



# 2012 Air Quality Updating and Screening Assessment for Glasgow City Council

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

June 2012

<b>Local Authority Officer</b>	Dom Callaghan
<b>Department</b>	Land & Environmental Services – Public Health
<b>Address</b>	231 George St Glasgow G1 1RX
<b>Telephone</b>	0141 287 6628
<b>e-mail</b>	dom.callaghan@glasgow.gov.uk
<b>Report Reference number</b>	USA2012
<b>Date</b>	June 2012

## Executive Summary

Local Authorities are required to regularly review and assess the air quality within their area of responsibility. This Review and Assessment process is the basis of local air quality management and is intended to compare current and future concentrations of key air pollutants against the objectives detailed in the regulations as part of the National Air Quality Strategy. This report comprises Glasgow City Council's Updating and Screening Assessment as part of Round 5 of Review and Assessment. This Updating and Screening Assessment has looked in detail at the new monitoring data available since the last round of review and assessment as well as considering the impact from various potential sources of pollution.

Previous rounds of Review and Assessment have shown the potential for exceedences of the nitrogen dioxide (NO<sub>2</sub>) annual mean at Napiershall St and Crow Rd. Although the measured NO<sub>2</sub> annual mean at Napiershall St in 2011 fell to below the objective level, a new nearby tube at Park Rd has recorded an annual mean above the objective. Glasgow City Council will therefore proceed to a Detailed Assessment for this area in respect of this pollutant. The recorded exceedence of the NO<sub>2</sub> annual mean at Crow Rd has continued to be observed for 2011. Glasgow City Council will therefore proceed to a Detailed Assessment for this area in respect of this pollutant.

Glasgow City Council will also produce an updated Air Quality Action Plan and Further Assessment in respect of the recently declared AQMAs and amendments.

# Table of contents

<b>1</b>	<b>Introduction .....</b>	<b>6</b>
1.1	Description of Local Authority Area .....	6
1.2	Purpose of Report.....	6
1.3	Air Quality Objectives .....	7
1.4	Summary of Previous Review and Assessments.....	8
1.4.1	Parkhead Cross .....	10
1.4.2	Byres Road / Dumbarton Road.....	11
1.4.3	City Centre.....	12
1.4.4	Citywide .....	13
<b>2</b>	<b>New Monitoring Data .....</b>	<b>15</b>
2.1	Summary of Monitoring Undertaken.....	15
2.1.1	Automatic Monitoring Sites.....	15
2.1.2	Non-Automatic Monitoring Sites .....	17
	Table 2.3 Details of Non- Automatic Benzene Monitoring Sites .....	22
2.2	Comparison of Monitoring Results with AQ Objectives.....	23
2.2.1	Nitrogen Dioxide .....	23
	Automatic Monitoring Data .....	23
	Diffusion Tube Monitoring Data .....	27
2.2.2	PM <sub>10</sub> .....	33
2.2.3	Sulphur Dioxide.....	36
2.2.4	Benzene.....	36
2.2.5	Carbon Monoxide .....	37
2.2.6	Ozone .....	38
2.2.7	PM <sub>2.5</sub> .....	38
	Summary of Compliance with AQS Objectives.....	39
<b>3</b>	<b>Road Traffic Sources .....</b>	<b>40</b>
3.1	Narrow Congested Streets with Residential Properties Close to the Kerb .....	40
3.2	Busy Streets Where People May Spend 1-hour or More Close to Traffic.....	40
3.3	Roads with a High Flow of Buses and/or HGVs.....	41
3.4	Junctions.....	41
3.5	New Roads Constructed or Proposed Since the Last Round of Review and Assessment 42	
3.6	Roads with Significantly Changed Traffic Flows.....	42
3.7	Bus and Coach Stations .....	43
<b>4</b>	<b>Other Transport Sources.....</b>	<b>44</b>
4.1	Airports.....	44
4.2	Railways (Diesel and Steam Trains) .....	44
4.2.1	Stationary Trains.....	45
4.2.2	Moving Trains .....	45

4.3	Ports (Shipping) .....	46
<b>5</b>	<b>Industrial Sources .....</b>	<b>47</b>
5.1	Industrial Installations .....	47
5.1.1	New or Proposed Installations for which an Air Quality Assessment has been Carried Out	47
5.1.2	Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced .....	47
5.1.3	New or Significantly Changed Installations with No Previous Air Quality Assessment...	47
5.2	Major Fuel (Petrol) Storage Depots .....	48
5.3	Petrol Stations.....	48
5.4	Poultry Farms.....	48
<b>6</b>	<b>Commercial and Domestic Sources .....</b>	<b>49</b>
6.1	Biomass Combustion – Individual Installations .....	49
6.2	Biomass Combustion – Combined Impacts.....	49
6.3	Domestic Solid-Fuel Burning .....	50
<b>7</b>	<b>Fugitive or Uncontrolled Sources.....</b>	<b>51</b>
<b>8</b>	<b>Conclusions and Proposed Actions.....</b>	<b>52</b>
8.1	Conclusions from New Monitoring Data .....	52
8.2	Conclusions from Assessment of Sources .....	54
8.3	Proposed Actions.....	54
<b>9</b>	<b>References.....</b>	<b>55</b>

**List of Tables**

Table 1.1	Air Quality Objectives included in Regulations for the Purpose of LAQM in Scotland
Table 1.2	Summary of Previous Rounds of Review and Assessment
Table 2.1	Details of Automatic Monitoring Sites
Table 2.2	Details of Non-Automatic NO <sub>2</sub> Monitoring Sites
Table 2.3	Details of Non-Automatic Benzene Monitoring Sites
Table 2.4	Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with Annual Mean Objective
Table 2.5	Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with 1-hour Mean Objective
Table 2.6	Results of Nitrogen Dioxide Diffusion Tubes in 2011
Table 2.7	Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2011)
Table 2.8	Results of Automatic Monitoring of PM <sub>10</sub> : Comparison with Annual Mean Objectives
Table 2.9	Results of Automatic Monitoring of PM <sub>10</sub> : Comparison with 24-hour Mean Objective

Table 2.10 Results of Automatic Monitoring of SO<sub>2</sub>: Comparison with Objectives

Table 2.11 Measured Annual Means and Maximum 8-hour Running Means for Carbon Monoxide

Table 2.12 Results of PM<sub>2.5</sub> Automatic Monitoring: Comparison with Annual Mean Objective

### **List of Figures**

Figure 1.1 Map of AQMA Boundaries

Figure 1.2 Parkhead Cross AQMA

Figure 1.3 Byres Rd / Dumbarton Rd AQMA

Figure 1.4 City Centre AQMA

Figure 1.5 Citywide AQMA

Figure 2.1 Map of Automatic Monitoring Sites

Figure 2.2 Map of Non-Automatic Monitoring Sites

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Automatic Monitoring Sites

Figure 2.4 Trends in Annual Mean PM10 Concentrations

Figure 2.5 Monthly Mean Benzene Levels Measured by Diffusion Tube

### **Appendices**

Appendix A QA/QC Data

Appendix B AEA Air Pollution Reports

Appendix C NO<sub>2</sub> Diffusion Tubes Monthly Results 2011

# **1 Introduction**

## **1.1 Description of Local Authority Area**

Glasgow City Council, serving a population of around 590,000, is Scotland's largest local authority. Glasgow is also the largest city in Scotland and is a centre for business, manufacturing and retail. As such, the city attracts a large daily influx of people and traffic from the surrounding areas.

The city of Glasgow lies at the western end of the Clyde Valley which takes its name from the river which runs through the city.

Glasgow in many ways typifies the modern developed city where road traffic tends to be the major air quality concern, superseding a long industrial heritage.

## **1.2 Purpose of Report**

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

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

### 1.3 Air Quality Objectives

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

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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	3.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 $\text{mg}/\text{m}^3$	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 <sub>10</sub> ) (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 Environment Act 1995 requires that local authorities review the air quality within their boundaries. Where the review concludes that air quality objectives will not be met within the statutory timeframe then the local authority is required to designate an Air Quality Management Area (AQMA). The local authority is then required to produce an air quality action plan (AQAP) to demonstrate how the authority intends to work towards meeting the air quality objectives within its AQMA.

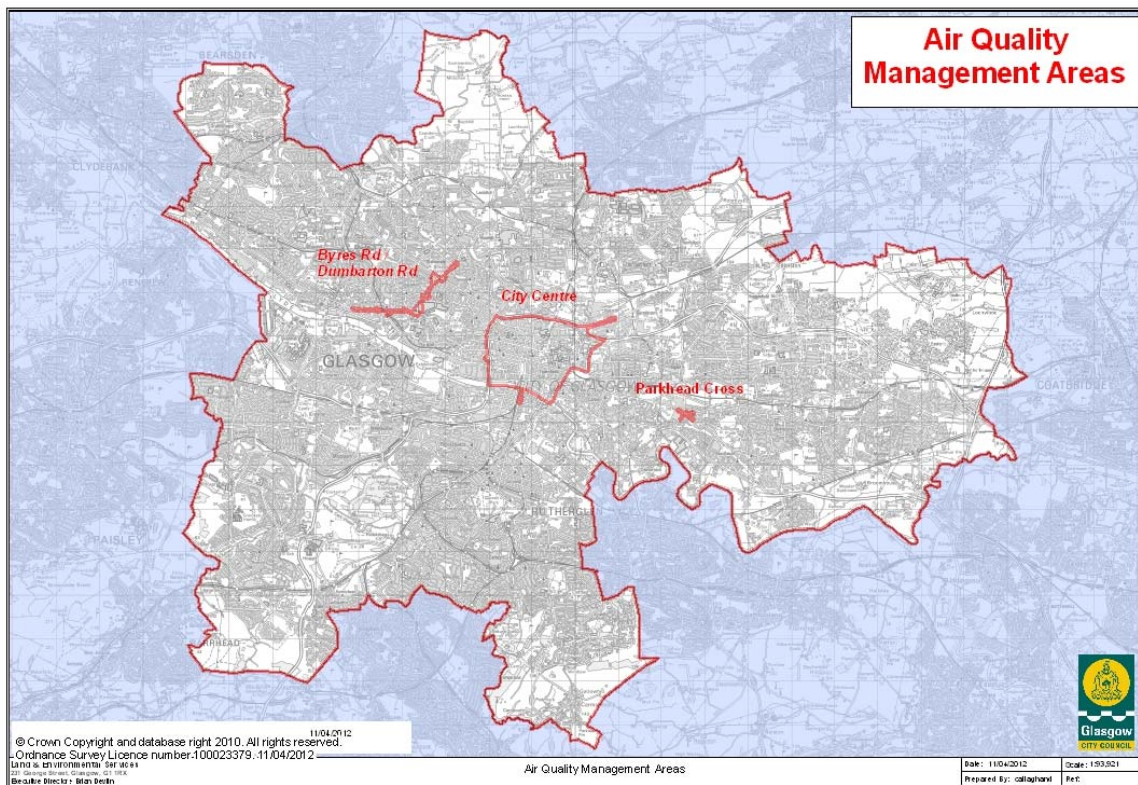
Glasgow's first AQMA was declared in 2004 for NO<sub>2</sub> within the City Centre area. Since that time further assessments have concluded that the boundary of the original AQMA required to be increased and that new AQMAs were required for both Parkhead Cross and for the Byres Rd / Dumbarton Rd area. In March 2012 further extensions were made to the City Centre and Byres Rd / Dumbarton Rd AQMA and the whole of the city was declared an AQMA in respect of the daily and annual mean PM<sub>10</sub> objectives. At this time the City Centre was also declared in respect of the hourly mean NO<sub>2</sub> objective.

Table 1.2 shows a summary of the previous rounds of review and assessment and a brief description of the outcomes from each.

Table 1.2 Summary of Previous Rounds of Review and Assessment

Report	Date Produced	Outcome
Stage I	1998	Proceed to Stage II for CO. Proceed to Stage III for NO <sub>2</sub> and PM <sub>10</sub>
Stage II	2000	Concluded that levels of CO and SO <sub>2</sub> will meet objectives.
Stage III	2001	Recommended an AQMA be declared for the city centre for NO <sub>2</sub>
USA	2003	Proceed to DA for NO <sub>2</sub> , SO <sub>2</sub> and PM <sub>10</sub>
Stage IV	2004	Confirmed city centre AQMA declared for NO <sub>2</sub>
Detailed Assessment	2005	Recommended AQMA's be declared for NO <sub>2</sub> at Parkhead Cross and Dumbarton Rd / Byres Rd. Extension of city centre AQMA to Royston Rd and recommended declaration of the city centre as an AQMA for PM <sub>10</sub>
Progress Report	2005	Reported on continuing monitoring and recommended new monitoring at various locations
USA	2006	Proceed to DA for NO <sub>2</sub> in a variety of areas. Recommended new monitoring of PM <sub>10</sub> at various locations
Detailed Assessment	2007	Recommended additional NO <sub>2</sub> monitoring at locations of concern
Further Assessment	2008	Confirmed ongoing exceedences of the objectives in the declared AQMA's
Progress Report	2008	Confirmed ongoing exceedences of the objectives in the declared AQMA's and predicted likely exceedences of PM <sub>10</sub> objectives for 2010
USA	2009	Proceed to DA for NO <sub>2</sub> at a variety of locations and proceed to DA for PM <sub>10</sub> citywide
Progress Report	2010	Highlighted exceedences of NO <sub>2</sub> hourly objective at Glasgow Kerbside site
Detailed Assessment	2010	Recommended extension of city centre AQMA to Bridge St for NO <sub>2</sub> . Recommended further monitoring city wide for PM <sub>10</sub> and Queen Margaret Drive for NO <sub>2</sub>
Progress Report	2011	Confirmed exceedences at Bridge St and QMD for NO <sub>2</sub> and citywide for PM <sub>10</sub> . Recommended new AQMA's be declared.

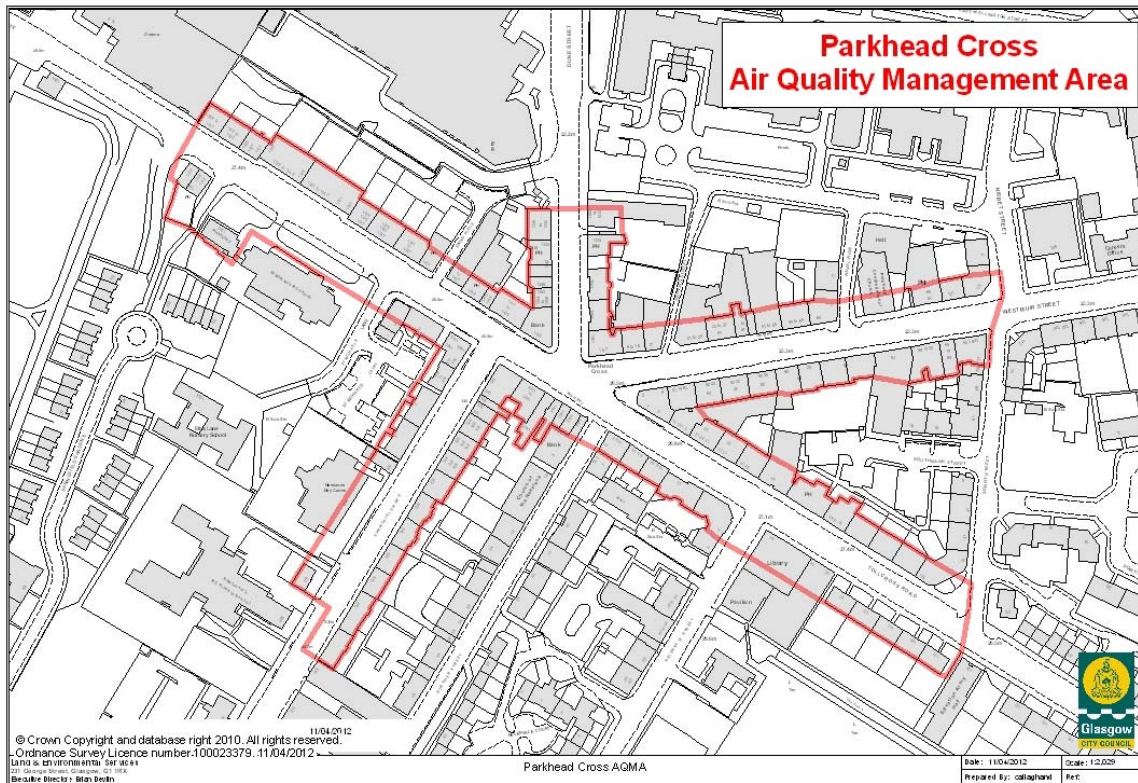
Figure 1.1 Map of AQMA Boundaries



#### 1.4.1 Parkhead Cross

Parkhead Cross is formed by the convergence of five roads in Glasgow's east end. The roads are Westmuir Street, Tollcross Road, Springfield Road, Duke Street and Gallowgate. The area is a mixture of commercial and residential properties within mostly tenement buildings. This area was declared an AQMA in 2007 in respect of the annual mean NO<sub>2</sub> objective.

Figure 1.2 Parkhead Cross Air Quality Management Area



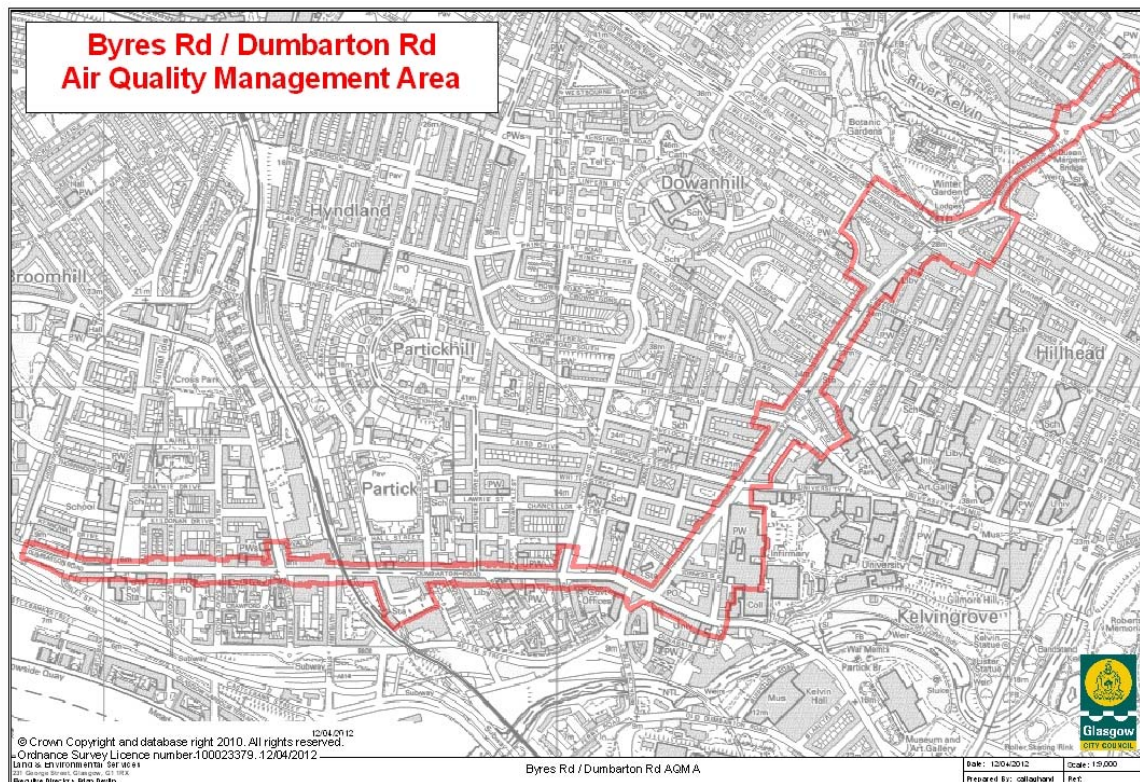
The detailed street listing for this AQMA can be found in the 1<sup>st</sup> July 2007 order.

### 1.4.2 Byres Road / Dumbarton Road

Byres Road and Dumbarton Road are at the heart of Glasgow's west end and comprise a mixture of residential and commercial properties within mostly tenement type buildings. The Area covers from the junction of Byres Road and Great Western Road south to Dumbarton Road and west along Dumbarton Road as far as Thornwood Drive roundabout. This area was declared an AQMA in 2007 in respect of the annual mean NO<sub>2</sub> objective. In 2012 the area covered by this AQMA was extended northwards along Queen Margaret Drive to the junction with Oban Drive.



Figure 1.3 Byres Rd / Dumbarton Rd AQMA

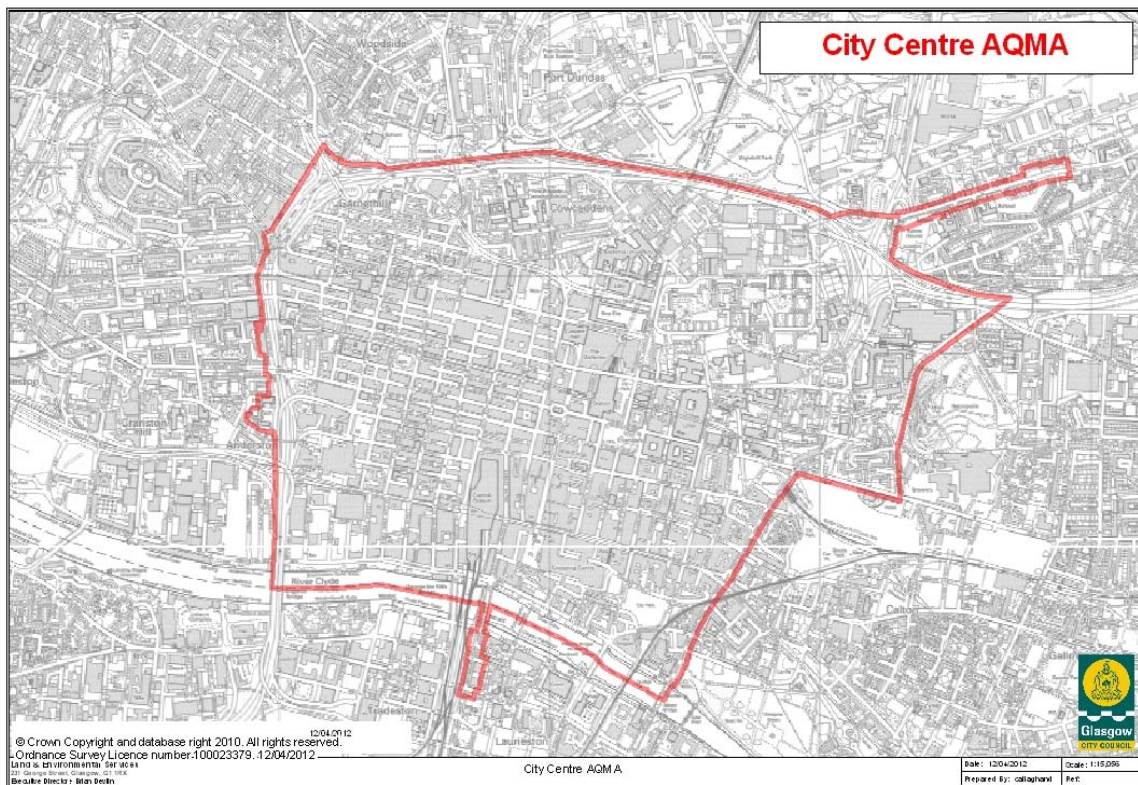


The detailed street listing for this AQMA can be found in the 1<sup>st</sup> March 2012 order.

### 1.4.3 City Centre

The city centre area has been extensively developed with a large number of multi-storey properties for both commercial and residential use. The city centre AQMA is loosely bound by the M8 motorway to the west and north (with slight protrusions at North Street and Royston Road), by High Street and Saltmarket to the east and by the river Clyde to the south. This area was declared an AQMA in 2004 in respect of the annual mean NO<sub>2</sub> objective. In 2007 the area covered by this AQMA was extended and declared in respect of the annual mean PM<sub>10</sub> objective. In 2012 a further extension of the AQMA was declared and the order amended in respect of the NO<sub>2</sub> hourly mean objective.

Figure 1.4 City Centre AQMA



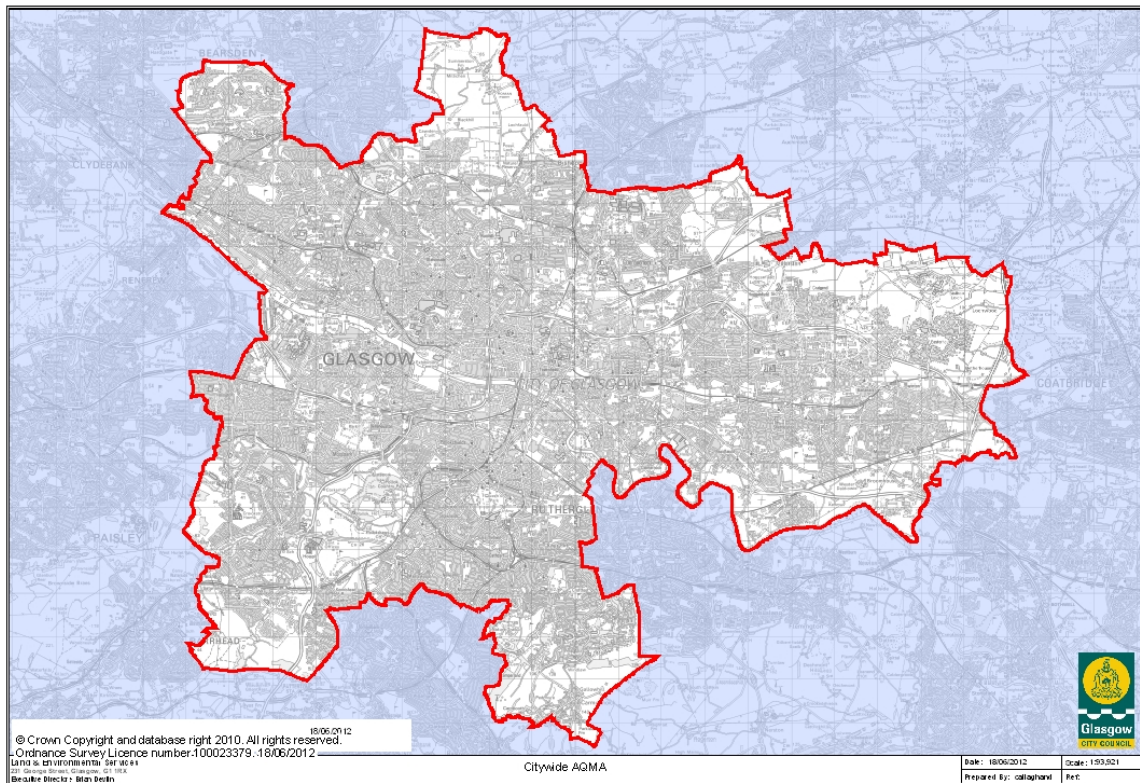
The detailed street listing for this AQMA can be found in the 1<sup>st</sup> March 2012 order.

#### 1.4.4 Citywide

The Citywide AQMA was declared in 2012 as a result of monitoring results showing exceedences of both the annual mean PM<sub>10</sub> objective and the daily mean PM<sub>10</sub> objective. Since these exceedences occurred at multiple locations across the city it was decided that the most effective strategy would be to declare the entirety of the city as an AQMA in respect of these exceedences.



Figure 1.5 Citywide AQMA



The detailed street listing for this AQMA can be found in the 1<sup>st</sup> March 2012 order.

## **2 New Monitoring Data**

### **2.1 Summary of Monitoring Undertaken**

#### **2.1.1 Automatic Monitoring Sites**

Glasgow City Council operates an extensive monitoring network across the city to measure ambient levels of air pollutants.

Automated monitoring equipment is located at ten sites with two of the units (Glasgow Kerbside and Glasgow Centre) forming part of the Department for Environment, Food and Rural Affairs (DEFRA) Automated Urban and Rural Network (AURN).

Equipment located at the sites measure a variety of air pollutants including NO<sub>2</sub>, carbon monoxide, sulphur dioxide and PM<sub>10</sub>. Instruments at these sites are calibrated according to the specific site guidelines by the Local Site Operators and audits are carried out every six months by AEA Technology. All of the automatic air quality data we gather is independently ratified by AEA Technology and made available for viewing by the public at the Scottish Government funded air quality website at: <http://www.scottishairquality.co.uk>

In August 2011 a new automatic monitoring site was established in Burgher St within the Parkhead Cross AQMA. During these latter months of 2011 the site experienced a number of problems with extensive building work and generators, cement mixers, stone cutting etcetera being used in close proximity to the monitoring station. As a result of these factors the site has not been included in this round of review and assessment. However, the site will continue to operate and the results will be included in future rounds.



Figure 2.1 Map of Automatic Monitoring Sites

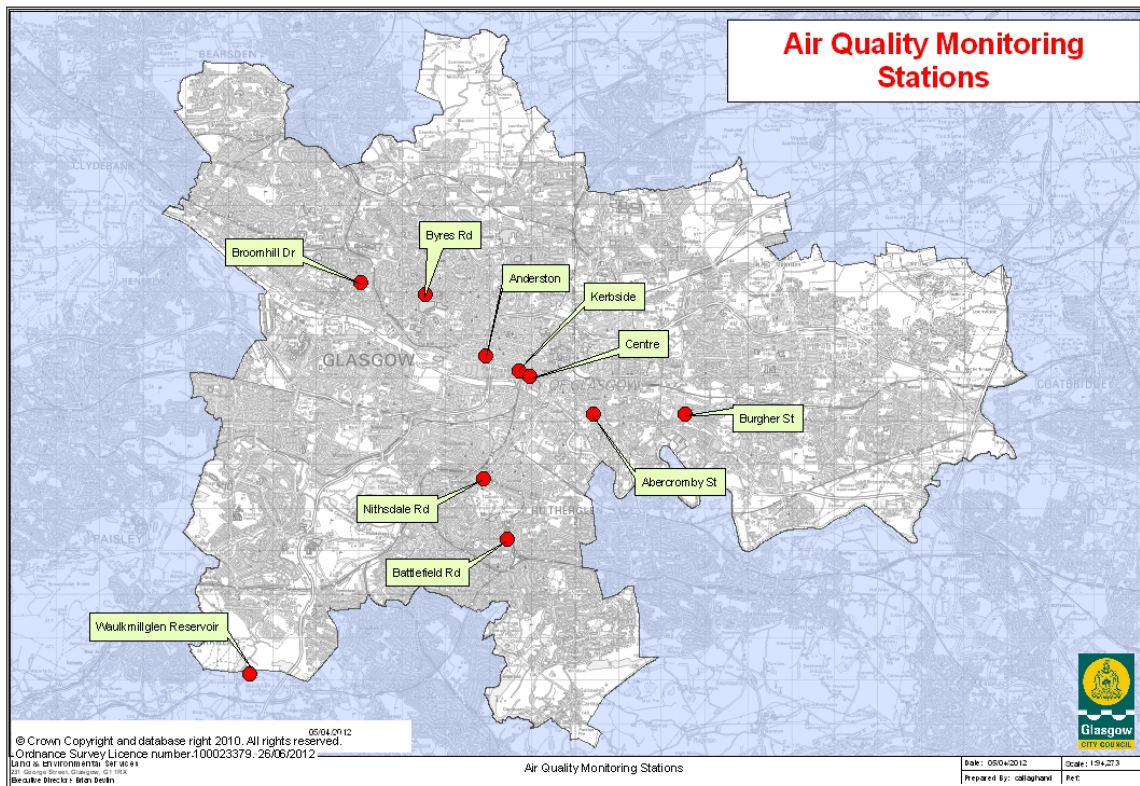


Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Glasgow Kerbside	Kerbside	X 258708 Y 665200	NO <sub>2</sub> PM <sub>10</sub> Hydrocarbon	Y	Y	1m	Y
Glasgow Centre	Urban Centre	X 258902 Y 665028	NO <sub>2</sub> PM <sub>10</sub> CO O <sub>3</sub> SO <sub>2</sub>	Y	Y	>10m	N
Glasgow Anderston	Urban Background	X 257925 Y 665487	NO <sub>2</sub> PM <sub>10</sub> CO SO <sub>2</sub>	Y	Y	N/A	N
Glasgow Byres Rd	Roadside	X 256526 Y 666933	NO <sub>2</sub> PM <sub>10</sub> CO	Y	Y	3m	Y
Glasgow Battlefield Rd	Roadside	X 258427 Y 661385	NO <sub>2</sub> PM <sub>10</sub>	Y	Y	3m	Y
Glasgow Abercromby St	Roadside	X 260420 Y 664175	PM <sub>10</sub>	Y	Y	3m	Y
Glasgow Broomhill	Roadside	X 255030 Y 667195	PM <sub>10</sub>	Y	Y	3m	Y
Glasgow Nithsdale Rd	Roadside	X 257883 Y 662673	PM <sub>10</sub>	Y	Y	3m	Y
Glasgow Waulkmillglen Reservoir	Rural	X 252520 Y 658095	NO <sub>2</sub> PM <sub>10</sub> O <sub>3</sub>	Y	N	N/A	N

### 2.1.2 Non-Automatic Monitoring Sites

Glasgow City Council operates a non-automatic monitoring network of diffusion tubes which measure NO<sub>2</sub> levels at almost 100 sites around the city. NO<sub>2</sub> diffusion tubes represent a simple, effective and low cost method of monitoring ambient concentrations of nitrogen dioxide in a large number of locations. However, NO<sub>2</sub> concentration data provided by diffusion tubes is limited to fairly long-term exposure. Tubes are generally exposed for periods of a month, annual mean concentrations determined and compared with the annual mean objective. Furthermore, the accuracy of diffusion tubes can vary depending on the preparation methodology, handling procedures and the identity of the analysing laboratory.

To correct for this possible bias in tube data, results are corrected using information gained from co-location studies. Triplicate tubes are co-located with the automatic NO<sub>2</sub> analysers at Glasgow Centre, Glasgow Kerbside and Glasgow Anderston. Concentrations detected by these tubes were compared against those recorded through chemiluminescent detection over the same sampling period and a bias-correction factor determined using the guidance outlined in LAQM.TG(09). Diffusion tubes utilised by Glasgow City Council are prepared and analysed by Glasgow City Council's Scientific Services. This laboratory participates in both the WASP scheme and the field intercomparison exercise managed by AEA. The laboratory also follows the procedures set out in the Harmonisation Practical Guidance. Results from the bias study conducted by Glasgow City Council were combined with others conducted on tubes analysed by the laboratory to give a laboratory specific factor. For the 2011 annual means a bias correction factor of 0.94 was used.

More details of the QA/QC process for NO<sub>2</sub> diffusion tubes are given in Appendix A.

In addition to these monitoring methods Glasgow City Council also operated benzene diffusion tubes at four sites across the city. All analysis is conducted by Glasgow City Council Scientific Services Laboratory.

Figure 2.2 Map of Non-Automatic Monitoring Sites

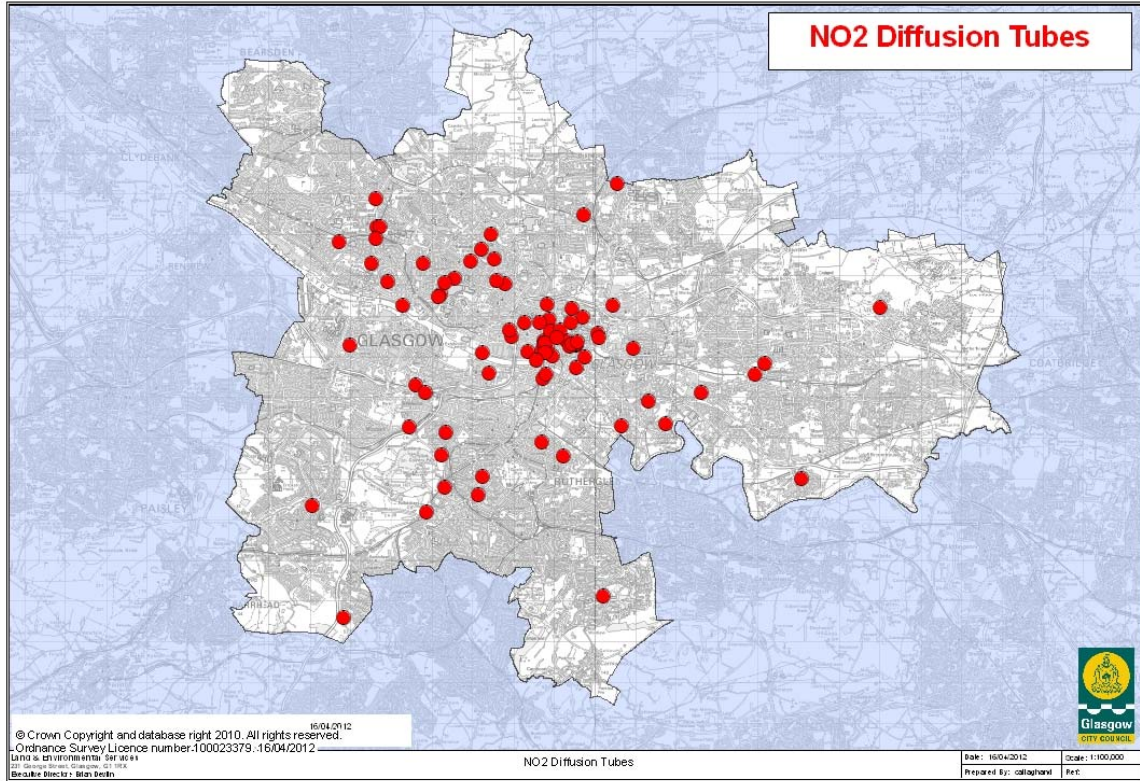


Table 2.2a Details of Non-Automatic NO<sub>2</sub> Monitoring Sites

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
George Square	Urban Background	259296 665389	Y	N(30m)	30m	N
Union St	Roadside	258828 665204	Y	Y	3m	Y
Bath St	Roadside	258262 665851	Y	N (3m)	3m	Y
Glassford St	Roadside	259361 665252	Y	Y	3m	Y
Buchanan St	Roadside	259055 665468	Y	Y	3m	N
Castle St	Roadside	260068 665589	Y	Y	3m	N
Hope St 2	Roadside	258733 665363	Y	Y	3m	Y
Hope St 3	Kerbside	258856 665940	Y	N (5m)	1m	N
Montrose St	Roadside	259536 665313	Y	Y	3m	Y
Cochrane St	Roadside	259430 665316	Y	Y	3m	Y
Renfield St	Roadside	258896 665637	Y	Y	3m	Y
George St	Kerbside	259551 665380	Y	N (3m)	1m	Y
North St	Roadside	257906 665672	Y	N (15m)	3m	N
Hope St 1	Roadside	258731 665322	Y	Y	3m	Y
Gordon St	Roadside	258756 665346	Y	N (5m)	3m	N
Heilan'man's Umbrella North	Roadside	258770 665120	Y	Y	3m	Y
Saltmarket	Roadside	259545 664739	Y	Y	3m	Y
High St	Roadside	259732 664991	Y	Y	3m	Y
Dobbies Loan	Urban Background	259415 666194	Y	Y	3m	N

Table 2.2b Details of Non- Automatic NO<sub>2</sub> Monitoring Sites

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Cathedral Bridge	Roadside	259136 665661	Y	N (10m)	3m	N
Dundasvale St	Urban Background	258820 666306	Y	Y	15m	N
Royston Rd	Roadside	260429 666264	Y	N (5m)	3m	N
St Mungo Avenue	Urban Background	259392 665866	Y	Y	5m	N
Brown St	Roadside	258336 665122	Y	Y	3m	N
Broomielaw	Roadside	258562 664933	Y	N(5m)	3m	N
McLeod St 1	Urban Background	260077 665481	Y	Y	8m	N
Sauchiehall St	Urban Background	258639 665852	Y	N (10m)	N/A	N
Kennedy Path	Urban Background	259701 665983	Y	Y	10m	N
Dumbarton Rd	Roadside	256209 666525	Y	N (3m)	3m	Y
Lawrence St	Roadside	256295 666816	Y	N (5m)	2m	N
Cooperswell St	Roadside	256154 666478	Y	Y	4m	Y
Westmuir St	Roadside	262589 664139	Y	Y	3m	Y
Mossie Rd	Roadside	257235 662064	N	N (3m)	3m	Y
Bridge St	Roadside	258702 664480	Y	N (3m)	3m	Y
Finnieston St	Roadside	257235 665108	N	N(5m)	3m	Y
Hillcrest Rd	Roadside	265075 662001	N	N (5m)	3m	N
St Andrews Dr	Urban Background	256229 662587	N	Y	N/A	N

Table 2.2c Details of Non- Automatic NO<sub>2</sub> Monitoring Sites

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Haggs Rd	Roadside	256295 661792	N	Y	3m	Y
Pollokshaws Rd	Roadside	255864 661180	N	Y	5m	N
Queen Margaret Dr	Roadside	257435 668015	N	N (20m)	3m	Y
Napiershall St	Roadside	257790 666791	N	Y	4m	Y
Queen Margaret Dr 2	Roadside	257216 667639	N	Y	3m	Y
Queen Margaret Dr 3	Roadside	257012 667433	N	Y	3m	N
Oxford St	Roadside	258798 664570	N	Y	3m	N
Anniesland Cross	Roadside	254613 668886	N	Y	15m	N
Balshagray Ave	Roadside	254498 667291	N	Y	10m	N
Dougie Rd	Roadside	260203 659128	N	N (20m)	3m	Y
Main St (Bridgeton)	Roadside	260650 663319	N	Y	5m	Y
Aikenhead Rd	Roadside	259225 662579	N	Y	6m	Y
Langside Primary School	Roadside	257138 661617	N	N (5m)	3m	N
Thornwood Dr	Roadside	254903 666855	N	Y	3m	N
Springburn Rd	Roadside	269541 669268	N	Y	6m	Y
Paisley Rd West	Roadside	255599 664313	N	Y	3m	Y
Sutherland Avenue	Urban Background	256343 663153	N	N (10m)	5m	N
Belmont St	Roadside	257533 667418	N	N (5m)	3m	Y
Mallaig Pl	Urban background	253989 665298	N	N (20m)	6m	N
Govanhill St	Roadside	258678 662901	N	N (3m)	3m	N
Westercraigs	Urban Background	260942 665226	N	Y	15m	N

**Table 2.2d Details of Non- Automatic NO<sub>2</sub> Monitoring Sites**

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Inveresk Lane	Urban Background	264163 664856	N	Y	20m	N
Kippen St	Urban Background	259731 668488	N	N (5m)	3m	N
Sacone SW	Urban background	263920 664569	N	Y	20m	N
Invergarrie Rd	Urban Background	253821 658590	N	N (5m)	3m	N
Easterhouse	Roadside	267005 666217	N	Y	5m	N
Dunn St	Urban Background	261305 663928	N	Y	5m	N
Glasgow Harbour	Urban Background	255287 666276	N	Y	30m	N
Mosspark Boulevard	Urban Background	255436 663274	N	Y	15m	N
Crow Road	Roadside	254640 254730	N	Y	3m	Y
Whittingeham e Park	Roadside	254730 668207	N	Y	3m	N
Silverburn	Roadside	253047 661349	N	Y	5m	N
Hyndland Rd	Roadside	255764 667297	N	Y	4m	N
Urrdale Rd	Urban Background	255826 664118	N	Y	N/A	N
Park Rd	Roadside	257555 666896	N	Y	2m	Y

**Table 2.3 Details of Non- Automatic Benzene Monitoring Sites**

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure ? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Heilanmans Umbrella North	Roadside	258770 665121	Y	Y	3m	Y
Hope Street	Kerbside	258738 665167	Y	N (3m)	<1m	Y
Ochiltree Avenue	Roadside	254839 669295	N	N (3m)	5m	Y
Pollokshaws Road	Roadside	255869 661185	N	N (3m)	3m	Y

## **2.2 Comparison of Monitoring Results with AQ Objectives**

### **2.2.1 Nitrogen Dioxide**

#### **Automatic Monitoring Data**

Nitrogen dioxide is monitored using automatic analysers at six locations. These are the two AUN sites; Glasgow Kerbside and Glasgow Centre and the Anderson, Byres Road, Battlefield Road and Waulkmillglen reservoir sites. Table 2.4 shows the measured annual mean at all sites over the last five years.



Table 2.4 Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA ?	Valid Data Capture for period of monitoring %	Valid Data Capture 2011 %	Annual Mean Concentration $\mu\text{g}/\text{m}^3$				
					2007	2008	2009	2010	2011
Glasgow Kerbside	Kerbside	Y	98.1	98.1	70	82	78	84	72
Glasgow Centre	Urban Centre	Y	96.1	96.1	31	35	42	44	34
Glasgow Anderston	Urban Background	Y	90.4	90.4	33	32	36	38	36
Glasgow Byres Rd	Roadside	Y	42.5	42.5	40	43	40	47	42
Glasgow Battlefield Rd	Roadside	N	91.6	91.6	34	32	34	30	26
Glasgow Waulkmillglen Reservoir	Rural	N	91.2	91.2	9	12	12	16	11

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations measures at Automatic Monitoring Sites

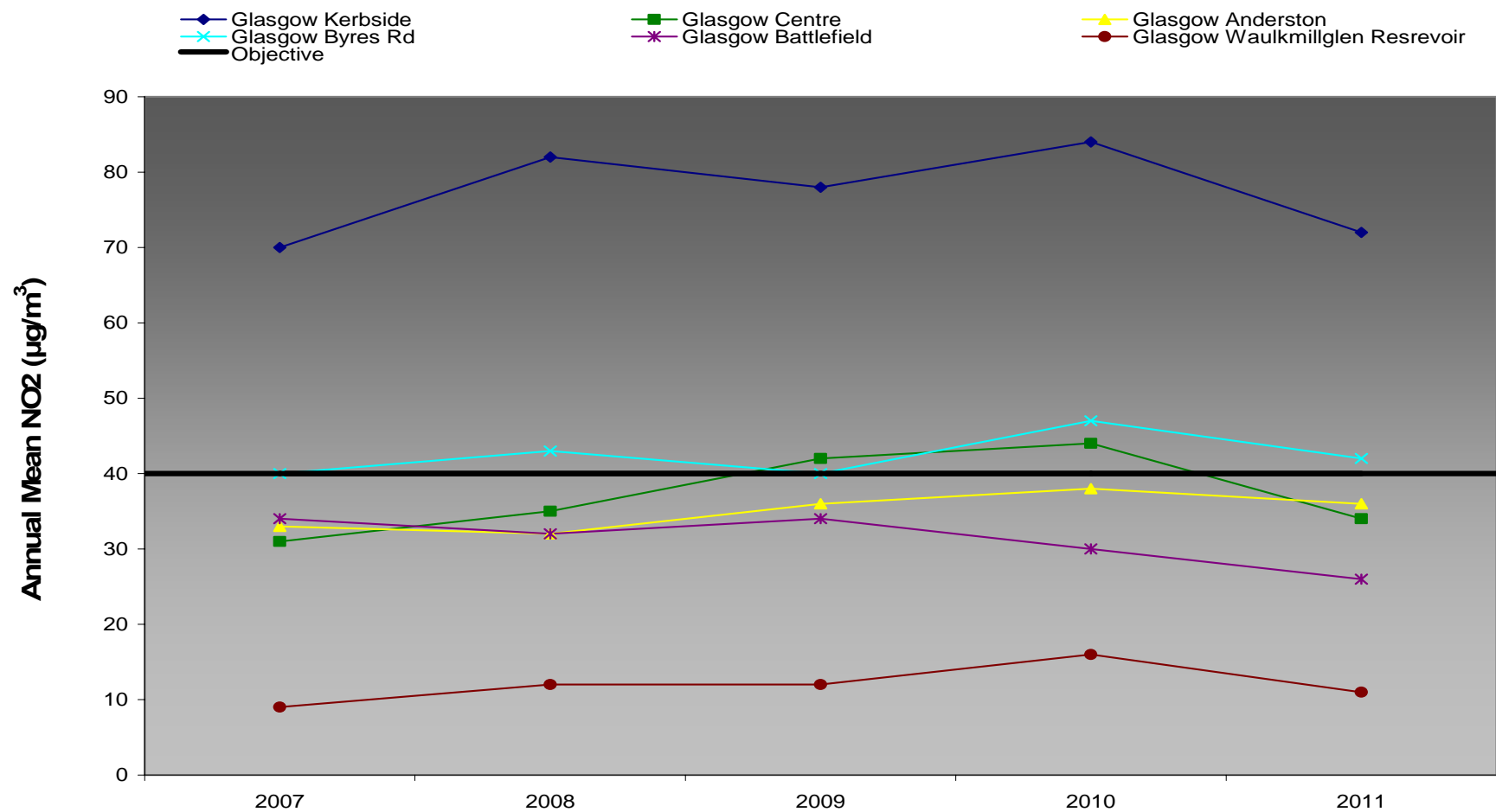


Table 2.5 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture 2011 %	Number of Exceedences of Hourly Mean (200 µg/m <sup>3</sup> )				
				2007*	2008*	2009*	2010*	2011
Glasgow Kerbside	Kerbside	Y	98.1	21	72	57	97	31
Glasgow Centre	Urban Centre	Y	96.1	0	0 (175)	48	56	0
Glasgow Anderston	Urban Background	Y	90.4	0	1 (137)	4	16 (204)	4
Glasgow Byres Rd	Roadside	Y	42.5	6	6	0	14	0 (145)
Glasgow Battlefield Rd	Roadside	N	91.6	0	0	1	0 (146)	20
Glasgow Waulkmillglen Reservoir	Rural	N	91.2	0	0 (87)	0	0	0

If the period of valid data is less than 90%, the 99.8<sup>th</sup> percentile of hourly means is in brackets

## Diffusion Tube Monitoring Data

Table 2.6 show the annual mean NO<sub>2</sub> concentrations measured using diffusion tubes. All values have been corrected for bias using the appropriate factor

**Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes in 2011**

Location	Site Type	Within AQMA?	Data Capture 2011 (Number of Months or %)	Annual mean concentration (Bias Adjustment factor = 0.94)
				2011 (µg/m <sup>3</sup> )
George Square	Urban Background	Y	100	44.1
Union St	Roadside	Y	100	64.3
Bath St	Roadside	Y	92	51.3
Glassford St	Roadside	Y	92	48.1
Buchanan St	Roadside	Y	92	46.3
Castle St	Roadside	Y	100	34.7
Hope St 3	Kerbside	Y	42	55.3
Montrose St	Roadside	Y	50	42.2
Cochrane St	Roadside	Y	58	42.3
Renfield St	Roadside	Y	92	58.5
George St	Kerbside	Y	100	47.2
North St	Roadside	Y	100	30.1
Hope St 1	Roadside	Y	100	76.3
Heilan'man's Umbra North	Roadside	Y	100	68.0
Saltmarket	Roadside	Y	100	41.6
High St	Roadside	Y	100	49.2
Dobbies Loan	Urban Background	Y	100	31.2
Cathedral Bridge	Roadside	Y	83	53.3
Royston Rd	Roadside	Y	92	44.9
St Mungo Avenue	Urban Background	Y	100	34.3
Brown St	Roadside	Y	100	30.7
Broomielaw	Roadside	Y	92	39.9
McLeod St 1	Urban Background	Y	100	35.1
Sauchiehall St	Urban Background	Y	58	50.7
Kennedy Path	Urban Background	Y	100	26.6
Dumbarton Rd	Roadside	Y	100	31.8
Lawrence St	Roadside	Y	92	25.9
Cooperswell St	Roadside	Y	100	27.0
Westmuir St	Roadside	Y	100	39.4
Mossie Rd	Roadside	N	92	29.2
Bridge St	Roadside	Y	92	38.9
Finnieston St	Roadside	N	100	35.0

Glasgow City Council

Location	Site Type	Within AQMA?	Data Capture 2011 (Number of Months or %)	Annual mean concentration (Bias Adjustment factor = 0.94)
				2011 ( $\mu\text{g}/\text{m}^3$ )
Hillcrest Rd	Roadside	N	100	18.9
St Andrews Dr	Urban Background	N	100	21.7
Haggs Rd	Roadside	N	100	36.0
Pollokshaws Rd	Roadside	N	100	32.2
Queen Margaret Dr	Roadside	N	100	29.5
Napiershall St	Roadside	N	92	30.9
Queen Margaret Dr 2	Roadside	Y	92	35.5
Queen Margaret Dr 3	Roadside	Y	100	41.9
Oxford St	Roadside	N	100	34.3
Anniesland Cross	Roadside	N	100	34.4
Balshagray Ave	Roadside	N	100	25.5
Dougie Rd	Roadside	N	92	19.9
Main St (Bridgeton)	Roadside	N	100	22.6
Aikenhead Rd	Roadside	N	100	23.4
Langside Primary School	Roadside	N	100	18.1
Thornwood Dr	Roadside	N	100	20.8
Springburn Rd	Roadside	N	92	29.8
Paisley Rd West	Roadside	N	92	30.7
Sutherland Avenue	Urban Background	N	100	16.4
Belmont St	Roadside	N	100	23.4
Mallaig Pl	Urban background	N	100	23.1
Govanhill St	Roadside	N	83	28.2
Westercraigs	Urban Background	N	100	22.1
Inveresk Lane	Urban Background	N	100	18.4
Kippen St	Urban Background	N	92	29.4
Sacone SW	Urban background	N	100	21.2
Invergarrie Rd	Urban Background	N	92	18.0
Easterhouse	Roadside	N	100	20.2
Dunn St	Urban Background	N	92	19.7
Glasgow Harbour	Urban Background	N	100	27.5
Mosspark Boulevard	Urban Background	N	100	26.5
Crow Road	Roadside	N	100	43.6
Whittingehame Park	Roadside	N	75	18.7
Silverburn	Roadside	N	100	20.6
Hyndland Rd	Roadside	N	100	31.0
Urrdale Rd	Urban Background	N	100	31.0
Park Rd	Roadside	N	42	45.2

Table 2.7 Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2011)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007 (Bias Adjustment Factor = 0.92)	2008 (Bias Adjustment Factor = 0.87)	2009 (Bias Adjustment Factor = 1.09)	2010 (Bias Adjustment Factor = 1.10)	2011 (Bias Adjustment Factor = 0.94)
George Square	Urban Background	Y	52.6	47.3	43.8	52.4	44.1
Union St	Roadside	Y	73.5	65.9	60.8	72.4	64.3
Bath St	Roadside	Y	39.9	59.8	52.7	56.2	51.3
Glassford St	Roadside	Y	63.3	67.3	51.4	50.7	48.1
Buchanan St	Roadside	Y	47.7	64.4	57.5	59.2	46.3
Castle St	Roadside	Y	41.2	39.6	32.3	39.8	34.7
Hope St 3	Kerbside	Y	64.0	61.5	57.2	60.7	55.3
Montrose St	Roadside	Y	44.9	41.0	41.8	47.1	42.2
Cochrane St	Roadside	Y	42.2	36.0	44.1	54.3	42.3
Renfield St	Roadside	Y	73.7	66.4	54.0	60.3	58.5
George St	Kerbside	Y	35.3	56.8	52.7	51.1	47.2
North St	Roadside	Y	58.6	44.4	39.6	40.1	30.1
Hope St 1	Roadside	Y	89.8	81.7	82.5	91.3	76.3
Heilan'man's Umbrella North	Roadside	Y	92.0	90.9	76.4	83.6	68.0
Saltmarket	Roadside	Y	46.1	46.9	42.9	48.0	41.6
High St	Roadside	Y	59.2	58.5	53.6	57.5	49.2
Dobbies Loan	Urban Background	Y	34.6	31.1	32.4	32.9	31.2
Cathedral Bridge	Roadside	Y	56.5	59.2	60.1	58.9	53.3
Royston Rd	Roadside	Y	46.1	49.4	41.8	44.4	44.9
St Mungo Avenue	Urban Background	Y	46.2	34.9	38.0	42.5	34.3

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007 (Bias Adjustment Factor = 0.92)	2008 (Bias Adjustment Factor = 0.87)	2009 (Bias Adjustment Factor = 1.09)	2010 (Bias Adjustment Factor = 1.10)	2011 (Bias Adjustment Factor = 0.94)
Brown St	Roadside	Y	37.9	39.9	32.3	37.9	30.7
Broomielaw	Roadside	Y	-	53.5	51.4	51.3	39.9
McLeod St 1	Urban Background	Y	40.6	39.6	38.5	40.3	35.1
Sauchiehall St	Urban Background	Y	42.1	51.1	45.6	51.4	50.7
Kennedy Path	Urban Background	Y	35.2	36.0	30.8	37.2	26.6
Dumbarton Rd	Roadside	Y	41.1	38.1	39.7	36.9	31.8
Lawrence St	Roadside	Y	29.8	33.1	30.2	30.9	25.9
Cooperswell St	Roadside	Y	30.3	33.0	27.3	31.6	27.0
Westmuir St	Roadside	Y	53.7	48.6	48.6	52.1	39.4
Mossie Rd	Roadside	N	38.3	34.8	36.3	36.9	29.2
Bridge St	Roadside	Y	49.1	50.2	43.3	43.0	38.9
Finnieston St	Roadside	N	44.5	47.5	37.3	39.1	35.0
Hillcrest Rd	Roadside	N	26.3	21.6	25.5	25.7	18.9
St Andrews Dr	Urban Background	N	25.8	22.2	21.1	24.0	21.7
Haggs Rd	Roadside	N	35.3	35.6	36.0	36.4	36.0
Pollokshaws Rd	Roadside	N	27.9	26.6	26.7	29.0	32.2
Queen Margaret Dr	Roadside	N	34.7	32.2	34.7	34.1	29.5
Napiershall St	Roadside	N	37.7	37.1	34.7	40.3	30.9
Queen Margaret Dr 2	Roadside	Y	33.3	41.5	38.9	41.1	35.5
Queen Margaret Dr 3	Roadside	Y	44.6	38.7	44.8	46.3	41.9
Oxford St	Roadside	N	35.9	32.4	37.6	37.0	34.3
Anniesland Cross	Roadside	N	44.5	39.1	28.8	35.5	34.4
Balshagray Ave	Roadside	N	33.0	29.8	31.6	32.8	25.5
Dougie Rd	Roadside	N	25.9	23.2	22.5	25.0	19.9

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007 (Bias Adjustment Factor = 0.92)	2008 (Bias Adjustment Factor = 0.87)	2009 (Bias Adjustment Factor = 1.09)	2010 (Bias Adjustment Factor = 1.10)	2011 (Bias Adjustment Factor = 0.94)
Main St (Bridgeton)	Roadside	N	29.5	25.5	26.6	28.0	22.6
Aikenhead Rd	Roadside	N	26.2	28.6	26.9	31.5	23.4
Langside Primary School	Roadside	N	29.0	22.5	23.9	25.1	18.1
Thornwood Dr	Roadside	N	28.8	25.2	25.8	28.7	20.8
Springburn Rd	Roadside	N	33.2	30.0	30.9	36.9	29.8
Paisley Rd West	Roadside	N	36.1	36.9	33.3	41.6	30.7
Sutherland Avenue	Urban Background	N	21.6	20.2	20.1	22.5	16.4
Belmont St	Roadside	N	26.5	25.7	28.1	31.0	23.4
Mallaig Pl	Urban background	N	23.9	29.3	26.8	28.7	23.1
Govanhill St	Roadside	N	32.4	30.5	30.8	32.4	28.2
Westercraigs	Urban Background	N	26.1	27.1	24.7	25.9	22.1
Inveresk Lane	Urban Background	N	23.5	20.2	20.3	26.0	18.4
Kippen St	Urban Background	N	22.0	21.0	27.8	26.8	29.4
Sacone SW	Urban background	N	25.6	21.1	21.9	26.7	21.2
Invergarrie Rd	Urban Background	N	21.9	16.2	19.2	22.5	18.0
Easterhouse	Roadside	N	21.7	21.2	19.6	21.8	20.2
Dunn St	Urban Background	N	31.5	26.4	23.1	31.1	19.7
Glasgow Harbour	Urban Background	N	29.9	27.1	27.7	33.7	27.5
Mosspark Boulevard	Urban Background	N	29.2	26.1	28.0	30.4	26.5
Crow Road	Roadside	N	-	-	-	45.0	43.6
Whittingehame Park	Roadside	N	-	-	-	25.8	18.7
Silverburn	Roadside	N	-	-	22.9	22.8	20.6



Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007 (Bias Adjustment Factor = 0.92)	2008 (Bias Adjustment Factor = 0.87)	2009 (Bias Adjustment Factor = 1.09)	2010 (Bias Adjustment Factor = 1.10)	2011 (Bias Adjustment Factor = 0.94)
Hyndland Rd	Roadside	N	-	-	-	35.3	31.0
Urrdale Rd	Urban Background	N	-	-	-	-	31.0
Park Rd	Roadside	N	-	-	-	-	45.2

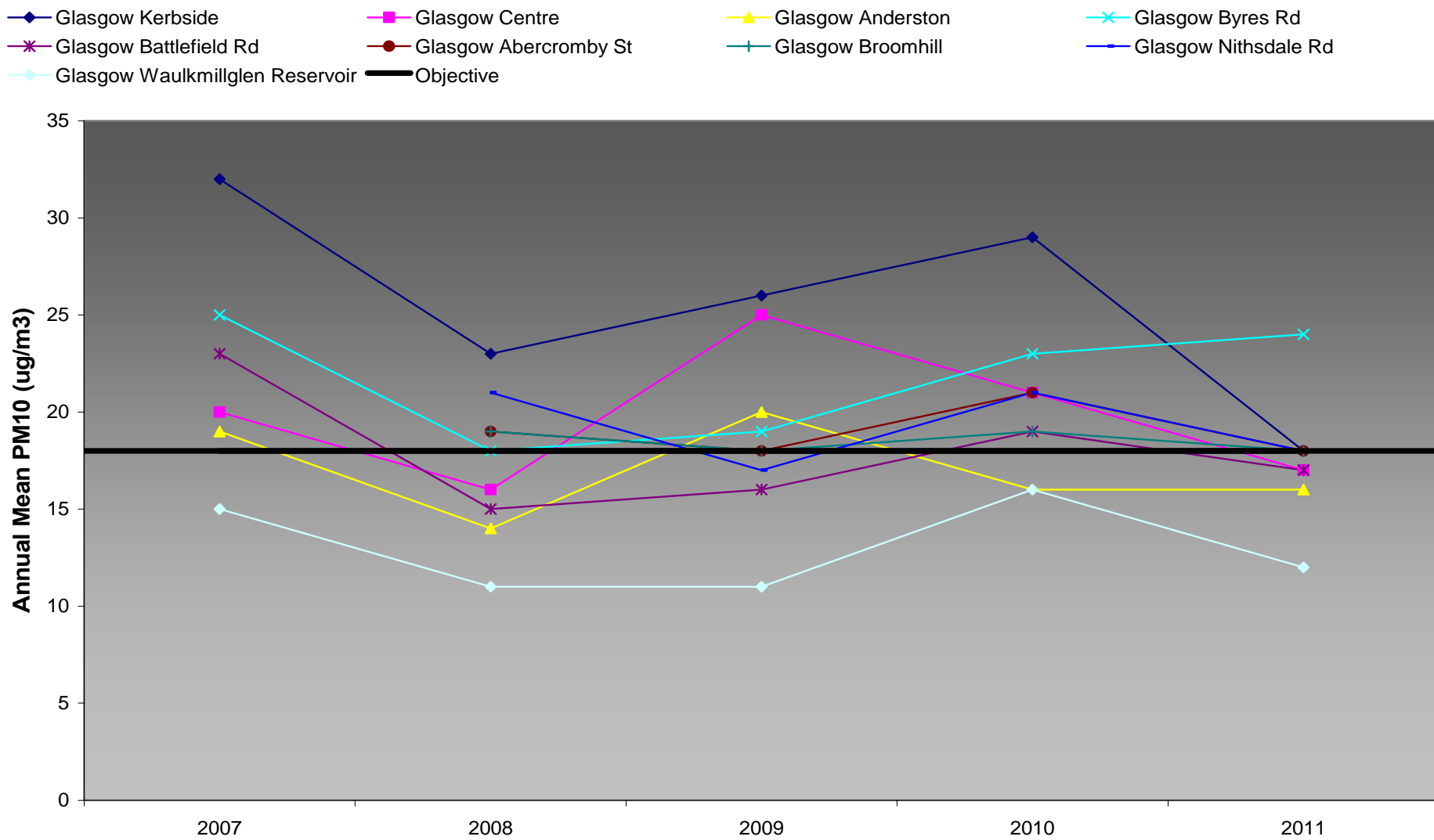
2.2.2 PM<sub>10</sub>Table 2.8 Results of Automatic Monitoring for PM<sub>10</sub>: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture 2011 %	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration µg/m <sup>3</sup>				
					2007	2008	2009	2010	2011
Glasgow Kerbside	Kerbside	Y	43.5	Y	32	23	26	29	18
Glasgow Centre	Urban Centre	Y	90.9	Y	20	16	25	21	17
Glasgow Anderston	Urban Background	Y	64.6	Y	19	14	20	16	16
Glasgow Byres Rd	Roadside	Y	30.2	Y	25	18	19	23	24
Glasgow Battlefield Rd	Roadside	Y	90.8	Y	23	15	16	19	17
Glasgow Abercromby St	Roadside	Y	94.8	Y	-	19	18	21	18
Glasgow Broomhill	Roadside	Y	95.0	Y	-	19	18	19	18
Glasgow Nithsdale Rd	Roadside	Y	99.4	Y	-	21	17	21	18
Glasgow Waulkmillglen Reservoir	Rural	N	84.4	Y	15	11	11	16	12

Table 2.9 Results of Automatic Monitoring for PM<sub>10</sub>: Comparison with 24-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture 2011 %	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 µg/m <sup>3</sup> )				
					2007	2008	2009	2010	2011
Glasgow Kerbside	Kerbside	Y	43.5	Y	41	10	18	25	0 (28)
Glasgow Centre	Urban Centre	Y	90.9	Y	4	0	21	7 (80)	2
Glasgow Anderston	Urban Background	Y	64.6	Y	3	1	12	4 (45)	2 (25)
Glasgow Byres Rd	Roadside	Y	30.2	Y	10	1	2	9	2 (40)
Glasgow Battlefield Rd	Roadside	Y	90.8	Y	7	0	2 (42)	1	6
Glasgow Abercromby St	Roadside	Y	94.8	Y	-	9	7	9 (60)	9
Glasgow Broomhill	Roadside	Y	95.0	Y	-	8	7	9	6
Glasgow Nithsdale Rd	Roadside	Y	99.4	Y	-	7	6	10 (57)	6
Glasgow Waulkmillglen Reservoir	Rural	N	84.4	Y	3	0	0	4	0 (20)

Figure 2.4 Trends in Annual Mean PM<sub>10</sub> Concentrations



### 2.2.3 Sulphur Dioxide

Sulphur Dioxide is measured at two sites in Glasgow using automatic analysers. Table 2.10 shows the measured annual mean concentrations of SO<sub>2</sub> measured at the Glasgow Centre and Glasgow Anderston sites.

The air quality objectives for SO<sub>2</sub> are 15-minute, 1-hour and 24-hour means. There were no measured exceedences of these objectives in Glasgow.

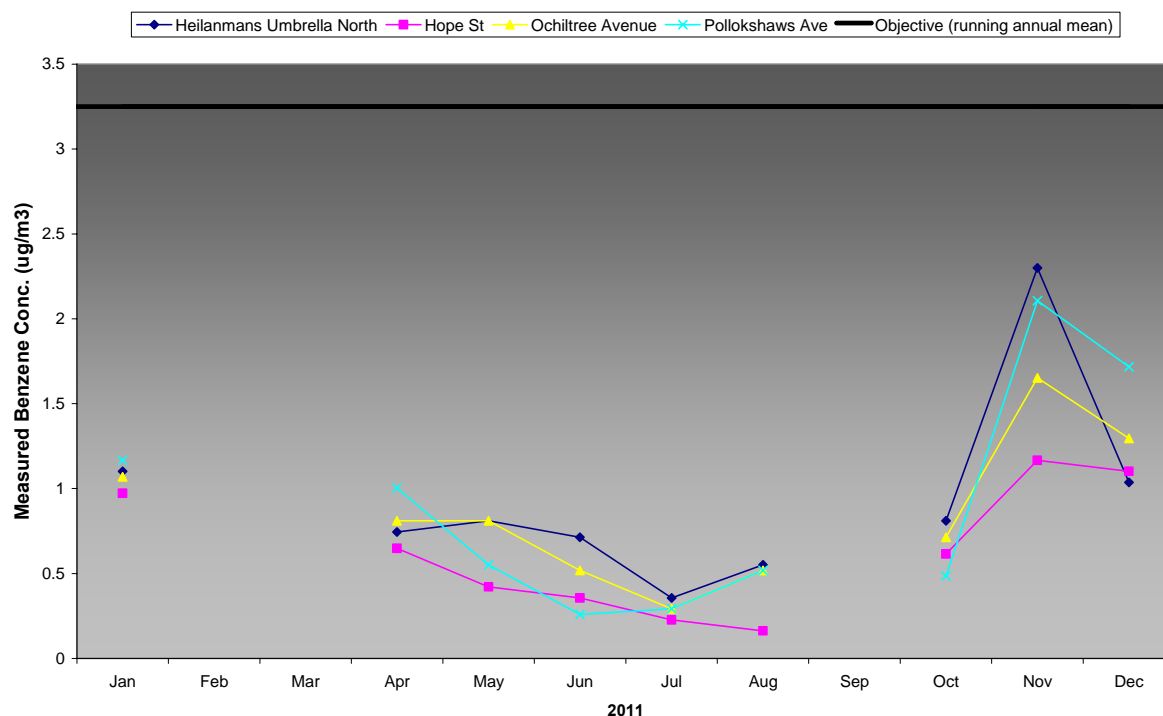
**Table 2.10 Results of Automatic Monitoring of SO<sub>2</sub>: Comparison with Objectives**

Site ID	Site Type	Valid Data Capture 2011 %	Annual Mean Conc. (µg/m <sup>3</sup> )	Number of Exceedences (percentile in bracket µg/m <sup>3</sup> )		
				15-minute Objective (266 µg/m <sup>3</sup> )	1-hour Objective (350 µg/m <sup>3</sup> )	24-hour Objective (125 µg/m <sup>3</sup> )
Glasgow Centre	Urban Centre	98.4	2	0	0	0
Glasgow Anderston	Urban Background	91.2	3	0	0	0

### 2.2.4 Benzene

Benzene is measured using diffusion tubes at four sites in Glasgow. The tubes at these sites have been in operation since early 2006. The tubes are exposed for one month at a time and then analysed. The results are significantly below the objective level and can be seen in Figure 2.6.

Figure 2.5 Monthly Mean Benzene Levels Measured by Diffusion Tube



### 2.2.5 Carbon Monoxide

Table 2.11 shows CO concentrations measured at three sites using automatic analysers. The air quality objective for Scotland for CO is a running 8-hour mean of 10.0 mg/m<sup>3</sup>. In Glasgow there have been no exceedences of this objective.

Table 2.11 Measured Annual Means and Maximum 8-hour Running Means for CO

	Data Capture 2011(%)	Measured Annual Mean (mg/m <sup>3</sup> )			Maximum 8hr running mean (mg/m <sup>3</sup> )		
		2009	2010	2011	2009	2010	2011
Glasgow Centre	98.4	0.2	0.3	0.2	1.9	2.4	1.1
Glasgow Anderston	91.0	0.1	0.2	0.1	1.6	2.5	1.1
Glasgow Byres Rd	42.5	0.3	0.3	0.3	1.8	2.9	1.1

### 2.2.6 Ozone

Glasgow City Council measures ozone at two locations, Glasgow Centre and Glasgow Waulkmillglen Reservoir. Ozone is a secondary pollutant and the highest concentrations are generally measured remotely from sources of pollution. This is seen in Glasgow where the Glasgow Centre site observed six exceedences of the running 8-hour mean objective set at 100  $\mu\text{g}/\text{m}^3$ . These exceedences covered a period of two days. In contrast, the rural site at Glasgow Waulkmillglen Reservoir experienced 44 exceedences of this objective during 2011 over a period of 9 days.

The objective for ozone is for no more than ten exceedences per year, however this is not included in regulations at present.

### 2.2.7 PM<sub>2.5</sub>

The Scottish Government has set objective levels for PM<sub>2.5</sub> at 12  $\mu\text{g}/\text{m}^3$  to be achieved by 2020. PM<sub>2.5</sub> is currently measured at two locations within Glasgow, Glasgow Centre and Glasgow Kerbside. Results from these sites are shown in the table below.

**Table 2.12 Results of PM<sub>2.5</sub> Automatic Monitoring: Comparison with Annual Mean Objective 2011**

	Data Capture 2011 (%)	Measured Annual Mean ( $\mu\text{g}/\text{m}^3$ )	
		2010	2011
Glasgow Centre	94.3	12	10
Glasgow Kerbside	90.2	23	22

In addition to the annual mean objective, there is a target of a 15% reduction in concentrations at urban background locations measured as a three year mean. There is insufficient monitoring data at this stage to gauge progress towards this objective.

## Summary of Compliance with AQS Objectives

Glasgow City Council has measured concentrations of nitrogen dioxide above the annual mean objective at relevant locations outside of the existing AQMAs, and **will need to proceed to a Detailed Assessment**, for the Park Road and Crow Road areas.



## **3 Road Traffic Sources**

### **3.1 Narrow Congested Streets with Residential Properties Close to the Kerb**

A location with a combination of high traffic volume and narrow streets is where exceedences of the objectives are most likely. Slow moving, stop/start driving can cause high emissions, with buildings on either side of the road reducing dispersion. Such locations should be assessed for potential exceedences of the air quality objectives.

Previous rounds of review and assessment have considered these streets in some detail. No new streets which meet the criteria have been identified.

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

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

There are certain locations where members of the public may be expected to spend 1-hour or more on a regular basis, such as shopping areas. These require to be assessed if they are next to a busy road where there is the potential for exceedences of the 1-hour objective for NO<sub>2</sub>.

Glasgow has a number of locations such as these. However, the busiest streets for traffic and for shopping are currently within the existing boundary of the city centre

AQMA. Therefore, these will not require to be assessed further at the present time. No new streets which meet the criteria have been identified.

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

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

Certain streets may not have an exceptionally high traffic flow, but if there are a high proportion of buses or heavy goods vehicles (HGVs), which are large emitters of NO<sub>x</sub>, there may still be elevated concentrations of pollution.

Outwith the existing AQMA's it is considered that there are no roads which meet the criteria laid out in LAQM.TG(09).

Glasgow City Council confirms that there are no new/newly identified roads with high flows of buses/HGVs.

### **3.4 Junctions**

Busy road junctions are areas where concentrations of NO<sub>2</sub> can increase due to build up of traffic. Busy junctions are those with more than 5000 vehicles per day where the annual mean PM<sub>10</sub> background in 2010 is expected to be above 15µg/m<sup>3</sup>. Alternatively it can be considered if there are more than 10,000 vehicles per day where the mean background level in 2010 is expected to be below 15µg/m<sup>3</sup>. It is not necessary to assess those junctions that do not have relevant exposure.

It is considered that all junctions which meet the above criteria have been evaluated in previous rounds of review and assessment.

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

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

In 2011 the extension to the M74 motorway running through Glasgow was opened to traffic. This motorway has been considered in detail in previous rounds of review and assessment and was subject to an Environmental Impact Assessment which produced an Environmental Statement.

This development is currently being assessed under the M74 Completion Project. As part of this traffic noise and air quality impacts are being assessed through a combination of monitoring and modelling. An extended period of air quality monitoring in relation to the motorway is being undertaken and will report in due course.

Glasgow City Council confirms that there are no new/proposed roads.

### **3.6 Roads with Significantly Changed Traffic Flows**

Those roads which were previously at risk of exceeding the objectives may be subject to higher concentration of pollutants if there has been a 'large' increase in traffic flow, where 'large' is defined as,

*"..more than 25% increase in traffic flow."*

The road network in Glasgow has not undergone any major changes that could lead to such an increase in traffic flow on at risk roads since the last round of review and assessment.

Glasgow City Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

### **3.7 Bus and Coach Stations**

Because of the high volume of buses and coaches using bus stations on a regular basis, there is a risk of exceedences of the hourly objective for NO<sub>2</sub>. The main bus station in Glasgow is Buchanan Bus Station, located within the city centre AQMA. Another major bus station is Partick Bus Station, located within the Byres Rd / Dumbarton Rd AQMA.

Both of these bus station have been extensively assessed in previous rounds of review and assessment.

Glasgow City Council confirms that there are no relevant bus stations which have not previously been assessed in the Local Authority area.

## 4 Other Transport Sources

### 4.1 Airports

Aircraft are significant sources of nitrogen oxide emissions, most particularly during takeoff. It is thought that they can make a significant contribution to ground-level concentrations when they are below 200m.

Glasgow International Airport is located outwith the city boundary and falls within the jurisdiction of Renfrewshire Council. Guidance suggests to,

*...establish whether there is relevant exposure within 1000m of the airport boundary...*

Since the airport is more than two kilometres from the city boundary, there is no relevant exposure and so emissions from aircraft takeoff are not predicted to have any effect on air quality in Glasgow.

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

### 4.2 Railways (Diesel and Steam Trains)

Diesel and coal-fired railway locomotives can potentially emit large quantities of SO<sub>2</sub>, and if these engines are stationary while running for 15-minute periods or more, then there is a risk of exceedences of the 15-minute objective. Locations where this is likely to occur include stations, depots and junctions. For this to be an issue in terms of public exposure, there must be, according to the Technical Guidance, a potential for:

“regular *outdoor exposure of members of the public within 15m of the stationary locomotives*”.

#### 4.2.1 Stationary Trains

It is considered unlikely that there will be any locations where diesel trains have their engines running for extended periods *and* where there is potential exposure for the public. Even in locations like Glasgow Central and Queen Street stations, where engines may idle occasionally, the areas where the public would wait are more than 15m from the locomotive engines. In addition, the potential exists for locomotive engines running at rail depots; however, such sites are not generally accessible to the public.

Glasgow City 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

The main Glasgow to Edinburgh line has been identified as a section of track that may have a large number of movements of diesel locomotives. However, there are no areas along the route identified using the national background maps where the background annual mean NO<sub>2</sub> concentration is above 25 µg/m<sup>3</sup>.

Glasgow City 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)

Large ships, such as cross-Channel ferries or cruise ships, often use fuel oil which has a high sulphur content, and if there is a large amount of shipping traffic in the area around a port, there will be a risk of exceedences of the 15-minute objective. However, there is currently on average three freight ships a week visiting Glasgow, with an average draft of 1500 tonnes. Consequently, it is considered unlikely that this volume of traffic would cause any exceedences of the SO<sub>2</sub> objective.

Glasgow City 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 has been Carried Out**

Glasgow City Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

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

Glasgow City Council 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**

Glasgow City Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.



## **5.2 Major Fuel (Petrol) Storage Depots**

There are no major fuel (petrol) storage depots within the Glasgow City Council area.

## **5.3 Petrol Stations**

Glasgow City Council confirms that there are no petrol stations meeting the specified criteria.

## **5.4 Poultry Farms**

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

## 6 Commercial and Domestic Sources

### 6.1 Biomass Combustion – Individual Installations

Within the last year planning permission has been granted for the installation of a biomass boiler system at the Glasgow School of Art. This 500kW development was located within the city centre AQMA and as such a full air quality assessment was conditioned as part of the application. This assessment concluded that the development would have a negligible impact on air quality at all modelled receptors. and was subsequently reviewed by the Public Health Group of Glasgow City Council.

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

### 6.2 Biomass Combustion – Combined Impacts

In areas where domestic solid fuel is still in widespread use, coupled with the combined effects of commercial biomass boilers, there can be a problem with PM<sub>10</sub> concentrations. The growth in popularity of biomass in domestic situations, particularly the use of wood burning stoves could lead to potential problems with PM<sub>10</sub>. At present within Glasgow, there is no area of 500 x 500m with sufficient numbers of small solid fuel burners to present a significant impact on PM<sub>10</sub> levels.

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

### **6.3 Domestic Solid-Fuel Burning**

Domestic solid fuel burning, whether coal or smokeless fuels, can give rise to exceedences of the objective for SO<sub>2</sub>. Significant coal burning is defined as any area of about 500 x 500m with more than 50 houses burning coal / smokeless fuel as their primary source of heating.

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

## 7 Fugitive or Uncontrolled Sources

Fugitive emissions from a variety of sources can give rise to elevated PM<sub>10</sub> concentrations. Fugitive sources, i.e. dust have the potential to be a problem in the achievement of the PM<sub>10</sub> objectives, especially in Scotland where the objective level for 2010 is lower than in the rest of the UK. It is thought that dust emissions contain around 20% PM<sub>10</sub>.

The guidance on dealing with these sources is to identify potential sources, and then determine whether there are dust concerns at the facility. This assessment should be based on dust complaints about the facility, air quality assessments already carried out or a visual inspection indicating significant dust.

The only potential sources which Glasgow contains within its boundaries are landfill sites, of which there are several. These have been considered in previous rounds of review and assessment where it was concluded that they would not have a significant impact on PM<sub>10</sub> concentrations.

Glasgow City Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

## **8 Conclusions and Proposed Actions**

### **8.1 Conclusions from New Monitoring Data**

#### **NO<sub>2</sub> Annual Mean Objective**

Automatic analyser and diffusion tube monitoring of NO<sub>2</sub> within this Updating and Screening Assessment indicates that concentrations of NO<sub>2</sub> are likely to continue to exceed the National Air Quality Annual Mean Objective at several locations within the existing Air Quality Management Areas.

The exceedence of the annual mean NO<sub>2</sub> observed for 2010 in Crow Rd has continued to be seen in the results from 2011. Glasgow City Council will therefore proceed to a Detailed Assessment in respect of this exceedence.

Diffusion tube monitoring at Park Road has also shown an exceedence of the NO<sub>2</sub> annual mean objective. Glasgow City Council will therefore proceed to a Detailed Assessment in respect of this exceedence.

#### **NO<sub>2</sub> 1-hour Mean Objective**

Monitoring results show that the Glasgow Kerbside monitoring site continues to show exceedences of the 1-hour mean objective for NO<sub>2</sub>. This site lies within the recently declared AQMA in respect of this objective.

#### **PM<sub>10</sub> Annual Mean Objective**

2011 generally saw an improvement in the recorded PM<sub>10</sub> annual mean concentrations across Glasgow with Glasgow Byres Rd being the only site which continued to record an exceedence of the objective level. However, four sites

recorded PM<sub>10</sub> annual mean levels at the objective level of 18µg/m<sup>3</sup> and a further three sites were within 2µg/m<sup>3</sup> of the objective. The data capture for the Glasgow Kerbside site was also very low for 2011 due to equipment problems and the reported value for the PM<sub>10</sub> annual mean appears to be unusually low.

### **PM<sub>10</sub> 24-hour Mean Objective**

The number of exceedences of the PM<sub>10</sub> 24-hour mean recorded at all monitoring locations showed a significant decrease in 2011. Only one site from the nine monitoring stations breached the permitted number of exceedences of this objective compared to six in 2010.

### **Other Pollutants**

Monitoring results for carbon monoxide, sulphur dioxide, benzene and 1,3-butadiene continue to show that in Glasgow, levels of these pollutants are well below the National Air Quality Objectives.

Ozone objective levels were exceeded at the Waulkmillglen Reservoir site located just outside Glasgow. This pollutant is not included in regulations at present.

PM<sub>2.5</sub> monitoring show that the objective to be achieved by 2020 is being exceeded at the Glasgow Kerbside site. As with ozone, this pollutant is not included in regulations at present.

## 8.2 Conclusions from Assessment of Sources

Roads, transport, industrial and domestic sources of air pollution were considered as part of the Updating and Screening Assessment. It was shown that there are no new developments or changes to existing developments likely to lead to significant contributions to air pollution levels.

## 8.3 Proposed Actions

Monitoring results have confirmed ongoing exceedences of the Air Quality Objectives at many locations within the relevant Air Quality Management Areas. However, nitrogen dioxide diffusion tube results from the Parkhead Cross AQMA are now marginally below the annual mean objective. A new automatic monitoring station was installed at this location in late 2011 and the results from this will be included in future rounds of review and assessment. This will allow for a more informed review of the air quality in this area and to see if the trend to below the objective level continues.

Two further locations outwith existing AQMAs have been identified as exceeding the NO<sub>2</sub> annual mean objective level. Therefore Glasgow City Council will proceed to a Detailed Assessment in respect of this objective in the Crow Road and Park Road / Great Western Road Area.

Glasgow City Council will also undertake the following within the next 12 months:

- Produce an updated Air Quality Action Plan in respect of the recently declared AQMAs and amendments
- Produce a Further Assessment in respect of the recently declared AQMAs and amendments.
- Produce a Progress Report for 2013.

## 9 References

- Department of the Environment, Food and Rural Affairs (2000). Part IV The Environment Act 1995, Local Air Quality Management, Technical Guidance, LAQM.TG(09);
- Glasgow City Council (1998). Local Air Quality Management, Review and Assessment of Air Quality in Glasgow Stage 1;
- Glasgow City Council (2000). Local Air Quality Management, Review and Assessment of Air Quality in Glasgow Stage 2;
- Glasgow City Council (2001). Local Air Quality Management, Review and Assessment of Air Quality in Glasgow Stage 3;
- Glasgow City Council (2003). Local Air Quality Management, Review and Assessment of Air Quality in Glasgow Stage 4;
- Glasgow City Council (2003). Local Air Quality Management, Updating and Screening Assessment;
- Glasgow City Council (2004). Local Air Quality Action Plan;
- Glasgow City Council (2005). Local Air Quality Management, Detailed Assessment;
- Glasgow City Council (2005). Local Air Quality Management, Progress Report;
- Glasgow City Council (2007). Local Air Quality Management, Detailed Assessment;
- Glasgow City Council (2008). Local Air Quality Management, Further Assessment;
- Glasgow City Council (2008). Local Air Quality Management, Progress Report;
- Glasgow City Council (2010). Local Air Quality Management, Detailed Assessment;
- The Scottish Executive (2002). Air Quality (Scotland) Amended Regulations



# Appendices

Appendix A: QA/QC Data

Appendix B: AEA Air Pollution Reports

Appendix C: NO<sub>2</sub> Diffusion Tube Monthly Results 2011

**Appendix A: QA:QC Data**

**Factor from Local Co-location Studies**

Glasgow City Council conducted three local co-location studies in 2011 with triplicate tubes located with chemiluminescent nitrogen dioxide analysers. Results from these studies are shown below.

<b>Site</b>	<b>Bias Adjustment Factor</b>
<b>Glasgow Centre</b>	0.95
<b>Glasgow Kerbside</b>	1.01
<b>Glasgow Anderston</b>	1.09
<b>Average Bias Adjustment Factor</b>	<b>1.02</b>

**Diffusion Tube Bias Adjustment Factors**

Glasgow City Council uses nitrogen dioxide diffusion tubes prepared and analysed by Glasgow Scientific Services. The tubes are prepared using the 20% TEA in water method and they are bias adjusted using a factor of 0.94. This factor was obtained from the national diffusion tube bias adjustment spreadsheet (version number 03/12) for the laboratory and which incorporated the three studies conducted by Glasgow City Council.

**Discussion of Choice of Factor to Use**

As stated above, the national bias adjustment factor obtained for tubes prepared and analysed by Glasgow Scientific Services was used for adjustment of the raw results. This factor was chosen primarily because Glasgow City Council operates a large number of tubes in a wide variety of locations. It is believed that a factor obtained from a range of collocation sites analysed by this laboratory would therefore provide a more comprehensive adjustment factor.

### PM Monitoring Adjustment

PM<sub>10</sub> monitoring at the Kerbside, Centre, Broomhill, Nithsdale Rd and Abercromby St sites were carried out using FDMS TEOMS and therefore no correction was applied.

PM<sub>10</sub> monitoring at Battlefield Rd and Waulkmillglen were carried out using standard TEOMS which were corrected for gravimetric equivalence using the Volatile Correction Model (VCM) method.

The TEOM units at Byres Rd and Anderston were upgraded to FDMS during 2011 resulting in the use of a VCM correction between 1/1/11 and 15/3/11. No correction was applied to the FDMS results after this date.

### Short-term to Long-term Data adjustment

The diffusion tube located at Park Rd began in August 2011. The data from the sites shown below were used to annualise the results.

Site	Site Type	Annual Mean	Period Mean	Ratio
Glasgow Centre	Urban Centre	34.7	31.8	1.09
Glasgow Anderston	Urban Background	35.8	37.3	0.96
Glasgow Battlefield	Roadside	25.6	23.3	1.10
Glasgow Waulkmillglen	Rural	10.5	7.6	1.39
			Average	1.136

**QA/QC of automatic monitoring**

QA/QC for all automatic sites are carried out by AEA Technology. This includes six monthly site audits and data ratification. Air pollution reports for all of the individual stations can be seen in Appendix B.

All sites are calibrated on a fortnightly basis with the exception of Glasgow Centre where calibrations are four weekly.

**QA/QC of diffusion tube monitoring**

Glasgow scientific services participate in the Workplace Analysis Scheme for Proficiency (WASP) and achieved 100% satisfactory scores in the four quarters of 2011. Co-location studies were analysed for seven sites by Glasgow Scientific Services with good precision at five sites and poor precision at two.

Appendix B: AEA Air Pollution Reports

Produced by AEA on behalf of Defra and the Scottish Government

**GLASGOW KERBSIDE**  
**1<sup>st</sup> January to 31<sup>st</sup> December 2011**

These data are provisional from 01/05/2011 and may be subject to further quality control

POLLUTANT	PM <sub>10</sub> <sup>+</sup>	NO <sub>2</sub>	NO <sub>x</sub>	PM <sub>25</sub> <sup>~</sup>
Number Very High	0	0	-	23
Number High	0	0	-	112
Number Moderate	0	0	-	747
Number Low	3771	8597	-	6957
Maximum 15-minute mean	259 µg m <sup>-3</sup>	592 µg m <sup>-3</sup>	1618 µg m <sup>-3</sup>	286 µg m <sup>-3</sup>
Maximum hourly mean	259 µg m <sup>-3</sup>	260 µg m <sup>-3</sup>	1436 µg m <sup>-3</sup>	286 µg m <sup>-3</sup>
Maximum running 8-hour mean	65 µg m <sup>-3</sup>	208 µg m <sup>-3</sup>	1179 µg m <sup>-3</sup>	224 µg m <sup>-3</sup>
Maximum running 24-hour mean	53 µg m <sup>-3</sup>	175 µg m <sup>-3</sup>	939 µg m <sup>-3</sup>	104 µg m <sup>-3</sup>
98.08 <sup>th</sup> percentile of daily means	38 µg m <sup>-3</sup>	-	-	-
Maximum daily mean	50 µg m <sup>-3</sup>	169 µg m <sup>-3</sup>	896 µg m <sup>-3</sup>	67 µg m <sup>-3</sup>
Average	18 µg m <sup>-3</sup>	72 µg m <sup>-3</sup>	243 µg m <sup>-3</sup>	22 µg m <sup>-3</sup>
Data capture	43.5 %	98.1 %	98.1 %	90.2 %

+ PM<sub>10</sub> as measured by a FDMS using a gravimetric factor of 1

~ PM<sub>25</sub> instruments:

FDMS from 1<sup>st</sup> January 2011

All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.

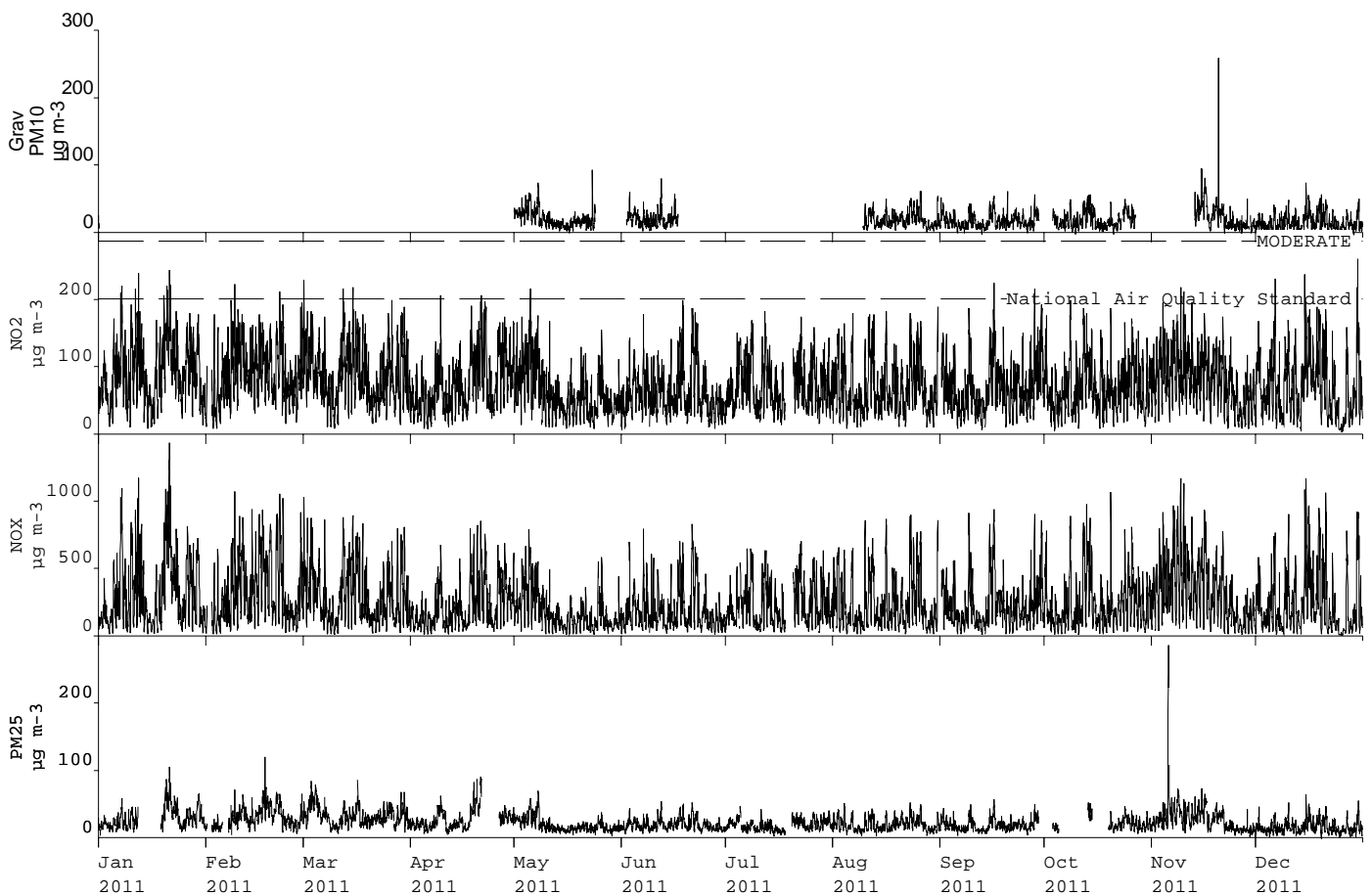
NO<sub>x</sub> mass units are NO<sub>x</sub> as NO<sub>2</sub> µg m<sup>-3</sup>

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM <sub>10</sub> Particulate Matter (Gravimetric)	Daily mean > 50 µg m <sup>-3</sup>	0	0
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 18 µg m <sup>-3</sup>	0	-
Nitrogen Dioxide	Annual mean > 40 µg m <sup>-3</sup>	1	-
Nitrogen Dioxide	Hourly mean > 200 µg m <sup>-3</sup>	31	21

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

Produced by AEA on behalf of Defra and the Scottish Government

**Glasgow Kerbside**  
**Hourly Mean Data for 1<sup>st</sup> January to 31<sup>st</sup> December 2011**



Date Created: 16/04/2012

Stephen Stratton  
Ambient Air Quality Monitoring  
AEA Group PLC  
Glengarnock Technology Centre  
Caledonian Road  
Lochshore Business Park  
Glengarnock  
Ayrshire  
KA14 3DD

Email: [Stephen.Stratton@aeat.co.uk](mailto:Stephen.Stratton@aeat.co.uk)  
Tel: 0870 190 5203  
Mob: 07968 707 276  
Fax: 0870 190 5151

Produced by AEA on behalf of Defra and the Scottish Government

## GLASGOW CENTRE

### 1<sup>st</sup> January to 31<sup>st</sup> December 2011

These data have been fully ratified by AEA

POLLUTANT	CO	PM <sub>10</sub> <sup>+</sup>	NO <sub>2</sub>	NO <sub>x</sub>	O <sub>3</sub>	PM <sub>25</sub> <sup>~</sup>	SO <sub>2</sub>
Number Very High	0	0	0	-	0	21	0
Number High	0	19	0	-	0	4	0
Number Moderate	0	6	0	-	14	136	0
Number Low	8634	7843	8420	-	8616	8084	33795
Maximum 15-minute mean	1.6 mg m <sup>-3</sup>	316 µg m <sup>-3</sup>	208 µg m <sup>-3</sup>	907 µg m <sup>-3</sup>	120 µg m <sup>-3</sup>	288 µg m <sup>-3</sup>	45 µg m <sup>-3</sup>
Maximum hourly mean	1.5 mg m <sup>-3</sup>	316 µg m <sup>-3</sup>	149 µg m <sup>-3</sup>	861 µg m <sup>-3</sup>	118 µg m <sup>-3</sup>	288 µg m <sup>-3</sup>	35 µg m <sup>-3</sup>
Maximum running 8-hour mean	1.1 mg m <sup>-3</sup>	233 µg m <sup>-3</sup>	131 µg m <sup>-3</sup>	673 µg m <sup>-3</sup>	103 µg m <sup>-3</sup>	213 µg m <sup>-3</sup>	18 µg m <sup>-3</sup>
Maximum running 24-hour mean	1.1 mg m <sup>-3</sup>	108 µg m <sup>-3</sup>	108 µg m <sup>-3</sup>	519 µg m <sup>-3</sup>	86 µg m <sup>-3</sup>	97 µg m <sup>-3</sup>	13 µg m <sup>-3</sup>
Maximum daily mean	1.0 mg m <sup>-3</sup>	67 µg m <sup>-3</sup>	104 µg m <sup>-3</sup>	480 µg m <sup>-3</sup>	75 µg m <sup>-3</sup>	59 µg m <sup>-3</sup>	12 µg m <sup>-3</sup>
Average	0.2 mg m <sup>-3</sup>	17 µg m <sup>-3</sup>	34 µg m <sup>-3</sup>	59 µg m <sup>-3</sup>	34 µg m <sup>-3</sup>	10 µg m <sup>-3</sup>	2 µg m <sup>-3</sup>
Data capture	98.4 %	90.9 %	96.1 %	96.1 %	98.3 %	94.3 %	98.4 %

+ PM<sub>10</sub> as measured by a FDMS using a gravimetric factor of 1~ PM<sub>25</sub> instruments:FDMS from 1<sup>st</sup> January 2011

All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.

NO<sub>x</sub> mass units are NO<sub>x</sub> as NO<sub>2</sub> µg m<sup>-3</sup>

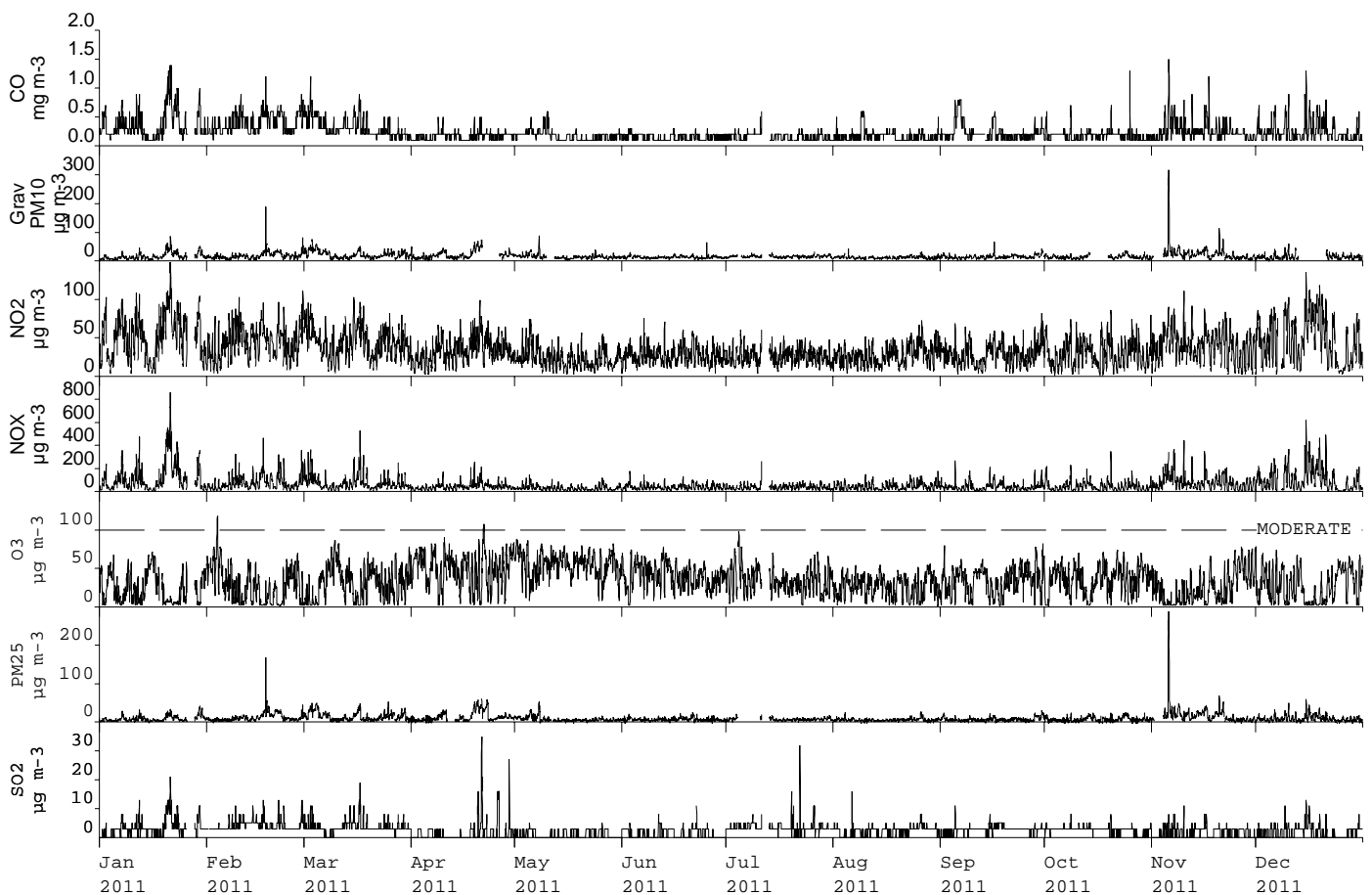
Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
Carbon Monoxide	Running 8-hour mean > 10.0 mg m <sup>-3</sup>	0	0
PM <sub>10</sub> Particulate Matter (Gravimetric)	Daily mean > 50 µg m <sup>-3</sup>	2	2
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 18 µg m <sup>-3</sup>	0	-
Nitrogen Dioxide	Annual mean > 40 µg m <sup>-3</sup>	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m <sup>-3</sup>	0	0
Ozone	Running 8-hour mean > 100 µg m <sup>-3</sup>	6	2
Sulphur Dioxide	15-minute mean > 266 µg m <sup>-3</sup>	0	0
Sulphur Dioxide	Hourly mean > 350 µg m <sup>-3</sup>	0	0
Sulphur Dioxide	Daily mean > 125 µg m <sup>-3</sup>	0	0

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



Produced by AEA on behalf of Defra and the Scottish Government

**Glasgow Centre**  
**Hourly Mean Data for 1<sup>st</sup> January to 31<sup>st</sup> December 2011**



Date Created: 16/04/2012

Stephen Stratton  
Ambient Air Quality Monitoring  
AEA Group PLC  
Glengarnock Technology Centre  
Caledonian Road  
Lochshore Business Park  
Glengarnock  
Ayrshire  
KA14 3DD

Email: [Stephen.Stratton@aeat.co.uk](mailto:Stephen.Stratton@aeat.co.uk)  
Tel: 0870 190 5203  
Mob: 07968 707 276  
Fax: 0870 190 5151

Produced by AEA on behalf of the Scottish Government

## GLASGOW ANDERSTON

### 1<sup>st</sup> January to 31<sup>st</sup> December 2011

These data have been fully ratified by AEA

POLLUTANT	CO	NO	NO <sub>2</sub>	PM <sub>10</sub> <sup>+</sup>	SO <sub>2</sub>
Maximum 15-minute mean	2.9 mg m <sup>-3</sup>	599 µg m <sup>-3</sup>	233 µg m <sup>-3</sup>	300 µg m <sup>-3</sup>	106 µg m <sup>-3</sup>
Maximum hourly mean	1.6 mg m <sup>-3</sup>	529 µg m <sup>-3</sup>	225 µg m <sup>-3</sup>	300 µg m <sup>-3</sup>	69 µg m <sup>-3</sup>
Maximum running 8-hour mean	1.1 mg m <sup>-3</sup>	439 µg m <sup>-3</sup>	190 µg m <sup>-3</sup>	238 µg m <sup>-3</sup>	20 µg m <sup>-3</sup>
Maximum running 24-hour mean	0.8 mg m <sup>-3</sup>	315 µg m <sup>-3</sup>	151 µg m <sup>-3</sup>	111 µg m <sup>-3</sup>	11 µg m <sup>-3</sup>
Maximum daily mean	0.7 mg m <sup>-3</sup>	295 µg m <sup>-3</sup>	144 µg m <sup>-3</sup>	83 µg m <sup>-3</sup>	10 µg m <sup>-3</sup>
98.08 <sup>th</sup> percentile of daily means	-	-	-	39 µg m <sup>-3</sup>	-
Average	0.1 mg m <sup>-3</sup>	21 µg m <sup>-3</sup>	36 µg m <sup>-3</sup>	14 µg m <sup>-3</sup>	3 µg m <sup>-3</sup>
Data capture	91.0 %	90.4 %	90.4 %	64.6 %	91.2 %

+ PM<sub>10</sub> instruments:

TEOM from 1<sup>st</sup> January to 15<sup>th</sup> March 2011 corrected using the VCM for Gravimetric Equivalent  
FDMS using a gravimetric factor of 1 from 16<sup>th</sup> March 2011 to 2<sup>nd</sup> November 2011

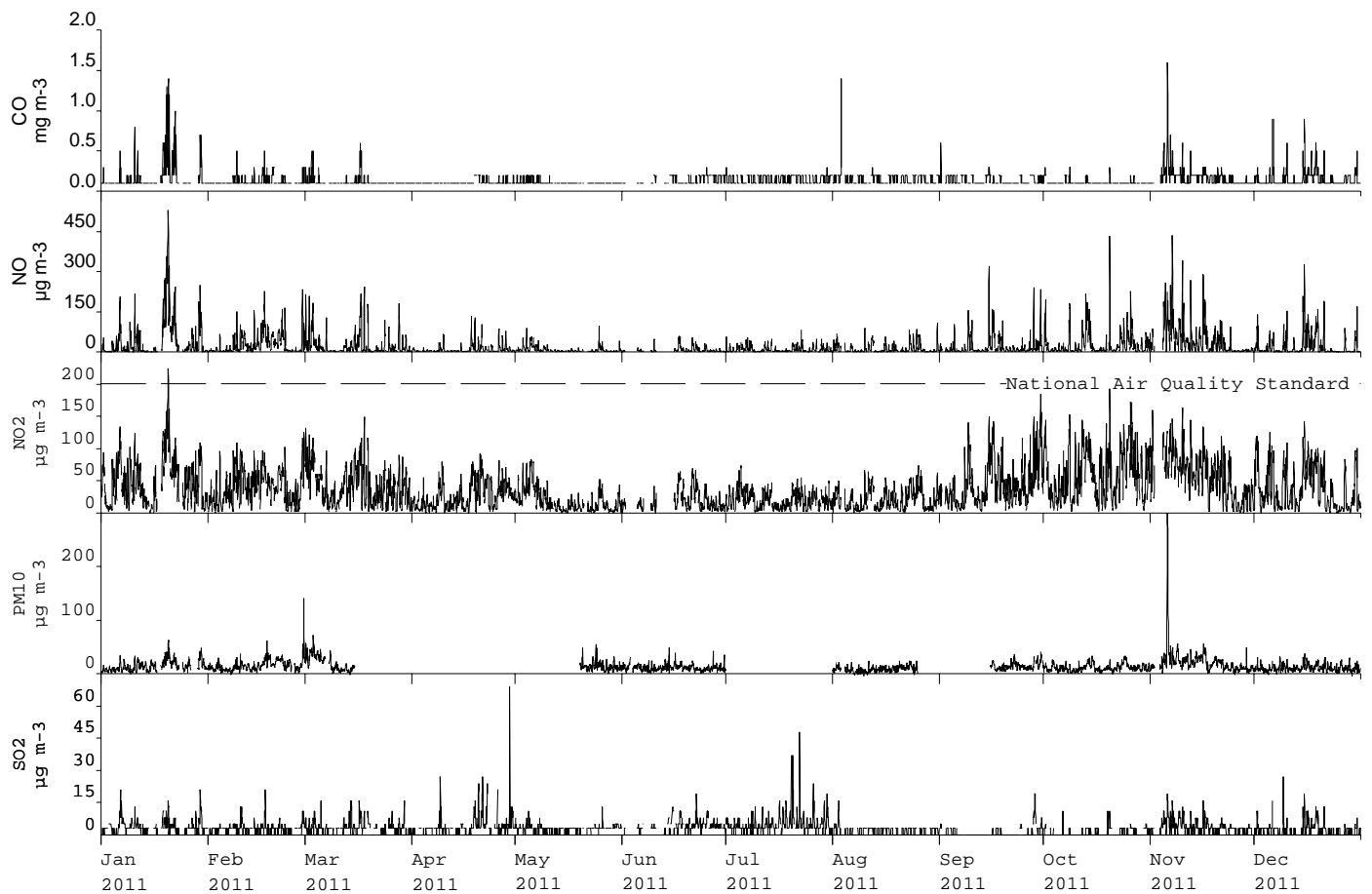
All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
Carbon Monoxide	Running 8-hour mean > 10.0 mg m <sup>-3</sup>	0	0
Nitrogen Dioxide	Annual mean > 40 µg m <sup>-3</sup>	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m <sup>-3</sup>	4	1
PM <sub>10</sub> Particulate Matter (Gravimetric)	Daily mean > 50 µg m <sup>-3</sup>	0	0
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 18 µg m <sup>-3</sup>	0	-
Sulphur Dioxide	15-minute mean > 266 µg m <sup>-3</sup>	0	0
Sulphur Dioxide	Hourly mean > 350 µg m <sup>-3</sup>	0	0
Sulphur Dioxide	Daily mean > 125 µg m <sup>-3</sup>	0	0

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

Produced by AEA on behalf of the Scottish Government

**Glasgow Anderston  
Hourly Mean Data for 1<sup>st</sup> January to 31<sup>st</sup> December 2011**



Date Created: 27/03/2012

Stephen Stratton  
Ambient Air Quality Monitoring  
AEA Group PLC  
Glengarnock Technology Centre  
Caledonian Road  
Lochshore Business Park  
Glengarnock  
Ayrshire  
KA14 3DD

Email: [Stephen.Stratton@aeat.co.uk](mailto:Stephen.Stratton@aeat.co.uk)  
Tel: 0870 190 5203  
Mob: 07968 707 276  
Fax: 0870 190 5151

Produced by AEA on behalf of the Scottish Government

## GLASGOW BYRES ROAD

### 1<sup>st</sup> January to 31<sup>st</sup> December 2011

These data have been fully ratified by AEA

POLLUTANT	CO	NO	NO <sub>2</sub>	PM <sub>10</sub> <sup>+</sup>
Maximum hourly mean	2.3 mg m <sup>-3</sup>	590 µg m <sup>-3</sup>	180 µg m <sup>-3</sup>	249 µg m <sup>-3</sup>
Maximum running 8-hour mean	1.7 mg m <sup>-3</sup>	390 µg m <sup>-3</sup>	142 µg m <sup>-3</sup>	209 µg m <sup>-3</sup>
Maximum running 24-hour mean	1.1 mg m <sup>-3</sup>	294 µg m <sup>-3</sup>	117 µg m <sup>-3</sup>	132 µg m <sup>-3</sup>
Maximum daily mean	1.1 mg m <sup>-3</sup>	289 µg m <sup>-3</sup>	116 µg m <sup>-3</sup>	113 µg m <sup>-3</sup>
98.8 <sup>th</sup> percentile of hourly means	-	-	145 µg m <sup>-3</sup>	-
98.08 <sup>th</sup> percentile of daily means	-	-	-	67 µg m <sup>-3</sup>
Average	0.3 mg m <sup>-3</sup>	44 µg m <sup>-3</sup>	42 µg m <sup>-3</sup>	24 µg m <sup>-3</sup>
Data capture	42.5 %	41.8 %	41.8 %	30.2 %

+ PM<sub>10</sub> instruments:

TEOM from 1<sup>st</sup> January to 15<sup>th</sup> March 2011 corrected using the VCM for Gravimetric Equivalent  
FDMS using a gravimetric factor of 1 from 16<sup>th</sup> March 2011 to 31<sup>st</sup> Decemeber 2011

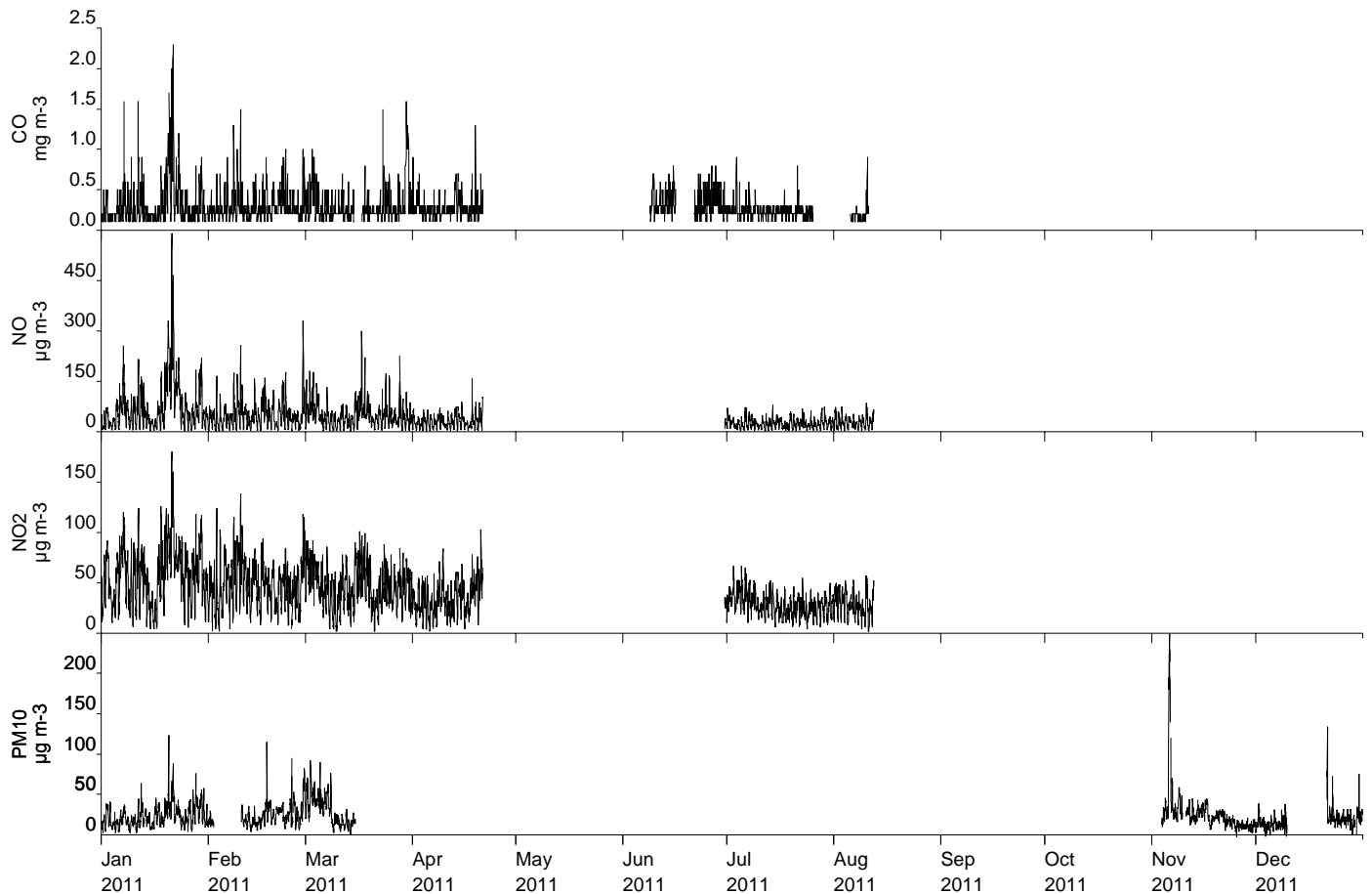
All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
Carbon Monoxide	Running 8-hour mean > 10.0 mg m <sup>-3</sup>	0	0
Nitrogen Dioxide	Annual mean > 40 µg m <sup>-3</sup>	-	-
Nitrogen Dioxide	Hourly mean > 200 µg m <sup>-3</sup>	0	0
PM <sub>10</sub> Particulate Matter (Gravimetric)	Daily mean > 50 µg m <sup>-3</sup>	2	2
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 40 µg m <sup>-3</sup>	-	-
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 18 µg m <sup>-3</sup>	-	-

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

Produced by AEA on behalf of the Scottish Government

### Glasgow Byres Road Hourly Mean Data for 1<sup>st</sup> January to 31<sup>st</sup> December 2011



Date Created: 27/03/2012

Stephen Stratton  
Ambient Air Quality Monitoring  
AEA Group PLC  
Glengarnock Technology Centre  
Caledonian Road  
Lochshore Business Park  
Glengarnock  
Ayrshire  
KA14 3DD

Email: [Stephen.Stratton@aeat.co.uk](mailto:Stephen.Stratton@aeat.co.uk)  
Tel: 0870 190 5203  
Mob: 07968 707 276  
Fax: 0870 190 5151

Produced by AEA on behalf of the Scottish Government

## GLASGOW BATTLEFIELD ROAD

### 1<sup>st</sup> January to 31<sup>st</sup> December 2011

These data have been fully ratified by AEA

POLLUTANT	NO <sub>2</sub>	NO <sub>x</sub>	PM <sub>10</sub> <sup>+</sup>
Maximum hourly mean	374 µg m <sup>-3</sup>	1068 µg m <sup>-3</sup>	174 µg m <sup>-3</sup>
Maximum running 8-hour mean	248 µg m <sup>-3</sup>	798 µg m <sup>-3</sup>	135 µg m <sup>-3</sup>
Maximum running 24-hour mean	179 µg m <sup>-3</sup>	598 µg m <sup>-3</sup>	74 µg m <sup>-3</sup>
Maximum daily mean	165 µg m <sup>-3</sup>	530 µg m <sup>-3</sup>	56 µg m <sup>-3</sup>
Average	26 µg m <sup>-3</sup>	56 µg m <sup>-3</sup>	17 µg m <sup>-3</sup>
Data capture	91.6 %	91.6 %	90.8 %

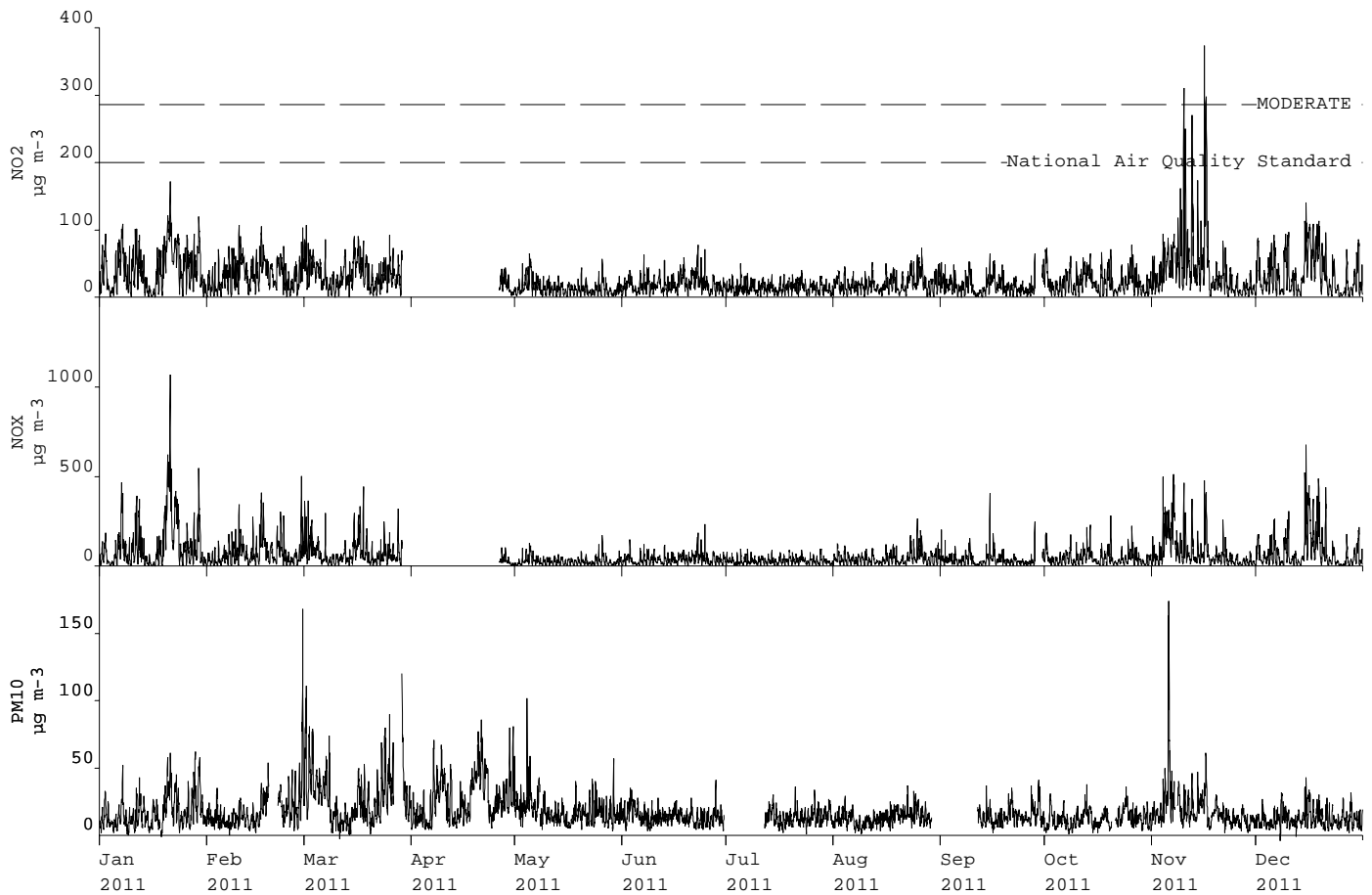
+ PM<sub>10</sub> as measured by a TEOM using the VCM for Gravimetric Equivalent concentrations.  
 All gaseous pollutant mass units are at 20°C and 1013mb. Particulate matter concentrations are reported at ambient temperature and pressure.  
 NO<sub>x</sub> mass units are NO<sub>x</sub> as NO<sub>2</sub> µg m<sup>-3</sup>

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 µg m <sup>-3</sup>	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m <sup>-3</sup>	20	3
PM <sub>10</sub> Particulate Matter (Gravimetric)	Daily mean > 50 µg m <sup>-3</sup>	7	7
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 18 µg m <sup>-3</sup>	0	-

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

Produced by AEA on behalf of the Scottish Government

**Glasgow Battlefield Road  
Hourly Mean Data for 1<sup>st</sup> January to 31<sup>st</sup> December 2011**



Date Created: 27/03/2012

Stephen Stratton  
Ambient Air Quality Monitoring  
AEA Group PLC  
Glengarnock Technology Centre  
Caledonian Road  
Lochshore Business Park  
Glengarnock  
Ayrshire  
KA14 3DD

Email: [Stephen.Stratton@aeat.co.uk](mailto:Stephen.Stratton@aeat.co.uk)  
Tel: 0870 190 5203  
Mob: 07968 707 276  
Fax: 0870 190 5151

Produced by AEA on behalf of the Scottish Government

## GLASGOW ABERCROMBY STREET 1<sup>st</sup> January to 31<sup>st</sup> December 2011

These data have been fully ratified by AEA

POLLUTANT	PM <sub>10</sub> +
Maximum hourly mean	371 µg m <sup>-3</sup>
Maximum running 24-hour mean	108 µg m <sup>-3</sup>
Maximum daily mean	70 µg m <sup>-3</sup>
Average	18 µg m <sup>-3</sup>
Data capture	94.8 %

+ PM<sub>10</sub> instruments:

FDMS using a gravimetric factor of 1 from 1<sup>st</sup> January 2011

Particulate matter concentrations are reported at ambient temperature and pressure.

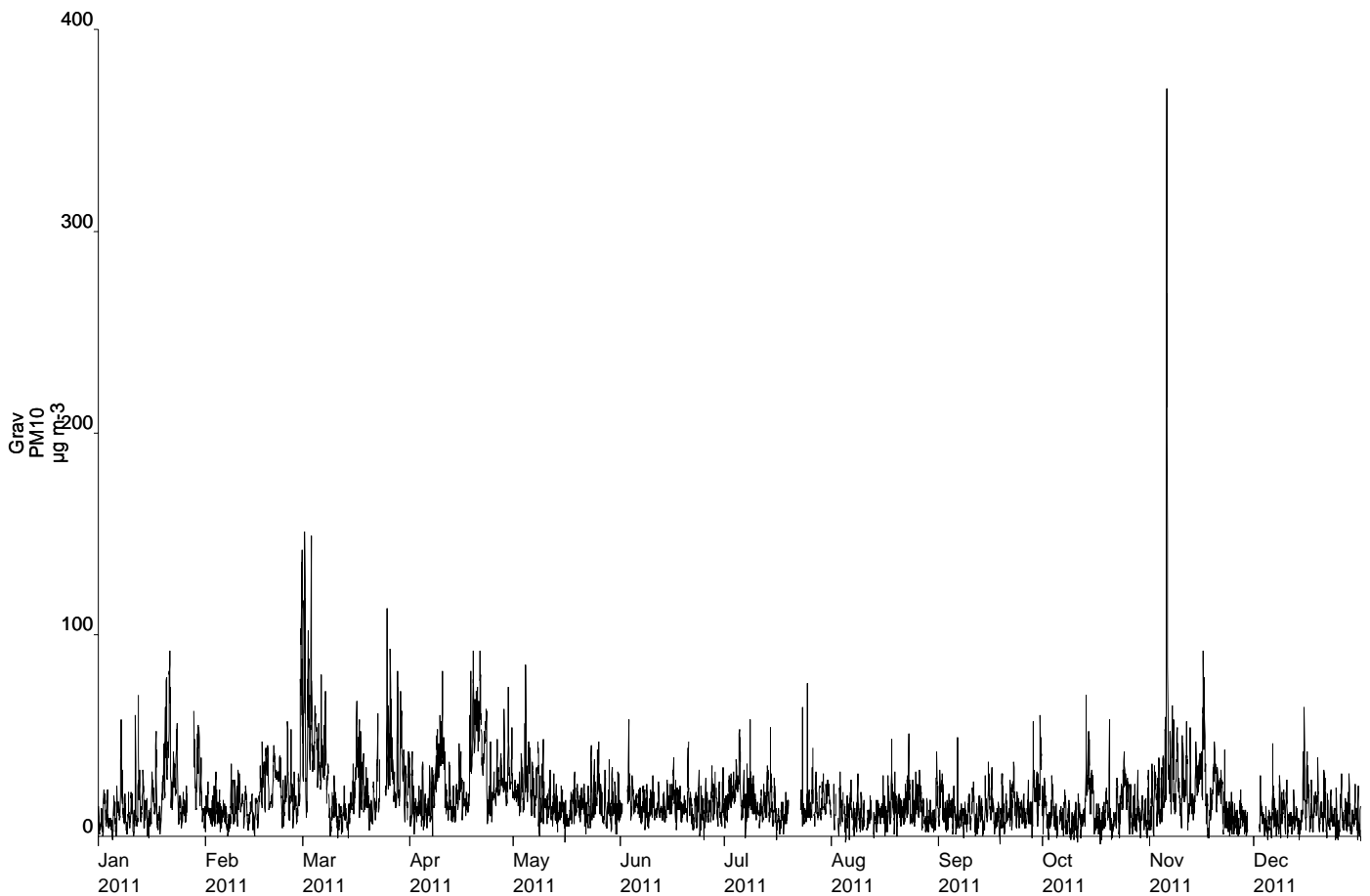
Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM <sub>10</sub> Particulate Matter (Gravimetric)	Daily mean > 50 µg m <sup>-3</sup>	9	9
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 18 µg m <sup>-3</sup>	0	-

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



Produced by AEA on behalf of the Scottish Government

**Glasgow Abercromby Street  
Hourly Mean Data for 1<sup>st</sup> January to 31<sup>st</sup> December 2011**



Date Created: 26/03/2012

Stephen Stratton  
Ambient Air Quality Monitoring  
AEA Group PLC  
Glengarnock Technology Centre  
Caledonian Road  
Lochshore Business Park  
Glengarnock  
Ayrshire  
KA14 3DD

Email: [Stephen.Stratton@aeat.co.uk](mailto:Stephen.Stratton@aeat.co.uk)  
Tel: 0870 190 5203  
Mob: 07968 707 276  
Fax: 0870 190 5151

Produced by AEA on behalf of the Scottish Government

## GLASGOW BROOMHILL

### 1<sup>st</sup> January to 31<sup>st</sup> December 2011

These data have been fully ratified by AEA

POLLUTANT	PM <sub>10</sub> <sup>+</sup>
Maximum hourly mean	266 µg m <sup>-3</sup>
Maximum running 24-hour mean	140 µg m <sup>-3</sup>
Maximum daily mean	115 µg m <sup>-3</sup>
Average	18 µg m <sup>-3</sup>
Data capture	95.0 %

+ PM<sub>10</sub> instruments:FDMS using a gravimetric factor of 1 from 1<sup>st</sup> January 2011

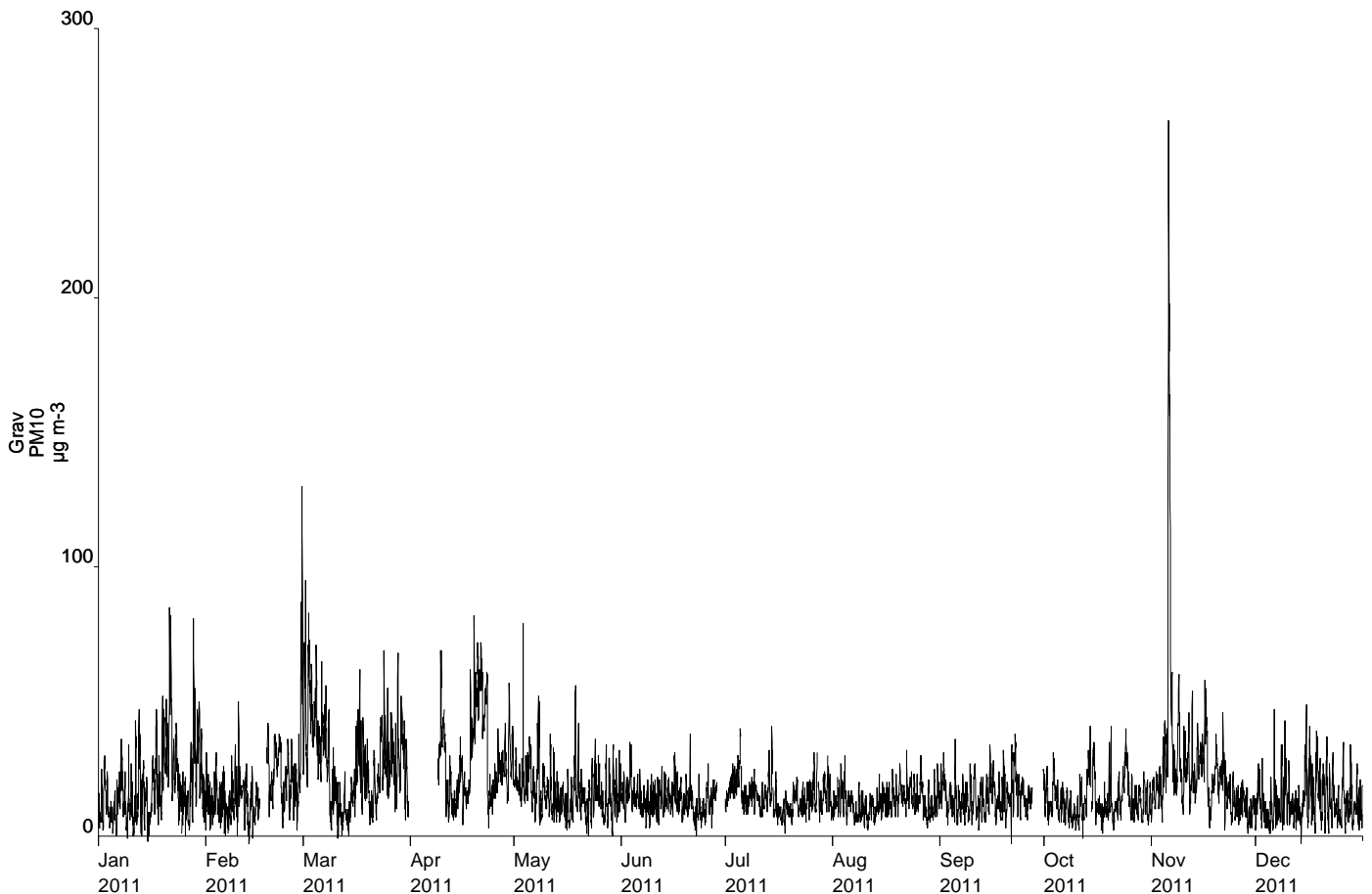
Particulate matter concentrations are reported at ambient temperature and pressure.

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM <sub>10</sub> Particulate Matter (Gravimetric)	Daily mean > 50 µg m <sup>-3</sup>	6	6
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 18 µg m <sup>-3</sup>	0	-

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

Produced by AEA on behalf of the Scottish Government

**Glasgow Broomhill**  
**Hourly Mean Data for 1<sup>st</sup> January to 31<sup>st</sup> December 2011**



Date Created: 26/03/2012

Stephen Stratton  
Ambient Air Quality Monitoring  
AEA Group PLC  
Glengarnock Technology Centre  
Caledonian Road  
Lochshore Business Park  
Glengarnock  
Ayrshire  
KA14 3DD

Email: [Stephen.Stratton@aeat.co.uk](mailto:Stephen.Stratton@aeat.co.uk)  
Tel: 0870 190 5203  
Mob: 07968 707 276  
Fax: 0870 190 5151

Produced by AEA on behalf of the Scottish Government

**GLASGOW NITHSDALE ROAD**  
**1<sup>st</sup> January to 31<sup>st</sup> December 2011**

These data have been fully ratified by AEA

POLLUTANT	PM <sub>10</sub> <sup>+</sup>
Maximum hourly mean	326 µg m <sup>-3</sup>
Maximum running 24-hour mean	102 µg m <sup>-3</sup>
Maximum daily mean	68 µg m <sup>-3</sup>
Average	18 µg m <sup>-3</sup>
Data capture	99.4 %

+ PM<sub>10</sub> instruments:

FDMS using a gravimetric factor of 1 from 1<sup>st</sup> January 2011

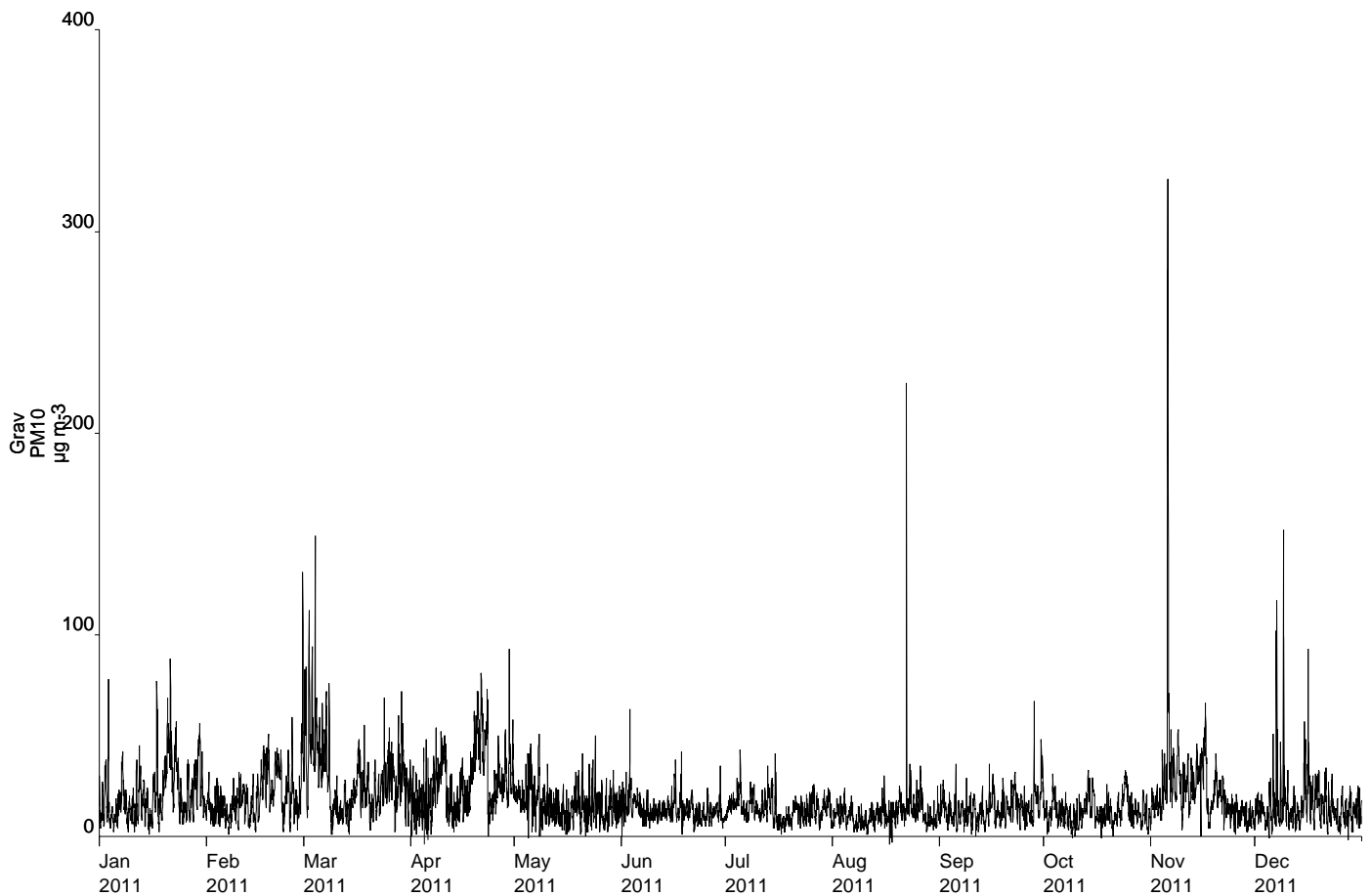
Particulate matter concentrations are reported at ambient temperature and pressure.

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM <sub>10</sub> Particulate Matter (Gravimetric)	Daily mean > 50 µg m <sup>-3</sup>	6	6
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 18 µg m <sup>-3</sup>	0	-

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

Produced by AEA on behalf of the Scottish Government

**Glasgow Nithsdale Road  
Hourly Mean Data for 1<sup>st</sup> January to 31<sup>st</sup> December 2011**



Date Created: 26/03/2012

Stephen Stratton  
Ambient Air Quality Monitoring  
AEA Group PLC  
Glengarnock Technology Centre  
Caledonian Road  
Lochshore Business Park  
Glengarnock  
Ayrshire  
KA14 3DD

Email: [Stephen.Stratton@aeat.co.uk](mailto:Stephen.Stratton@aeat.co.uk)  
Tel: 0870 190 5203  
Mob: 07968 707 276  
Fax: 0870 190 5151

Produced by AEA on behalf of the Scottish Government

## GLASGOW WAULKMILLGLEN RESERVOIR

### 1<sup>st</sup> January to 31<sup>st</sup> December 2011

These data have been fully ratified by AEA

POLLUTANT	NO <sub>2</sub>	NO <sub>x</sub>	O <sub>3</sub>	PM <sub>10+</sub>
Maximum hourly mean	118 µg m <sup>-3</sup>	447 µg m <sup>-3</sup>	120 µg m <sup>-3</sup>	62 µg m <sup>-3</sup>
Maximum running 24-hour mean	70 µg m <sup>-3</sup>	179 µg m <sup>-3</sup>	105 µg m <sup>-3</sup>	43 µg m <sup>-3</sup>
Maximum daily mean	69 µg m <sup>-3</sup>	178 µg m <sup>-3</sup>	96 µg m <sup>-3</sup>	43 µg m <sup>-3</sup>
98.08th percentile of daily means	-	-	-	28 µg m <sup>-3</sup>
Average	11 µg m <sup>-3</sup>	17 µg m <sup>-3</sup>	54 µg m <sup>-3</sup>	12 µg m <sup>-3</sup>
Data capture	91.2 %	91.2 %	95.3 %	84.4 %

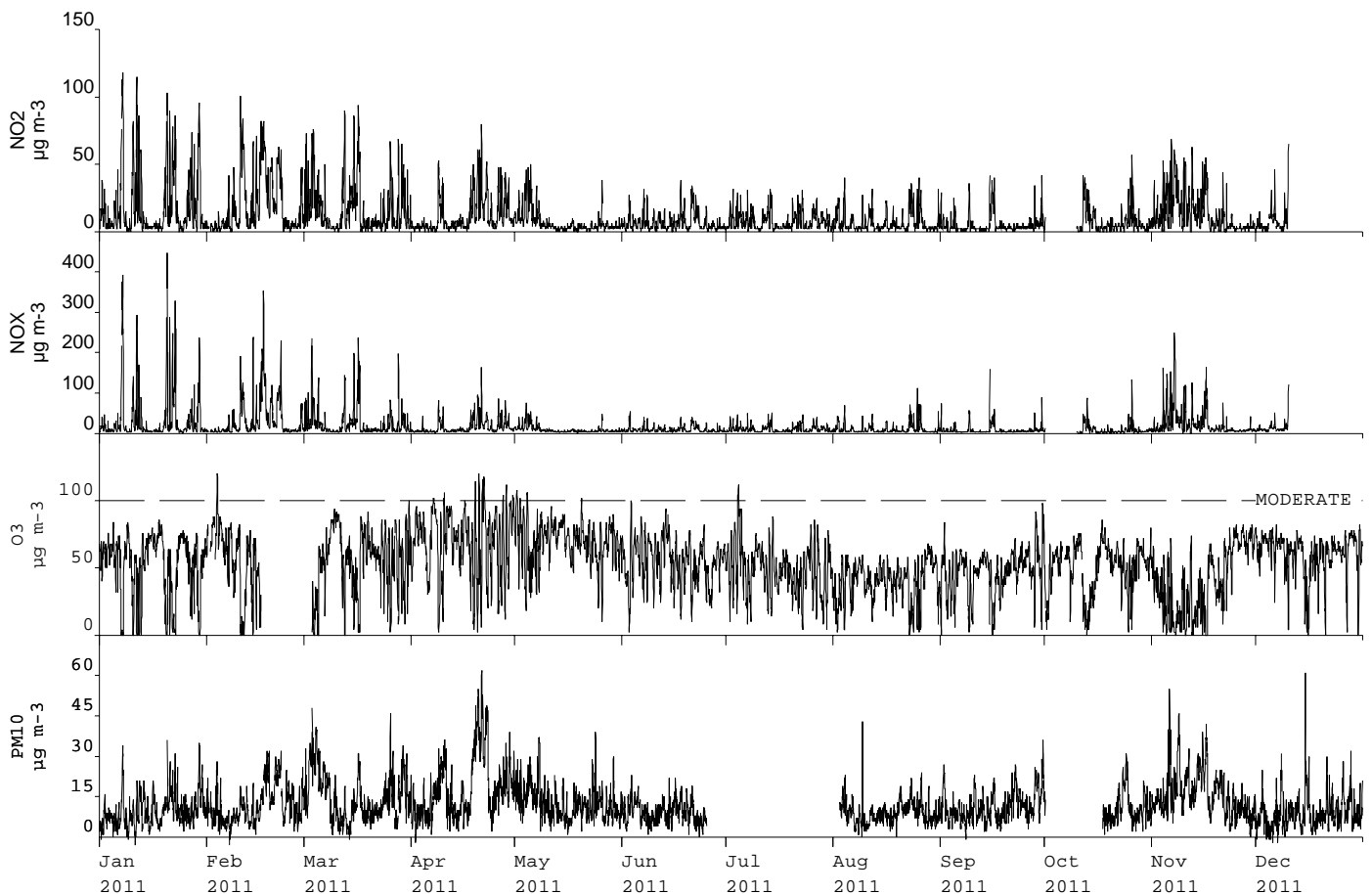
+ PM<sub>10</sub> as measured by a TEOM using the VCM for Gravimetric Equivalent concentrations.  
 All gaseous pollutant mass units are at 20°C and 1013mb. Particulate matter concentrations are reported at ambient temperature and pressure.  
 NO<sub>x</sub> mass units are NO<sub>x</sub> as NO<sub>2</sub> µg m<sup>-3</sup>

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 µg m <sup>-3</sup>	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m <sup>-3</sup>	0	0
Ozone	Running 8-hour mean > 100 µg m <sup>-3</sup>	44	9
PM <sub>10</sub> Particulate Matter (Gravimetric)	Daily mean > 50 µg m <sup>-3</sup>	0	0
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 18 µg m <sup>-3</sup>	0	-

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

Produced by AEA on behalf of the Scottish Government

**Glasgow Waulkmillglen Reservoir  
Hourly Mean Data for 1<sup>st</sup> January to 31<sup>st</sup> December 2011**



Date Created: 27/03/2012

Stephen Stratton  
Ambient Air Quality Monitoring  
AEA Group PLC  
Glengarnock Technology Centre  
Caledonian Road  
Lochshore Business Park  
Glengarnock  
Ayrshire  
KA14 3DD

Email: [Stephen.Stratton@aeat.co.uk](mailto:Stephen.Stratton@aeat.co.uk)  
Tel: 0870 190 5203  
Mob: 07968 707 276  
Fax: 0870 190 5151

Appendix C: NO<sub>2</sub> Diffusion Tube Monthly Results 2011

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
George Square	Urban Background	259296 665389	Y	N(30m)	30m	N
Union St	Roadside	258328 665204	Y	Y	3m	Y
Bath St	Roadside	258262 665351	Y	N (3m)	3m	Y
Glassford St	Roadside	259361 665252 259055	Y	Y	3m	Y

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average	Data Collection	Bias Adjusted
Mosspark Boulevard	37.7	33.3	35.9	26.4	18.5	21.2	19.3	15.6	21.6	55.4	23.9	28.9	28.1	100.0	26.5
St Andrews Drive	34.1	49.7	30	17.1	14.1	19.2	17.3	12.2	15.9	22.3	18.5	27.2	23.1	100.0	21.7
Hags Rd	53.7	48.7	44.2	19.6	26.6	29.1	22.7	26.3	29.7	39.3	40.4	79.2	38.3	100.0	36.0
Pollokshaws Rd	62.6	72.4	35	22.1	17.8	25.4	22.3	16.1	37.9	59.6	27.4	12.2	34.2	100.0	32.2
Invergarrie Rd	30.9	34.4	26		11.5	14.2	13.2	6.4	15.1	16.4	22.5	20.6	19.2	91.7	18.0
High St	59.2	65.4	60	49.4	34.7	55.4	44.9	21.4	54.3	60.5	46.5	75.9	52.3	100.0	49.2
Saltmarket	51.7	59.8	57.9	49.3	29.4	46.8	33.8	26.1	44.7	45.3	34.5	53.7	44.4	100.0	41.8
Glassford St	51.4		58.5	50.2	34.5	59.4	50.9	43.3	57.5	59.3	41.4	56	51.1	91.7	48.1
George Square	56.6	49.8	56	41	30.7	49.9	37.9	17.7	47.7	51	61.4	62.9	46.9	100.0	44.1
Buchanan Street	62.7	56.7	57.6	46.5	30.5	21	42.1		45.8	69.8	54	55.6	49.3	91.7	46.3
Union St	56	68.7	71.4	72.5	57.8	66.9	63.9	58.1	72.1	88.5	78.8	66.3	68.4	100.0	64.3
ST Enoch AUN (1)	49.6	78.2	47	20.9	27.8	31.3	22.2	15.3	40.8	36.1	50.9	33.2	37.8	100.0	35.5
ST Enoch AUN (2)	42.9	94.2	44.4	19.8	26.7	29.9	24.5	14.9	47.2	28.4	47.1	31.4	37.6	100.0	35.4
ST Enoch AUN (3)	40	44.6	49.1	21	29.1	28.1	24.9	16.9	45.8	33.9	37.7	32.2	33.6	100.0	31.6
H Umbrella North	43.2	79.1	107	48.9	68.2	72.7	56.3	33.3	108	103	71.4	77.6	72.4	100.0	68.0



## Glasgow City Council

Hope Street AUN (1)	36.8	139	82.1	43.5	76.5	57.7	74.3	50.4	78	76.4	48.4	108	72.6	100.0	68.2
Hope Street AUN (2)	57.2	79.4	80.8	57.7	61.1	70.5	58.8	51.8	85.4	81.4	61.7	85.1	69.2	100.0	65.1
Hope Street AUN (3)	69.2	145	87.6		65	66	60.9	41.3	69.2	70.2	65.4	87.6	75.2	91.7	70.7
Hope Street 1	84.9	97.7	65.6	74.1	66	92	62.4	56.2	99.7	102	84.2	89.4	81.2	100.0	76.3
Cathedral Bridge	49.7	56	56	33.4			133	55.1	52.4	59.8	28.1	43.4	56.7	83.3	53.3
Sauchiehall Street	57.4	81.5	46.9	40.2						50.1		48.5	53.9	58.3	50.7
Bath Street	57.9	79	72.1	49.6	40	62.2	43.3	28.4		52.4	51.3	64.5	54.6	91.7	51.3
Hope Street 3	28.1	71.6	89.8	59.8	44.8								58.8	41.7	55.3
Castle Street	41.2	39.9	44.1	31.4	26.3	44.5	30.6	21.8	39.7	38.3	43.4	41.2	36.9	100.0	34.7
McLeod Street	49.3	50	43.6	35.7	23.5	39	23.3	18.7	38.5	44.4	37.6	45	37.4	100.0	35.1
Montrose Street	48.9	50.4	50.2	39.9	25.8		54.2						44.9	50.0	42.2
Renfield Street	55.6	69.9	42.9	76.7	45.6	76.3		28.7	75	83.7	54.9	75.2	62.2	91.7	58.5
Westercraigs	32.1	40.2	28.1	20.3	19.3	52.8	16.7	13.7	22.3	25.9	25.2	27	23.5	100.0	22.1
Dunn Street	32.9	44.9	25	21.1	14.5		3	11.5	14.2	21.8	19.9	22.1	21.0	91.7	19.7
Hillcrest Road	23.3	30.6	27.2	15.2	15.4	19.9	15.2	9.7	14.3	22.6	22.2	25.5	20.1	100.0	18.9
Westmuir Street	61.9	58.5	27.8	54	32.3	42.1	36.4	19.4	40.6	45.9	33.2	51.2	41.9	100.0	39.4
Inveresk Lane	37.5	27.3	29.2	11.5	12.7	15.6	15	8.8	13.9	11.9	26.8	25	19.6	100.0	18.4
Easterhouse Sports Centre	28.9	44.2	24.8	20.5	12.8	19.2	15.8	11.8	18.7	17.9	18.6	25.1	21.5	100.0	20.2
George Street	63.5	53.7	52.9	57.5	28.2	37.4	39.7	29.7	53.1	61.3	71.2	54.9	50.3	100.0	47.2
Kipen Street	97.7	32.9	26.9		21.6	23.3	15.3	12.3	17.5	23.5	38.9	34.7	31.3	91.7	29.4
QMD / Maryhill Street	52.8	37	43.4	20	26.7	34.1	16.8	18.2	27.7	31.4	34.3	34.7	31.4	100.0	29.5
Groundhog (1)	25.8	55.9	41.2	30.8	23.9	32.9			9.8	35.6	42.7	35.2	33.4	83.3	31.4
Groundhog (2)	35.6	39.8	30.8	21.6	21.3	31.1				39.4	33	37.6	32.3	83.3	30.3
Groundhog (3)	32	45.4	42.2	26	25.7	36.4				34.6	34.1	37.1	34.8	75.0	32.7
Anniesland Cross	53.1	49.6	38.5	23.6	26.8	16	22.4	19.3	35.7	40.9	32.5	80.7	36.6	100.0	34.4
Balshagray Avenue	39.4	50.3	32.9	26.8	17.7	25.4	21.5	13.1	5.9	28.8	27.7	35.9	27.1	100.0	25.5
Belmont Road	38	32.1	29.1	21.5	17.1	21.6	12.6	16.4	23.5	18.9	39.4	28.7	24.9	100.0	23.4
Napiershall Street		50.9	39.3	39.7	24.4	41.5	18.7	21.6	36.2	25.6	26.6	37.4	32.9	91.7	30.9
North Street	44.3	42.9	39.7	28.6	24.9	34.2	18.1	20.3	31.9	23.5	44.8	30.6	32.0	100.0	30.1
Bridge Street / Norfolk Street		64.4	51	47.2	25.5	42.2	36.1	23.7	36	39.4	47	42.4	41.4	91.7	38.9
Govanhill Street	23.3	41.8	36.1	26.4	26.3	27.2		19.7	29	33.1	36.8		30.0	83.3	28.2
Mosside Road	43.8	43.8	41.7	28.1	27.4	31.7	25.3	19.6	28	33	19.1		31.0	91.7	29.2
Sutherland Avenue	29	23.8	26.5	9.8	11.6	15	12.2	9.5	13.2	18.1	21.6	19.6	17.5	100.0	16.4
Mallaig Place	46	36.2	31.1	14.3	17.5	19.5	15.8	15.4	20.8	25.3	27.9	24.5	24.5	100.0	23.1
Rollalong 1	78.8	72.3	53	46.7				28.4	53.8	58	43.1	53.9	54.2	75.0	51.0

## Glasgow City Council

Rollalong 2	58.6	75	60	42.9				55.1	55.8	51.9	62.6	53.3	57.2	75.0	53.8
Rollalong 3	64.4	116	53.1	47.2				22.1	53.8	61.3	51.6	56.7	58.5	75.0	55.0
Dumbarton Road	37.6	48.6	40.1	29.7	20.2	30.7	27.4	20.4	31.3	36.5	45.4	37.5	33.8	100.0	31.8
Broomielaw	53.7	52.2	56.1	47.1	32.7	49.9	40.8	24.7	47.1		25.5	37.2	42.5	91.7	39.9
Finnieston Street	50.3	53.7	43.9	29.5	26.7	34.5	28	24.5	41.1	39.6	37.3	37.1	37.2	100.0	35.0
QMD2	48.9	56.8	43.8	23.5	25.2	44.2	19.5	29.4	42		43	38.8	37.7	91.7	35.5
QMD3	58.3	82.5	59.5	19.8	31.6	49.9	21.2	27.7	46.5	51.1	38.9	48	44.6	100.0	41.9
Lawrence Street	42.9	38.7	29.9	20.7	20.4	23.8	18.8	14.7	30.4	28.8		34	27.6	91.7	25.9
Cooperswell Street	41.2	57.1	31.9	22.4	18.3	25.6	22.3	18	23.4	26.5	39.3	18.1	28.7	100.0	27.0
Royston Road	89.3	38.2	58.9	23.6	34.4		55.2	25.9	41.3	50.7	48.4	59.5	47.8	91.7	44.9
Oxford Street	40.3	75.4	36.2	32.1	24.3	33	29.7	22.8	29.2	32.9	30.1	51.9	36.5	100.0	34.3
Douglas Road	27.8	38.2	23.9	17.2	16	20.3	16	12.4	16.5	20.3	23.8	< 1.6	21.1	91.7	19.9
Sacone SW	43.3	31.9	30.9	18.9	10.5	17.3	13.7	15.4	18.1	21	19.1	31	22.6	100.0	21.2
Cochrane Street	46.8	55.4	56.1	49.1	28.1	43.4	36.2						45.0	58.3	42.3
Main Street (Bridgeton)	36.6	31.7	34.3	22	17.5	23.9	16.4	16.9	17.3	24.9	25.3	21.5	24.0	100.0	22.6
Calder Street / Aikenhead Road	24.1	40.1	31.7	20.6	20	24.9	23.5	14.3	23.9	29.2	21.3	25.5	24.9	100.0	23.4
Langside Primary School	19.9	40.2	24.6	15.2	10.8	17.9	14.6	12.9	16.5	21.8	14.8	21.8	19.3	100.0	18.1
Thornwood Drive	27.5	39.7	29.8	20.3	14.7	18.1	13.9	12.6	23.5	21	19.1	25.1	22.1	100.0	20.8
Glasgow Harbour	42.6	52.4	35.3	16.7	20.3	28.7	18.1	18.8	27.7	29.6	26.2	34.3	29.2	100.0	27.5
Springburn Road	51.9	33.3	34.6		31.6	31.7	19.6	16.9	24.9	29.4	33.3	41.1	31.7	91.7	29.8
Dobbies Loan	34.3	39.8	39.8	29.1	21.7	28.8	18.1	21.2	29.8	33.1	44.1	58.9	33.2	100.0	31.2
Kennedy Path	35.9	56.8	2.1	19.3	21.6	26.6	22.6	18.7	29.1	29.8	43.9	32.6	28.3	100.0	26.6
St Mungo Avenue	47.3	57.8	47.7	30.5	26.8	35.4	26.5	23.3	41	37.2	33.9	30.7	36.5	100.0	34.3
Brown Street	36.4	44.8	39.1	26.6	24.1	33.3	29.5	25	29.5	31.1	29.6	43.4	32.7	100.0	30.7
Paisley Road West	39.4	51.7	36	38.6	27.1		27.8	24.7	15.3	37.9	30	31.2	32.7	91.7	30.7
Hyndland Rd	34	83.1	37.7	25.1	18.3	28.4	23.8	11.9	35.8	44	37.2	16.9	33.0	100.0	31.0
Silverburn	20.6	29.1	22.1	14.8	16.7	17.3	14	19.4	27.8	21.4	26	33.9	21.9	100.0	20.6
Crow Road	49.7	95.6	52.2	36.4	35	43.4	37.1	28.2	38.4	47	52.5	41.5	46.4	100.0	43.6
Whittingehame Drive	31	36.3	26.7	13.4	14.2	15.5	11.7	11.5	18.3				19.8	75.0	18.7
Urrdale Road	39.2	41.8	41.8	31.4	25.9	38.8	30.5	25	24.4	31.5	30.3	35.2	33.0	100.0	31.0
Park Road									28.6	55.5	55.5	35.7	42.3	41.7	39.8

Annualised