



Air Quality Monitoring in Northern Ireland 2005



Department of the
Environment
www.doeni.gov.uk

1. Introduction

Air quality in Northern Ireland has shown substantial improvement in recent years. In particular, levels of pollutants associated with coal and oil combustion have declined significantly over the past decade. However, some pollutants in some areas continue to exceed air quality objectives. The 2006 review of the Air Quality Strategy reports that current average levels of man-made particulate pollution in the UK are estimated to reduce life expectancy by up to eight months. Continued effort to reduce air pollution is therefore important, together with monitoring to assess progress. This brochure, produced by the Department of Environment in Northern Ireland, provides a summary of air quality monitoring carried out in Northern Ireland on behalf of Government and by District Councils during 2005.

2. Which Pollutants are monitored in Northern Ireland?

The following pollutants were monitored in Northern Ireland during 2005:

- ▶ Carbon Monoxide (CO)
- ▶ Oxides of Nitrogen (NO_x) and Nitrogen Dioxide (NO₂)
- ▶ Sulphur Dioxide (SO₂)
- ▶ Particles (as PM₁₀ and using the older Black Smoke technique)
- ▶ Ozone
- ▶ Benzene
- ▶ 1,3-Butadiene
- ▶ Polycyclic Aromatic Hydrocarbons (PAH)

There are currently 39 air quality monitoring stations in Northern Ireland, each equipped with continuous monitoring equipment for some or all of the above pollutants. In addition, indicative monitoring is widely undertaken in Northern Ireland using low-cost non-automatic techniques such as NO₂ diffusion tubes at over 200 sites.

3. What Air Quality Objectives and Limit Values Apply in Northern Ireland?

Two sets of air quality objectives and limits apply to air quality in Northern Ireland:

(i) EC Directives

The European Community has agreed a series of Air Quality Directives covering key pollutants. These Directives establish Limit Values for specified pollutants; these requirements have been incorporated into Northern Ireland's own legislation.

(ii) The UK Air Quality Strategy

The Air Quality Strategy (AQS) sets out a comprehensive strategic framework for air quality policies and establishes Air Quality Objectives for key air pollutants.

In most cases, the Air Quality Strategy (AQS) Objectives are identical to the EC Directive Limit Values, the only differences being the more stringent dates by which the former must be achieved. Table 1 shows the AQS Objectives and EC Limit Values applicable to Northern Ireland.

4. What Are District Councils Doing About Air Quality?

Under the Environment (NI) Order 2002, District Councils in Northern Ireland must carry out a regular Review and Assessment of their local air quality. Where it is likely that an AQS Objective will not be met in an area where the public will be exposed, the Council is required to:

- ▶ Declare an Air Quality Management Area (AQMA), and
- ▶ Develop an Action Plan to address the problem.

All of Northern Ireland's 26 District Councils have completed the first round of review and assessments. Eleven have declared Air Quality Management Areas. Of these 11, six have declared AQMAs for PM₁₀ only, two for NO₂ and PM₁₀ together, two for NO₂ only, and one for SO₂.

Table 1. Air quality Strategy Objectives and EC Directive Limit Values Applicable in Northern Ireland				
<i>Averaging period</i>	<i>EC Limit Value or AQS Objective</i>	<i>No. of Permitted exceedences</i>	<i>To be achieved by (AQS Objectives)</i>	<i>To be achieved by (EC Directive Limit Values)</i>
Carbon Monoxide (CO)				
Max. Daily 8-hour Mean	10 mgm ⁻³	-	-	1 Jan 2005
Running 8-hour mean	10 mgm ⁻³	-	31 Dec 2003	-
Nitrogen Dioxide (NO₂) and total oxides of nitrogen (NO_x)				
1 hour	200 µg m ⁻³	18 per year	31 Dec 2005	1 Jan 2010
Annual Mean	40 µg m ⁻³	-	31 Dec 2005	1 Jan 2010
Annual Mean, for protection of vegetation (rural areas)	30 µg m ⁻³	-	31 Dec 2000	19 July 2001
	Total NO _x	-		
Sulphur Dioxide (SO₂)				
15 minute	266 µg m ⁻³	35 per year	31 Dec 2005	-
1 hour	350 µg m ⁻³	24 per year	31 Dec 2004	1 Jan 2005
24 hour	125 µg m ⁻³	3 per year	31 Dec 2004	1 Jan 2005
Annual mean and winter (1st October – 31st March), for protection of vegetation (rural)	20 µg m ⁻³	-	31 Dec 2000	19 July 2001
Particulate Matter (PM₁₀), as measured using a gravimetric method				
24 hour	50 µg m ⁻³	35 per year	31 Dec 2004	1 Jan 2005
24 hour ^a	50 µg m ⁻³	7 per year	31 Dec 2010	1 Jan 2010
Annual Mean	40 µg m ⁻³	-	31 Dec 2004	1 Jan 2005
Annual Mean ^a	20 µg m ⁻³	-	31 Dec 2010	1 Jan 2010
Ozone (O₃)				
Max. daily 8-hour mean. Compliance assessment based on average no. of day's exceedence over 3 consecutive years.	120 µg m ⁻³	25 days per calendar year	-	Averaged over 3 years, beginning 2010.
AOT40^b , calculated from 1h values May- July. For protection of vegetation.	18,000 µg m ⁻³ h	-	-	Averaged over 5 years, beginning 2010
Max. daily running 8-hour mean ^a	100 µg m ⁻³	10 days per year	31 Dec 2005	-
Benzene				
Running annual mean	16.25 µg m ⁻³	-	31 Dec 2003	-
Calendar Year Mean	3.25 µg m ⁻³	-	31 Dec 2010	-
Calendar Year Mean	5 µg m ⁻³	-	-	1 Jan 2010
1,3-Butadiene				
Running annual mean	2.25 µg m ⁻³	-	31 Dec 2003	-
PAH				
PAHs (B(a)P as an indicator)		-		
Calendar year mean	0.25 ng m ⁻³	-	31 Dec 2010	
Lead				
Calendar Year Mean (1)	0.5 µg m ⁻³	-	31 Dec 2004	1 Jan 2005.
Calendar Year Mean (2)	0.25 µg m ⁻³	-	31 Dec 2008	-

a Not prescribed in regulations for the purposes of local air quality management

b AOT 40 is the sum of the differences between hourly concentrations greater than 80 µg m⁻³ (=40ppb) and 80 µg m⁻³, over a given period using only the 1-hour averages measured between 0800 and 2000.

Four Councils - Antrim, Ards, Belfast and Strabane - have submitted Air Quality Action Plans to the Department. The remaining Councils, except for Carrickfergus and Newtownabbey who intend to revoke, are currently preparing Action Plans.

The second round of local air quality management review and assessment commenced during 2006. Councils are required to submit Updating and Screening Reports (USAs); these have been submitted by all Councils.

Table 2 shows the locations of these AQMAs, and what pollutants they are intended to tackle.

Table 2. Air Quality Managements Areas Declared By District Councils in Northern Ireland				
Council	Pollutant	Source	Date Declared	No. of AQMAs
Antrim	SO ₂	Domestic	31/10/04	1
Ards	PM ₁₀	Domestic	1/04/05	1
Ballymena	PM ₁₀	Domestic	1/11/04	2
Ballymoney	PM ₁₀	Domestic	1/08/05	1
Belfast	NO ₂ & PM ₁₀	Roads & Domestic	31/08/04	4
Carrickfergus	PM ₁₀	Domestic	7/09/04	2
Limavady	NO ₂	Roads	01/03/06	1
Newry & Mourne	NO ₂ & PM ₁₀	Roads	11/04/06	5
Derry	NO ₂	Roads	21/02/05	1
Newtownabbey	PM ₁₀	Domestic	26/10/04	1
Strabane	PM ₁₀	Domestic	30/06/04	3

5. New Air Quality Web Site for Northern Ireland

During the last year, a dedicated air quality web site and data archive was established for Northern Ireland. The site was officially launched on July 6th 2006; this can be found at www.airqualityni.co.uk (Figure 1).

The site is funded by the Department of Environment in Northern Ireland. It provides comprehensive information on:

- ▶ Latest up-to-date air quality levels across Northern Ireland
- ▶ Reports and Analysis of trends and historical data
- ▶ Information on both National air quality policy and the work of local authorities
- ▶ Descriptions of what causes air pollution, how it is measured, and the relevant impacts

The site contains a map showing where Northern Ireland's 39 automatic monitoring stations are located. By clicking on the map, users can view details of each monitoring site, a photograph of its location, and a list of the pollutants monitored. An "Air Pollution Index" is used to provide a simple indication of current pollution levels (Figure 2).

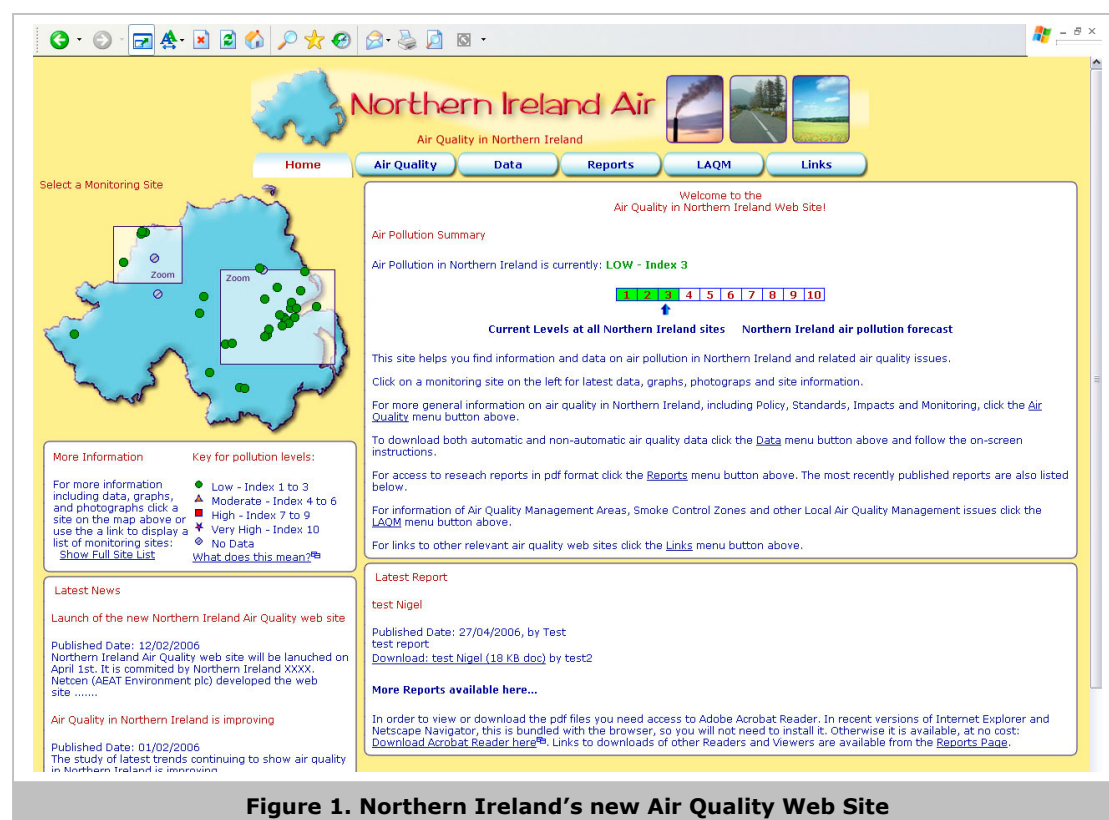
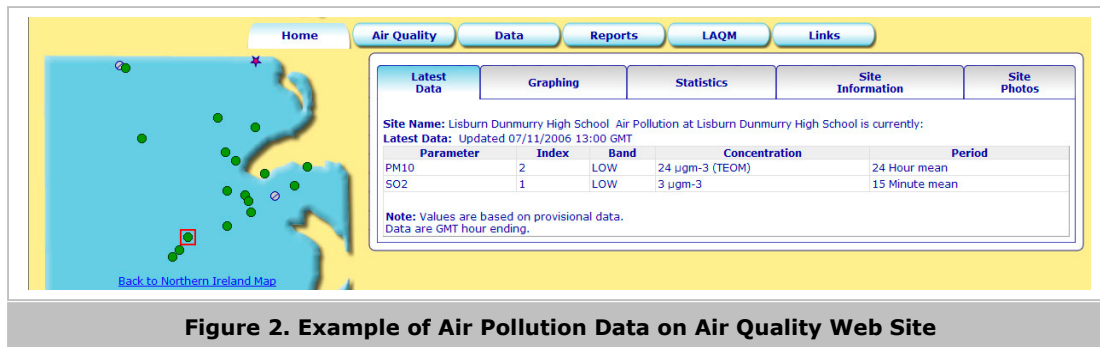


Figure 1. Northern Ireland's new Air Quality Web Site



6. Monitoring Results For 2005 and Long-Term Trends

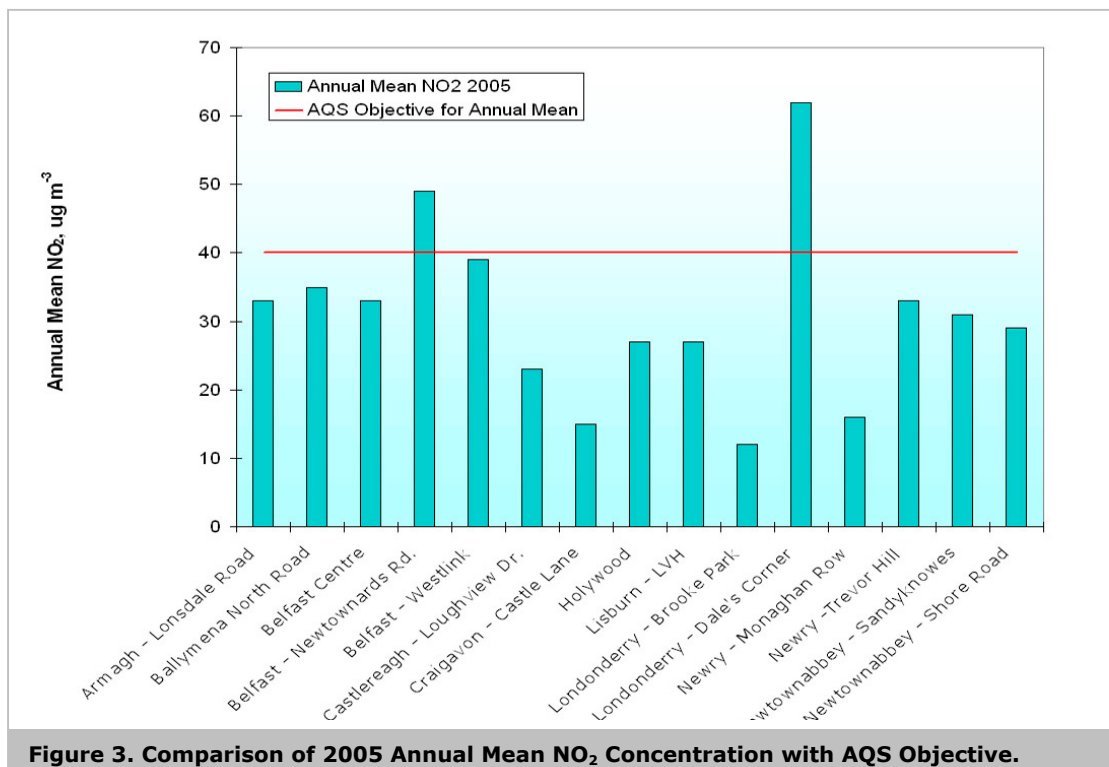
Air quality in Northern Ireland is generally improving - (see www.airqualityni.co.uk) - as decreasing emissions have led to reductions in ambient concentrations of these pollutants. More information on this downward trend in emissions can be found in the National Atmospheric Emissions Inventory (NAEI) at www.naei.org.uk).

It is usually considered that at least five years' data are required for the meaningful assessment of trends in pollutant concentrations at any location. Most of Northern Ireland's automatic monitoring sites have not been running this long. However, a small number of sites have been operating for a sufficient time to assess trends in air quality.

Northern Ireland was required to achieve four Air Quality Objectives by 31st December 2005; these were for 1-hour and annual mean nitrogen dioxide, 15-minute mean sulphur dioxide, and ozone. In addition, there are Objectives for carbon monoxide, lead, 1-hour and 24-hour mean sulphur dioxide and 24-hour and annual mean PM₁₀, which were to be met by the end of 2004.

Carbon monoxide is monitored using automatic techniques at two sites (Belfast Centre and Londonderry Brooke Park). Both achieved the Air Quality Strategy (AQS) Objective for this pollutant by the required date of 31st December 2003, and continue to meet the objective.

Nitrogen dioxide is monitored using automatic techniques at 15 sites. No sites exceeded the AQS Objective of 200 $\mu\text{g m}^{-3}$ for the hourly mean more than the permitted 18 times. However, two roadside automatic sites exceeded the AQS Objective for the annual mean ($40 \mu\text{g m}^{-3}$) - see Figure 3. These were Belfast Newtownards Road, and Londonderry Dale's Corner. These sites have therefore failed to meet the annual mean objective for NO₂ by the end of 2005, as required. Both these sites are close to busy roads.



Sulphur Dioxide Sulphur Dioxide was monitored at 20 automatic sites in 2005. All sites in Northern Ireland continue to meet the requirements of the Air Quality Strategy for 1-hour and 24-hour mean SO₂ by the due date of 31st December 2004, and have met the 15-minute mean objective by the due date of 31st Dec 2005.

Most of these automatic SO₂ monitoring stations only started operation in 2001, but some have been in operation long enough to assess trends (Figure 4). A significant downward trend in annual mean SO₂ concentrations has been identified at Belfast Centre, Belfast East, and Londonderry Brandywell. Belfast East, in particular, showed a marked decrease in annual mean SO₂ concentration between 2001 and 2005.

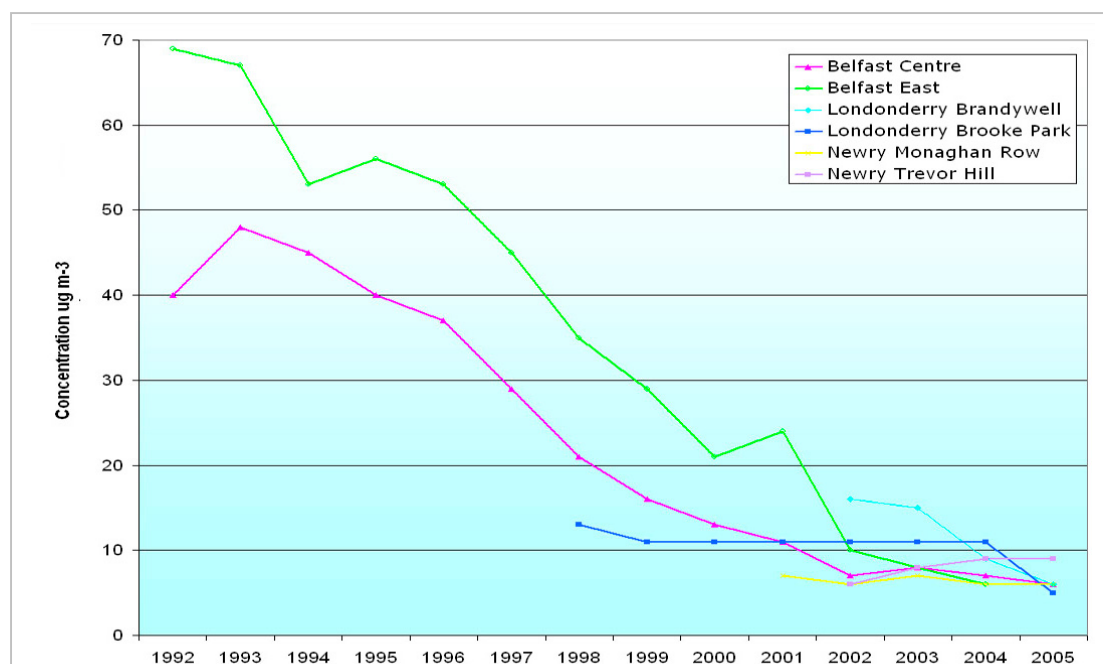


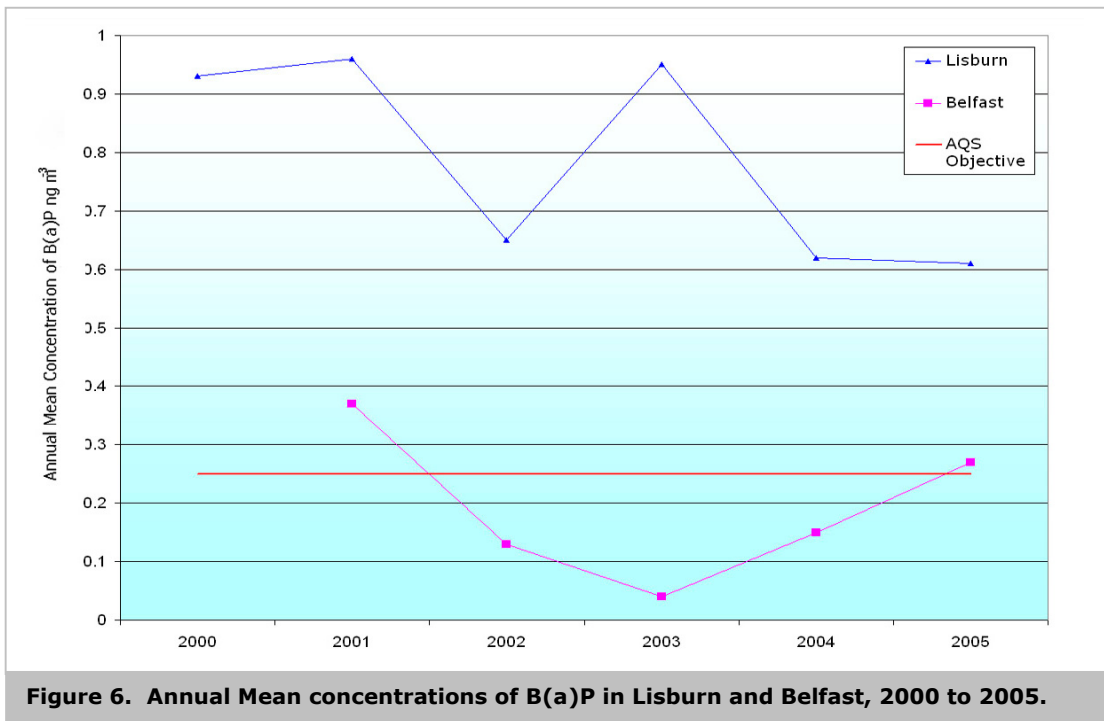
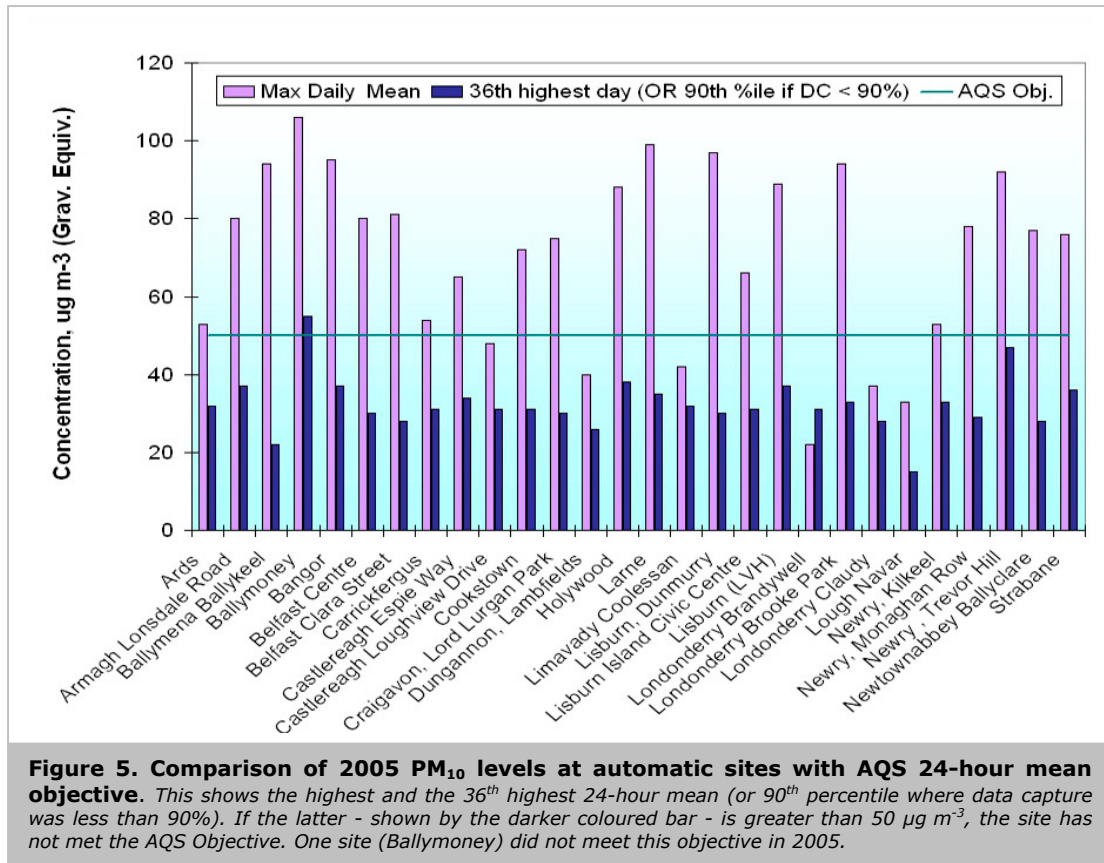
Figure 4. Trends in Annual Mean SO₂ concentrations in Belfast, Londonderry and Newry

Particulate matter – PM₁₀ Particulate matter as PM₁₀ was monitored automatically at 28 locations in 2005. All the monitoring stations met the AQS Objective of 40 µg m⁻³ (gravimetric equivalent) for the annual mean PM₁₀, as gravimetric equivalent. However, one site exceeded the AQS Objective of 50 µg m⁻³ (gravimetric equivalent) for the 24-hour mean on more than the permitted 35 occasions – see Figure 5 below. This site is located in Ballymoney.

Ozone was monitored using automatic analysers at Belfast, Londonderry and Lough Navar (rural). Ozone (O₃) is a secondary pollutant that is formed by reactions involving other pollutant gases, in the presence of sunlight, and over several hours. Once formed, it may persist for several days and be transported over long distances. This means that District Councils have little control over ozone levels in their area. Unlike some other pollutants, levels of ozone in Northern Ireland do not appear to be decreasing, but remain variable from year to year, depending on weather conditions. Ozone exceedences therefore remain a possibility (the most recent occurred in 2003). However, during 2005 no sites exceeded the target value of the AQS Objective on more than the permitted ten days.

Benzene and 1,3-Butadiene are monitored at Belfast Centre and Belfast Roadside. Both sites continue to meet Objectives for these pollutants, without difficulty.

Polycyclic aromatic hydrocarbons (PAH) are monitored at two sites: Lisburn (Dunmurry) and Belfast (Clara Street). Neither of these two sites met the AQS Objective for the PAH pollutant benzo(a) pyrene during 2005 (Figure 6). Belfast Clara Street's exceedence was marginal; however, levels of this pollutant at Lisburn remained high compared with other urban sites, and significantly above the AQS Objective. The major source of PAH in the vicinity of the site is thought to be the widespread use of domestic solid fuels. Both sites will be required to consistently meet this Objective by the due date of 2010.



7. Conclusions

1) Air quality is continuing to improve generally in Northern Ireland; however, monitoring has identified some areas across the province that will require action.

2) Measurements from Northern Ireland's network of 39 automatic air quality monitoring stations during 2005 and previous years show that the Air Quality Strategy Objectives for the following pollutants have been met by the due dates –

- ▶ **Carbon Monoxide**
- ▶ **Benzene**
- ▶ **1,3-Butadiene**
- ▶ **Sulphur Dioxide**
- ▶ **Lead**

3) Two sites close to busy roads in Belfast and Londonderry did not meet AQS Objectives for annual mean **Nitrogen Dioxide** by the end of 2005 as required.

4) One site in Ballymoney also failed to meet the AQS Objective for 24-hour mean **Particulate matter as PM₁₀**. However, three other sites in Belfast, Newry and Strabane, which did not meet the objective in 2004, have now achieved this.

5) Having completed the first round of Review and Assessment, District Councils have now declared a total of 22 Air Quality Management Areas covering PM₁₀, NO₂ and SO₂. Action Plans are being developed, and will be made available on the Northern Ireland Air Quality web site when completed. The second round of local air quality management review and assessment commenced during 2006. All Councils have now submitted Updating and Screening Reports to the Department for appraisal.

This report has been produced in partnership with the Northern Ireland Chief Environmental Health Officers Group.

For further information on local air quality please see the Northern Ireland Air Quality Web site, at www.airqualityni.co.uk , or contact the Environmental Health Department at your local District Council Office .

Contact Details for the Department of Environment in Northern Ireland

Air and Environmental Quality Unit,
Environmental Policy Division
20-24 Donegall St
BELFAST BT1 2GP

Telephone 02890 544573

Web site www.doeni.gov.uk

Contact details for AEA Energy & Environment:

Alison Loader, 551.11, Harwell Business Centre,
Didcot OX11 0QJ
Telephone 0870 190 6518 Facsimile 0870 190 6377

ISBN 1-905127-49-9

Produced on behalf of the Department of Environment in Northern Ireland by AEA Energy & Environment

AEA Energy & Environment is certificated to ISO 9001 and ISO 14001