

Air Monitoring and quality assurance in Scotland



Scottish Executive

Ken Stevenson, March 2006



NETCEN in Glengarnock

Ken Stevenson
Stephen Stratton
David Hector

AEA Technology –netcen
Glengarnock Technology
Centre
Caledonian Road
Lochshore Business Park
Glengarnock
Ayrshire
KA14 3DD
0870 190 6574
ken.stevenson@aeat.co.uk



Project Aims related to Monitoring and QA/QC



Project Aim

- To assess the quality and variety of air quality data collected across Scotland and evaluate its compatibility

Technical Requirements

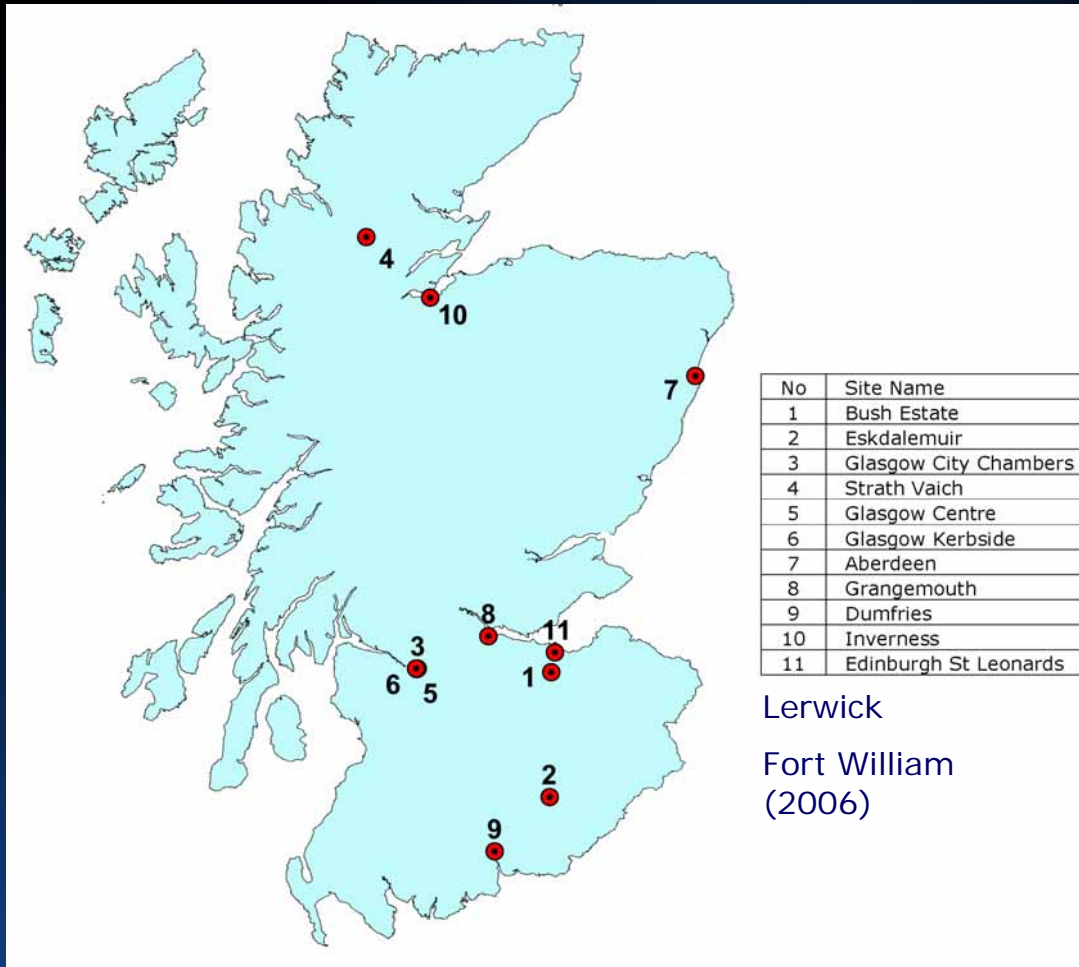
- To explore options for an automatic interrogation systems for collecting non-continuous air quality monitoring data from selected Scottish local authorities
- To provide QA and QC procedures for capturing and handling air quality data and advising local authorities and others on these issues

Non - automatic data

The screenshot shows a web browser window titled "Welsh Air Quality :: Data Submission System - Mozilla Firefox". The address bar shows the URL "http://www.welshairquality.co.uk/proac/auditor.php?PHPSESSID=-". The page features a navigation menu on the left with sections: "Data Submission" (containing "Create New Records"), "Maintenance" (containing "Control Panel", "Export Data as Batch", "Data Import Search", "User details", "Logout"), and "Key" (containing "Provisional", "Audited", "Not suitable for upload", "Exported"). The main content area is titled "Auditor Control Panel" and includes a welcome message, a link to "here" for help, and a "Find Your Previous Submissions" section with search criteria: Local Authority (Anglesey), Measurement Period (Monthly), Parameters (Nitrogen dioxide), Sites (- all -), Status (- all -), and Measurement Date (From: To:). Below the search section is a table with columns: Network, End Date, Measurement, Unit, Sample Flow Rate, Less than? *, Audit / Update / Unsuitable. The table is currently empty.

- We will use innovative web forms to collect the data
- First used for Welsh archive
- To be used UK-wide
- Improve efficiency, speed and reliability of capture process
- Also makes life easier easier for data providers!

Automatic Sites in Scotland



- Data collected automatically by telemetry
- Proven technologies and procedures
- Highly reliable process

UK Network Sites in Scotland

Network	Auto/ Sampler	No. sites
Automatic Urban and Rural (AURN)	A	12
Non Auto smoke/SO ₂ and NO ₂	S	14 (S) 121 (N)
Rural Acid Deposition and SO ₂	S	11
Automatic Hydrocarbon	A	1
PAH	S	3
Heavy Metals	S	3
Rural Metal Deposition	S	2
Non – Auto Benzene and Butadiene	S	2
Ammonia	S	26
Nitric Acid	S	4

Local Authority Automatic Sites:

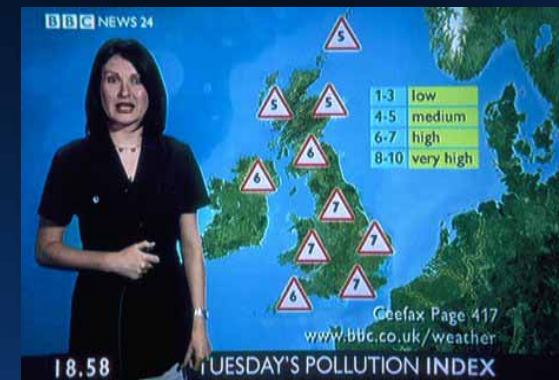
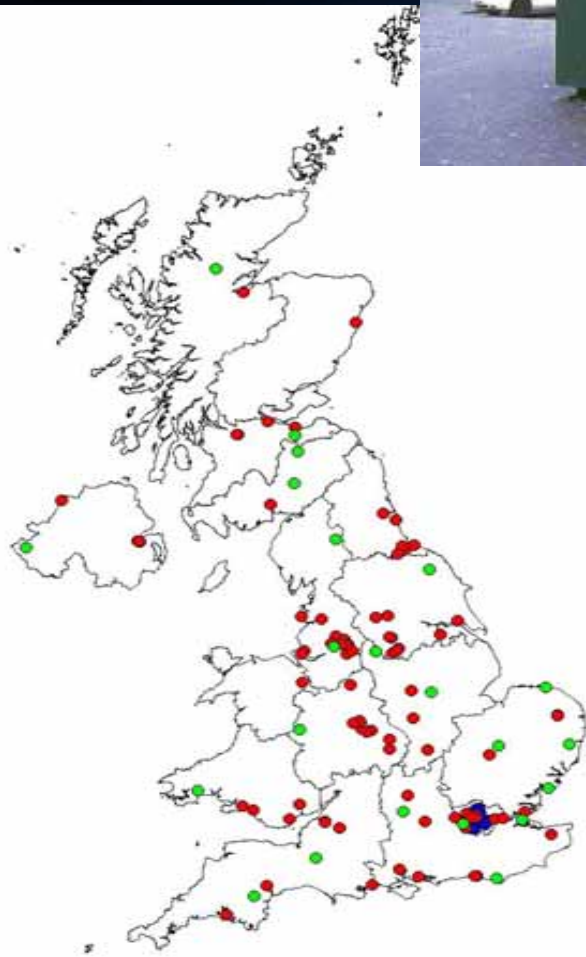
Results of Scottish Executive Questionnaire in 2005

- 32 Scottish Local Authorities
- 13 no reply
- 8 no automatic monitoring
- 19 LA automatic sites in 8 LAs
- 150 NO₂ diffusion tubes – probably lots more



We will be contacting Local Authorities to update the data as part of the Database Project

Overview of National Network QA/QC



Overall aim of National QA/QC

Network Aims & Objectives:

- Meeting statutory requirements (eg EC Directives)
- Informing the public about air quality
- Providing information for local air quality review and assessment
- Identifying long term trends
- Assessment of policy effectiveness



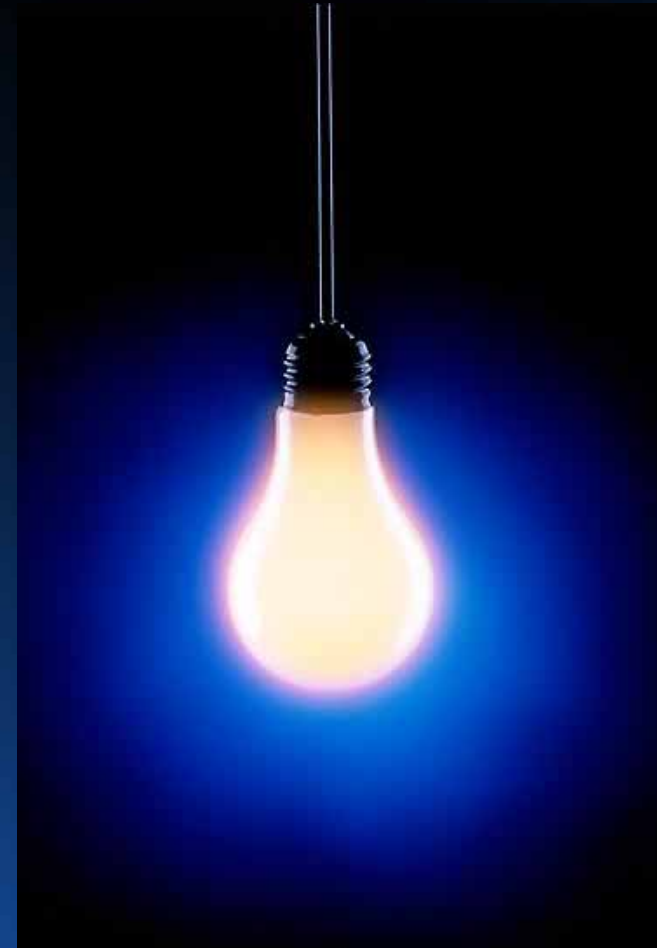
QA and QC- what are they?

Quality Assurance relates to the *process* of monitoring:

- Network design, station siting
- Instrument and inlet manifold
- Instrument service and repair
- Operations manual
- Operator training
- Instrument calibration
- 6-monthly site audit and intercalibration

Quality Control is concerned with checking *outputs*:

- information management
- data ratification
- quality circle review and feedback



Network, Stations and Instruments



*Rural
Aston Hill*



**Urban
Background**
Aberdeen



*Urban
Centre
Glasgow*



*Roadside
London
Brentford*

- Location must be appropriate for objectives
- Need to carefully record location details – maps photos grid references distances etc

Operations Manual and Training

- Operations Manual
- Detailed instructions for Local Operators
- Manual available on the Air Quality Archive at www.airquality.co.uk
- Useful information source for Local Authorities



Analyser Calibration

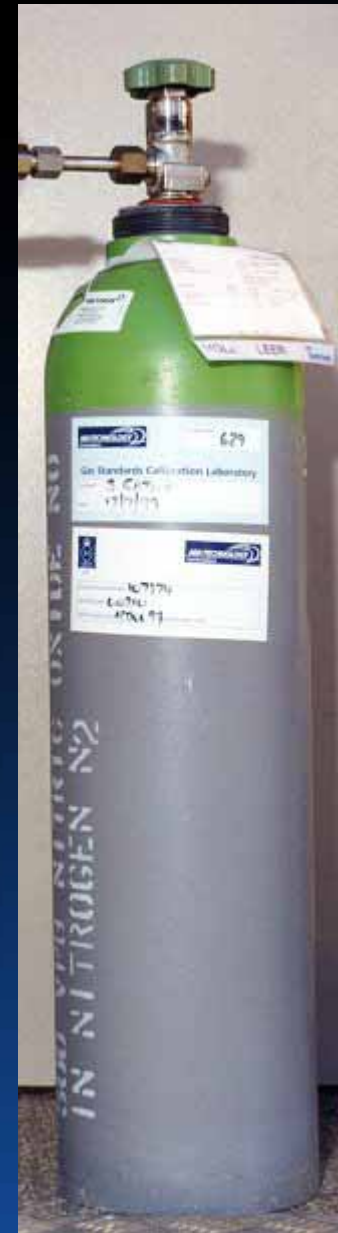
Autocalibration

- Zero and span check
- Every 24 hrs
- Permeation tubes (NO_2/SO_2)

Manual Calibration

- Used to scale data
- Every 2-weeks
- Accredited gas cylinders

6-monthly site audit



Calibration Gases on-site

Supplied and delivered by Air Liquide

NO in nitrogen 150ppb

NO₂ in air 150ppb

CO in air 1.5/20ppm

SO₂ in air 150ppb



UKAS certified by AEA
Technology against national
reference standards from the
National Physical Laboratory.

(ISO 17025)



0401

6-Monthly site intercalibration and audit

QA/QC Unit visits every site in network every 6-months

This involves full check of:

- All analysers
- Calibration standards
- Site infrastructure
- Local operator



Analyser Checks



0401

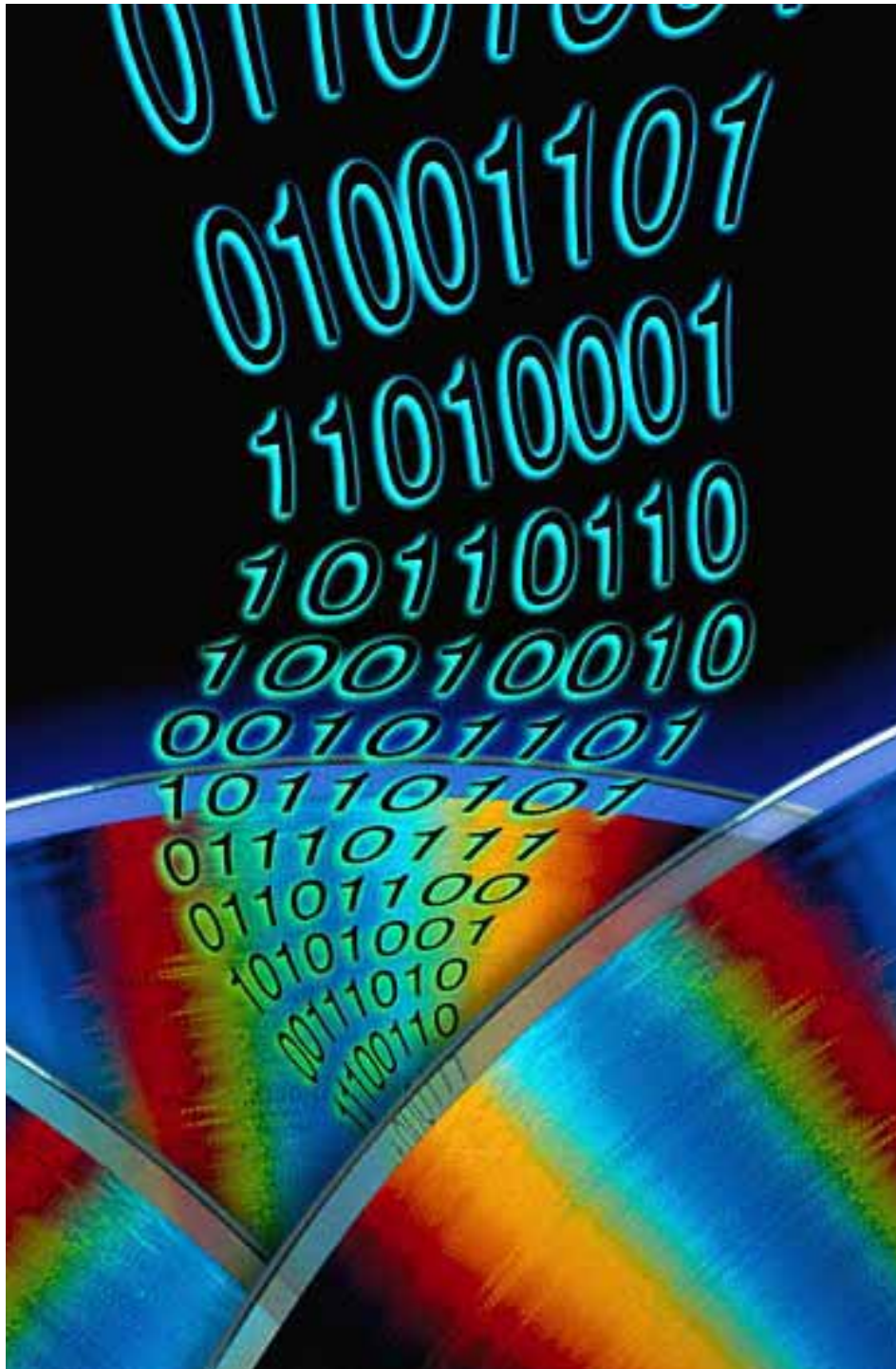
Analyser Checks:

- linearity
- noise
- response time
- leak and flow test
- converter efficiency (NO_x)
- Hydrocarbon interference (SO₂)
- calibration with audit gas cylinders
- ozone calibration with photometer

PM10 checks

- Flow rate
- k_o check (TEOM)





Provisional and Ratified data

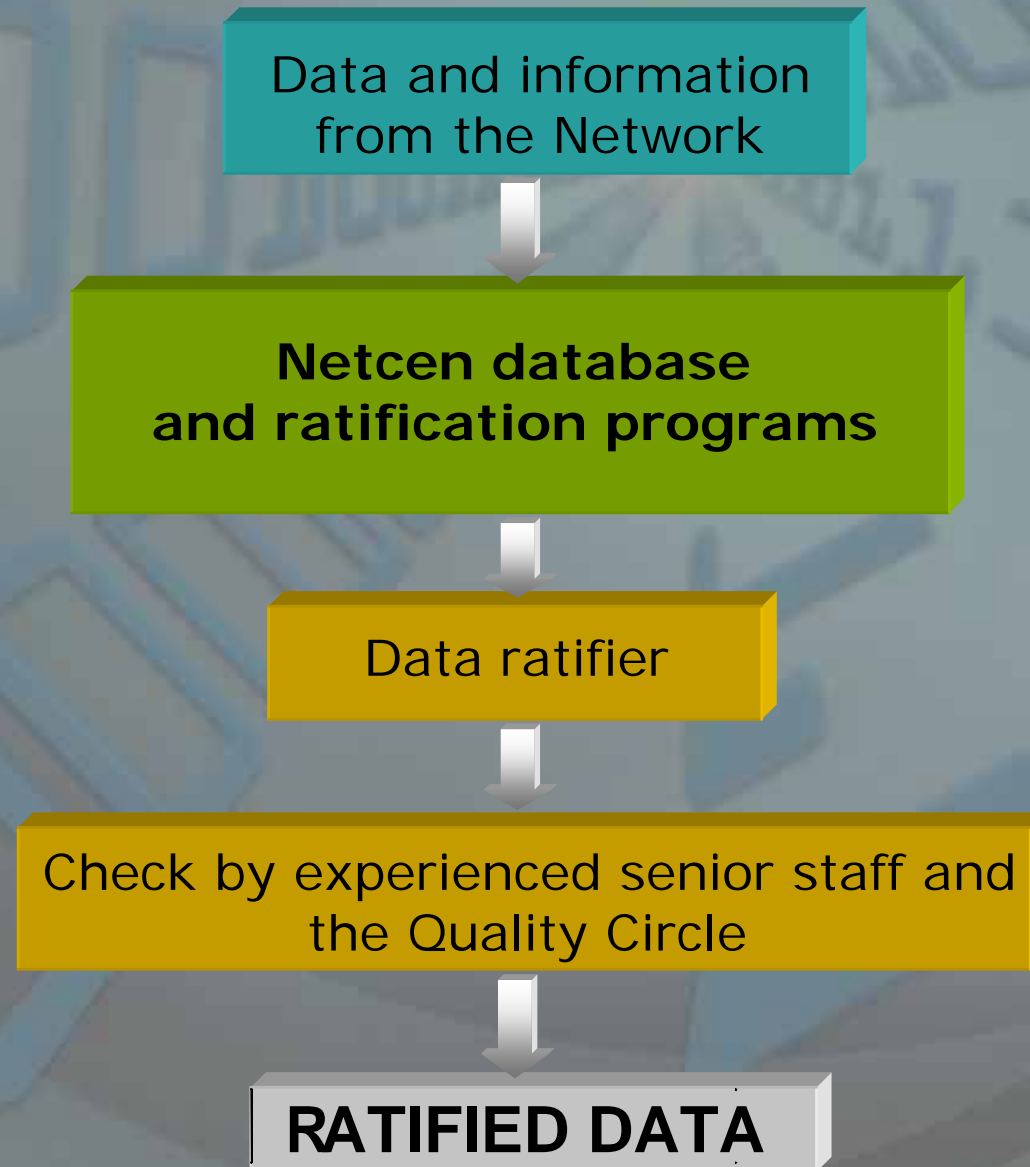
Provisional data

- available every hour
- based on last manual calibration
- data screened by software

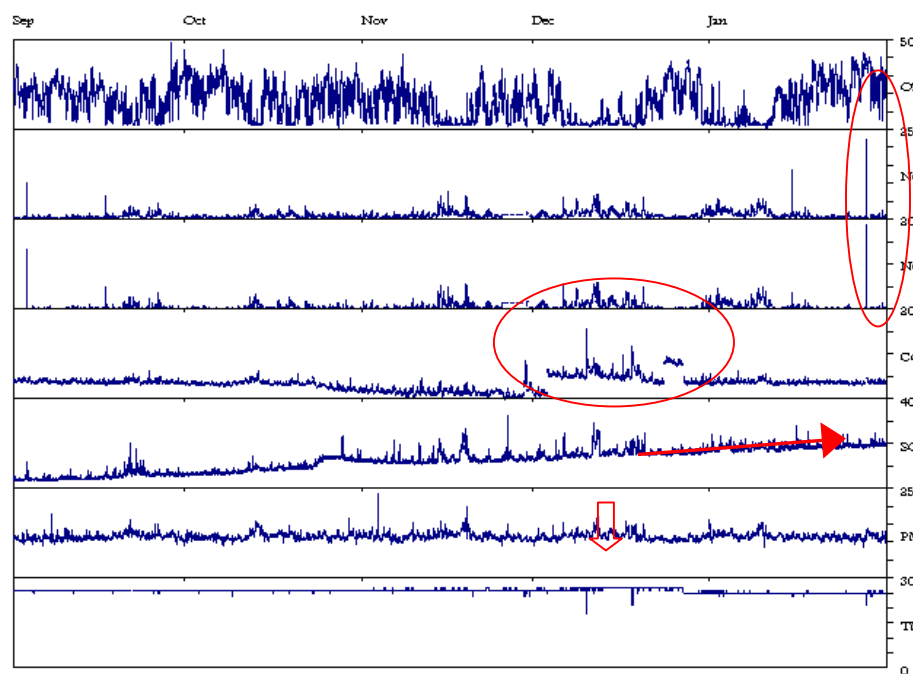
Ratified data

- available after 3-months
- additional manual checking and ratification
- fully quality assured and quality controlled

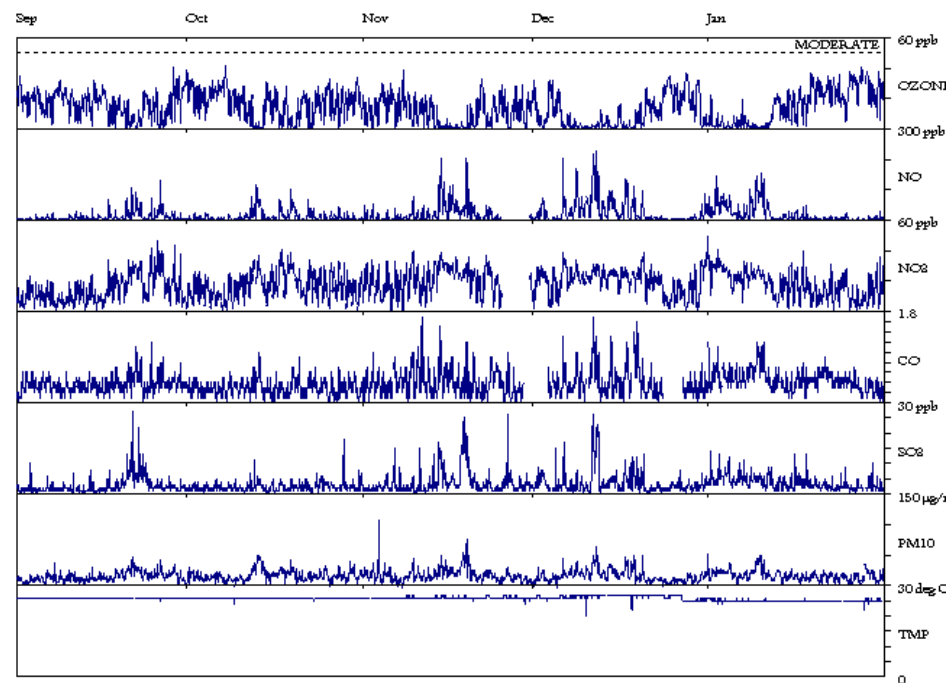
Information Management & Data Ratification



Data Ratification



Raw 15 min data



Ratified hourly data

Suspect data!



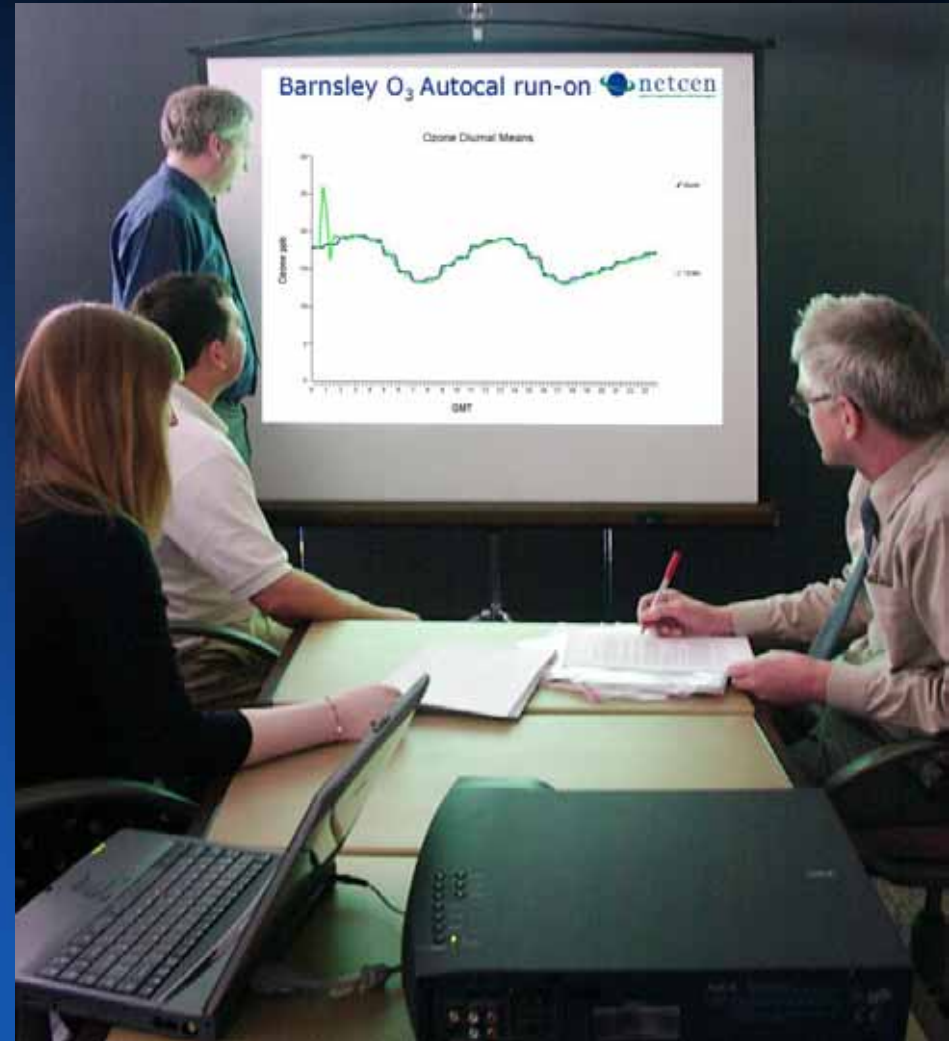
The Quality Circle

Members

- Project Manager
- Operations Manager
- Data Manager
- Field Manager
- Other senior staff

Aims

- Final decisions on data
- Identify quality issues
- Feedback via actions & recommendations



Lots of ways to access the data....

- Freephone 0800 556677
- www.airquality.co.uk
- Teletext
- http://air-climate.eionet.eu.int/databases/airbase/index_html
- www.scottishairquality.co.uk





Summary

- Scottish Executive Database will include National **and** LA data
- LA data needs to be of high quality
- We need to complete the information on LA monitoring activities
- Assess how these data can be input to the database
- Provide advice to LAs on QA/QC issues