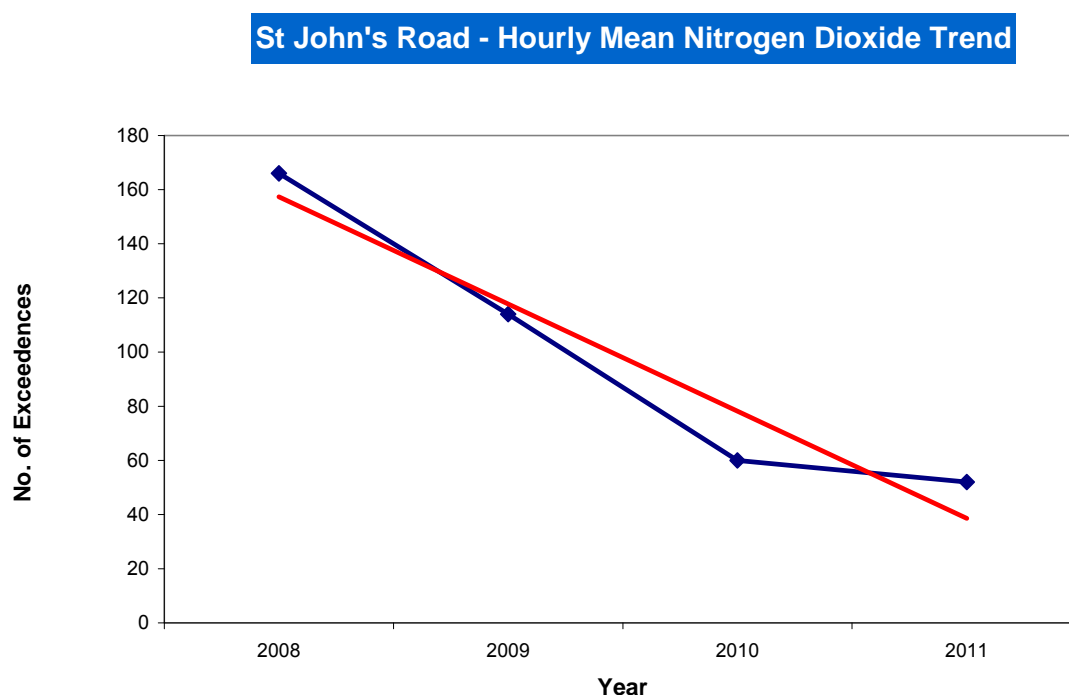


Figure 2.2e Trend in the Number of Exceedences of the Hourly Mean Objective for Nitrogen Dioxide at St John's Road



Non-Automatic (Diffusion Tube) Monitoring Data

Exceedences

The passive diffusion tube monitoring data for 2011 shows exceedences of the annual mean nitrogen dioxide objective (Table 2.5 and 2.5a) within each of the three AQMAs and therefore they remain valid. Exceedences are also shown at sites identified within the proposed extensions to the Central and Great Junction Street AQMAs and the new Glasgow Road/Newbridge AQMA – see Figures 1.1 to 1.4. Orders are being progressed to include these additional areas of exceedences.

Exceedences at monitoring locations outwith the AQMAs are identified at the following locations; Queensferry Road, Inverleith Row, Angle Park Terrace and Portobello Road, and are shown in Table 2.6. Table 2.7 shows data of diffusion tube monitoring from 2008 to 2011.

Potential exceedences

Locations which are considered borderline with respect to exceeding the annual mean nitrogen dioxide air quality objective are detailed in Table 2.8. There are no exceedences at these sites in 2011, however monitoring will continue. Detailed Assessments are already being progressed at the following locations; Slateford Road, Fountainbridge/Tollcross, Hope Park Terrace and Hillhouse Road.

Detailed Assessments

Cowgate/Grassmarket

Additional monitoring sites were established in the Grassmarket/Cowgate area in 2011 to carry out Detailed Assessment. One Grassmarket site (ID37c) was lost early in the year and was not re-instated until early 2012.

The $32\mu\text{g}/\text{m}^3$ NO_2 result for Grassmarket site ID37 meets the annual mean objective, as it has done for the previous three years. The $37\mu\text{g}/\text{m}^3$ for new Grassmarket site ID37b also meets the objective. The result from site Grassmarket ID37a of $42\mu\text{g}/\text{m}^3$ does not meet the annual mean objective for nitrogen dioxide.

The data capture from Cowgate site ID48a was 67%, so the data was annualised using the prescribed method detailed in the technical guidance (Box 3.2, TG(09)). The annualised result of $31\mu\text{g}/\text{m}^3$ meets the annual mean objective of $40\mu\text{g}/\text{m}^3$. The $40\mu\text{g}/\text{m}^3$ result for Cowgate site ID48 is at the limit of the objective.

An assessment of all data since 2008 is detailed in Table 2.7a. The planned extension of the Central AQMA will encompass all these sites.

Portobello High Street

The assessment shows that one of the monitoring sites does not meet the annual mean objective at the Ramsay Institute building near the junction between Portobello Road and Sir Harry Lauder Road (ID73a). The result of $42\mu\text{g}/\text{m}^3$ slightly exceeds the maximum annual mean objective of $40\mu\text{g}/\text{m}^3$. See Table 2.7b. Detailed Assessment will be undertaken at this location.

All other passive diffusion tubes established for Detailed Assessment work meet the objective and therefore there would be no requirement for an AQMA in Portobello High Street.

Inverleith Row

Analysis of Inverleith Row at its junction with Ferry Road which included a duplicate site at ID55 confirms exceedence of the annual mean objective (Table 2.7c). The result of $44\mu\text{g}/\text{m}^3$ at ID55 exceeds the annual mean objective of $40\mu\text{g}/\text{m}^3$ as it has done in the preceding two years at a similar level. Therefore, it will be necessary to declare an AQMA at this location.

Queensferry Road

All monitoring locations on Queensferry Road, except ID64 meet the annual mean objective, see Table 2.7d. Monitoring at the ID64 location has been showing consistently elevated concentrations ($44\mu\text{g}/\text{m}^3$ in 2011) compared to the adjacent façade sites. Agreement has been reached with a residential owner to permit an additional tube to be located at the façade of their property at a location coincident with the existing roadside site. Passive diffusion tube monitoring will commence in August 2012.

General Note

Detailed Assessment work at Hope Park Terrace/Clerk Street, Hillhouse Road, Slateford Road, Fountainbridge/Tollcross and Angle Park Terrace is on going. 2011 data shows a maximum NO_2 concentration of $38\mu\text{g}/\text{m}^3$ at Slateford Road ID77 and a range of $34\mu\text{g}/\text{m}^3$ to $38\mu\text{g}/\text{m}^3$ across the other various monitoring sites. Monitoring will continue in 2012 and reviewed again in 2013.

Data from Salamander Street/Bath Road and Salamander Street/Baltic Street at $37\mu\text{g}/\text{m}^3$ and $38\mu\text{g}/\text{m}^3$ NO_2 respectively is close to the annual mean objective. Elevated levels of PM_{10} at this location, as monitored at the automatic station, suggested that this may be impacting on the passive diffusion tube analysis. Sampling officers have been instructed following exposure to wipe clean the external

surface of the passive diffusion tubes prior to capping. Observation of the results will continue and the matter reviewed in light of any new knowledge.

Monitoring locations at Princes Street (ID24), Inverleith Tanfield (ID55a)/(new) and Grassmarket (ID37c) were lost due to posts being removed.

Data capture from London Road (ID66) and Leith Walk (ID20) was very sporadic throughout the year and therefore reliable annualised results could not be generated.

All raw monthly passive diffusion tube data is shown in Appendix B. The calculations showing estimation of annual mean concentrations from short-term monitoring data are detailed in Appendix A5.

Table 2.5 Results of Nitrogen Dioxide Passive Diffusion Tubes in 2011

Nitrogen Dioxide Passive Diffusion Tube Data 2011							
Site ID	Location	Within AQMA ?	Result is Mean of Duplicate Tube	Data Capture 2011 %	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81) 2011 ($\mu\text{g}/\text{m}^3$)
1	St John's Road	Yes	No	91.6	N/A	Yes	35.1
1b	St John's Road	Yes	No	100	N/A	N (façade)	38.4
1d	St John's Road	Yes	No	91.6	N/A	N (façade)	56.3
39	St John's Road	Yes	No	91.6	N/A	Yes	30.0
2	West Maitland Street	Yes	Yes	100	N/A	Yes	55.3
3	Torphichen Place	Yes	No	100	N/A	Yes	55.1
24	Princes St/Mound	Yes	No	N/A	N/A	N/A	N/A
47	Princes Street	Yes	No	100	N/A	Y (façade)	38.9 (45.3) ^a
23	Roseburn Terrace	Yes	No	100	N/A	Yes	34.5
27	North Bridge (south)	Yes	No	75	N/A	N (façade)	48.7
5	Gorgie Road	Yes	No	100	N/A	Yes	44.4
18	Gorgie Road	Yes	Yes	91.6	N/A	N (façade)	48.2
33	Queen St/Hanover St	Yes	No	83.3	N/A	N (façade)	50.0
36	York Place	Yes	No	91.6	N/A	Yes	35.4
21	Leith Walk/Brunswick Rd	Yes	No	83.3	N/A	Yes	34.2
20	Leith Walk/ McDonald Rd	Yes	No	41.6	No	No	45.5
28	West Port	Yes	No	58.3	Yes	N (façade)	43.5
28b	West Port	Yes	No	66.6	Yes	N (façade)	57.0
28c	West Port	Yes	No	66.6	Yes	N (façade)	39.0
28d	West Port	Yes	No	83.3	N/A	N (façade)	55.2
30	Gt Junction Street	Yes	Yes	100	N/A	N (façade)	39.1
30b	Gt Junction Street	Yes	No	91.6	N/A	N (façade)	40.0
30c	Gt Junction Street	Yes	No	100	N/A	N (façade)	38.4
30d	Gt Junction Street	Yes	No	91.6	N/A	N (façade)	33.8
30e	Gt Junction Street	Yes	No	83.3	N/A	N (façade)	41.2

Nitrogen Dioxide Passive Diffusion Tube Data 2011							
Site ID	Location	Within AQMA ?	Result is Mean of Duplicate Tube	Data Capture 2011 %	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81) 2011 ($\mu\text{g}/\text{m}^3$)
49	Morrison Street	Yes	No	58.3	Yes	Yes	48.5
25	Easter Road	No	No	91.6	N/A	N (façade)	43.6
25b	Easter Road	No	No	83.3	N/A	N (façade)	35.8
25c	Easter Road	No	No	91.6	N/A	N (façade)	41.0
25d	Easter Road	No	No	83.3	N/A	N (façade)	32.7
25e	Easter Road	No	No	100	N/A	N (façade)	32.0
25f	Easter Road	No	No	66.6	Yes	N (façade)	27.9
25g	Easter Road	No	No	100	N/A	N (façade)	26.8
46	London Road	No	No	91.6	N/A	N (façade)	40.4
66	London Rd/Regent Rd	No	No	66.6	No	No	35.3
67	London Rd/Earl Place	No	No	75	N/A	N (façade)	45.5
68	London Rd /Parsons GrnT	No	No	100	N/A	N (façade)	31.5
69	London Rd/Wolseley Pl	No	No	100	N/A	N (façade)	50.4
70	London Rd/Wolseley Terr	No	No	75	N/A	N (façade)	42.4
50a	Whitehouse Road	No	No	100	N/A	Yes	27.8
61	Maybury Rd/Queensferry Rd	No	No	100	N/A	Yes	25.8
62	Queensferry Rd No 561	No	No	100	N/A	N (façade)	19.2
63	Queensferry Rd No 544	No	No	100	N/A	N (façade)	25.2
64	Queensferry Rd No 550	No	No	91.6	N/A	Yes	43.9
43	Broughton Road	No	No	91.6	N/A	N (façade)	34.6
44	Broughton Street	No	No	100	N/A	N (façade)	32.8
14	Trinity Crescent	No	No	100	N/A	Yes	28.9
7	Commercial Street	No	No	83.3	N/A	N (façade)	32.2
9	Commercial Street	No	No	100	N/A	N (façade)	31.2
15	Glasgow Road	No	No	83.3	N/A	Yes	40.9
16	Glasgow Road	No	Yes	100	N/A	Yes	43.8
56	Glasgow Road No 18/20	No	No	91.6	N/A	Yes	29.5

Nitrogen Dioxide Passive Diffusion Tube Data 2011							
Site ID	Location	Within AQMA ?	Result is Mean of Duplicate Tube	Data Capture 2011 %	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81)
							2011 ($\mu\text{g}/\text{m}^3$)
57	Glasgow Road No 158	No	No	100	N/A	Yes	36.5
58	Glasgow Road No 319	No	Yes	83.3	N/A	Yes	51.5
8	Morningside Road	No	N	75	N/A	Yes	28.6
10	Home Street	No	N	66.6	Yes	N (façade)	25.7
13	Deanhaugh Street	No	N	100	N/A	Yes	33.5
4	Calder Road	No	N	100	N/A	Yes	31.7
31	Dalkeith Road	No	N	100	N/A	Yes	28.0
35	Dundas Street	No	N	100	N/A	Yes	30.6
32	Niddrie Mains Road	No	N	91.6	N/A	Yes	30.9
11	Lanark Road	No	N	100	N/A	Yes	22.5
19	Baileyfield Road	No	N	100	N/A	Yes	24.3
38	Melville Drive	No	N	83.3	N/A	Yes	27.3
34	India Street	No	N	66.6	No	No	23.6 ^b
40	Hillhouse Road	No	N	91.6	N/A	N (façade)	34.2
41	Hillview Terrace	No	N	91.6	N/A	No	18.4 ^b
42	Midmar Drive	No	N	100	N/A	No	16.1 ^b
45	Ferry Road	No	N	100	N/A	N (façade)	32.6
45b	Ferry Road	No	N	66.6	Yes	N (façade)	32.7
45d	Ferry Road	No	N	83.3	N/A	N (façade)	39.6
52	Ferry Road No 268	No	N	100	N/A	Yes	32.5
53	Bowhill Terrace No 6	No	N	100	N/A	Yes	32.5
55	Inverleith Row	No	Yes	100	N/A	N (façade)	43.8
29	Bernard Street (Leith)	No	N	91.6	N/A	N (façade)	38.9
29a	Bernard Street (Leith)	No	Yes	95.8	N/A	N (façade)	41.9
29b	Bernard Street (Leith)	No	N	91.6	N/A	N (façade)	32.7
29c	Bernard Street (Leith)	No	Yes	87.5	N/A	N (façade)	44.6
51b	Salamander St/Bath Rd	No	N	83.3	N/A	N (façade)	37.0

Nitrogen Dioxide Passive Diffusion Tube Data 2011							
Site ID	Location	Within AQMA ?	Result is Mean of Duplicate Tube	Data Capture 2011 %	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81) 2011 ($\mu\text{g}/\text{m}^3$)
51c	Salamander St/Baltic St	No	N	100	N/A	N (façade)	38.5
9a	Commercial St/Port Place	No	N	66.6	Yes	Yes	41.0
9b	Ocean Drive	No	N	83.3	N/A	N (façade)	26.2
71	Portobello High St - west	No	Yes	100	N/A	N (façade)	36.0
72	Seafield Rd - east	No	N	100	N/A	N (façade)	33.1
73	Portobello High St – east	No	N	75	N/A	N (façade)	26.3
74c	George Street No 41	Yes	N	100	N/A	Yes	41.1
74e	George St/Charlotte Sq	Yes	N	83.3	N/A	Yes	42.5
74f	George Street No 112	Yes	N	100	N/A	N (façade)	44.7
75a	St Colme Street	No	N	100	N/A	Yes	36.5
75b	Great Stuart Street	No	N	100	N/A	Yes	33.4
37	Grassmarket	No	N	66.6	Yes	Yes	32.5
37a	Grassmarket	No	Yes	83.3	N/A	N (façade)	42.0
48	Cowgate	No	N	83.3	N/A	N (façade)	40.2
48a	Cowgate	No	N	66.6	Yes	N (façade)	31.4
76	Angle Park Terrace	No	N	100	N/A	N (façade)	44.4
77	Slateford Rd	No	N	100	N/A	N (façade)	38.1
78	Slateford Rd/ Maltings	No	N	83.3	N/A	N (façade)	30.2
79	Fountainbridge/Tollcross	No	N	91.6	N/A	N (façade)	36.3
80	Gorgie Rd /Delhaig	No	N	100	N/A	N (façade)	42.2
17a	Hope Park Terrace	No	N	100	N/A	N (façade)	37.4

^a Princes Street (ID47) data in brackets represents pavement exposure 2.5m from the kerb, data without brackets represents concentrations at the façade.

^b Background sites at India Street (ID34), Hillview Terrace (ID41) and Midmar Drive (ID42) were not distance corrected to relevant exposure or annualised where data capture was poor as concentrations were low.

Table 2.5a Results of New Nitrogen Dioxide Diffusion Tubes in 2011

Nitrogen Dioxide Passive Diffusion Tube Data – New Tubes Sites in 2011							
Site ID	Location	Within AQMA?	Result is Mean of Duplicate Tube	Data Capture 2011 %	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81)
37b	Grassmarket	No	No	100	N/A	N (façade)	37.1
81	London Road/ENorton PI	No	No	100	N/A	N (façade)	51.2
82	Piersfield Terrace	No	No	91.6	N/A	N (façade)	27.8
73a	Portobello Road/Ramsay	No	No	100	N/A	Yes	41.6
73b	Portobello High St No 23	No	No	100	N/A	N (façade)	31.2
73c	Portobello High St No 288	No	No	83.3	N/A	N (façade)	22.9
55b	Inverleith Row/SummerPI	No	No	100	N/A	N (façade)	33.7
55c	Inverleith Row/Montague	No	No	100	N/A	Yes	28.2
75c	Gt Stuart St/Randolph Cr	No	No	100	N/A	Yes	32.4

Table 2.6 Locations outwith AQMAs where 2011 monitoring results showed exceedences of the Annual Mean Nitrogen Dioxide Objective

Nitrogen Dioxide PDT Data – Excedances Outwith an AQMA in 2011			
Site ID	Location	Data Capture %	Annual Mean Concentration 2011 ($\mu\text{g}/\text{m}^3$)
64	Queensferry Rd 550	91.6	43.9
55	Inverleith Row	100	43.8
76	Angle Park Terrace	100	44.4
73a	<i>Portobello Road/Ramsay</i>	100	41.6

Note - New (2011) monitoring locations not previously reported are highlighted in italic above.

Table 2.7 Results of Nitrogen Dioxide Diffusion Tubes (2008 to 2011)

Nitrogen Dioxide PDT Data 2008 to 2011						
Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$			
			2008 (Bias Adjustment Factor = 0.88)	2009 (Bias Adjustment Factor = 0.86)	2010 (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.81)
1	St John's Road	Yes	41.2	36.7	38.6	35.1
1b	St John's Road	Yes	48.8	44.2	43.5	38.4
1d	St John's Road	Yes	84.9**	57.8	58.8	56.3
39	St John's Road	Yes	31.7	28.2	31.1	30.0
2	West Maitland Street	Yes	70.1**	45.6	52.4	55.3
3	Torphichen Place	Yes	58.2	26.3	55.6	55.1
24	Princes Street/Mound	Yes	51.5	36.2	49.3	N/A
47	Princes Street	Yes	51.7 (64) ^{a**}	31.6 (34) ^a	47.5 (58) ^a	38.9 (45.3) ^a
23	Roseburn Terrace	Yes	49.5	37.2	43.2	34.5
27	North Bridge – south	Yes	52.3	48.4	49.4	48.7
5	Gorgie Road	Yes	44.3	42.6	42.9	44.4
18	Gorgie Road	Yes	51.5	45.0	54.5	48.2
33	Queen St/Hanover St	Yes	43.7	50.8	56.3	50.0
36	York Place	Yes	40.5	37.5	39.0	35.4
21	Leith Walk/Brunswick Rd	Yes	37.3	35.3	35.4	34.2
20	Leith Walk/McDonald Rd	Yes	53.1	36.8	38.1	N/A
28	West Port	Yes	53.3	47.7	51.0	43.5
28b	West Port	Yes	72.5**	66.7**	62.4**	57.0
28c	West Port	Yes	51.5	43.5	41.5	39.0
28d	West Port	Yes	66.6**	60.2**	54.9	55.2
30	Gt Junction Street	Yes	44.6	44.1	41.8	39.1
30b	Gt Junction Street	Yes	38.4	38.5	39.9	40.0

Nitrogen Dioxide PDT Data 2008 to 2011

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$			
			2008 (Bias Adjustment Factor = 0.88)	2009 (Bias Adjustment Factor = 0.86)	2010 (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.81)
30c	Gt Junction Street	Yes	50.2	42.6	44.1	38.4
30d	Gt Junction Street	Yes	39.0	37.1	39.9	33.8
30e	Gt Junction Street	Yes	43.1	41.9	38.7	41.2
49	Morrison Street	Yes	61.4**	44.6	49.3	48.5
25	Easter Road	No	58.2	50.8	49.7	43.6
25b	Easter Road	No	44.9	38.8	39.1	35.8
25c	Easter Road	No	43.8	38.0	37.7	41.0
25d	Easter Road	No	40.8	37.3	37.1	32.7
25e	Easter Road	No	37.3	34.1	34.2	32.0
25f	Easter Road	No	35.0	30.1	32.5	27.9
25g	Easter Road	No	33.4	27.9	30.3	26.8
46	London Road	No	52.3	43.4	46.2	40.4
66	London Rd/Regent Rd	No	-	43.0	40.5	N/A
67	London Rd/Earl Place	No	-	47.9	51.3	45.5
68	London Rd /ParsonsGrnT	No	-	30.4	36.6	31.5
69	London Rd/Wolseley PI	No	-	56.2	50.6	50.4
70	London Rd/Wolseley Terr	No	-	47.3	46.1	42.4
43	Broughton Road	No	40.4	38.1	39.8	34.6
44	Broughton Street	No	37.7	35.1	35.3	32.8
14	Trinity Crescent	No	28.3	28.6	27.5	28.9
7	Commercial Street	No	38.6	34.8	34.2	32.2
9	Commercial Street	No	40.4	31.6	36.7	31.2
9a	Commercial St/Port Place	No	-	-	38.1	41.0
9b	Ocean Drive	No	-	-	33.0	26.2
15	Glasgow Road	No	35.7	42.0	37.6	40.9

Nitrogen Dioxide PDT Data 2008 to 2011

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$			
			2008 (Bias Adjustment Factor = 0.88)	2009 (Bias Adjustment Factor = 0.86)	2010 (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.81)
16	Glasgow Road	No	42.4	46.8	44.5	43.8
56	Glasgow Road No 18/20	No	-	28.6	30.7	29.5
57	Glasgow Road No 158	No	-	34.9	36.3	36.5
58	Glasgow Road No 319	No	-	51.1	51.3	51.5
8	Morningside Road	No	30.0	27.1	28.8	28.6
10	Home Street	No	37.4	32.3	36.5	25.7
13	Deanhaugh Street	No	32.3	30.1	33.0	33.5
4	Calder Road	No	29.5	26.3	25.9	31.7
17a	Hope Park Terrace	No	-	38.8	43.4	37.4
31	Dalkeith Road	No	31.8	28.1	27.8	28.0
35	Dundas Street	No	28.9	27.2	31.6	30.6
32	Niddrie Mains Road	No	26.9	30.7	32.5	30.9
11	Lanark Road	No	24.8	22.3	23.5	22.5
19	Baileyfield Road	No	24.6	22.5	27.5	24.3
38	Melville Drive	No	26.2	25.3	27.6	27.3
34	India Street	No	22.7	22.6	22.7	23.6
40	Hillhouse Road	No	44.4	37.4	42.4	34.2
41	Hillview Terrace	No	19.6	21.2	22.4	18.4
42	Midmar Drive	No	17.4	15.2	18.4	16.1
45	Ferry Road	No	39.6	35.4	41.5	32.6
45b	Ferry Road	No	35.3	30.9	33.5	32.7
45d	Ferry Road	Yes	42.4	40.9	38.3	39.6
52	Ferry Road No 288	No	-	32.1	32.4	32.5
53	Bowhill Terrace No 6	No	-	36.4	34.8	32.5
29	Bernard Street (Leith)	No	45.3	45.1	43.7	38.9

Nitrogen Dioxide PDT Data 2008 to 2011

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$			
			2008 (Bias Adjustment Factor = 0.88)	2009 (Bias Adjustment Factor = 0.86)	2010 (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.81)
29a	Bernard Street (Leith)	No	48.0	42.0	44.6	41.9
29b	Bernard Street (Leith)	No	41.3	32.9	36.9	32.7
29c	Bernard Street (Leith)	No	53.4	48.2	49.4	44.6
51b	Salamander St/Bath Rd	No	-	37.4	40.3	37.0
51c	Salamander St/Baltic St	No	-	37.1	36.2	38.5
74c	George Street No 41	Yes	-	-	39.5	41.1
74e	George St/Charlotte Square	Yes	-	-	42.6	42.5
74f	George Street No 112	Yes	-	-	43.4	44.7
75a	St Colme Street	No	-	-	38.5	36.5
75b	Great Stuart Street	No	-	-	36.2	33.4
75c	Gt Stuart St/Randolph Cr	No	-	-	-	32.4
76	Angle Park Terrace	No	-	-	52.9	44.4
77	Slateford Road	No	-	-	47.6	38.1
78	Slateford Rd/ Maltings	No	-	-	35.9	30.2
79	Fountainbridge/Tollcross	No	-	-	42.0	36.3
80	Gorgie Road /Delhaig	No	-	-	47.4	42.2
81	London Road/ENorton PI	No	-	-	-	51.2
82	Piersfield Terrace	No	-	-	-	27.8

^a Princes Street data (ID47) in brackets represented pavement exposure 2.5m from the kerb, data without brackets represents concentrations at the façade.

** NB Likely to also exceed 1 hourly objective ($60\mu\text{g}/\text{m}^3$ or above as an annual mean)

Tables 2.7a to 2.7d – Nitrogen Dioxide Detailed Assessments

Nitrogen Dioxide Detailed Assessments						
Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m ³			
			2008 (Bias Adjustment Factor = 0.88)	2009 (Bias Adjustment Factor = 0.86)	2010 (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.81)
Grassmarket/Cowgate – Detailed Assessment – Table 2.7a						
37	Grassmarket	No	35.1	35.4	38.4	32.5
37a	Grassmarket	No	42.3	40.5	60.0**	42.0
37b	Grassmarket	No	-	-	-	37.1
48	Cowgate	No	46.6	39.8	46.2	40.2
48a	Cowgate	No	-	-	37.7	31.4
Portobello High Street – Detailed Assessment – Table 2.7b						
71	Portobello High St – west	No	-	43.0	39.2	36.0
72	Seafield Road – east	No	-	35.0	38.4	33.1
73	Portobello High St - east	No	-	26.3	25.5	26.3
73a	Portobello Road/Ramsay	No	-	-	-	41.6
73b	Portobello High St No23	No	-	-	-	31.2
73c	Portobello High St No288	No	-	-	-	22.9
Inverleith Row – Detailed Assessment – Table 2.7c						
55	Inverleith Row	No	-	42.6	44.0	43.8
55b	Inverleith Row/SummerPI	No	-	-	-	33.7
55c	Inverleith Row/Montague	No	-	-	-	28.2

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m³			
			2008 (Bias Adjustment Factor = 0.88)	2009 (Bias Adjustment Factor = 0.86)	2010 (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.81)
Queensferry Road – Detailed Assessment – Table 2.7d						
50a	Whitehouse Road	No	31.4	29.8	32.1	27.8
61	Maybury Rd/Queensferry	No	-	24.2	27.0	25.8
62	Queensferry Road No 561	No	-	22.0	25.6	19.2
63	Queensferry Road No 544	No	-	27.6	29.4	25.2
64	Queensferry Road No 550	No	-	46.8	47.5	43.9
Annual Mean Results from Queensferry Road Automatic Monitoring Station at relevant receptor						29
Note	No hourly mean exceedences were monitored at the automatic monitoring station ** likely also to exceed 1 hourly objective of 60ug/m³ as an annual mean					

Table 2.8 Locations outwith AQMAs where monitoring results indicated Potential Exceedences of the Annual Mean Nitrogen Dioxide Objective

Potential Exceedences of Nitrogen Dioxide Annual Mean Out With AQMA's						
Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$			
			2008 (Bias Adjustment Factor = 0.88)	2009 (Bias Adjustment Factor = 0.86)	2010 (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.81)
43	Broughton Road	N	40.4	38.1	39.8	34.6
40	Hillhouse Road*	N	44.4	37.4	42.4	34.2
17a	Hope Park Terrace*	N	-	38.8	43.4	36.6
45	Ferry Road	N	39.6	35.4	41.5	32.6
51b	Salamander St/Bath St	N	-	37.4	40.3	37.0
51c	Salamander St/Baltic St	N	-	37.1	36.2	38.5
477	Slateford Road*	N	-	-	47.6	38.1
79	Fountainbridge/Tollcross*	N	-	-	42.0	36.3

* NB Sites which are part of 2012/13 Detailed Assessments

Trend Data from Nitrogen Dioxide Passive Diffusion Tubes within AQMAs

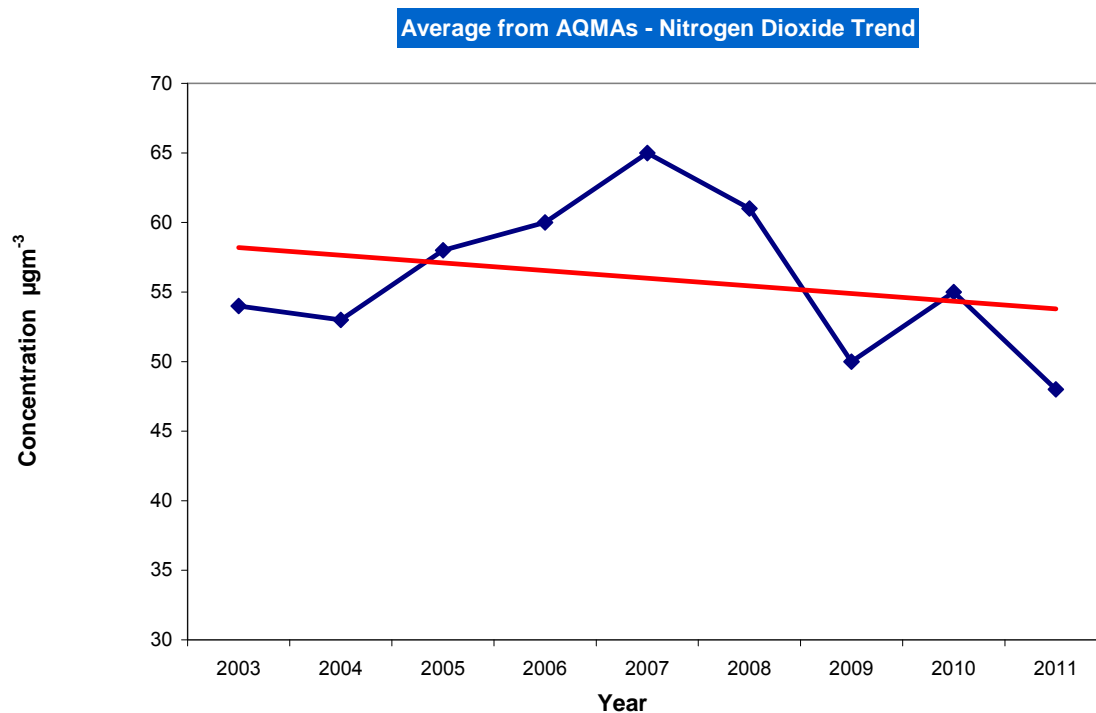
Passive diffusion tube data which has been used in the trend assessment has been corrected for bias and taken from the point of measurement (see Figure 2.4). This is to ensure consistency due to the change in methodology in 2008 for calculating nitrogen dioxide fall off with increasing distance from source.

Many of Edinburgh's historic monitoring sites within the Central AQMA were positioned at the kerbside/roadside and these locations have been retained for continuity. Trend lines have been drawn using an Excel simple regression statistical program. The trend data is based on the average mean concentrations obtained from passive diffusion tube monitoring at the following locations each year.

St John's Road (ID1)	West Maitland Street (ID2)	MacDonald Road (ID21)
St John's Road (ID1b)	Torphichen Place (ID3)	Roseburn Terrace (ID 23),
St John's Road (ID1d)	Gorgie Road (ID18)	Princes Street (ID 24)
North Bridge (ID 27),	Queen Street (ID 33)	York Place (ID 36),
Gt Junction Street (ID 30)	West Port (ID 55)	

Due to the loss of the Princes Street site (ID24) in 2011 suitable data was not available to use. Data used to establish the average trend is shown in Appendix C.

Figure 2.4 Trend in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites in AQMAs



The average data for 2011 shows a general decrease (11 per cent) compared with the first year of average trend data in 2003. Some of this decrease could be attributable to the low bias adjustment factor (lowest since 2003) as well as general disruption to traffic movements in the city centre.

Traffic disruption is due to road closures and traffic diversions associated predominately with construction of Edinburgh Tram and other infrastructure works, such as gas mains replacement at Queensferry Street (January to June 2011) and the redevelopment of Waverly Steps (ongoing from February 2011).

The observed decrease has resulted in the year-on-year trend for diffusion tube monitoring data to exhibit a fall. However, caution should be applied to this considering the significant level of temporary changes in traffic.

2.2.2 PM₁₀

Other than the sites at St Leonard's (AURN) and Queensferry Road, which operate a Filter Dynamics Measurement System (FDMS) unit, PM₁₀ monitoring is undertaken using Tapered Element Oscillating Microbalance (TEOM) instruments.

The data at Queen Street, Roseburn, Salamander Street and Currie has been corrected to provide a gravimetric equivalent, using the Kings College Volatile Correction Model (VCM). This is discussed in Appendix A4.

The data has also been gravimetrically corrected using Edinburgh's local derived gravimetric factor of 1.14 for comparison and continuity with historical data. The data shows that the two correction methodologies are comparable. Data is shown in Table 2.9 and Table 2.10.

All monitoring locations are representative of relevant public exposure.

Table 2.9 Results of Automatic Monitoring of PM₁₀: Comparison with Annual Mean Objective (notes overleaf)

PM ₁₀ Data From Automatic Monitoring Sites Compared to Annual Mean							
Site ID	Location/ Type	Within AQMA?	Data Capture %	Annual mean concentrations (µg/m ³)			
				2008	2009	2010	2011
1	Queen St TEOM	Y (NO ₂)	94.0	(vcm) 19 (1.14) 19	(vcm) 18 (1.14) 18	(vcm) 18 (1.14) 19	(vcm) 16 (1.14) 16
3	Roseburn ^a TEOM	Y (NO ₂)	60.9	(vcm) 16 (1.14) 16	(vcm) 15 (1.14) 15	(vcm) 15 (1.14) 15	(vcm) 15 (1.14) 15
6	Currie ^b TEOM	N	99.0	-	-	(vcm) 11 (1.14) 11	(vcm) 13 (1.14) 11
7	St Leonard's FDMS	N	98.4	15	17	14	15
8	Salamander St TEOM	N	97.1	-	(vcm) 22 (1.14) 23	(vcm) 26 (1.14) 27	(vcm) 26 (1.14) 27
9	Queensferry Road FDMS ^c	N	62.5	-	-	-	21

^a Roseburn station ceased operating in August 2011. Concentrations were not annualised due to a lack of reliable data from appropriate background sites.

^bCurrie station was not supported by the Scottish Government's data QA/QC programme. The PM₁₀ data at this site was ratified by the Local Authority.

^c Concentrations not annualised due to sporadic data capture and a lack of reliable data from appropriate background sites.

Exceedences of the Scottish Air Quality Annual Mean Objective of 18ug/m³ are highlighted in **bold red**

Table 2.10 Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour mean (daily) Objective

PM ₁₀ Data From Automatic Monitoring Sites Compared to 24-Hour Mean							
Site ID	Location/ Type	Within AQMA?	Data Capture 2011 %	Number of Exceedences of daily mean objective (50 µg/m ³) If data capture < 90%, include the 98 th percentile (in Scotland) of daily means in brackets.			
				2008	2009	2010	2011
1	Queen Street TEOM	Y (NO ₂)	94.0	0	1	1	0
3	Roseburn TEOM	Y (NO ₂)	60.9	0	0	0	0 (34µg/m ³)
6	Currie ^a TEOM	N	99.0	-	-	0	0
7	St Leonard's FDMS	N	98.4	0	2	1	0
8	Salamander St TEOM	N	97.1	-	2(44)	19	22
9	Queensferry Road FDMS	N	62.5	-	-	-	2

^a Currie station is not supported by the Scottish Government's data QA/QC programme. The PM₁₀ data at this site is ratified by the Local Authority

Note: Where the period of valid data is less than 90% of a full year, the 99.8th percentile of the hourly mean data that has been collected is described in brackets. Exceedences of the daily mean objective are highlighted in **bold red**. In Scotland the permitted number is 7.

Data from all monitoring locations in 2011 meet the PM₁₀ EU limit values and UK National Objectives. Background sites at St Leonard's and Currie, and roadside locations at Roseburn and Queen Street also meet the tighter Scottish Air Quality

Annual Mean Objective of $18\mu\text{g}/\text{m}^3$. Queensferry Road AQMS and Salamander Street AQMS did not meet the annual mean Scottish Air Quality Objective of $18\mu\text{g}/\text{m}^3$ for PM_{10} .

Salamander Street AQMS also did not meet the permitted number of daily exceedences. It is likely that fugitive emission sources from an adjacent scrap yard and cement batching process contribute to this exceedence. Fugitive emissions are being investigated in conjunction with Edinburgh Scientific Services and SEPA and the findings will be reported in the city-wide PM_{10} Detailed Assessment Study.

Based on new and historical data the requirement to progress the city-wide Detailed Assessment remains valid.

Further analysis is required to determine the contribution from road traffic pollution and that derived from other sources. Findings should be reported in the city-wide PM_{10} Detailed Assessment study due in 2013.

Trend in Annual Mean PM_{10} concentrations.

Uncorrected TEOM data (non-volatile fraction) has been used to assess PM_{10} trends due to changes in gravimetric correction methodology.

The non-volatile fraction of the FDMS data for years 2008 to 2011 at St Leonard's has also been used to ensure a consistent approach. Although non-volatile data was used for the trend assessment at St Leonard's, this has to be viewed with caution as the TEOM instrument was replaced with a FDMS unit in 2008. Trend lines have been drawn using an Excel simple regression statistical program.

Data trends are shown in Figures 2.5a and 2.5b and are summarised in Table 2.11 (overleaf).

Table 2.11 Summary of PM₁₀ Annual Mean Trend Data

Monitoring Location / Type	Trend in annual mean PM ₁₀ (years)	Concentrations of PM ₁₀
Queen Street (Roadside)	↓ (1999 to 2011)	Decreasing
St Leonard's (Urban background)	↓ (2004 to 2011)	Decreasing

Downward trends in PM₁₀ concentrations are noted at St Leonard's and Queen Street.

Although the PM₁₀ trends remained downward it is considered prudent to continue with the Detailed Assessment of PM₁₀ due in 2013.

Figure 2.5a Trend in Uncorrected Annual Mean Non Volatile Fraction PM₁₀ Concentrations (µg/m³) measured at Queen Street

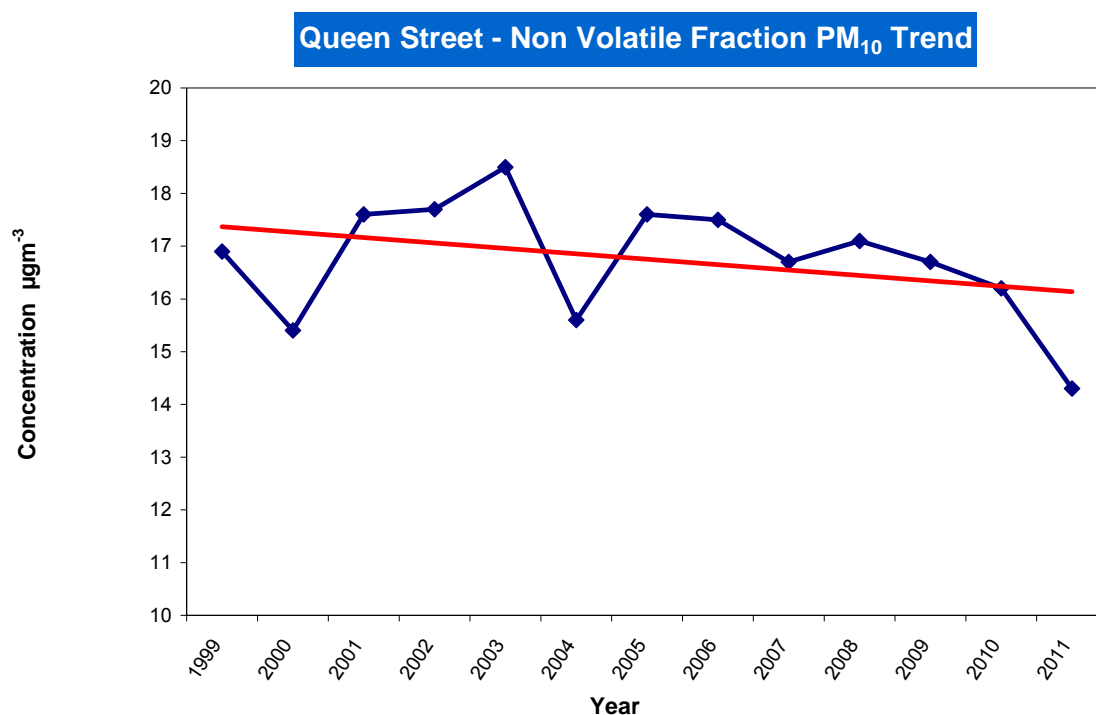
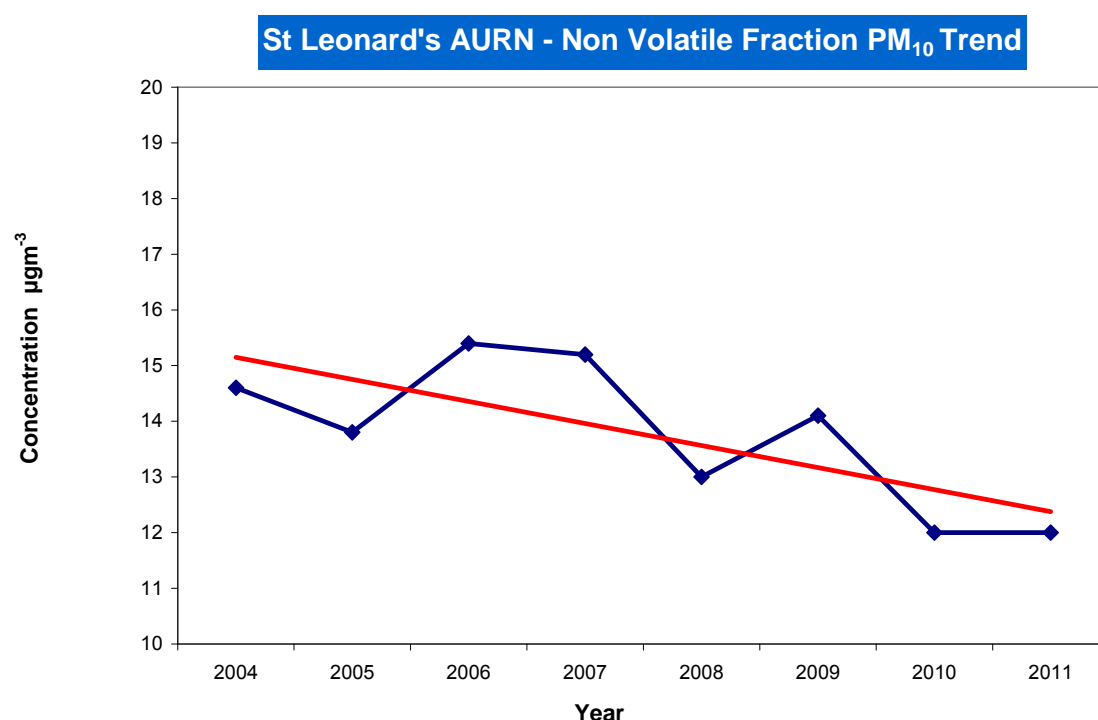


Figure 2.5b Trend in Uncorrected Annual Mean Non Volatile Fraction PM₁₀ Concentrations (µg/m³) measured at St Leonard's AURN



2.2.3 Sulphur Dioxide

Historical and current data from the urban background site at St Leonard's shows that the 15-minute, 1-hour and 24-hour monitoring periods all met their appropriate Objectives. Table 2.12

Table 2.12 Results of Automatic Monitoring of SO₂: Comparison with Annual Mean Objective

Sulphur Dioxide Data from Automatic Monitoring Compared to Annual Mean						
Site ID	Site Type	Within AQMA ?	Monitoring Year (% Data Capture)	Number of Exceedences (percentile in bracket µg/m ³)		
				15-minute Objective (266 µg/m ³)	1-hour Objective (350 µg/m ³)	24-hour Objective (125 µg/m ³)
St Leonard's	Urban Background	N	2009 (95%)	0	0	0
			2010 (92%)	0	0	0
			2011 (98%)	0	0	0

2.2.4 Benzene

Benzene is no longer monitored within the Local Authority area.

2.2.5 Other pollutants monitored

The UK Government and Devolved Administrations are responsible for the review and assessment of the following pollutants: Ozone, Polycyclic Aromatic Hydrocarbons (PAHs) and PM_{2.5}. These pollutants were monitored at the AURN site at St Leonard's and data is presented below.

2.2.5.1 Ozone

Ozone concentrations did not meet UK objective between the years 2007 to 2009, but did meet the objective in 2010 and 2011. Table 2.13

Table 2.13 Number of Ozone exceedences at St Leonard's

St Leonard's [Urban BG]	2007	2008	2009	2010	2011
No. of exceedences	11	14	12	0	0
Ozone Objective 100µgm ⁻³ not to be exceeded more than 10 times per year as an 8-hour running mean by 31 st December 2005					

2.2.5.2 PM_{2.5}

PM_{2.5} monitoring commenced at St Leonard's in November 2008. Annual mean concentrations have increased annually since 2009. The measured concentration in 2011 was at the limit value of 12µg/m³. Table 2.14.

Table 2.14 PM_{2.5} Average annual concentrations

St Leonard's [Urban BG]	2009	2010	2011
Annual Concentration (µg/m ³)	8	9	12
PM_{2.5} Scottish Objective 12µg/m ³ annual average (limit) 2010. This target is not in Air Quality Regulations			

2.2.5.3 Polycyclic Aromatic Hydrocarbons (PAHs)

There are a range of PAHs with benzo (a) pyrene (BaP) used as a marker. Concentrations monitored at St Leonard's complied with the UK Objective. Monitoring is undertaken using a digital sampler. Concentrations and a comparison with the objective are shown in Table 2.15.

Table 2.15 PAH (B(a)P) Monitoring: Comparison with Objective

St Leonard's [Urban BG]	2009	2010	2011
Annual Concentration (ngm ⁻³)	0.115	0.129	0.099
BaP Objective 0.25ngm ⁻³ as an annual average by 31 December 2010			

2.2.6 Summary of Compliance with AQS Objectives

City of Edinburgh Council has measured concentrations of nitrogen dioxide and PM₁₀ above the annual mean and 24-hour mean (PM₁₀) at relevant locations outside of AQMA's and **will need to proceed to a Detailed Assessment**, at the following location;

Nitrogen Dioxide

Portobello Road/Sir Harry Lauder Road junction.

Detailed assessments are being progressed at the following locations. Additional monitoring commenced in 2012:

Angle Park Terrace, Slateford Road, Hillhouse Road, Hope Park Terrace and Fountainbridge/Tollcross

PM₁₀

City-wide for exceedences of Scottish Objectives as identified in Progress Report 2011.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Major consented developments adjacent to Leith Street and Morrison Street when constructed will also form street canyons. These sites are located within the Central AQMA.

New residential development constructed on Gorgie Road forms a street canyon. This site is located within the proposed extension to the Central AQMA

Monitoring will continue in all these areas.

Street canyons may also be formed as a result of consented developments at Brunswick Road and Salamander Place. These areas will be reviewed once completed.

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

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

There are no new locations identified outwith the existing AQMAs where there is public exposure of 1-hour or more close to traffic.

The Central AQMA is being extended to include the Grassmarket where public exposure is prevalent. However, it is unlikely that concentrations at this location will exceed the 1-hour Objective.

The City of Edinburgh confirmed that there are no new or newly identified busy streets where people may spend 1 hour or more close to traffic.

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

Construction of Edinburgh Tram is on-going. Phase 1 will operate between Edinburgh Airport and York Place and is due to be operational by summer 2014. The route is unlikely to be extended to Leith/Ocean Terminal in the foreseeable future. Consequently, it is likely that the existing level of bus services will be retained and a proportion potentially re-routed on a permanent basis. Additional Traffic Regulation Orders are being promoted by the Council's Transport Authority in relation to post-tram traffic management. Investigation of the potential impacts on HGV and bus routing, in particular into and through the city centre, is required.

The City of Edinburgh confirmed that there is a potential for newly identified roads with high flows of buses/HGVs.

3.4 Junctions

Previous Review and Assessment work based on measured data from roadside and urban background locations concluded that a city-wide Detailed Assessment was necessary for PM₁₀. DMRB modelling identified that London Road, Ferry Road/Inverleith and Slateford Road may not meet the PM₁₀ Scottish Objective².

Technical issues with the monitoring stations at Glasgow Road and Queensferry Road have delayed completion of the city-wide study, which is ongoing.

The City of Edinburgh Council confirmed that there are no new or newly identified busy junctions/busy roads. **The city-wide Detailed Assessment for PM₁₀ is being progressed .**

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

Construction of the Forth Replacement Crossing has commenced and is due for completion in 2016. In accordance with the project's Environmental Management Plan, dust and PM₁₀ are being monitored. A number of automatic light scatter meters are sited at a number of sensitive locations to measure PM₁₀ concentrations. Frisbee dust deposition gauges are also deployed to measure dust deposition rates across the construction site.

The Local Authority strongly recommended to the project's management that monitoring results be correlated with regional concentrations of PM₁₀ to ensure a comparative assessment and that consideration be given to the use of a reference (or equivalent) methodology during the construction period. This advice was accepted.

Mitigation measures are applied where the agreed threshold limits for airborne dust are breached, as detailed in the Air Quality and Dust Management Plan.

The Environmental Impact Assessment carried out for the project concluded that there was no relevant exposure on the small stretch of the M8 where exceedences of nitrogen dioxide occurred.

There are conceptual proposals for construction of a new east-west road between Seafield Road and Ocean Drive/Constitution Street, with additional improvements to the Lindsay Road junction. These areas are in close proximity to the Great Junction Street AQMA. It was recommended to the promoters that an air quality impact assessment be undertaken in support of these proposals.

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

3.6 Roads with Significantly Changed Traffic Flows

Many areas within Edinburgh are subject to major regeneration proposals in locations where there are current air quality concerns². Following recent reforms of the Planning system in Scotland a new Strategic Development Plan (SDP) was published in November 2011 by SESplan, the Strategic Development Planning Authority for Edinburgh and South East Scotland. The plan aimed to facilitate and steer development across Edinburgh and South East Scotland between 2012 and 2032.

The Local Authority is reviewing and unifying its Local Plans, by way of a Main Issues Report to assess and analyse a number of options for a new Local Plan. The Proposed SDP & the LDP's Main Issues Report are available electronically³.

In addition, the Area Development Framework (ADF) for the area to the south of the city centre, known as the City Centre Southern Arc was approved by the Planning Committee on 1 March 2012. The ADF identified a series of projects aimed at improving pedestrian and cycle movement between Holyrood and Haymarket. These projects may have implications on the City Centre transport network, and will require further consideration. The projects focus on Haymarket and the Royal Mile within the Central AQMA, as well as Chambers Street and Tollcross on the periphery of the AQMA.

The finalised Waterfront and Leith ADF was approved by Planning Committee in October 2011. For Leith Docks the ADF and the Main Issues Report, described the planning consents that were in place to deliver a housing-led mixed use regeneration of the area as well as an alternative future, based on the continuation of port related activities and manufacturing for the renewables industry. Therefore, at this stage it is difficult to conclude whether there would be any change to the density of development at Leith Docks. One major improvement in the area is the withdrawal of plans to develop a biomass power plant. (See section 6.1.)

Local knowledge identified additional traffic on roads and junctions in the vicinity of schools and playgrounds at Balgreen and Hamilton Place. The increase in traffic is likely to be temporary due to city centre roads closures and diversions. As a precaution passive diffusion tube monitoring will be undertaken in these areas to assess the levels of nitrogen dioxide.

City of Edinburgh Council confirmed that there are no new or newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

Edinburgh Bus Station at St Andrew Square is within the Central AQMA. The majority of buses which use the station pass through both the St John's Road and Central AQMAs. There has been a slight increase in the number of movements of buses since the last Updating and Screening Assessment in 2009. However, this is still below the review and assessment criteria that would require further assessment.

Table 3.1 shows the number of bus movements reported previously and those in 2011. There are approximately a further 30 departures on a Monday and Friday, operated by tour companies.

Table 3.1 Comparison of daily mean bus movements in 2006, 2008 and 2011

Day	Daily Mean (2006)	Daily Mean (2008)	Daily Mean (2011)
Monday to Friday	560	702	776
Saturday	470	642	666
Sunday	242	346	410

City of Edinburgh Council confirmed that there are no relevant bus stations in the Local Authority area.

4 Other Transport Sources

4.1 Airports

Previous rounds of Review and Assessment work did not identify likely exceedences from aircraft emissions at Edinburgh Airport.

The number of airline passengers has increased since the previous round in 2009 from 9.004 to 9.385 million passengers per annum (mppa). Freight handling has decreased from 51,182 to 45,627 tonnes. Applying the guidance in section b.1 Box 5.4 TG(09), the amount of freight equates to 0.456 mppa. Therefore total mppa for Edinburgh Airport in 2011 is 9.84. Table 4.1.

Table 4.1 Comparison of annual airline passengers and freight between 2002 and 2011 at Edinburgh Airport

Edinburgh Airport	2002	2005	2009	2011
Passenger throughput (mppa*)	5.6	8.48	9.047	9.385
Freight (tonnes)	18,280	31,868	53,161	45,627
Total mppa including equivalent freight	5.78	8.79	9.58	9.84

*mppa million passengers per annum

Monitoring of nitrogen dioxide is carried out by AEA Technology on behalf of British Airports Authority (BAA) for six month periods at 2-3 year intervals using passive diffusion samplers at a number of locations within and outside the airport boundary. Data for 2010 was annualised and corrected using the national bias adjustment factor (0.95)⁴ to assess against air quality objectives.

Out of 19 monitoring locations seven sites exceeded the annual mean objective of 40µg/m³ for nitrogen dioxide. Table 4.2 (overleaf).

Table 4.2. Nitrogen dioxide concentrations ($\mu\text{g}/\text{m}^3$) monitored at Edinburgh Airport 2010.

Location	NO ₂ $\mu\text{g}/\text{m}^3$	Location	NO ₂ $\mu\text{g}/\text{m}^3$
Stand 9	61	Fuel Farm	42
International Arrivals	55	Main Short Stay Car-park	42
Coach Park entrance	52	Taxi area	50
Eastfield Road East	50		

The highest measured concentration in 2010 was found at Stand 9, with an estimated annual concentration of $61\mu\text{g}/\text{m}^3$. This is likely due to the extension of the first floor of the terminal building creating a sheltered canopy directly adjacent to the monitoring location.

The locations of exceedences are not considered relevant in terms of public exposure.

The estimated annual mean concentrations of NO₂ at Edinburgh Airport are higher than in previous studies. This may be due to the change in the bias adjustment factor which was higher than previous years.

The AEA Technology report stated that some of the increase was also attributed to an increase in vehicle traffic. The Local Authority has also recognised an increase in traffic levels at this locus and, as mentioned previously, is in the process of declaring an Air Quality Management Area on part of the A8 corridor, westbound from the airport, for breaches of the NO₂ objective. The Local Authority met with airport representatives in July 2012 to discuss potential initiatives to manage emissions.

A summary of the 2010 airport data can be found in the following report 'Air Quality at BAA Edinburgh Airport' – 2010. AEA Technology plc. March 2011⁵.

The City of Edinburgh Council confirmed that there are no airports that meet the specified criteria in the Local Authority area

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

East Coast Main Line's Craighentenny Service Delivery/Maintenance Depot is situated adjacent to residential property. Previous Review and Assessment work did not identify operations on this site which would adversely impact meeting the sulphur dioxide 15-minute objective.

An Environmental Ambient Air Quality Assessment carried out by the company at the depot in 2011, did not highlight any major concerns with sulphur dioxide pollutant concentrations. However, the Local Authority has identified deficiencies in the chosen methodology: in terms of comparisons made with the objectives. Consequently, the possibility of a short-term automatic-monitoring study will be explored with East Coast Main Line.

In general, there has been an improvement to the all-diesel fleet due to completion of the re-design of engines to manage low-sulphur emission fuel. There has also been some improvement in operations at the site with the installation of a new wash pad which resulted in a reduction of train movements. However, technical issues have delayed plans to develop a shore supply system, which would allow stationary vehicles to be linked to an electricity supply during servicing and maintenance.

Sidings at the Portobello Maintenance Depot are currently being used for nightly maintenance and servicing work. This is an intensification of the use of this site. Relevant exposure is 60m from this area, therefore it is not considered to be an issue for the purpose of assessment.

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

4.2.2 Moving Trains

Detailed Assessment work was carried out during 2009 with respect to potential exceedences of nitrogen dioxide objectives associated with the movement of diesel trains at Haymarket Station. The location, which is a cul-de-sac lane with a small number of motor vehicle movements, was identified as representing 'worse-case' exposure. The monitoring was 8m from the railway line and residential property is directly behind, 5m from the monitoring location. The data showed that moving trains will not result in exceedences of nitrogen dioxide objectives.

A summary of this data can be found in the following report – 2010 Air Quality Progress Report for City of Edinburgh Council².

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

4.3 Ports (Shipping)

Previous rounds of Review and Assessment did not identify shipping in Leith Docks to be a significant source of sulphur dioxide. The number of shipping movements at Leith Docks for the year 2011 was 1068, which is below the assessment criteria.

City of Edinburgh Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

5.1.1 New or Proposed Installations for which an Air Quality Assessment had been carried out

The North British Distillery Company in the Gorgie area of the city commenced operation of an anaerobic digestion facility in December 2011 following receipt of Local Authority planning permission and Scottish Environment Protection Agency (SEPA) regulated Pollution Prevention and Control permit. An air quality impact assessment undertaken to assess the change of operation predicted that there would be no exceedences of any of the National Air Quality Objectives where there was relevant exposure⁶.

City of Edinburgh Council has assessed new or proposed industrial installations, and concluded that it will not be necessary to proceed to a Detailed Assessment.

5.1.2 Existing Installations where Emissions had increased substantially or New Relevant Exposure had been introduced

Previous rounds of review and assessment work have not identified any installations in Edinburgh which give rise to significant emissions of the regulated pollutants. Consultation with SEPA was undertaken in this respect.

City of Edinburgh confirms that there are no industrial installations with substantially increased emissions, or new relevant exposure in their vicinity, within its area or nearby in a neighbouring authority.

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

Planning permission in principle has been granted by neighbouring Midlothian Council for Millerhill Zero Waste site, located on the boundary between both authorities, south-east of Edinburgh city centre near to Newcraighall. The proposals include an anaerobic digestion facility, mechanical biological treatment plant and an installation to produce energy from waste. At the detailed planning stage an air quality impact assessment will be carried out and assessed by the neighbouring local authority.

Cockenzie coal-fired Power Station in East Lothian will officially close on 31st March 2013. Although outside the Edinburgh boundary the power station is approximately 16km east of the City Centre. The power station was shut down for summer 2012, but will resume operations in the autumn and will run at half capacity until its closure. This closure is anticipated to have a positive impact on background concentrations of NO_x, SO_x and fine particles when an easterly wind blows towards the city.

Detailed information on the emissions from the Millerhill installation is required. City of Edinburgh Council will consider this proposed industrial installation in the neighbouring Local Authority area. The detailed proposals if available **will be assessed as a part of the Detailed Assessment for PM₁₀ city-wide study.**

5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots in the Local Authority area. Previous reports have assessed the crude oil storage tanks at Dalmeny and the fuel transfer facility at Hound Point in the Firth of Forth, for potential exceedences of benzene. However, no exceedences were identified.

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

5.3 Petrol Stations

A Petrol Vapour Recovery facility at ASDA supermarket at Chesser in the west of the city will be developed to the rear of the existing supermarket's car-park. The location is not in close proximity to busy roads and the nearest residential properties are 60m to the east. Conditions do not meet the criteria for further assessment in terms of the LAQM regime.

City of Edinburgh Council confirms that there are no petrol stations which meet the specified criteria.

5.4 Poultry Farms

The Gogar Poultry Complex on the outskirts of Edinburgh has been identified as meeting the criteria to progress to a Detailed Assessment. The Scottish Environment Protection Agency (SEPA) confirmed that the permit limit for the number of birds is 451,900.

There is relevant exposure within 24m of the poultry sheds on the farm. The sheds are mechanically ventilated. The Local Authority is waiting for further guidance from the Scottish Government with regard to assessment of this source.

It is anticipated that this would be considered when undertaking the citywide detailed assessment for PM₁₀.

City of Edinburgh Council has identified a poultry farm potentially meeting the specified criteria, and **will need to consider this in the city-wide Detailed Assessment for PM₁₀.**

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

The City of Edinburgh Council has actively discouraged new biomass installations of less than 20MWe through the planning process, due to the potential that urban background levels of PM₁₀ would be raised in relation to the Scottish National Objective and the need to progress to a Detailed Assessment city-wide for this pollutant.

The Local Authority raised concerns in relation to proposals to develop a biomass power station (200MWe) at Leith Docks in terms of emissions arising from the combustion process, transportation of fuel and waste and fugitive emissions associated with open-air storage of wood material. In 2011 the Local Authority received confirmation that the application for this development had been withdrawn.

There are four known commercial biomass installations in the Local Authority area; 122 Lasswade Road (150kW), Newbridge Industrial Estate (56kW), Royal Botanic Gardens (200kW) and Russell Road (Edinburgh Council Depot (360kW). The latter has not been operational for some time and was expected to be replaced with a natural gas boiler. Approval for funding is being sought.

Previous rounds of Review and Assessment identified potential exceedences from biomass installations at Lasswade Road and the Royal Botanic Gardens. Both will be considered in the city-wide Detailed Assessment for PM₁₀.

A biomass installation at Queen Margaret University in East Lothian, just outside the boundary of Edinburgh City Council became operational in 2011. An Air Quality Assessment⁷ carried out to assess the impact of the boiler indicated that the emissions would not result in exceedences of the objective for nitrogen dioxide and PM₁₀ at the closest receptors which were all located within East Lothian Council area.

City of Edinburgh Council has assessed biomass combustion plant, and concluded that **it will be necessary to consider the details as part of the city-wide Detailed Assessment for PM₁₀.**

6.2 Biomass Combustion – Combined Impacts

There have been no new small commercial biomass combustion installations nor areas identified where the combined impact of several small biomass sources may be relevant, since the last Air Quality Progress Report (2011).

The Council adopted Interim Planning Policy in 2010 to discourage the installation of commercial biomass combustion in the City.

An increasing trend in the use of domestic biomass (wood) installations has been identified. The Local Authority is collating a database of all domestic solid-fuel appliances that have been identified through local knowledge, enforcement activity, local area inspection and Planning and Building Control processes. The PM₁₀ source from small scale biomass will be considered in the city-wide Detailed Assessment.

City of Edinburgh Council has assessed the combined effect of biomass combustion plant, and concluded that **it will be necessary to proceed to a Detailed Assessment for PM₁₀.**

6.3 Domestic Solid-Fuel Burning

Smoke Control Orders are operational across the entire Local Authority area. There are no areas where significant levels of coal burning take place. However, previous Review and Assessment reports have mentioned an increasing trend in small scale

domestic solid-fuel burning, identified from odour and smoke issues in many areas of the city.

It is recognised that the use of open fires is occasional and therefore not likely to lead to exceedences of the sulphur dioxide objectives. As mentioned above, the Local Authority is collating a database of all known domestic solid-fuel appliances.

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

6.4 Combined Heat and Power Plants

A number of natural gas Combined Heat and Power (CHP) systems are proposed in the following areas of the City; Greendykes, Pleasance, Little France and Portobello (High School). These sites have been identified through the Planning and Development Management process. In relation to the requirements of the Clean Air Act, the Local Authority has requested that any plant with an output capacity above 366kW undertakes an appropriate chimney height calculation.

Assessment of potential cumulative air quality impacts of multiple CHP installations will become increasingly important, if a greater number of CHP systems are installed over the coming years. At the present time it is difficult to set an overall 'acceptable level' of CHP deployment in terms of local air quality, since technology and regulation is subject to change⁸. In the meantime the Local Authority is logging information of proposed CHP installations.

7 Fugitive or Uncontrolled Sources

There are potential fugitive sources from an existing scrap yard and a cement batching process at Bath Street/Salamander Street, which may be contributing towards the PM₁₀ concentrations monitored at the automatic station on Salamander Street. There are relevant receptors near to these sources of emissions and visual inspection has identified significant dust deposition around the monitoring station.

Both the scrap yard and cement batching plant are regulated by Scottish Environment Protection Agency (SEPA). City of Edinburgh Council has entered into discussion with SEPA regarding selective speciation measurement in conjunction with Scientific Services. This work was expected to be funded by SEPA and included in the city-wide Detailed Assessment Study of PM₁₀.

There are two quarries located at the periphery of the city, Hillwood and Ravelrig. Previous Review and Assessment work concluded that quarrying activity was not likely to result in any exceedences of the air quality objectives. However, these sources have been reconsidered in relation to the new Scottish Estimated Background Air Pollution Maps for PM₁₀ (2011). According to the maps the background concentration at the Hillwood Quarry is 18µg/m³ and 12µg/m³ at the Ravelrig quarry. These sources will be considered in more detail in the city-wide assessment for PM₁₀.

City of Edinburgh Council has identified potential sources of fugitive particulate matter that meet specified criteria, and **will need to proceed to a Detailed Assessment for PM₁₀, to be included in the city- wide assessment.**

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

Nitrogen dioxide

Nitrogen dioxide data for the year 2011 shows that the majority of monitoring locations within each of the AQMAs continue to exceed air quality objectives. Therefore, the AQMAs remain valid. Some sites within the AQMAs also show the NO₂ objective is met.

A number of monitoring locations outwith the current AQMAs exceed air quality objectives. Of these locations, London Road, Easter Road, Bernard Street (Leith), Glasgow Road, Commercial Street, Grassmarket and Cowgate will be included in the proposed extensions to the existing Central and Great Junction Street AQMAs and the declaration of a new AQMA at Glasgow Road/Newbridge. The Orders to ensure these changes to AQMAs are being drafted by the Local Authority's solicitor and the maps detailing the boundary changes are shown in Figures 1.1 to 1.4.

Other exceedences outwith AQMAs were noted at Inverleith Row, Angle Park Terrace, Queensferry Road and Portobello Road. A summary of all locations where monitoring results are at or exceed the objective are shown in Table 8.1.

Table 8.1 Summary of locations where monitoring results exceed the Nitrogen Dioxide objective

Locations where Nitrogen Dioxide Annual Mean Exceeded 40ug/m ³				
Site ID [#]	Location	Within AQMA?	Data Capture 2011 %	Annual mean concentration (Bias Adjust. factor = 0.81) 2011 (µg/m ³)
1d	St John's Rd	Y (St Johns)	91.6	56.3
5 [#]	St John's Road (AQMS)	Y (St Johns)	90.9	65
2	West Maitland St	Y (Central)	100	55.3
3	Torphichen Place	Y (Central)	100	55.1
47	Princes Street	Y (Central)	100	38.9 (45.3) ^a
27	North Bridge – south	Y (Central)	75.0	48.7
5	Gorgie Road	Y (Central)	100	44.4
18	Gorgie Road	Y (Central)	91.6	48.2
33	Queen St/Hanover St	Y (Central)	83.3	50.0
20	Leith Walk/ McDonaldRd	Y (Central)	41.6	45.5
28	West Port	Y (Central)	58.3	43.5
28b	West Port	Y (Central)	66.6	57.0
28d	West Port	Y (Central)	83.3	55.2
30b	Gt Junction Street	Y (Gt Junction St)	91.6	40.0
30e	Gt Junction Street	Y (Gt Junction St)	83.3	41.2
49	Morrison Street	Y (Central)	58.3	48.5
25	Easter Road	N* (Central)	91.6	43.6
25c	Easter Road	N* (Central)	91.6	41.0
46	London Road	N* (Central)	91.6	40.4
67	London Rd/Earl Place	N* (Central)	75.0	45.5
69	London Rd/Wols Place	N* (Central)	100	50.4
70	London Rd/Wolesley Ter	N* (Central)	75	42.4
64	Queensferry Road No550	N	91.6	43.9
15	Glasgow Road	N* (Newbridge)	83.3	40.9
16	Glasgow Road	N* (Newbridge)	100	43.8
58	Glasgow Road No 319	N* (Newbridge)	83.3	51.5
55	Inverleith Row	N	100	43.8
29c	Bernard St (Leith)	N*(Gt Junction St)	87.5	44.6
9a	Commercial St/Port Pl	N*(Gt Junction St)	66.6	41.0
74c	George Street No 41	Y (Central)	100	41.1
74e	George St/Charlotte Sq	Y (Central)	83.3	42.5
74f	George Street No 112	Y (Central)	100	44.7
37a	Grassmarket	N* (Central)	83.3	42.0
48	Cowgate	N* (Central)	83.3	40.2
76	Angle Park Terrace	N	100	44.4
80	Gorgie Rd /Delhaig	N* (Central)	100	42.2
81	London Rd/ENorton Pl	N* (Central)	100	51.2
73a	Portobello Road/Ramsay	N	100	41.6

(Notes for table overleaf)

Notes for Table 8.1

Passive Diffusion Tube analysis except 5#, which is automatic monitoring

* Sites located in AQMA to be declared

^a Princes Street (ID47) data in brackets represents pavement exposure 2.5m from the kerb, data without brackets represents concentrations at the façade.

Locations which are considered borderline with respect to exceeding the annual mean nitrogen dioxide Air Quality Objective are: Slateford Road, Fountainbridge /Tollcross, Hope Park Terrace and Hillhouse Road. Detailed Assessments are being progressed at these locations, including Angle Park Terrace, due to exceedences identified in the previous Air Quality Progress Report 2011.

Passive diffusion tube monitoring locations established along Portobello High Street fulfilling Detailed Assessment work have shown that there is no breach of the objective. An AQMA will not be required for this area. However, the monitoring did highlight an exceedence at Portobello Road/Sir Harry Lauder Road junction and further investigation will be necessary to consider the extent of the exceedence.

Detailed Assessment work at Inverleith Row shows that the exceedence is likely to be localised close to Ferry Road junction. This was based on new data and historical data, including duplicate passive diffusion tube analysis with 100% data capture. An AQMA will be required for this area.

Additional monitoring sites were established in the Grassmarket/Cowgate area in 2011 for Detailed Assessment. Sites show breaches of the annual mean objective or borderline results. The planned extension to the Central AQMA will encompass all these areas.

One location on Queensferry Road showed consistently elevated concentrations compared to the adjacent façade sites. Agreement was reached with a residential owner to permit an additional tube to be located at the façade of their property at a location coincident with the existing roadside site. Passive diffusion tube monitoring will commence in August 2012.

Particles (PM₁₀)

2011 data from all monitoring locations met with the PM₁₀ EU limit values and the UK National Objectives. The background sites at St Leonard's and Currie, and roadside locations at Roseburn and Queen Street met with the Scottish Air Quality Objectives.

Queensferry Road and Salamander Street did not meet the annual mean Scottish Air Quality Objective. Salamander Street also exceeded the permitted number of daily exceedences.

The requirement to progress to city-wide Detailed Assessment of PM₁₀ remains valid and will be completed in 2013, when it is anticipated that sufficient data will be collected. There has been poor data capture at Queensferry Road due to technical issues with the FDMS unit. The Roseburn Automatic Monitoring Station was relocated to Glasgow Road in November 2011. Re-commissioning of this station was delayed due to damage to equipment and analysers, sustained during the heavy storms of December 2011/January 2012. It is expected to be operational in summer 2012.

Trend Data

It has proved difficult to formulate reliable assumptions on data trends for both NO₂ and PM₁₀ due to disruptions to normal traffic flows, arising from construction works associated with Edinburgh Tram project.

The average roadside trend of nitrogen dioxide within the AQMAs (2003 to 2011) using passive diffusion tubes is beginning to fall. However, this has to be viewed with caution due to major traffic disruption.

NO₂ concentrations are decreasing at Queen Street and St John's Road, where a marked reduction in the number of hourly exceedences has been recorded. NO₂ concentrations at the AURN background site at St Leonards show a very slight increasing trend since the site was established in 2004. Data trend at Gorgie Road shows no change around the NO₂ annual mean of 40µg/m³

Downward trends showing a decrease in PM₁₀ concentrations are noted at St Leonard's and Queen Street.

8.2 Conclusions from Assessment of Sources

The assessment of road traffic sources supports previous review and assessment work that a city-wide study for PM₁₀ is undertaken.

The impact of changes to the tram proposals must be fully assessed with regards to bus displacements and potential congestion at junctions. Changes to the transport network in the 'Southern Arc' are also required to be further analysed.

Monitoring during the construction phase of the new Forth Road Replacement Crossing is being carried out and will be reviewed periodically by the Local Authority.

Proposals to develop a biomass power station in Leith have been withdrawn. The new Local Authority administration has pledged to oppose industrial biomass installation in Edinburgh⁹.

Impacts of the Millerhill Zero Waste site in neighbouring East Lothian will be considered as a part of the city-wide study for PM₁₀. The Local Authority is collating data on new CHP plants and domestic solid fuel appliances/installations, as identified through Planning and Building Standards processes.

There are potential fugitive sources from an existing scrap yard and a cement batching process at Bath Street/ Salamander Street, which may be contributing towards the PM₁₀ concentrations monitored at the automatic station on Salamander Street. Both are regulated by Scottish Environment Protection Agency (SEPA). City of Edinburgh Council is in discussion with SEPA regarding selective speciation measurement. This work will be funded by SEPA and included in the city-wide Detailed Assessment Study.

The poultry farm at Gogarburn and Hillwood quarry will also be taken into account during the city- wide PM₁₀ study.

8.3 Proposed Actions

The Local Authority will carry out the following actions:

Complete the legal process to extend and declare AQMAs, as required by the findings of the 2011 Progress Report.

Declare an AQMA to cover the junction of Inverleith Row and Ferry Road subject to the approval of this report.

Progress Detailed Assessments for NO₂ at the following locations: Hope Park Terrace/Clerk Street, Hillhouse Road, Slateford Road, Fountainbridge/Tollcross and Angle Park Terrace. The expected completion date is April 2013

Progress Detailed Assessment for PM₁₀ city-wide required in line with previous rounds of Review and Assessment.

Progress Detailed Assessment at Portobello Road/Sir Harry Lauder Road junction. Monitoring will commence in 2013.

Continue precautionary monitoring at Balgreen and Hamilton Place where local knowledge suggests a traffic increase in these areas (potentially temporary).

Commission the AQMS at Glasgow Road during summer 2012.

Discuss with Edinburgh Airport, Transport Scotland (Forth Replacement Crossing) and East Coast Main Line recommended best practice regarding methodologies and examine their general emissions reduction plans.

9 References

- 1 Population Projection for Scottish Areas, National Records of Scotland. 29 February 2012.
- 2 Progress Report 2010, City of Edinburgh Council, 2010.
- 3 Local and Strategic Development Plans, CEC website
http://www.edinburgh.gov.uk/info/178/local_and_strategic_development_plans/1019/local_and_strategic_development_plans/1.
- 4 National Bias Factors, DEFRA website
<http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>.
- 5 Air Quality at BAA Edinburgh Airport – 2010. AEA Technology plc, March 2011.
- 6 Anaerobic digestion plant – An air quality and odour impact assessment. Report No. G_North British, 16 June 2010, BMT Cordah.
- 7 Air Quality Assessment: Queen Margaret University Biomass Boiler, Report to East Lothian Council, AEA, October 2010.
- 8 Combined Heat and Power: Air Quality Guidance for Local Authorities, Environmental Protection UK, February 2012.
- 9 A New Contract with the Capital, Coalition Agreement between Edinburgh Labour Party & the Scottish National Party, City of Edinburgh Council 2012
http://www.edinburgh.gov.uk/downloads/file/7513/coalition_agreement.

10 Appendices

Appendix A: QA/QC Data

- A1 Nitrogen Dioxide (NO₂) Diffusion Tube Bias Adjustment Factors
- A2 NO₂ Bias Adjustment Factor from Co-location Studies
- A3 Discussion of Choice of Factor to Use
- A4 PM Monitoring Adjustment
- A5 Short-term to Long-term Data adjustment for NO₂
- A6 QA/QC of automatic monitoring
- A7 QA/QC of Diffusion Tube Monitoring

Appendix B: Raw Passive Diffusion Tube Data

Appendix C: Passive diffusion tube data used in Trend analysis

Appendix A: QA:QC Data

A1 Nitrogen Dioxide Diffusion Tube Bias Adjustment Factors

Edinburgh Scientific Services supply and analyse the passive diffusion tubes. The tubes are made of acrylic and the laboratory uses 50% v/v Triethanolamine (TEA) in acetone for the adsorbent; the grids are dipped into this solution and allowed to dry before insertion into the tube. The tubes are exposed for 4 or 5 week periods in accordance with the recommended calendar supplied by DEFRA. The method has remained unchanged during the monitoring periods.

The annual mean data from the co-location studies always show that passive diffusion samplers over read the real time analysers by average factors from 0.85 to 0.91. Table A1.

Table A1 Historical bias data used in previous reports

Site	Type	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Queen St	R	0.91	0.91	0.91	0.90	0.84	0.83	0.85	0.81	0.83	0.84
Haymarket	R	0.93			0.88	0.93	0.91	0.92	0.87		
Leith Walk	R	0.89									
Currie	SB				0.91						
Gorgie	R					0.86		0.91	0.94		
Roseburn	R					0.92			0.91	0.82	0.85
St John's Rd	K							0.93	0.86	0.92	0.92
Salamander	R										0.79
Mean		0.91	0.91	0.91	0.89	0.89	0.87	0.90	0.88	0.86	0.85

A2 NO2 Bias Adjustment Factor from Co-location Studies

Five automatic monitoring stations were considered for the co-location study during 2011. The monitoring station located at Roseburn was relocated in August to Glasgow Road and due to various set backs is still waiting to be commissioned. Therefore data capture was insufficient to undertake co-located work at this site. The factors for 2011 studies are shown in Table A2

Table A2 Bias factors used for 2011 data

Site	Type	Analyser	PDT* Mean	PDT* Precision	DC# %	Analysed	Period	Bias Factor A	Bias B (%)
Queen Street	Road-side	29	42	7	99		12	0.69	44
Queensferry Road	Road-side	40	62	6	95		11	0.66	52
Salamander Street	Road-side	29	38	6	98		12	0.77	30
St John's Road	Kerb-side	65	81	6	93		10	0.79	26
Gorgie Road	Road-side	38	44	6	97		11	0.87	15

* PDT - Passive Diffusion Tube

DC - Data Capture

A3 Discussion of Choice of Factor to Use

Edinburgh co-locates triplicate tubes on the sampler head cages of each roadside/kerbside monitoring station. The analysis has been undertaken for a number of years using Edinburgh Scientific Services Laboratory and the preparation of tubes has remained the same. Historical data shows that the annual mean bias factors (Bias A) range from 0.85 to 0.91. The passive diffusion tubes consistently give higher concentrations than the real time analysers over an annual period.

However, the co-location study for 2011 showed a step change in the mean bias factor (A) 0.76. The two sites that showed the greatest over read were Queen Street and Queensferry Road, 0.69 and 0.66 respectively. See Table A2

Further investigations were undertaken with respect to the automated and passive diffusion tube data to assess the reliability of the bias factor. This included a review of calibration data, site service reports, site audit and data scaling, by AEA Technology. Checks for discrepancies with raw data bases were also investigated. AEA confirmed that there were no issues with the real time data. In addition, a service engineer re checked sample manifolds at Queen Street and Queensferry Road for leaks. No problems were identified at either site.

With respect to analysis of passive diffusion tubes, Edinburgh Scientific Services stated that there had not been any change in laboratory procedures. Sample results for WASP R115 were not submitted due to a slight procedural error with respect to eluting nitrite from the frit (apparently the tubes received one shake instead of two). This did not affect the analysis of local authority tubes. All the WASP submissions were within range for 2011.

The co-located studies showed that overall precision of triplicate tubes and data capture from the automatic sites was good. The AEA bias spread sheets were submitted for peer review to the National Physical Laboratory (NPL). It was considered that all studies showed good classification. The studies have since been forwarded to NPL for inclusion in the National Bias Data Base study.

The 2011 bias was calculated using a combination of local factors and the factors contained in the National Bias Data Base for Marylebone Road and West Lothian (Edinburgh Scientific Services carried out the analysis of passive diffusion tubes located at both of these sites).

This involved undertaking a manual approximate orthogonal regression calculation using the bias B values in accordance with Air Quality Consultant Guidance document paragraph 2.4. This method resulted in a combined bias factor of 0.81 and represents the worse case scenario. The approach has been approved by the LAQM Helpdesk, Scottish Government and SEPA. The calculation is shown in Table A3 (overleaf).

Table A3 Manual approximate orthonogel regression calculation for 2011 bias

Site	Bias A 2011	Bias B 2011	Calculation as AQC Guidance Para 2.4	Bias 2011
Local				
Queen Street	0.69	44%		
Queensferry Road	0.66	52%		
Gorgie Road	0.87	15%		
Salamander Street	0.77	30%		
St John's Road	0.79	26%		
National				
Marylebone Road	0.97	3.2%		
West Lothian	1.04	-4.1%		
Mean Local Bias B		33%	$0.33 + 1 = 1.33$	
			$1/1.33 = 0.75$	0.75
Mean Combined		24%	$0.24 + 1 = 1.24$	
			$1/1.24 = 0.81$	0.81

A4 PM₁₀ Monitoring Adjustment

AEA provided Volatile Correction Model (VCM) corrected Tapered Element Oscillating Microbalance (TEOM) data to the Local Authority under the Scottish Air Quality Database and Website project for the following automatic monitoring stations, Queen Street, Roseburn and Salamander Street.

Data from the Currie station was corrected by the Local Authority using the VCM correction spread sheet provided by Kings College to provide a gravimetric equivalent concentration. The PM₁₀ FDMS purge data over the same period was obtained from the following two AURN sites, St Leonards Edinburgh and Grangemouth. The latter location is approximately 25 miles from Edinburgh centre. Temperature and pressure data were obtained from Gogarburn, Edinburgh.

TEOM data was also corrected to provide a gravimetric equivalent using Edinburgh's local gravimetric factor 1.14, which was derived from undertaking a co-location study with a partisol unit and TEOM instrument in Detailed Assessment Report 2004.

A5 Short-term to Long-term Data adjustment for NO₂

The long-term sites selected for calculation were within 50 miles of Edinburgh and classed as urban background and rural locations; respectively Edinburgh St Leonard's and Bush. Data capture (DC) was considered to be within acceptable limits for both sites.

Automatic Monitoring at Roseburn

Monitoring at the Roseburn site ceased in August 2011. The period means were calculated from 1/1/2011 to 14/8/2011. The annual means were for a full calendar year January to December 2011. The mean ratio which was used to calculate the estimated annual mean for Roseburn was 0.947.

Site	Site Type	Annual Mean µg/m ³	Period Mean µg/m ³	Ratio
St Leonard's	Urban background	24.8	26.8	0.925
Bush	Rural	6.2	6.4	0.969
			Mean	0.947

Estimation of Annual Mean Concentration for Nitrogen Dioxide at Roseburn

Roseburn monitoring data for the period 1/1/2011 to 14/8/2011 = 25.4 µg/m³ (Data capture 99.6%)

Annual estimated mean $25.4 \times 0.947 = 24.1$ (**24 µg/m³**)

Non-Automatic monitoring

The period mean for each diffusion tube exposure was defined specifically for each tube and was relevant to the nearest hour of exposure. The annual means were calculated from January 2011 until the 4th/5th of January 2012 which was end of exposure for 2011 tubes. The calculation for each tube is detailed below;

Site ID 9a Commercial Street			
Period: Jul – Dec 28/06/2011-04/01/2011			
	Annual mean	Period mean	Ratio AM/PM
St L	24.7	20.8	1.188
Bush	6.1	5.5	1.109
		Average Ra	1.148
Monitored mean value (M) = 49.6			
Adjusted mean (MxRa) = 57.0			

Site ID 28 West Port			
Period: Aug-Dec 03/08/2011 - 05/01/2012			
	Annual mean	Period mean	Ratio AM/PM
St L	24.7	21.1	1.171
Bush	6.1	5.5	1.109
		Average Ra	1.140
Monitored mean value (M) = 47.1			
Adjusted mean (MxRa) = 53.7			

City of Edinburgh Council

Site ID 10 Home Street			
Period: Jan-Apr 12/01/2011 - 28/04/2011			
	Annual mean	Period mean	Ratio AM/PM
St L	24.7	31.8	0.777
Bush	6.1	8.3	0.735
		Average Ra	0.756
Monitored mean value (M) = 42.0			
Adjusted mean (MxRa) = 31.7			

Site ID 37 Grassmarket			
Period: Sept-Dec 31/08/2011 - 05/01/2012			
	Annual mean	Period mean	Ratio AM/PM
St L	24.7	20.9	1.182
Bush	6.1	5.8	1.052
		Average Ra	1.117
Monitored mean value (M) = 38.5			
Adjusted mean (MxRa) = 42.9			

Site ID 25f Easter Road			
Period: Mar – Aug 01/03/2011 - 30/08/2011			
	Annual mean	Period mean	Ratio AM/PM
St L	24.7	23.1	1.069
Bush	6.1	5.4	1.130
		Average Ra	1.099
Monitored mean value (M) = 31.4			
Adjusted mean (MxRa) = 34.5			

Site ID 28b West Port			
Period: Feb-May 02/02/2011 - 01/06/2011			
	Annual mean	Period mean	Ratio AM/PM
St L	24.7	26.5	0.932
Bush	6.1	7.2	0.847
		Ave Ra2	0.890
Monitored mean value (M) = 79.10			
Adjusted mean (MxRa) = 70.4			

Site ID 45b Ferry Road			
Period: June – Dec 31/05/2011 - 04/01/2012			
	Annual mean	Period mean	Ratio AM/PM
St L	24.7	20.9	1.182
Bush	6.1	5.3	1.151
		Average Ra	1.166
Monitored mean value (M) = 34.6			
Adjusted mean (MxRa) = 40.4			

Site ID 48a Cowgate			
Period: Jan-May 12/01/2011 - 01/06/2011			
	Annual mean	Period mean	Ratio AM/PM
St L	24.7	28.7	0.861
Bush	6.1	7.2	0.847
		Average Ra	0.854
Monitored mean value (M) = 45.4			
Adjusted mean (MxRa) = 38.8			

Site ID 28c West Port					
Period 1: Sept-Dec 31/08/2011 - 05/01/2011					
Period 2: Mar – Jun 02/03/2011 - 29/06/2011					
	Annual mean	Period 1 mean	Ratio1 AM/PM	Period 2 mean	Ratio2 AM/PM
St L	24.7	20.9	1.182	24.3	1.02
Bush	6.1	5.8	1.052	5.7	1.07
		Average Ra1	1.117	Average Ra2	1.04
Monitored mean value M1 = 39.0 & M2 = 50.70					
Adjusted mean M1xRa1 = 43.5 & M2xRa2 = 52.9					
Mean annualised from 2 periods = 48.2					

A6 QA/QC of automatic monitoring

All monitoring stations except Currie, are subject to an independent audit and stringent QA/QC procedures which are undertaken by A.E.A Technology on behalf of the Scottish Government. This agreement commenced in 2007. Nevertheless all data, including calibration data is scrutinised on a daily basis by Local Authority officers (Monday to Friday) by visual examination, to see if they contained unusual measurements. Any data which was considered to be suspicious e.g. large spikes, is flagged to undergo further checks.

Staff competence

Three officers are trained as local site operators in relation to the management of the DEFRA AURN National Network site and undertake the necessary calibrations and basic maintenance at all the Edinburgh automated sites.

Calibration procedures

The three ML 9841 B NO_x analysers (located at Queen Street, Roseburn and Salamander Street) perform an auto-calibration each day with zero air and NO gas. Warning limits are set at +/- 5 % on the software program.

All other sites including those listed above are visited fortnightly, apart from the National Network site AURN, which is visited monthly and manual calibration checks are carried out using certified NO gas at approximately 500ppb plus a zero check. All cylinders are replaced at 12 - 18 month intervals. NO cylinders are supplied by Air Liquide UK.

Details of manual calibration checks and precision and accuracy of instruments can be made available on request.

Servicing

All instruments are serviced and recalibrated every six months by the appropriate supplier. The service contracts include a support package for software and replacement parts, plus any necessary call outs to the sites.

The TEOM heads on the automatic PM₁₀ units are cleaned monthly and filters are changed regularly (approximately every 2 weeks).

All visits to the monitoring stations, actions which are taken and activities adjacent to the site are recorded in the site log book.

Data validation and ratification for the Currie Monitoring Station

Data from the Currie Monitoring station is not subject to the independent audit and QA/QC procedures by the Scottish Government (A.E.A Technology). However some basic checks are made to data on a daily basis (Monday to Friday) by visual examination. If suspicious data e.g. large spikes, is noted then this is flagged to undergo further checks.

PM10 data sets which require further investigation are checked with respect to the following:

- Assessment of calibration records for drift precision /accuracy of analyser
- Negative values e.g. during /after TEOM filter change
- Spikes generated by analysers.
- Time/date of manual calibration no out of service switch Mobile AQ unit
- Examination of data gathered from other sites to ascertain if high values are caused by pollution episodes.
- Assessment of local activity construction/ road works.
- Data capture rates distribution of missing or suspect data.

Nitrogen dioxide data from the Currie station does not undergo such investigation and is therefore raw data.

A7 QA/QC of Diffusion Tube Monitoring

Three local site operators are trained to fulfil the requirements associated with passive diffusion tube samplers. Passive diffusion tubes are supplied and analysed by Scientific Services, City of Edinburgh Council. The laboratory is UKAS accredited for this task and participates in the Workshop Analysis Scheme for Proficiency (WASP) inter laboratory QC/QA. The laboratories performance was rated as being good over the monitoring periods 2008, 2009, 2010 and 2011.

NO₂ diffusion tube monitoring is conducted in accordance with the quality requirements contained in the UK NO₂ Survey Instruction Manual for local/unitary authorities and Government Guidance Document LAQM.TG (09). The kerbside diffusion tubes are located within 1 metre of the edge of the kerb, roadside locations are greater than 1 metre from the road edge or at the façade of residential property. The tubes are attached to sign posts/lamp posts using plastic spacer holders at a height of 2.0m above ground level. All exposure times and dates are recorded and retained as paper documents, copies of which are sent with the exposed diffusion tubes to the laboratory.

Three diffusion tubes from each monthly batch are used as blanks. These tubes are not exposed and are stored in the refrigerator during the exposure period. They are analysed along with the appropriate batch of exposed tubes. The purpose of blanks is to determine whether or not NO₂ contamination occurred during tube preparation.

All passive diffusion tube monitoring data shown in this report has been corrected for diffusion tube bias in accordance with LAQM TG (09). The monthly exposed passive diffusion tubes in Edinburgh over read real-time analysers by factors of 0.81 to 0.91.

Appendix B

Raw Passive Diffusion Tube Data 2011

Note:

Data highlighted in red was excluded from the annual set due to either very low concentrations or extremely high values that were not in keeping with the monitoring location or related to pollution episodes.

City of Edinburgh Council

ADDRESS	SITE ID	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	MEAN	CORR
St John's Road	1	48.3	55.8	45.7	56.6	43.0	57.8	62.2	49.4	M	35.0	41.4	39.4	48.6	
St John's Road	1b	46.2	58.3	62.6	51.0	47.6	56.8	53.3	60.4	39.9	24.5	29.2	39.4	47.4	
St John's Road	1d	86.4	80.0	82.0	69.0	M	69.5	68.0	67.5	66.7	46.7	62.8	66.1	69.5	
West Maitland Street	2	113.5	89.0	91.5	100.8	92.6	105.4	80.1	96.2	91.0	80.1	70.5	98.5	92.4	
West Maitland Street	2	114.0	85.7	97.2	70.7	89.6	98.0	71.7	85.1	76.8	88.6	78.8	102.8	88.3	
Torphichen Place	3	94.9	77.2	69.0	81.3	56.0	81.9	66.8	80.4	71.5	86.0	93.5	80.2	78.2	
Calder Road	4	54.8	50.6	46.8	54.8	39.0	38.3	50.9	60.0	43.5	23.3	37.9	35.1	44.6	
Murieston Road	5	78.7	67.1	69.8	64.7	56.5	65.9	60.1	70.0	58.7	61.3	72.5	79.0	67.0	
Commercial Street	7	50.2	48.9	42.6	41.8	30.8	44.6	35.8	M	M	21.5	42.8	39.1	39.8	
Cannan Lane	8	50.1	37.6	42.3	34.2	M	28.5	M	37.4	25.1	M	42.2	32.5	36.7	
Commercial Street	9	49.5	45.9	37.8	43.6	27.9	47.2	47.7	42.5	28.5	21.4	40.1	30.8	38.6	
Commercial St/Portland Place	9a	72.8	M	M	M	48.8	M	55.6	56.6	45.9	33.1	55.9	50.7	52.4	57.0 ^a
Ocean Drive	9b	44.4	35.6	32.7	M	29.0	M	30.8	37.3	27.3	17.0	40.4	29.0	32.4	
Home Street	10	48.3	40.6	44.4	34.5	M	M	39	M	36.8	20.1	M	33.5	37.2	31.7 ^a
Lanark Road	11	39.5	30.7	30.6	33.9	26.6	29.7	29.7	36.8	25.0	16.1	19.7	29.3	29.0	
Deanhaugh Street	13	55.7	47.4	40.9	49.1	39.0	36.8	64.8	42.3	37.4	33.9	48.2	47.4	45.2	
Trinity Crescent	14	51.1	45.1	40.2	43.8	32.4	33.5	30.9	40.2	33.2	24.3	48.7	39.6	38.6	
Newbridge/Glasgow Road	15	63.8	68.8	55.7	56.7	52.1	60.9	48.9	58.8	M	M	41.0	59.8	56.7	
Newbridge/Glasgow Road	16	64.4	69.7	54.6	60.4	52.6	74.7	68.2	86.7	65.1	43.8	66.9	47.3	62.9	
Newbridge/Glasgow Rd duplicate	16	75.9	80.0	60.6	63.7	59.9	66.8	66.6	79.4	63.5	38.4	50.1	46.1	62.6	
Gorgie Road	18	M	70.5	66.0	60.4	55.1	58.9	65.9	64.6	46.4	49.3	66.6	63.2	60.6	
Gorgie Road	18	M	60.4	69.4	60.7	49.7	66.5	61.0	53.7	48.3	51.5	63.3	57.9	58.4	
Baileyfield Road	19	51.4	36.0	36.6	32.3	24.3	24.0	24.1	29.9	23.4	24.2	34.4	24.2	30.4	
McDonald Rd/Leith Walk	20	66.2	58.3	55.1	M	M	M	M	M	M	M	50.7	50.3	56.1	N/A
Brunswick Rd/Leith Walk	21	54.2	54.1	43.4	50.5	30.2	44.0	M	41.6	M	18.7	50.6	54.8	44.2	
Roseburn Terrace	23	57.0	59.6	59.7	53.8	51.8	60.9	38.4	69.7	44.3	27.3	55.2	35.7	51.1	
Princes Street	24	89.3	84.6	133.1	M	M	M	M	M	M	7.5	M	M	N/A	
Princes Street	47	62.4	50.9	56.2	53.7	48.2	53.2	47.7	52.9	43.6	27.7	46.2	34.3	48.1	
Easter Road	25	66.0	58.2	53.9	M	44.7	55.5	52.8	55.9	46.4	48.4	64.7	46.1	53.9	
Easter Road	25b	51.9	43.3	44.3	75.7	M	43.1	40.1	44.4	39.5	37.7	57.4	39.8	47.0	44.2 ^b
Easter Road	25c	82.7	60.4	41.0	44.6	29.6	42.0	37.9	59.9	45.3	111.8	67.1	46.0	55.7	50.6 ^b
Easter Road	25d	50.0	48.0	M	45.8	27.8	21.8	43.7	M	35.1	36.8	54.5	40.2	40.4	
Easter Road	25e	44.2	44.6	40.1	42.3	30.0	36.2	39.3	37.0	38.2	32.9	49.1	40.5	39.5	
Easter Road	25f	52.7	M	39.9	34.9	22.7	29.5	26.5	34.6	M	M	2.3	40.4	31.5	34.5 ^a
Easter Road	25g	42.1	40.5	34.8	31.5	23.6	26.2	26.3	31.5	35.5	30.3	35.3	38.7	33.0	
North Bridge	27	48.1	65.6	62.4	56.8	53.9	68.3	78.6	M	M	M	66.5	40.9	60.1	
West Port	28	62.9	M	M	48.9	M	M	M	55.1	49.8	40	45.8	44.8	49.6	53.7 ^a

City of Edinburgh Council

ADDRESS	SITE ID	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	MEAN	CORR
Bernard Street/Leith	29	60.3	49.3	47.9	52.7	34.2	48.6	43.6	51.0	43.2	M	47.1	50.3	48.0	
Bernard St/Leith King Chambers	29a	53.4	52.6	49.9	49.4	43.6	59.6	55.1	56.7	42.9	24.8	56.5	42.7	48.9	
Bernard St/Leith King Chambers	29a	65.5	58.2	57.4	48.0	46.2	57.8	61.7	55.3	M	37.3	62.6	49.3	54.5	
Bernard St/Leith	29b	54.3	48.0	46.9	39.8	28.7	44.6	41.1	40.4	M	25.2	40.1	35.5	40.4	
Bernard St/Leith @Petals Shop	29c	62.4	64.7	64.0	57.2	47.8	53.3	53.5	55.9	51.4	43.9	64.6	M	56.2	
Bernard St/Leith@ Petals shop	29c	<1	67.5	63.3	49.0	53.3	57.7	51.0	59.2	49.7	36.5	51.2	M	53.8	
Great Junction Street	30	53.6	54.6	59.7	43.2	43.6	50.4	55.0	50.8	38.6	26.1	57.7	42.7	48.0	
Great Junction Street	30	54.1	58.9	53.6	42.1	43.3	56.2	58.7	50.3	37.2	32.8	56.6	37.0	48.4	
Dalkeith Road	31	41.3	44.1	52.2	40.0	33.6	32.0	46.5	40.5	27.7	19.4	37.9	30.0	37.1	
Niddrie Mains Road	32	54.7	46.8	50.5	40.6	36.6	34.2	35.5	46.0	34.0	M	50.8	36.7	42.4	
Broughton Road	43	M	61.7	52.8	42.7	21.6	32.5	35.7	46.3	44.5	30.2	55.6	46.7	42.8	
Queen Street	33	67.5	65.5	59.9	61.1	60.4	64.6	60.1	63.7	54.5	59.2	M	M	61.7	
India Street	34	38.5	36.1	M	M	16.9	M	M	27.4	22.5	22.1	37.7	31.7	29.1	N/A
Dundas Street	35	55.3	52.6	41.3	44.2	33.6	33.1	34.9	41.9	33.2	37.0	51.0	38.6	41.4	
York Place	36	57.9	53.7	45.7	42.0	42.4	38.8	40.6	47.5	43.1	43.7	M	44.6	45.5	
Broughton Street	44	50.1	48.1	43.1	39.4	36.8	37.8	39.6	42.2	34.7	31.4	45.2	37.4	40.5	
Melville Drive	38	52.0	40.7	M	34.7	M	30.3	28.6	41.5	34.6	18.6	31.6	42.6	35.5	
Grassmarket	37	M	30.0	46.9	47.9	M	41.7	M	M	39.1	30.8	40.7	43.2	40.0	42.9 ^a
Ferry Road	45	52.1	44.8	41.5	43.4	36.5	43.9	50.6	44.5	30.3	17.9	44.5	31.8	40.2	
Ferry Road	45b	49.6	M	M	M	109.9	35.1	33.6	36.1	28.0	32.5	43.2	33.9	44.7	40.6 ^a
Ferry Road	45d	66.1	54.8	M	M	M	49.8	41.6	44.7	50.4	24.2	59.1	48.9	48.8	
Gt Junction Street	30b	70.8	55.4	51.9	47.7	44.6	47.4	45.4	48.2	50.6	28.0	M	53.7	49.4	
Gt Junction Street	30c	46.4	50.4	62.9	51.2	44.5	52.9	52.3	52.4	37.2	20.2	59.1	40.0	47.5	
Gt Junction Street	30d	M	49.0	48.2	43.0	34.2	51.0	51.1	50.5	30.7	19.6	43.1	38.9	41.8	
Gt Junction Street	30e	59.0	59.2	52.4	46.6	41.8	51.8	43.8	M	M	M	55.5	47.9	50.9	
West Port	28b	M	80.0	77.7	95.9	62.8	M	M	87.8	M	32.7	66.0	59.3	70.3	70.4 ^a
West Port	28c	M	M	58.7	53.7	42.0	48.4	M	M	45.8	25.4	44.5	40.2	44.8	48.2 ^a
West Port	28d	70.7	M	87.0	70.4	M	65.9	63.6	82.4	65.3	37.3	64.7	73.9	68.1	
Grassmarket No 41	37a	62.8	51.9	M	54.5	M	48.8	48.8	64.4	46.2	36.1	43.5	51.9	50.9	
Grassmarket No41 (Duplicate)	37a	71.8	55.9	M	48.1	M	55.9	47.9	54.3	45.9	43.3	60.9	44.0	52.8	
Grassmarket @Anta	37b	57.1	58.2	46.2	43.6	41.3	48.8	49.0	57.6	36.3	36	37.6	37.6	45.8	
Grassmarket Thomsons Crt	37c	43.9	38.1	37.0	M	M	M	M	M	M	M	M	M	N/A	
Cowgate	48	62.1	50.3	54.9	51.7	45.2	M	44.8	59.8	M	40.4	47.0	40.5	49.7	
Cowgate	48a	52.0	49.1	50.6	35.6	39.6	M	M	M	32.7	29.0	38.0	M	40.8	38.8 ^a
London Road	46	59.4	48.8	49.3	48.4	43.9	53.3	50.1	59.1	47.4	49.7	M	39.9	49.9	
Morrison Street	49	70.8	66.6	M	M	M	M	M	71.7	50.4	48.5	60.7	59.5	61.2	66.1 ^a
Whitehouse Road	50a	50.4	42.2	41.7	38.9	32.2	33.4	32.1	30.4	37.0	26.0	27.5	38.9	35.9	

City of Edinburgh Council

ADDRESS	SITE ID	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	MEAN	CORR
Salamander St No 29b/Bath Road	51b	49.3	50.8	46.9	44.0	31.3	46.8	58.9	49.1	35.0	10.4	45.2	N/A	42.5	45.7 ^b
Salamander St No10/Baltic Street	51c	64.2	60.7	49.2	46.0	43.5	37.1	38.0	49.8	44.8	28.4	55.4	52.8	47.5	
Ferry Road No 268	52	56.5	47.4	50.6	47.4	36.6	54.4	38.1	47.8	42.4	30.2	49.5	47.1	45.7	
Bowhill Terrace No 6/Ferry Rd	53	55.0	46.5	54.4	47.4	41.8	43.7	38.4	46.9	48.4	24.2	48.9	52.0	45.6	
Inverleith Row/ Montague Terrace	55	68.9	57.5	51.7	53.8	55.7	57.1	54.0	61.8	53.2	30.0	60.7	59.2	55.3	
Inverleith Row Duplicate	55	66.6	59.2	48.7	63.4	50.1	32.0	56.5	59.1	54.3	28.6	54.9	60.0	52.8	
Inverleith Row/Tanfield	55a	59.8	53.9	55.1	Lost Post	M	M	M	M	M	M	M	M	N/A	
Inverleith Row/Summer PI	55b	60.7	46.3	49.3	43.7	29.1	35.5	31.2	42.9	37.4	28.7	47.2	47.3	41.6	
Inverleith Row/Café Montague	55c	37.4	44.6	38.4	31.7	32.9	35.4	45.9	43.3	28.2	19.8	40.8	25.7	35.3	
Glasgow Road No 18-20	56	67.0	57.3	45.9	40.4	36.2	39.4	44.7	M	41.6	20.7	26.4	31.2	41.0	
Glasgow Road GFC 75 (158)	57	76.1	65.8	56.6	58.4	45.9	58.4	50.1	61.9	59.4	27.4	39.4	39.0	53.2	77.7 ^b
Glasgow Road GFC 319	58	73.2	106.0	M	M	74.7	70.8	76.9	93.8	M	37.8	50.9	70.3	72.7	
Glasgow Road GFC 319	58	101.9	80.8	M	M	85.6	75.0	71.9	76.0	M	34.5	67.7	68.6	73.6	
Maybury Rd/Queensferry Road	61	47.9	50.7	49.0	42.2	36.5	36.4	16.3	48.3	34.6	30.0	31.7	33.7	38.1	
Queensferry Road No 561	62	30.9	31.0	26.4	22.9	21.4	22.5	27.1	28.1	19.9	14.1	19.8	20.3	23.7	
Queensferry Road No 544	63	44.6	39.9	33.8	29.6	29.6	30.2	28.3	36.8	31.8	17.1	24.3	27.1	31.1	
Queensferry Road No 550	64	264.4	93.3	84.5	73.1	83.2	81.7	86.0	100.9	78.6	37.2	64.7	71.3	93.2	
Hope Park Terrace/val solic	17a	49.2	58.4	54.1	42.7	42.8	51.7	55.1	58.8	32.3	22.5	40.1	35.0	45.2	
Hope Park Terrace/val solic	17a	55.3	54.5	56.2	43.8	39.5	52.4	50.7	57.1	37.5	33.7	44.6	39.7	47.1	
London Rd/Regent Place	66	61.6	M	47.6	42.0	M	38.2	43.9	47.0	M	36.9	M	31.1	43.5	52.4 ^b
London Rd/Earlston Place	67	55.6	63.7	59.0	64.2	51.6	52.2	57.6	M	56.5	M	M	45.3	56.2	
Parsons Green Terrace	68	50.1	40.9	52.6	37.2	34.2	37.7	40.0	44.3	28.9	21.5	37.9	40.9	38.9	
Wolseley PI HBOS	69	68.9	100.7	71.5	52.9	48.4	49.1	42.2	75.8	53.1	70.8	62.3	51.3	62.3	
Wolseley Terrace No 3	70	64.0	60.1	M	50.3	52.2	46.7	45.8	408.5	114.6	34.2	57.3	60.8	90.4	
Portobello High St No173	71	65.4	53.0	53.2	45.4	39.4	37.0	35.8	47.5	41.9	24.9	45.2	42.4	44.3	
Portobello High St No 173 (Dup)	71	66.7	55.4	55.3	43.9	41.1	43.2	34	45.8	39.5	22.7	48.3	39.0	44.6	
Seafield Rd East No 10	72	49.9	44.2	48.4	33.2	39.1	49.9	46.9	45.3	34.1	20.1	47.0	32.8	40.9	
Portobello High Street No 74	73	44.8	38.4	34.4	31.3	26.3	26.9	INV	M	25.5	M	30.3	34.5	32.5	
Portobello Rd Ramsay Inst	73a	69.5	66.5	60.5	53.0	52.5	45.5	51.6	58.2	58.9	28.3	67.2	47.6	54.9	
Portobello High St @ 23	73b	56.8	44.5	43.9	33.8	35.0	34.1	26.9	40.5	36.1	27.5	44.2	39.5	38.6	52.4 ^b
Portobello High St @ 288	73c	36.1	38.1	36.3	25.4	22.2	M	M	30.5	22.1	14.1	31.3	26.8	28.3	
George St No 10	74c	69.7	57.0	52.7	49.0	52.8	51.3	57.4	66.9	65.4	77.1	80.4	83.7	63.6	
George St Charlotte Sq Junc	74e	69.8	77.2	70.1	59.5	62.9	M	59.1	69.1	71.9	94.0	M	84.2	71.8	
George St No 112	74f	61.0	57.2	51.6	48.6	48.7	44.8	44.8	49.7	45.6	65.3	77.4	67.4	55.2	
St Colme Street No7-8	75a	64.8	56.4	54.0	52.6	50.7	50.8	55.8	62.9	43.7	56.0	65.3	48.0	55.1	
Great Stuart Street No 7	75b	68.4	47.1	47.7	52.7	35.8	33.3	37.5	40.1	37.6	44.9	56.3	47.9	45.8	
Gt Stuart St/Randolph Crescent	75c	43.9	54.9	41.5	46.7	44.9	37.2	40.2	43.6	32.3	37.9	58.9	49.2	44.3	

City of Edinburgh Council

ADDRESS	SITE ID	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	MEAN	CORR
Angle Park Terrace	76	63.1	69.9	67.2	55.4	45.3	52.6	45.3	59.2	44.7	48.9	64.2	41.6	54.8	
Slateford Road No 97	77	56.5	56.4	50.9	52.2	43.9	48.5	37.2	52.4	41.1	34.0	56.7	34.4	47.0	
Slateford Road Maltings	78	35.2	49.5	50.7	37.6	29.6	M	M	37.2	32.8	25.8	42.1	32.3	37.3	
Tollcross Primary School	79	53.9	M	52.2	43.7	40.2	46.4	55.1	M	42.3	25.9	44.5	44.2	44.8	
Gorgie Road (Chesser House)	80	78.2	57.5	52.9	47.7	42.8	45.6	46.5	54.5	43.5	44.9	63.9	47.0	52.1	
East Norton Place @PO	81	68.3	71.4	55.3	68.6	52.4	56.6	52.8	65.0	62.3	65.7	71.2	68.3	63.2	
Piersfield Terrace No 149	82	41.0	40.2	43.4	34.5	M	35.6	32.6	39.5	26.9	18.5	32.8	32.2	34.3	
St John's Road	39	61.0	48.3	3.4	57.3	36.2	40.6	40.1	51.9	36.4	24.2	27.3	41.3	39.0	42.2 ^b
Hillhouse Rd	40	45.7	52.9	44.0	42.7	M	40.5	57.3	50.1	36.9	28.1	27.5	38.5	42.2	
Hillview Terrace	41	31.0	30.9	32.7	M	16.8	19.3	22.3	15.2	19.7	12.5	25.3	24.4	22.7	
Midmar Drive	42	28.6	23.1	26.7	20.6	15.4	18.3	16.4	21.5	14.9	12.9	24.3	15.1	19.8	

Notes

^a Correction relates to annualised data i.e. estimation of Annual Mean Concentration from short term monitoring

^b Correction made to mean calculation having regard to outliers

M – Tube missing on collection

INV – Tube inverted on collection

N/A – Data not used

Figures in red – Problematic data not used

Appendix C

Passive diffusion tube data used in Trend analysis

Data which has been used to establish the average trend is shown below.

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bias	0.91	0.89	0.89	0.87	0.90	0.88	0.86	0.85	0.81
1 St John's Rd	46	45	52	57	54	50	43	47	39
1b St John's Rd		41	59	51	51	49	44	44	38
1d St John's Rd		66	79	80	82	76	58	59	56
2 West Maitland St	78	77	85	96	104	97	57	73	75
3 Torphichen Place	63	72	87	77	87	67	65	64	63
18 Gorgie Road	46	43	43	48	47	52	45	55	48
21 MacDonald Road	41	39	38	42	47	42	40	41	36
23 Roseburn Terrace	47	40	49	52	70	67	48	58	41
24 Princes Street	84	85	84	87	93	79	46	73	
27 North Bridge	58	54	49	52	56	52	48	49	49
33 Queen Street	44	44	44	46	53	53	51	56	50
36 York Place	44	42	46	44	52	54	38	41	37
30 Gt Junction Street	40	43	39	43	49	45	44	42	39
55 West Port				68	65	73	67	62	57
Mean	54	53	58	60	65	61	50	55	48