Scottish Air Quality Database
QA/QC Process

AEA

The Scottish Government
Riaghaltas na h-Alba

Stephen Stratton – 28th March 2012

Data Quality Objectives

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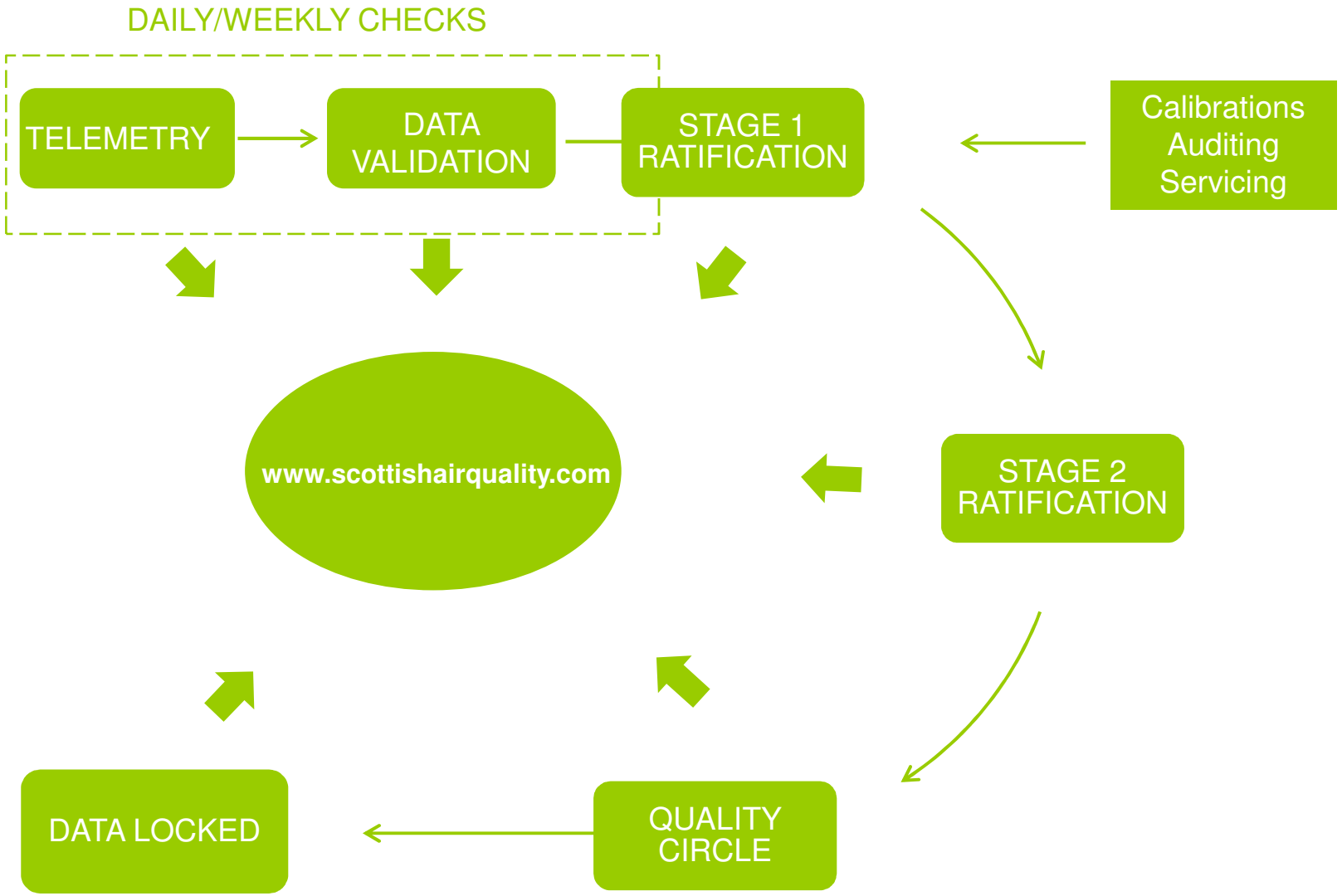
•As outlined in LAQM.TG(09):

"Proper QA/QC practice is necessary to ensure data integrity and guarantee the data quality required for meeting the overall monitoring objectives. Fundamental data requirements are:"

- accuracy;
- precision;
- data capture;
- traceability to national/international metrology standards;
- long-term consistency.

QA - the control of operational factors affecting data quality.
QC – identifying any problems not identified at the quality assurance stage.

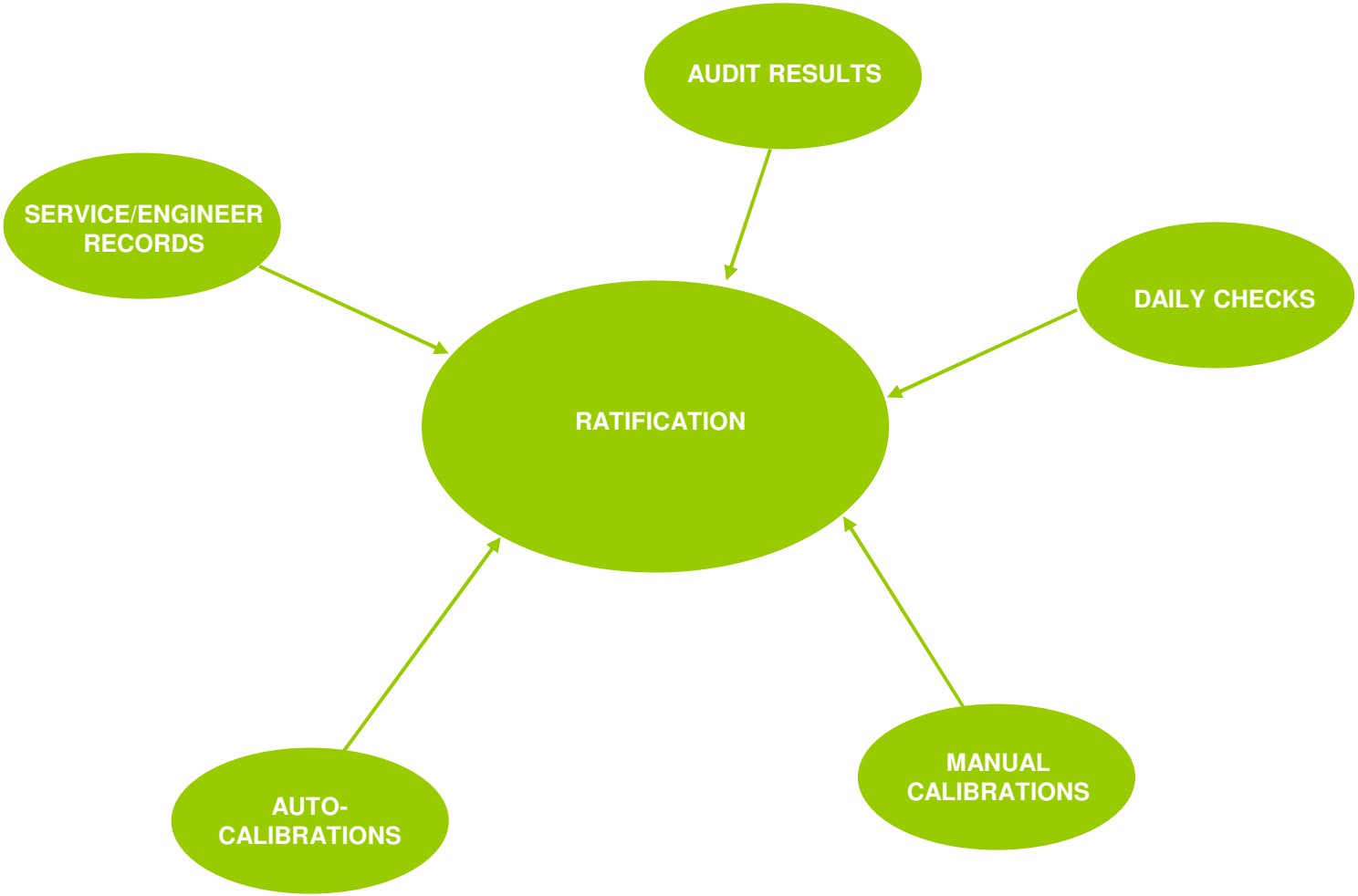
SAQD QA/QC Process



Data Validation

- Data are automatically scaled using the last manual or automatic calibration
- Database software automatically highlights possible problems using custom-built algorithms
- Daily checks carried out to check if data have been collected, check for scaling errors, analyser faults etc
- Weekly FDMS checks
- Poor data are removed
- Local Authorities are contacted

Data Ratification – Stage 1



Site Audits and Servicing

All LA's should have a service contract – yearly or six monthly

The SAQD project has enabled LA's to have audits carried out

Why service?

- Requirement outlined in LAQM.TG(09)
- Ensures monitoring equipment is well maintained
- Reduces down time and increases data capture

Why audit?

- Analyser performance checks
- Site cylinder checks using UKAS certified gas standards
- PM_{10} checks: Flow rate, k_0 check (TEOM)
- Site infrastructure checks
- Provides an additional reference calibration
- Reduces down time and increases data capture

All this improves the quality of the monitoring data

Data Ratification – Stage 2

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- Senior ratifier/Data Manager checks Stage 1 processing

- Regional pollutant and inter-pollutant relationships looked at more closely

- Problems that need to be discussed further at the Quality Circle are highlighted

Example Problems

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- Example faults found during audits:
  - TEOM k_0 factor out by greater than 2.5%
  - Site cylinder out by greater than 10%
  - NO_x analyser converter less than 95%
- Service and engineer records:
  - Faults can be pin-pointed within the data-set ensuring unreliable data is removed
- How does this affect the data?

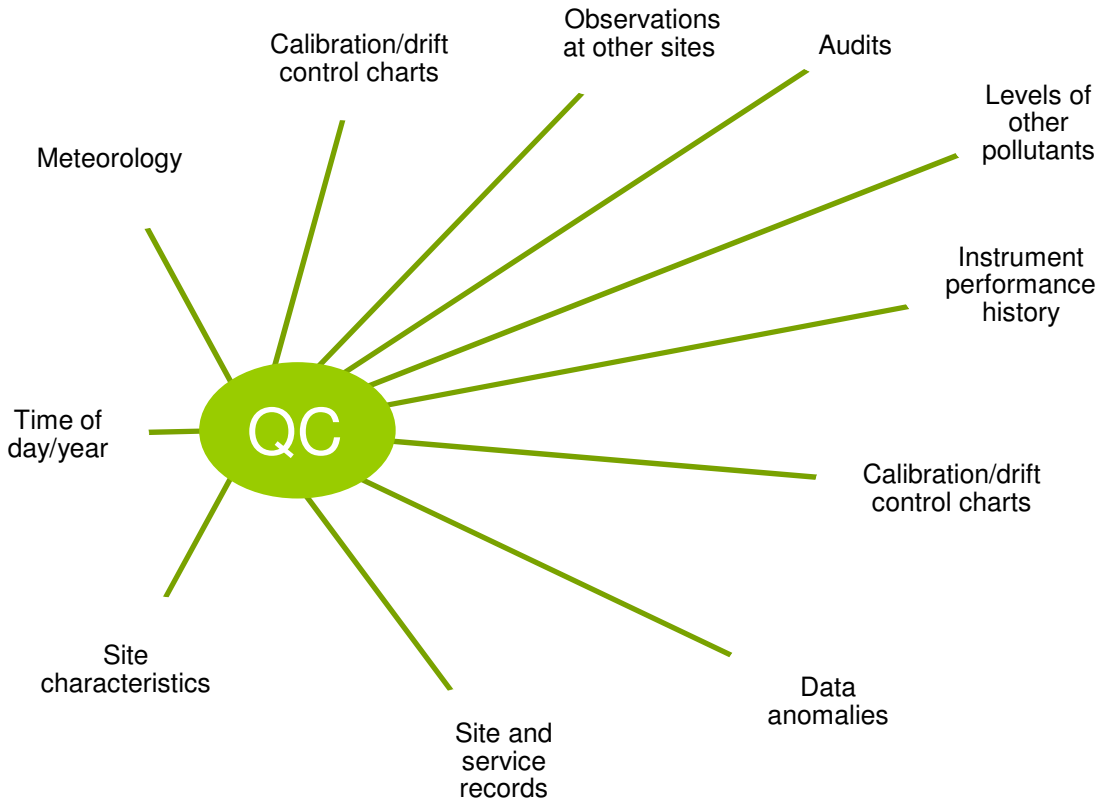
SAQD Quality Circle

Quality Circle

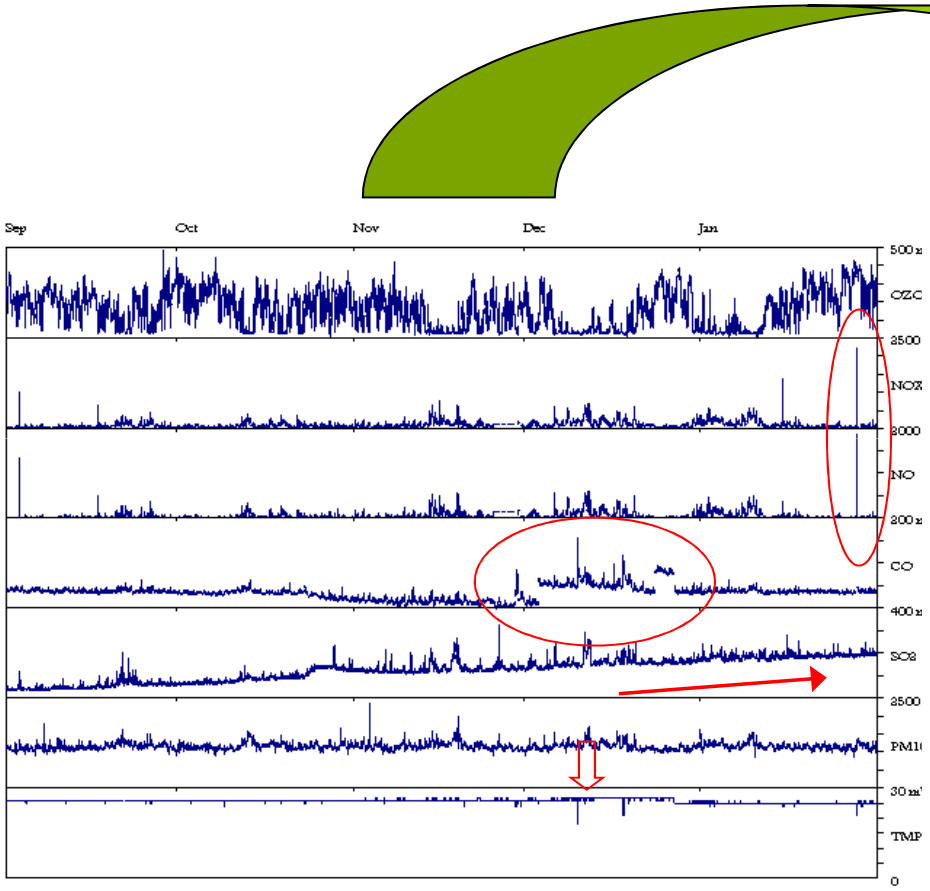
- Project Manager
- Data Manager
- Field Manager
- Data Ratifiers

Aims of the Quality Circle

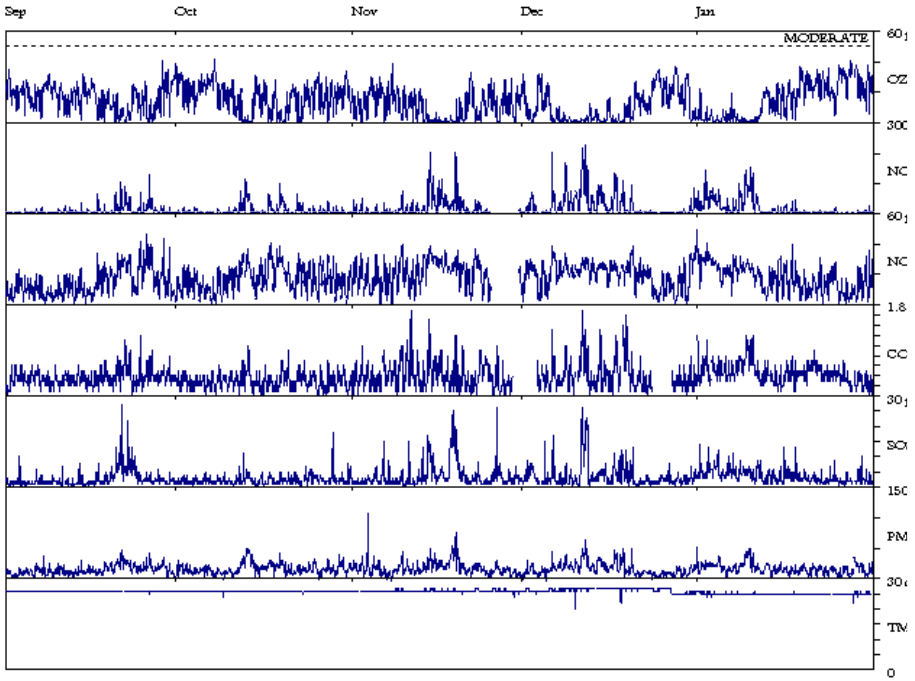
- Final decisions on data
- Identify quality issues
- Feedback via actions & recommendations



Data Locked

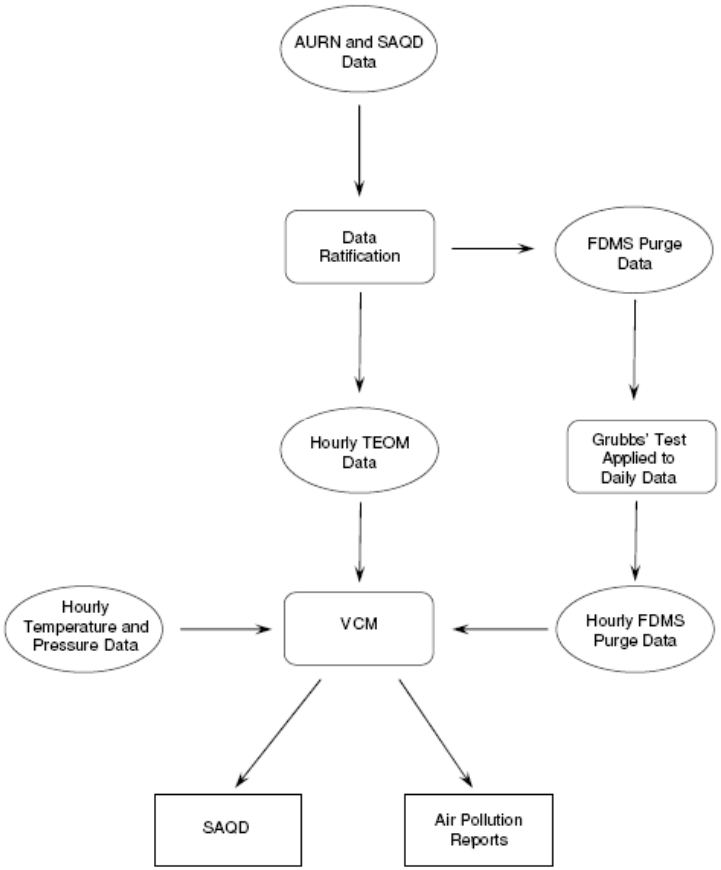


Raw 15 min data



Ratified hourly data

Volatile Correction Model



Correct TEOM data for loss of volatile particles;

FDMS analyser measures volatile particles;

Volatile particle concentrations are similar over regional scale;

Use volatile measurement from nearby FDMS (<130 km) to correct TEOM data;

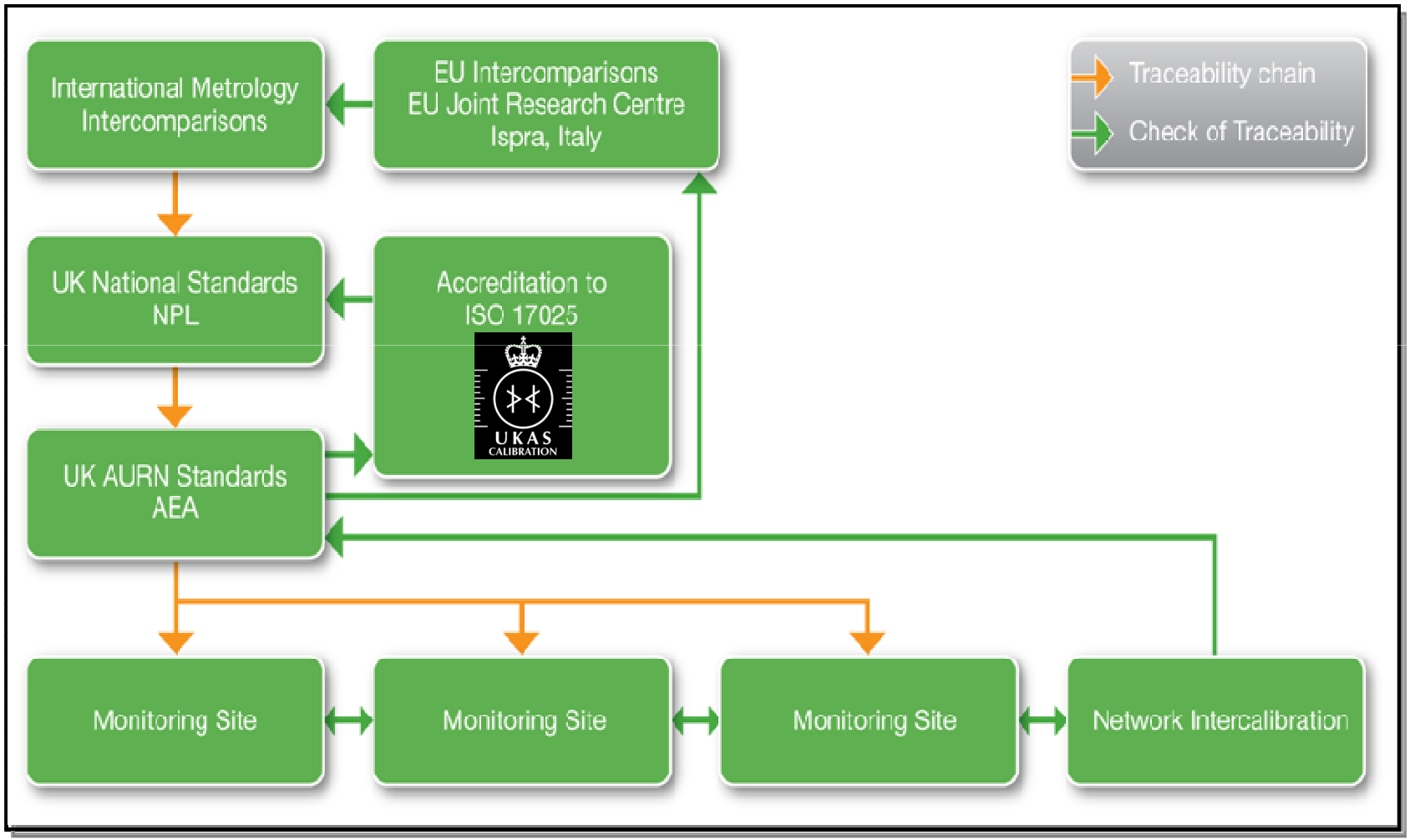
Use meteorological data from within 500 km of the TEOM site;

Hourly average temps – Edinburgh Gogarbank and Aberdeen Dyce Airport;

Hourly average pressures – Edinburgh Gogarbank and Aberdeen Dyce Airport;

Hourly average purge measurements – all SAQD and AURN FDMS (27 for Central Scotland and 3 sites for Aberdeen);

Traceability Chain



Data Quality Objectives and the SAQD

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Accuracy and Precision

- Down to analyser specs, but regular audits and servicing help maintain good analyser performance

Data Capture

- Faults are identified more quickly through data validation and site audits
- Data can also be corrected using audit results

Traceability to national/international metrology standards

- Intercomparisons and UKAS accreditation ensures traceability

Long-term Consistency

- There are now 86 (soon to be 89) monitoring sites (from ~20 in 2006) within the SAQD network, 16 of which are also part of the AURN
- Consistent QA/QC applied throughout the network ensuring high quality, comparable data
- More accurate data for informing LAQM policies

Ratified Data 2011

- The majority of ratified Air Pollution Reports will be delivered this week
- AURN data ratified separately
- TEOM data and the Scottish air quality website:

$\mu g\ m^{-3}$ (GRAV EQ) = TEOM x 1.3
$\mu g\ m^{-3}$ (VCM) = VCM Corrected

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