

# 2010 Air Quality Progress Report for ***ARGYLL AND BUTE COUNCIL***

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

April 2010



|                                |                   |
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#### Further information

Further copies of this report are available on the Council's website [www.argyll-bute.gov.uk](http://www.argyll-bute.gov.uk). Should you require clarification on any aspect of this report or the local air quality work undertaken by Argyll and Bute Council, please contact Malcolm Chattwood, Environmental Protection Officer by means of the above contact details.

## Executive Summary

The continuing work to monitor local air quality within Argyll and Bute Council has established that there is no requirement to progress to a Detailed Assessment for any pollutants and that:-

- (a) Diffusion tube results indicate that the 2004 annual mean objective for nitrogen dioxide (NO<sub>2</sub>) continues to be met
- (b) Compliance with 2004 fine particulates (PM<sub>10</sub>) 24 hour mean and annual mean objectives has been achieved.
- (c) Compliance with 2010 fine particulates (PM<sub>10</sub>) 24 hour mean and annual mean objectives will be achieved
- (d) The results from the two Streetbox monitors in Port Ellen indicate that the 2003 carbon monoxide (CO) objective is being met.

A review of planning applications submitted in 2009 did not reveal any developments with the potential to significantly affect local air quality. There were no new permitted processes opened in 2009 with the capacity to affect local air quality. No new landfill sites or quarries opened with relevant public exposure.

### Conclusions

1. There is no requirement for Argyll and Bute Council to progress to Detailed Assessment. In the course of our work we have :-
  - a. Identified this position through objective monitoring
  - b. Worked with businesses to improve their awareness of local air quality. Of significant note is the current work to provide new higher flues at Port Ellen Maltings which will assist in improving air quality and address ongoing issues of smoke pollution
2. The Council will review its local air quality monitoring programme in 2010/11,

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# **1 Introduction**

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

The Argyll and Bute Council area covers approximately 6900 square kilometres and borders upon Stirling, Highland, West Dunbartonshire, and Perth and Kinross Councils. Much of the land area is occupied by mountain and moorland, particularly in the north eastern portion. Off the coastline lie some 550 islands, 25 of which are inhabited. The principal islands are Bute, Islay, Mull, Luing, Jura, Coll, Lismore, Iona, Colonsay and Gigha, and the main settlements are located at Bowmore, Campbeltown, Dunoon, Lochgilphead, Oban, Rothesay, Tobermory, Tarbert, Inveraray and Helensburgh.

The combination of mountain, moorland, coastline, particularly the long indented sea lochs, as well as several large fresh water lochs, give the area a distinctive character. The designations of several National and Regional Scenic Areas and the Loch Lomond and the Trossachs National Park reflect this.

### **Industries**

Industries tend to be related to the natural assets of the area. Forestry and agriculture are prevalent inland, whilst in coastal areas there are a large number of distilleries, fish farms, boat building and fishing businesses. Tourism makes a significant and important contribution to the Argyll and Bute economy.

Those industries that are regulated by the Scottish Environmental Protection Agency (SEPA) because of their potential to cause pollution i.e. prescribed processes in terms of the Pollution Prevention & Control (Scotland) Regulations 2000, are mapped in Appendix C.

### **Population**

The population of the area was recorded in the 2001 census as 91306. Appendix C indicates the distribution of the population in the major settlements.

### **Road Network and Transport**

The topography of the area, together with the relatively dispersed population, means that the majority of transport movements involve long road journeys. Most of the main roads follow the coastline and have to make long detours around the head of extensive sea lochs. The only large towns served by the rail network are Oban and Helensburgh. Throughout the area heavy reliance is therefore placed upon road transport, both by the resident population and visitors. Between 1995 and 1997, 82% of the 1.8 million trips made into the Argyll, the Isles, Loch Lomond, Stirling and the Trossachs Tourist Board area were made by road transport. Summertime traffic flows are consequently much higher than those experienced during the winter months.

Regular car ferry services connect the larger islands and there are numerous smaller car and passenger ferries serving the smaller islands. In addition, ferry services operate between mainland settlements for commuter, freight and tourist traffic, for example Dunoon to Gourock. The main ferry terminals are located at Dunoon, Oban, Rothesay and Kennacraig.

Airports operating scheduled flights between island and mainland communities are found at Coll, Colonsay, Tiree, Campbeltown, Islay and Oban.

A map showing the location of ferry terminals and airports is included in Appendix C.

## **1.2 Purpose of Progress Report**

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedance of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

## **1.3 Air Quality Objectives**

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

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

| Pollutant  | Concentration   | Measured as         | Date to be achieved by |
|--|---|---------------------|------------------------|
| <b>Benzene</b>                                   | 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             |
| <b>1,3-Butadiene</b>                             | 2.25 $\mu\text{g}/\text{m}^3$   | Running annual mean | 31.12.2003             |
| <b>Carbon monoxide</b>                           | 10.0 $\text{mg}/\text{m}^3$   | Running 8-hour mean | 31.12.2003             |
| <b>Lead</b>                                      | 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             |
| <b>Nitrogen dioxide</b>                          | 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             |
| <b>Particles (PM<sub>10</sub>) (gravimetric)</b> | 50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year  | 24-hour mean        | 31.12.2004             |
|  | 50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 7 times a year   | 24-hour mean        | 31.12.2010             |
|  | 40 $\mu\text{g}/\text{m}^3$   | Annual mean         | 31.12.2004             |
|  | 18 $\mu\text{g}/\text{m}^3$   | Annual mean         | 31.12.2010             |
| <b>Sulphur dioxide</b>                           | 350 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 24 times a year | 1-hour mean         | 31.12.2004             |
|  | 125 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 3 times a year  | 24-hour mean        | 31.12.2004             |
|  | 266 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year | 15-minute mean      | 31.12.2005             |



## 1.4 Summary of Previous Review and Assessments

**Table 1.2 Summary of Previous Reports.**

| <b>Report</b>  | <b>Date</b> | <b>Outcome</b>   |
|--|-------------|--|
| First Stage Assessment   | 1998        | Further assessment of NO <sub>2</sub> & SO <sub>2</sub> required   |
| Second Stage Assessment (USA)  | 2003        | Detailed assessments required for PM <sub>10</sub> and SO <sub>2</sub> in relation to the combustion of solid fuel in Tarbert. Further assessment recommended for Port Ellen Maltings. |
| Detailed Assessment – PM <sub>10</sub> & SO <sub>2</sub> from solid fuel combustion in Tarbert | 2005        | Indicated compliance with PM <sub>10</sub> & SO <sub>2</sub> objectives.   |
| Further Assessment for industrial process at Port Ellen  | 2005        | Recommended monitoring for CO at Port Ellen  |
| Progress Report  | 2005        | Recommended monitoring for CO at Port Ellen  |
| Updating & Screening Assessment  | 2006        | Continue monitoring PM <sub>10</sub> related to solid fuel combustion at Tarbert and detailed assessment for CO at Port Ellen Maltings   |
| Progress Report & Detailed Assessment  | 2007        | Detailed assessment reported Port Ellen Maltings should comply with CO objective.  |
| Progress Report  | 2008        | Continued monitoring indicates compliance with CO & PM <sub>10</sub> objectives  |
| Updating & Screening Assessment  | 2009        | Continued monitoring indicates compliance with CO & PM <sub>10</sub> objectives  |

## **2 New Monitoring Data**

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

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

Table 2.1 provides details of automatic monitoring sites within Argyll and Bute. All three sites were originally established to support Detailed Assessments undertaken to further consider the pollutants monitored. The conclusion of the Detailed Assessments<sup>2,8</sup> was that designation of Air Quality Management areas was not necessary although it was decided to maintain the operation of the three automatic monitoring sites. Details of QA/QC procedures are included in Appendix A.

**Table 2.1 Details of Automatic Monitoring Sites**

| <b>Site Name</b>         | <b>Site Type</b> | <b>OS Grid Ref</b>   | <b>Pollutants Monitored</b> | <b>Monitoring Technique</b> | <b>In AQMA?</b> | <b>Relevant Exposure? (Y/N with distance (m) to relevant exposure)</b> | <b>Distance to kerb of nearest road</b> | <b>Worst-case Location?</b> |
|--------------------------|------------------|----------------------|-----------------------------|-----------------------------|-----------------|--|---|-----------------------------|
| Tarbert                  | Urban background | E 186553<br>N 668458 | PM <sub>10</sub>            | TEOM                        | N               | Y (23m)  | N/A                                     | Y                           |
| Port Ellen – Antrim View | Urban background | E 135970<br>N 645880 | CO                          | Streetbox                   | N               | Y (12m)  | N/A                                     | Y                           |
| Port Ellen – Bay View    | Urban background | E 135970<br>N 645880 | CO                          | Streetbox                   | N               | Y (22m)  | N/A                                     | Y                           |

### **2.1.2 Non-Automatic Monitoring**

Argyll and Bute Council undertakes monitoring of nitrogen dioxide using diffusion tubes at 10 sites throughout the district, mainly on roads which are perceived to be subject to the highest concentrations due to traffic flow but possibly associated with other features such as street canyons. Details of current sites are provided in Table 2.1 and QA/QC procedures are included in Appendix A.

Following a review of NO<sub>2</sub> diffusion tube monitoring sites in April 2009 it was concluded that the 2 tubes sited on Soroba Road Oban had fulfilled their purpose in confirming low concentrations and that they should be removed. The tubes were resited to George Street, Oban to supplement an existing site. George Street was identified in the 2009 USA as being a narrow congested street with a traffic flow greater than 5000 vehicles per day with residential property close to the kerb.

**Table 2.2 Details of Non- Automatic Monitoring Sites**

| Site Name                    | Site Type      | OS Grid Ref          | Pollutants Monitored | In AQMA? | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road | Worst-case Location? |
|------------------------------|----------------|----------------------|----------------------|----------|---|----------------------------------|----------------------|
| George Street 1, Oban        | Roadside       | E 185920<br>N 729942 | NO <sub>2</sub>      | N        | Y (5m)  | 2m                               | Y                    |
| George Street 2, Oban        | Roadside       | E 185870<br>N 730319 | NO <sub>2</sub>      | N        | Y (4m)  | 9m                               | Y                    |
| George Street 3, Oban        | Roadside       | E 185880<br>N 730250 | NO <sub>2</sub>      | N        | Y (4m)  | 9m                               | Y                    |
| Argyll Street, Dunoon        | Roadside       | E 217324<br>N 676894 | NO <sub>2</sub>      | N        | Y(6m)   | 3                                | Y                    |
| Main St, Campbeltown         | Roadside       | E 171918<br>N 620330 | NO <sub>2</sub>      | N        | Y(1m)   | 3                                | Y                    |
| Colchester Sq, Lochgilphead  | Roadside       | E 186222<br>N 687940 | NO <sub>2</sub>      | N        | Y(10m)  | 2                                | N                    |
| Inverneil                    | Rural B'ground | E 186048<br>N 729293 | NO <sub>2</sub>      | N        | Y(3m)   | N/A                              | Y                    |
| East Princes St, Helensburgh | Roadside       | E 229809<br>N 682326 | NO <sub>2</sub>      | N        | Y(12m)  | 2                                | N                    |
| Main Road, Cardross          | Roadside       | E 234262<br>N 677771 | NO <sub>2</sub>      | N        | Y(6m)   | 3                                | Y                    |
| Tarbet                       | Roadside       | E 231927<br>N 704469 | NO <sub>2</sub>      | N        | N   | 2                                | N                    |

## 2.2 Comparison of Monitoring Results with Air Quality Objectives

### 2.2.1 Nitrogen Dioxide

#### Diffusion Tube Monitoring Data

The annual mean concentrations for NO<sub>2</sub> diffusion tubes (adjusted for bias) are presented in Table 2.3. A monthly breakdown of results is included in Appendix B. The last 3 years' annual mean results are shown in Table 2.4 and also in graphical format in Appendix B.

**Table 2.3 Results of Nitrogen Dioxide Diffusion Tubes**

| Location                     | Within AQM A? | Data Capture 2009 % | Data Capture Monitoring Period % | Annual mean concentrations                     |
|------------------------------|---------------|---------------------|----------------------------------|--|
|                              |               |                     |                                  | 2009 (µg/m <sup>3</sup> )<br>Adjusted for bias |
| George Street 1, Oban        | N             | 100                 | n/a                              | 30   |
| George Street 2, Oban        | N             | 67(8 months)        | 100                              | 25 (annualised)                                |
| George Street 3, Oban        | N             | 67(8 months)        | 100                              | 33 (annualised)                                |
| Argyll Street, Dunoon        | N             | 100                 | n/a                              | 19   |
| Main St, Campbeltown         | N             | 92                  | n/a                              | 24   |
| Colchester Sq, Lochgilphead  | N             | 83                  | n/a                              | 12   |
| Inverneil                    | N             | 100                 | n/a                              | 3  |
| East Princes St, Helensburgh | N             | 100                 | n/a                              | 24   |
| Main Road, Cardross          | N             | 100                 | n/a                              | 21   |
| Tarbet                       | N             | 100                 | n/a                              | 17   |

**Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes**

| Location   | Within AQMA? | Annual mean concentrations<br>( $\mu\text{g}/\text{m}^3$ )<br>Adjusted for bias |      |      |
|--|--------------|---|------|------|
|  |              | 2007  | 2008 | 2009 |
| George Street 1, Oban                                | N            | 29  | 28   | 30   |
| George Street 2, Oban                                | N            | n/a   | n/a  | 25   |
| George Street 3, Oban                                | N            | n/a   | n/a  | 30   |
| Argyll Street, Dunoon                                | N            | 17  | 17   | 19   |
| Main St, Campbeltown                                 | N            | 18  | 22   | 26   |
| Colchester Sq, Lochgilphead                          | N            | 11  | 9    | 12   |
| Inverneil  | N            | 3   | 2    | 3    |
| East Princes St, Helensburgh                         | N            | 25  | 20   | 24   |
| Main Road, Cardross                                  | N            | 20  | 18   | 21   |
| Tarbet   | N            | 16  | 17   | 17   |
| Bias adjustment factor used (from Spreadsheet 03/10) |              | 1.05  | 0.97 | 1.23 |

An examination of the results obtained from established diffusion tubes does not reveal any significant trends at any sites.

## 2.2.2 PM<sub>10</sub>

A TEOM PM<sub>10</sub> monitor was sited at Tarbert Academy following the conclusion of the 2003 USA<sup>1</sup> to progress to a Detailed Assessment in respect of domestic solid fuel combustion. The site is surrounded by housing with many properties burning solid fuel as a primary source of heating and is considered to be representative of relevant public exposure. It was reported in the 2007 Progress Report and Detailed Assessment<sup>2</sup> that there would be compliance with all the 2004 and 2010 objectives. Monitoring of PM<sub>10</sub> using the TEOM has continued at the site.

The Volatile Correction Model cannot be used for the TEOM monitoring data as there are no FDMS instruments within range. The results presented below have been corrected by using the equation *Reference equivalent PM<sub>10</sub> = TEOM x 1.3 – 2.2494* as directed by the UK Air Quality Archive<sup>6</sup>. Annual means and 24 hour exceedances are presented in graphical form in Appendix B and Tables 2.5 and 2.6 below

Box 2.2 in TG(09) is not relevant to the projection of the 2010 annual mean as the monitoring site is not a roadside location. The calculation of the predicted 2010 annual mean was undertaken as described in Para 2.10 of TG(09) and is shown in Box 1 below. None of the 2004 objectives were exceeded in 2007-9 and compliance with the 2010 annual objective is predicted, based on 2009 data.

No significant trend is apparent from an examination of the results of the Tarbert TEOM.

**Table 2.5 Results of PM<sub>10</sub> Automatic Monitoring: Comparison with Annual Mean Objective**

| Location | Within AQMA? | Data Capture for monitoring period % | Data Capture for full calendar year 2009 % | Annual mean concentration gravimetric equivalent ( $\mu\text{g}/\text{m}^3$ ) |      |      |                |
|----------|--------------|--------------------------------------|--|---|------|------|----------------|
|          |              |                                      |  | 2007  | 2008 | 2009 | 2010 predicted |
| Tarbert  | N            | n/a                                  | 92   | 15.8  | 16.9 | 14.3 | 14.0           |

Note: 2008 data annualised as per Box 3.2 of TG(09)

**Box 1 Calculation of projected 2010 annual mean concentration using reference equivalent**

|  |                              |      |                              |
|--|------------------------------|------|------------------------------|
| Total PM <sub>10</sub> Background concentrations at E 186500 N688500 from background maps              |                              |      |                              |
| 2009   | 9.1 $\mu\text{g}/\text{m}^3$ | 2010 | 8.9 $\mu\text{g}/\text{m}^3$ |
|  |                              |      | Multiplication factor 0.98   |
| Projected 2010 concentration = 2009 concentration X 0.98 = 14.3 X 0.98 = 14.0 $\mu\text{g}/\text{m}^3$ |                              |      |                              |

**Table 2.6 Results of PM<sub>10</sub> Automatic Monitoring: Comparison with 24-hour Mean Objective**

| Location | Within AQMA? | Data Capture 2009 % | Number of exceedances of daily mean objective ( $50 \mu\text{g}/\text{m}^3$ ) |      |      |
|----------|--------------|---------------------|---|------|------|
|          |              |                     | 2007  | 2008 | 2009 |
| Tarbert  | N            | 98                  | 2   | 0    | 0    |

### 2.2.3 Carbon monoxide

The 2006 USA<sup>3</sup> concluded that there was a possibility that the NAQS objective for carbon monoxide (CO) could be exceeded in the vicinity of the Maltings, Port Ellen, Islay. The process at the Maltings prepares malted barley for use at island distilleries. The malted barley is dried in kilns which are fired by medium fuel oil and the primary air to the burners is supplemented by smoke from burning peat with the intention of flavouring the product. Two kilns may be in operation at any one time. Modelling exercises undertaken following the 2003 USA suggested that the carbon monoxide produced by the burning peat could cause an exceedance of the NAQS objective at residential property close to the process.

Two Streetbox monitors were installed in 2006 at Port Ellen to provide continuous indicative monitoring of CO. These were attached to street furniture near to residential properties on Bay View and Antrim View. These sites were identified from



the 2005 report<sup>4</sup> which had indicated maximum concentrations of CO would be found at these locations.

Streetbox monitors contain electrochemical cells and are regarded as suitable for use as a screening tool by LAQM.TG(09)<sup>5</sup>. Data is collected by the Streetbox in units of parts per million v/v and the periodic mean logged at 15 minute intervals. The data from both monitors is presented graphically in Appendix B and numerically in Table 2.7.

**Table 2.7 Results of carbon monoxide monitoring at Port Ellen**

| Site        | Objective Exceeded?<br>(8 hour mean = 10mg/m <sup>3</sup> ) | Highest 8 hourly mean mg/m <sup>3</sup> |      |      |      |
|-------------|---|---|------|------|------|
|             |   | 2006                                    | 2007 | 2008 | 2009 |
| Antrim View | No  | 1.5                                     | 2.1  | 3.4  | 1.9  |
| Bay View    | No  | 8.5                                     | 8.0  | 4.5  | 6.7  |

Following the 2007 Detailed Assessment<sup>2</sup> Diageo plc installed cowls on the three kiln discharge stacks in August 2007 which tripled the discharge velocity from 5.5 to 16.5 m/s. Although the building effects on plume behaviour are still evident it is apparent that under some weather conditions dispersion is noticeably improved. This is reflected in the trend of highest 8 hourly means reported in Table 2.7.

The results continue to indicate that there are no exceedances of the 2003 air quality objective and the installation of the cowls on the kiln stacks has resulted in an overall lowering of concentrations in the residential area close to the Streetbox monitors.

Working in partnership with Argyll and Bute Council Diageo plc has proposed to construct a new 39m multi-flue stack to discharge the kiln emissions more effectively and to eliminate plume grounding in adjacent residential areas. Planning permission has been granted and construction is scheduled to begin in June and the new stack will be commissioned by October 2010.

#### **2.2.4 Summary of Compliance with AQS Objectives**

Argyll and Bute Council has examined the results from monitoring in its area. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

## **3 New Local Developments**

### **3.1 Road Traffic Sources**

Argyll and Bute Council has not identified any new road traffic sources that have not been adequately considered in previous rounds of Review and Assessment.

### **3.2 Other Transport Sources**

Argyll and Bute Council has not identified any new other transport sources that have not been adequately considered in previous rounds of Review and Assessment.

### **3.3 Industrial Sources**

Argyll and Bute Council has not identified any new other industrial sources that have not been adequately considered in previous rounds of Review and Assessment.

### **3.4 Commercial & Domestic Sources**

Argyll and Bute Council has not identified any new commercial or domestic sources that have not been adequately considered in previous rounds of Review and Assessment.

### **3.5 New Developments with Fugitive or Uncontrolled Sources**

Argyll and Bute Council has not identified any new developments with likely fugitive or uncontrolled sources that have not been adequately considered in previous rounds of Review and Assessment.

## **4 Conclusions and Proposed Actions**

### **4.1 Conclusions from New Monitoring Data**

Indicative monitoring of PM<sub>10</sub> and carbon monoxide has continued at sites previously the subject of Detailed Assessments. There is no indication that any objectives have been exceeded in 2009. It is predicted that compliance with the PM<sub>10</sub> 2010 annual mean objective will be achieved in the area of densest primary coal combustion.

The nitrogen dioxide diffusion tube network has continued in operation and reference to the graphs in Appendix B show that no significant trends have been revealed or that any measured concentrations are close to the annual mean objective.

### **4.2 Proposed Actions**

The Updating and Screening Assessment has not identified any need to proceed to a Detailed Assessment for any pollutant.

In 2010 - 11, it is our intention to review our air monitoring strategy for PM<sub>10</sub>, carbon monoxide and nitrogen dioxide. This will include:-

- i. The development of a revised monitoring programme for 2010 - 12 including an appraisal of current diffusion tube monitoring sites in relation to receptors.
- ii. Consider the relocation of the TEOM PM<sub>10</sub> monitor to a site close to the proposed biomass power station in Lochgilphead. This will allow an assessment of baseline data to be undertaken before the construction and operation of the proposed plant.

The matters considered by this assessment will be updated and presented in a Progress Report in April 2011.

## 5 References

- (1) Argyll & Bute Council, Updating & Screening Assessment of Air Quality, May 2003
- (2) Argyll and Bute Council, Local Air Quality Management Progress Report and Detailed Assessment, April 2007
- (3) Argyll and Bute Council, Updating & Screening Assessment of Air Quality, April 2006
- (4) Argyll and Bute Council, Air Quality Study of Port Ellen Maltings, Islay, October 2005
- (5) Defra in partnership with the devolved administrations, Technical Guidance LAQM.TG(09), February 2009
- (6) [www.airquality.co.uk/news.php](http://www.airquality.co.uk/news.php)
- (7) [www.uwe.ac.uk/aqm/review/](http://www.uwe.ac.uk/aqm/review/)
- (8) Argyll and Bute Council, Detailed Assessment of Emissions from Domestic Solid Fuel Burning in Tarbert, November 2005

# Appendices

## Appendix A: QA:QC Data

### Diffusion Tube Bias Adjustment Factors

Nitrogen dioxide diffusion tubes are supplied and analysed by Glasgow Scientific Services. The preparation method used is 20% TEA in water and the 2009 bias adjustment factor of 1.23 was obtained from Spreadsheet Version 03/10<sup>7</sup>. No local co-location studies were available to produce bias adjustment factors.

### PM Monitoring Adjustment

The Volatile Correction Model cannot be used for the TEOM monitoring data as there are no FDMS instruments within range. The results for the annual mean have been corrected to gravimetric equivalence by applying the equation *Reference equivalent*  $PM_{10} = TEOM \times 1.3 - 2.2494$  as directed by the UK Air Quality Archive<sup>6</sup>.

### QA/QC of automatic monitoring

#### PM<sub>10</sub> Monitoring

##### Service of TEOM

The TEOM is covered by a service and maintenance contract with Air Monitors Ltd which covers cleaning of components, calibration checks, flow and leak checks, and replacement of consumable items. The performance of the tapered element is checked against a pre-weighed filter & the result checked against the stated calibration constant. Records are kept of any service or maintenance of the analyser.

##### Data Handling and Validation

Raw data is downloaded at intervals not exceeding 25 days. The raw data file is opened in Excel and is visually examined for suspect data which is deleted from the data set before subsequent calculation of periodic means. Readings that are generally considered invalid are:

- Readings indicated by the analyser as invalid
- Several consecutive zero readings
- Minus concentrations

The raw data file is retained so it can re-examined at a late date if deemed necessary. The validated data file is saved in an Excel spreadsheet where it is used to calculate the 24 hour mean and to allow subsequent presentation in graphical format. All concentrations are multiplied by corrected to gravimetric equivalence by application of the *Reference equivalent*  $PM_{10} = TEOM \times 1.3 - 2.2494$ . 24 hour mean values are only calculated where data capture in the 24 hour period exceeds 75%. A

separate spreadsheet is produced for each quarter starting January 1<sup>st</sup>. A fifth spreadsheet is produced as a combination of the four quarterly spreadsheets. This allows for calculation of the annual mean and presentation of graphical results.

#### Data ratification

Completed quarterly spreadsheets are checked periodically to ensure that the data results are reliable and consistent. This includes:

- Checking the characteristics of the plotted results to highlight any potential baseline drift or departure from the normal range of readings.
- Check any high readings against the results from other sites to help identify any possible PM<sub>10</sub> episodes.
- Investigate potential local changes in the local environment that may have produced changes in PM<sub>10</sub> concentrations.

### Carbon monoxide monitoring

#### Service of Streetbox Monitors

The Streetboxes are covered by a service and maintenance contract with Signal Ambitech Ltd which covers calibration checks and replacement of consumable items. Records are kept of any service or maintenance of the analyser.

#### Data Handling and Validation

Raw data is downloaded at intervals not exceeding 100 days. The raw data file is opened in Excel and is visually examined for suspect data which is deleted from the data set before subsequent calculation of periodic means. Readings that are generally considered invalid are:

- Readings indicated by the analyser as invalid
- Minus concentrations

The raw data file is retained so it can re-examined at a late date if deemed necessary. The validated data file is saved in an Excel spreadsheet where it is used to convert the raw data to mg/m<sup>3</sup>, to calculate the hourly mean and running 8 hour mean and to allow subsequent presentation in graphical format. 8 hour mean values are only calculated where data capture in the 8 hour period exceeds 75%. An annual spreadsheet is produced for each monitor starting January 1<sup>st</sup>.

#### Data ratification

Completed quarterly spreadsheets are checked periodically to ensure that the data results are reliable and consistent. This includes:

- Checking the characteristics of the plotted results to highlight any potential baseline drift or departure from the normal range of readings.
- Investigate any changes in the method of working at the Maltings that may have affected the magnitude of measured CO concentrations.

- Investigate other potential local changes in the local environment that may have produced changes in concentrations.

**QA/QC of diffusion tube monitoring**

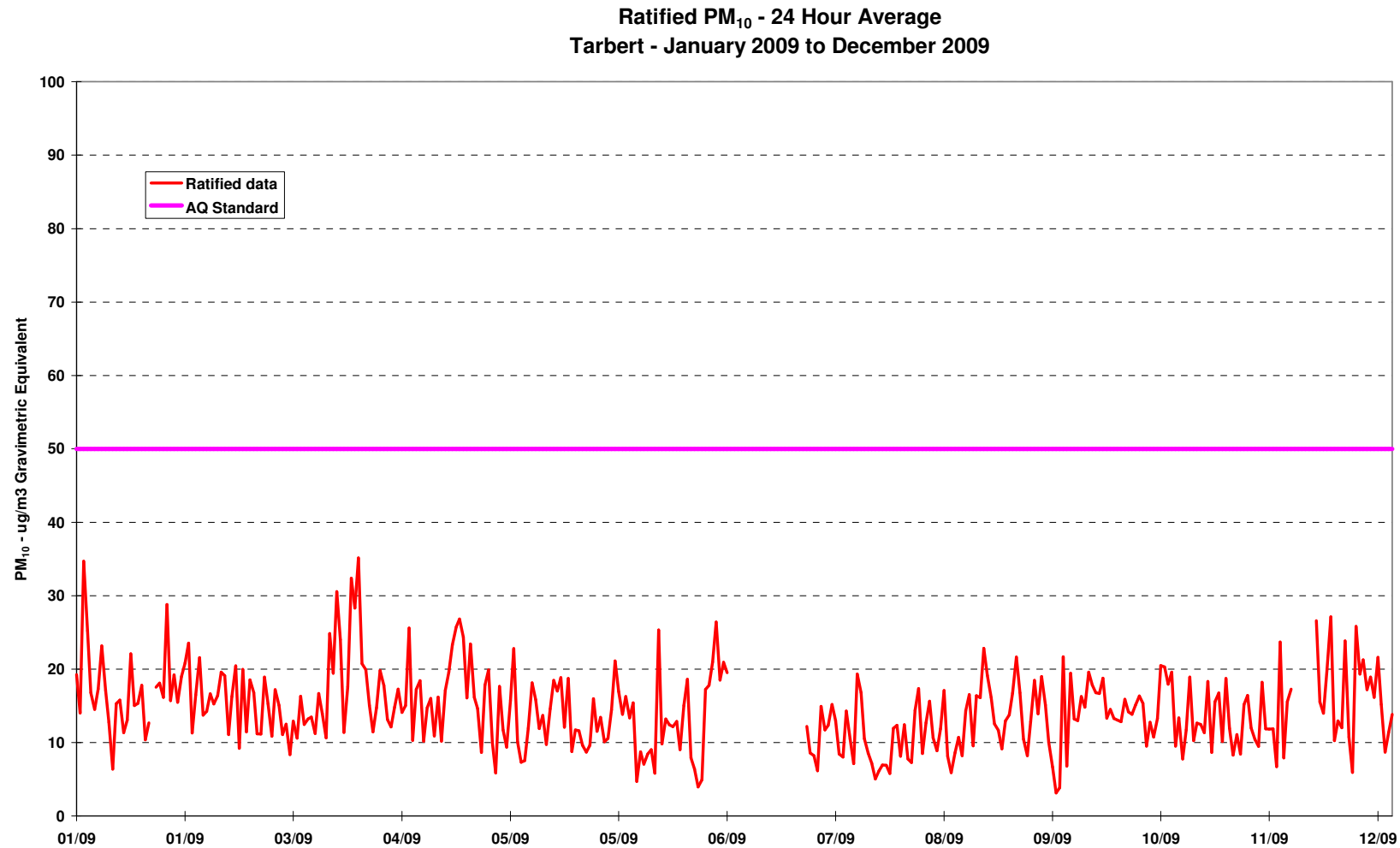
The NO<sub>2</sub> diffusion tubes are supplied and analysed by Glasgow Scientific Services and prepared by using 20% TEA in water. The duration of exposure is normally the 4/5 week period suggested by the calendar provided by Defra. Glasgow Scientific Services have adopted the procedures for preparation and analysis contained in the document "Diffusion Tubes for Ambient NO<sub>2</sub> Monitoring: Practical Guidance." Section 3 of this document also provides the basis for the operation of the Council's diffusion tube network.

A bias adjustment factor was applied to the annual mean NO<sub>2</sub> concentrations for 2009. The factor of 1.23 was obtained from Spreadsheet Version Number 03/10 downloaded from the Review and Assessment website<sup>7</sup>.

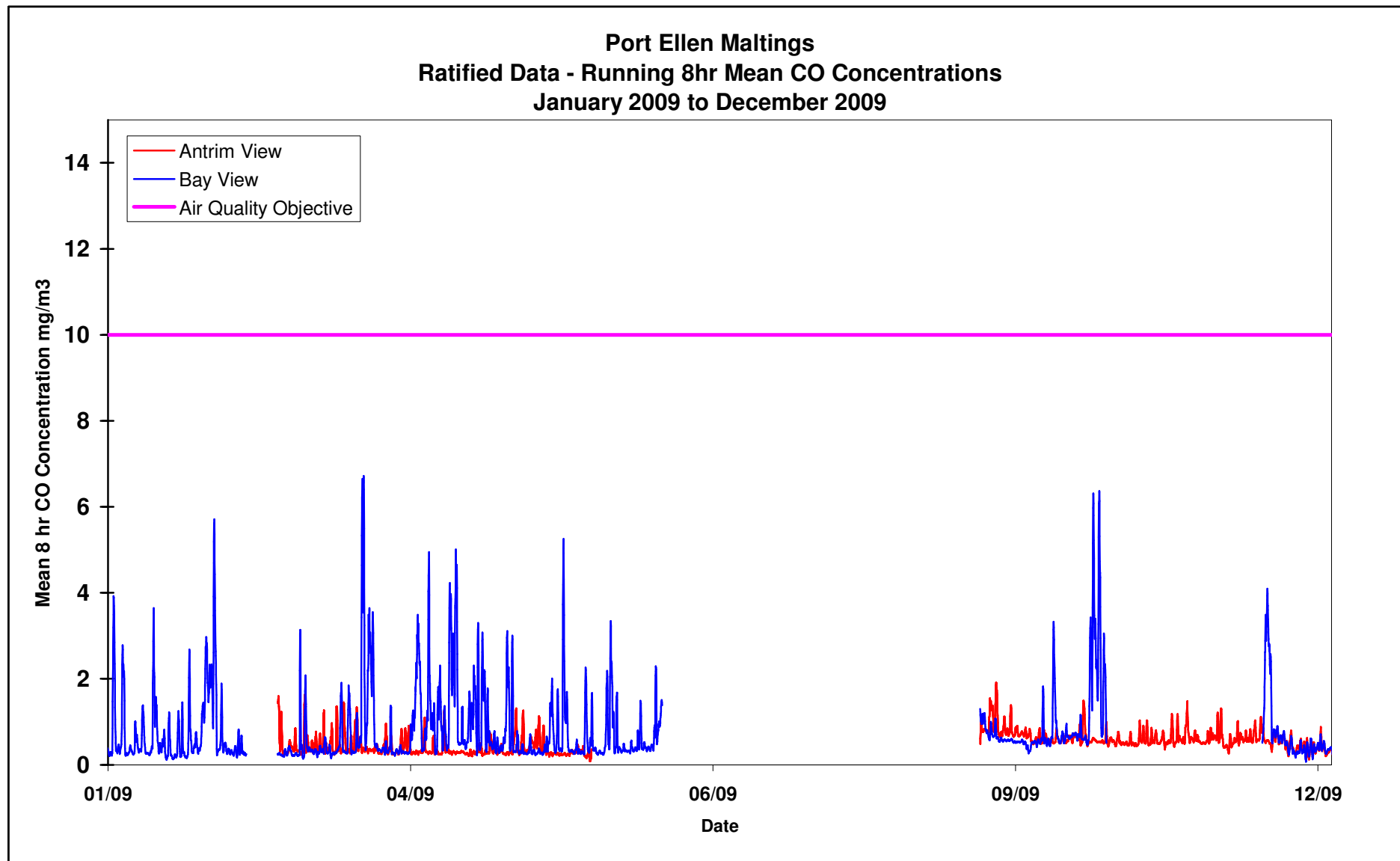


## Appendix B: Monitoring Results and Graphs

Figure 1 **PM<sub>10</sub> Monitoring Results**



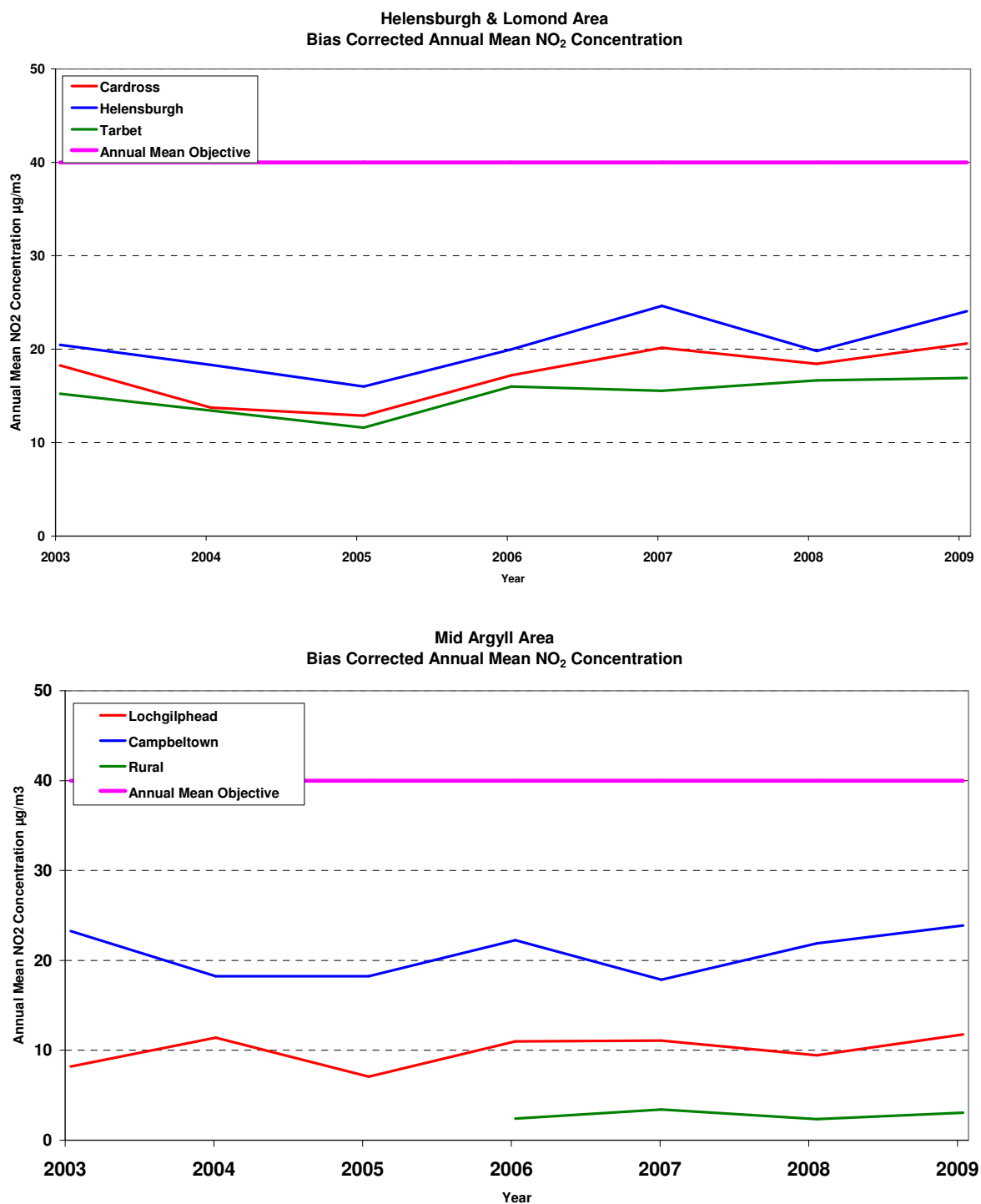
**Figure 2 Carbon Monoxide Monitoring Results**

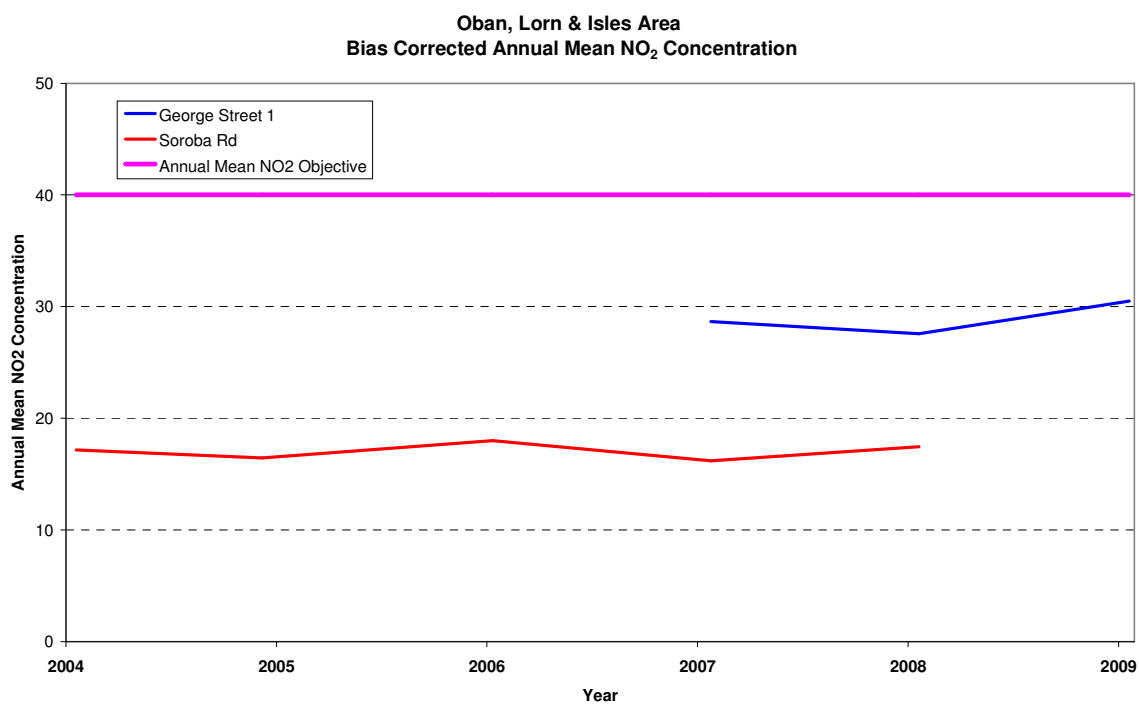
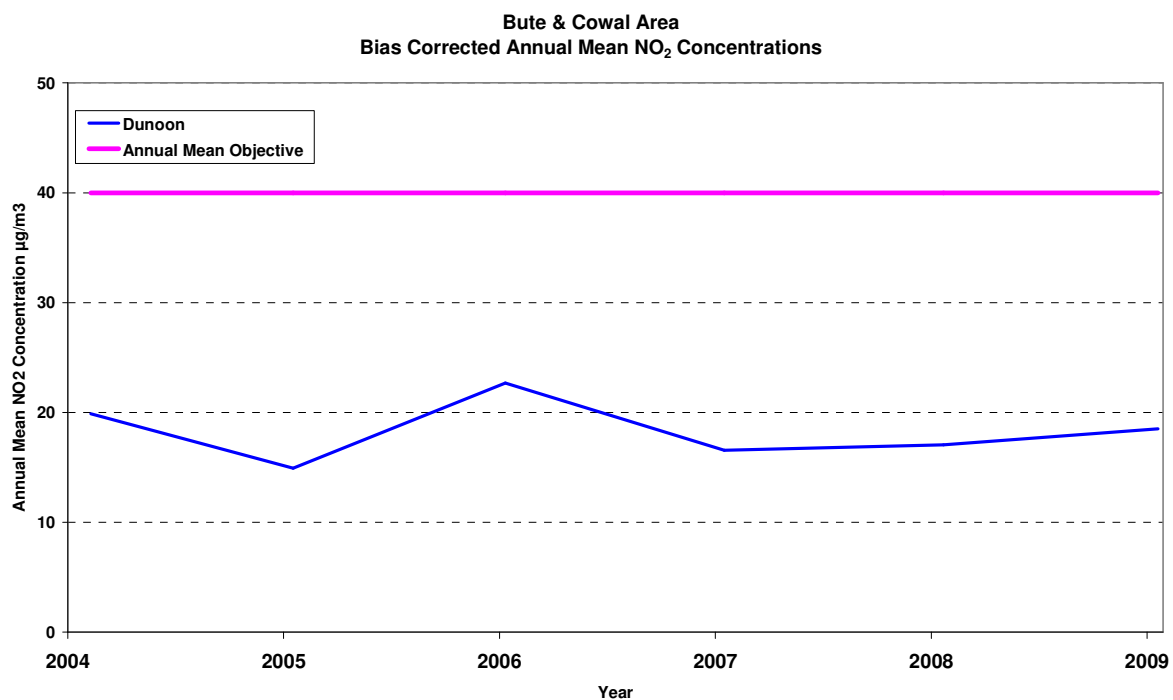


**Table B.1 Monthly Nitrogen Dioxide Diffusion Tube Monitoring Results**

| 2009      | George<br>St 1<br>Oban | George<br>St 2<br>Oban | George<br>St 3<br>Oban | Lochgilphead | Campbeltown | Mid Argyll<br>Rural | Dunoon | Helensburgh | Cardross | Tarbet |
|-----------|------------------------|------------------------|------------------------|--------------|-------------|---------------------|--------|-------------|----------|--------|
| January   | 38                     |                        |                        | 11           | 28          | 5                   | 15     | 26          | 21       | 16     |
| February  | 27                     |                        |                        | 10           | 20          | 2                   | 15     | 32          | 20       | 15     |
| March     | 29                     |                        |                        | 8            | 19          | 3                   | 19     | 27          | 18       | 12     |
| April     | 23                     |                        |                        | 8            | 26          | 3                   | 16     | 18          | 17       | 12     |
| May       | 25                     | 22                     | 26                     | 9            | 23          | 2                   | 14     | 16          | 14       | 14     |
| June      | 16                     | 18                     | 20                     |              |             | 2                   | 15     | 9           | 12       | 14     |
| July      | 18                     | 20                     | 20                     |              | 16          | 2                   | 9      | 12          | 11       | 12     |
| August    | 17                     | 18                     | 27                     | 8            | 16          | 2                   | 10     | 13          | 15       | 14     |
| September | 29                     | 12                     | 29                     | 5            | 14          | 2                   | 11     | 16          | 16       | 11     |
| October   | 20                     | 17                     | 26                     | 11           | 21          | 2                   | 13     | 22          | 21       | 21     |
| November  | 28                     | 21                     | 24                     | 11           | 21          | 3                   | 20     | 17          | 17       | 13     |
| December  | 28                     | 21                     | 23                     | 15           | 25          | 2                   | 24     | 25          | 20       | 10     |

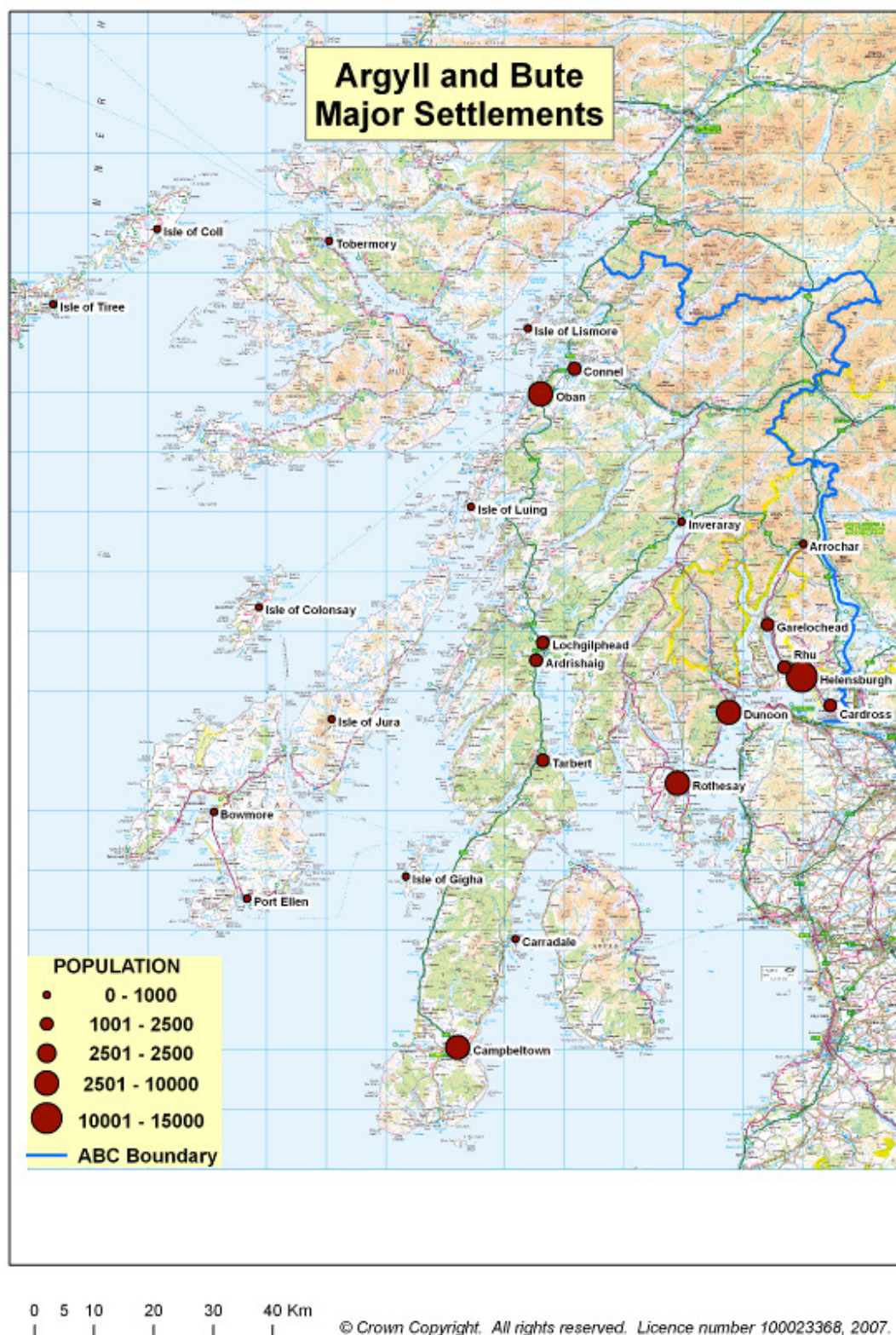
**Figure 3**      **Graphs of Annual NO<sub>2</sub> Trends**



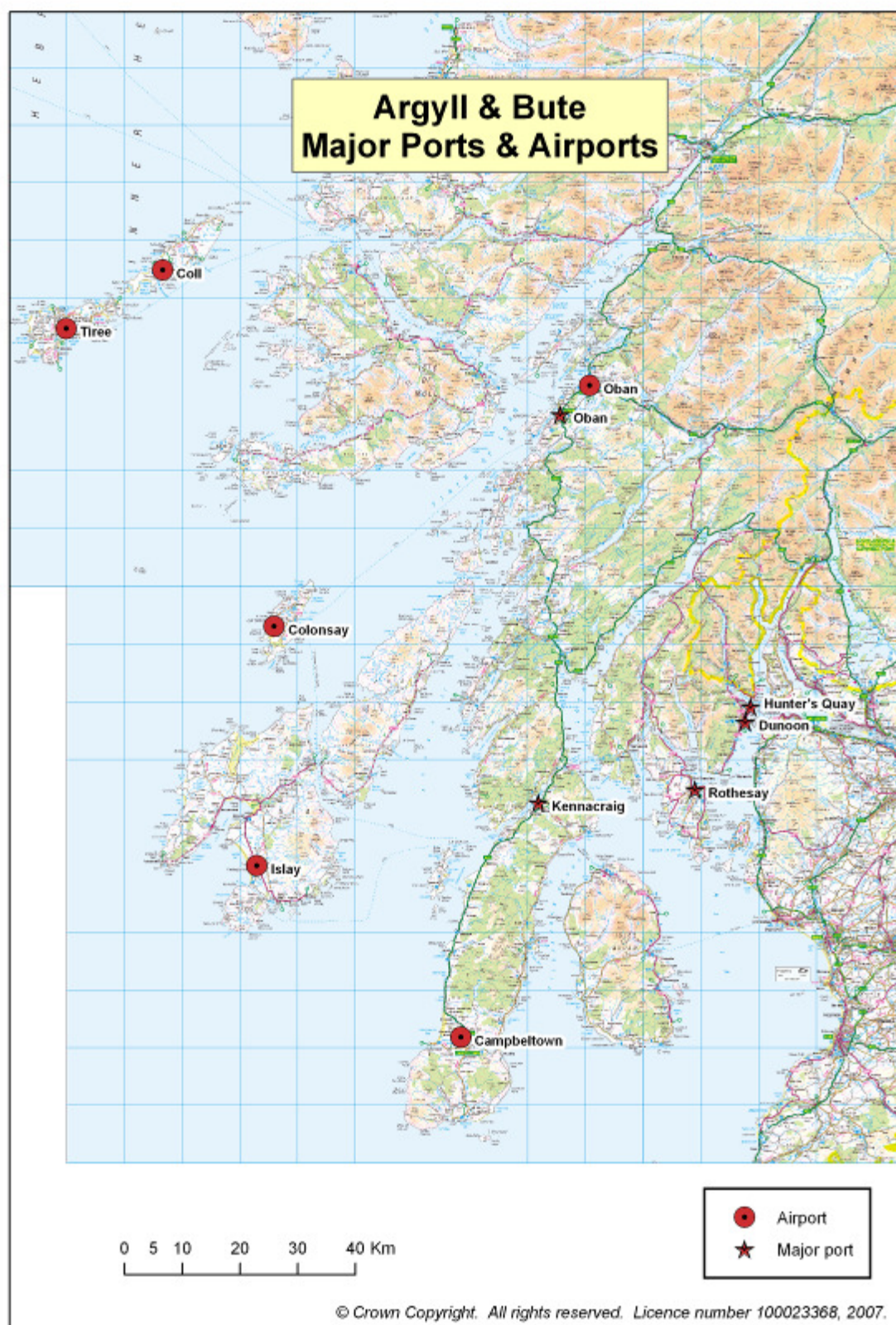


## Appendix C: Maps

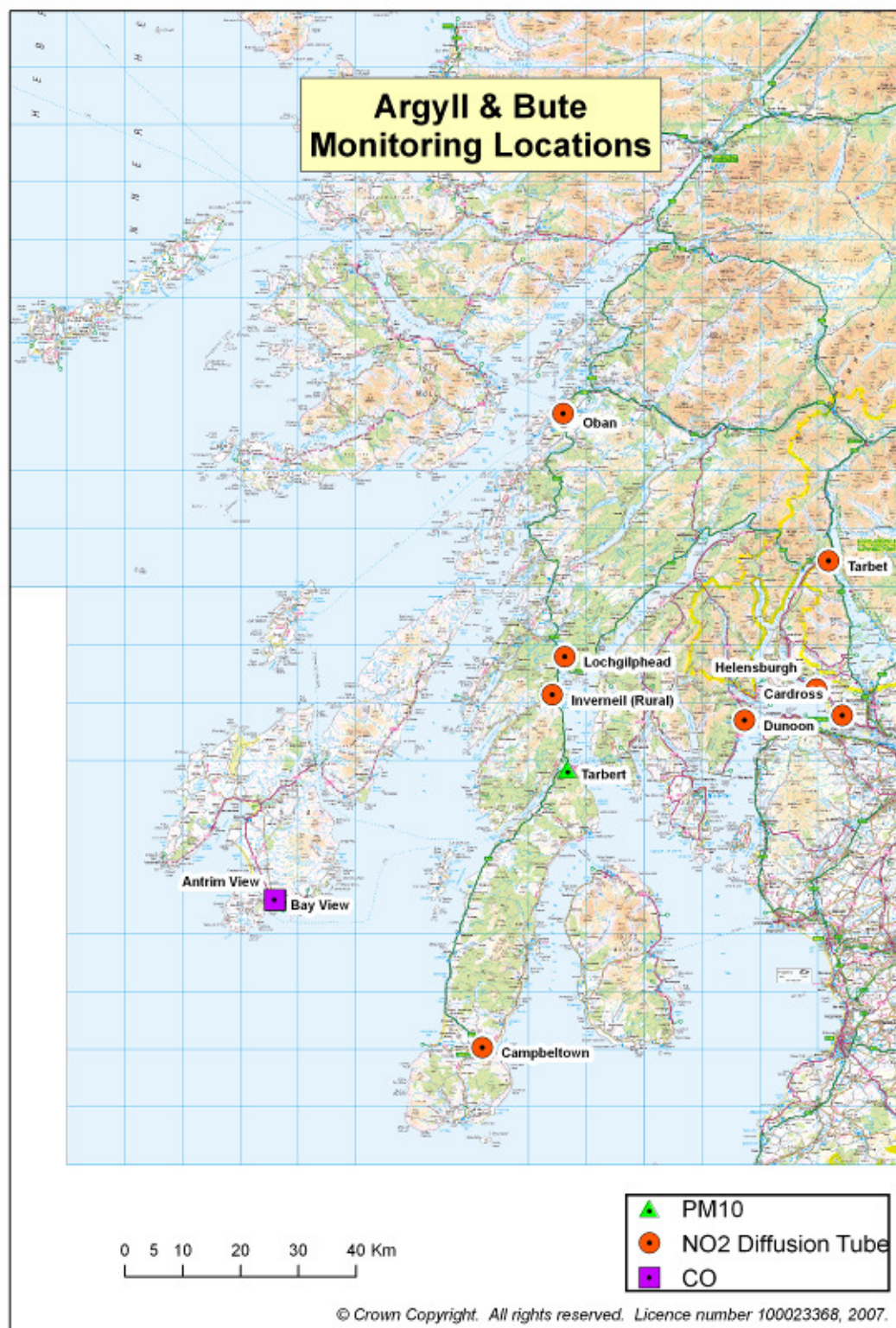
Figure 4 Major Settlements





**Figure 5 Major Ports & Airports**

**Figure 6 Monitoring Locations**





**Figure 7     PPC Installations**