



Evidence of long-term improvements data quality in a national hydrometric dataset through a quantitative, indicator-based quality assurance programme

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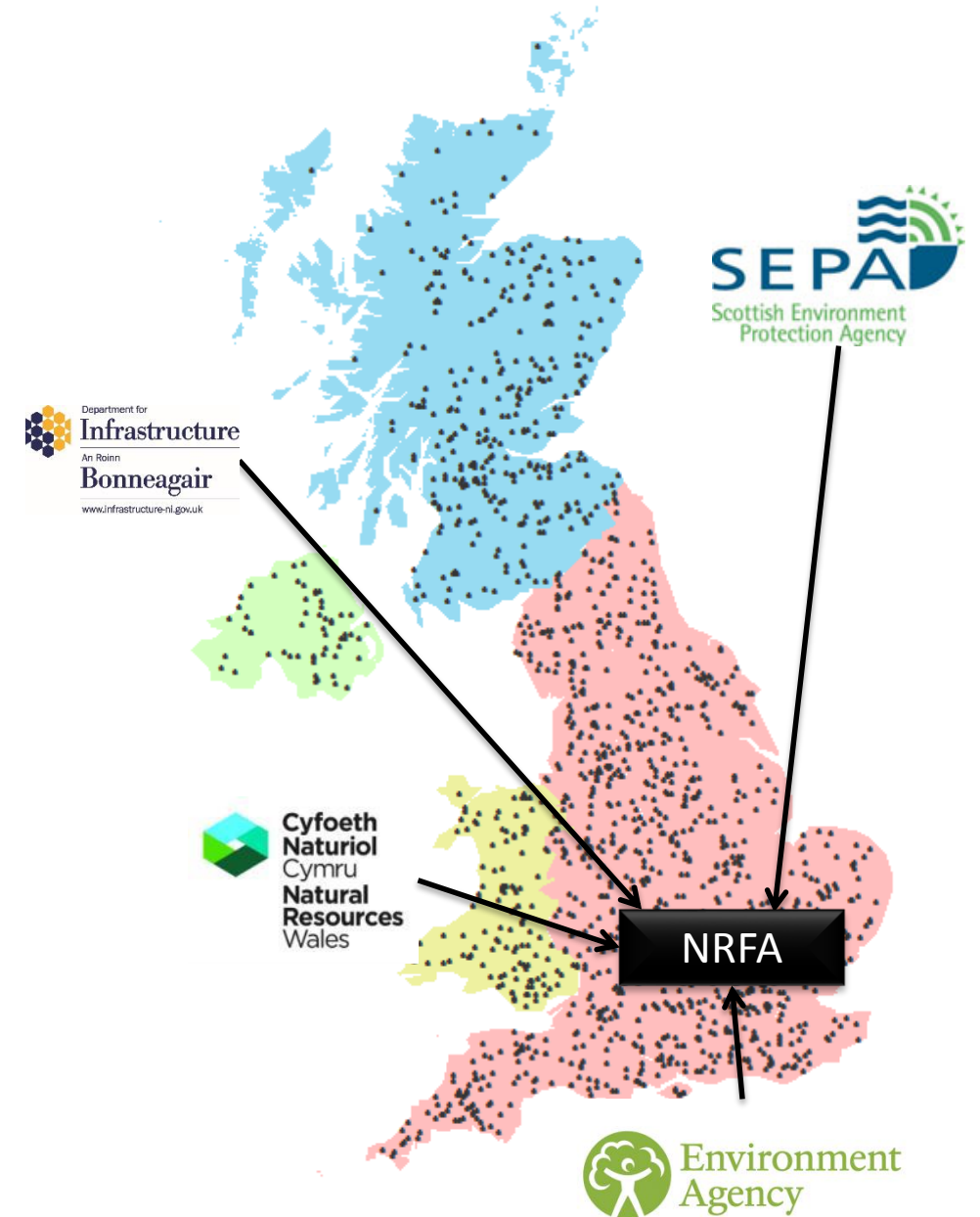
Session H41D, American Geophysical Union Fall Meeting, Washington DC, 10th - 14th December 2018.

Outline

- Hydrometric Data in the UK
- The UK National River Flow Archive
- Quality Control Methods
- Service Level Agreement
- Results of Performance Indicators
 - Completeness
 - Quality
- Applications

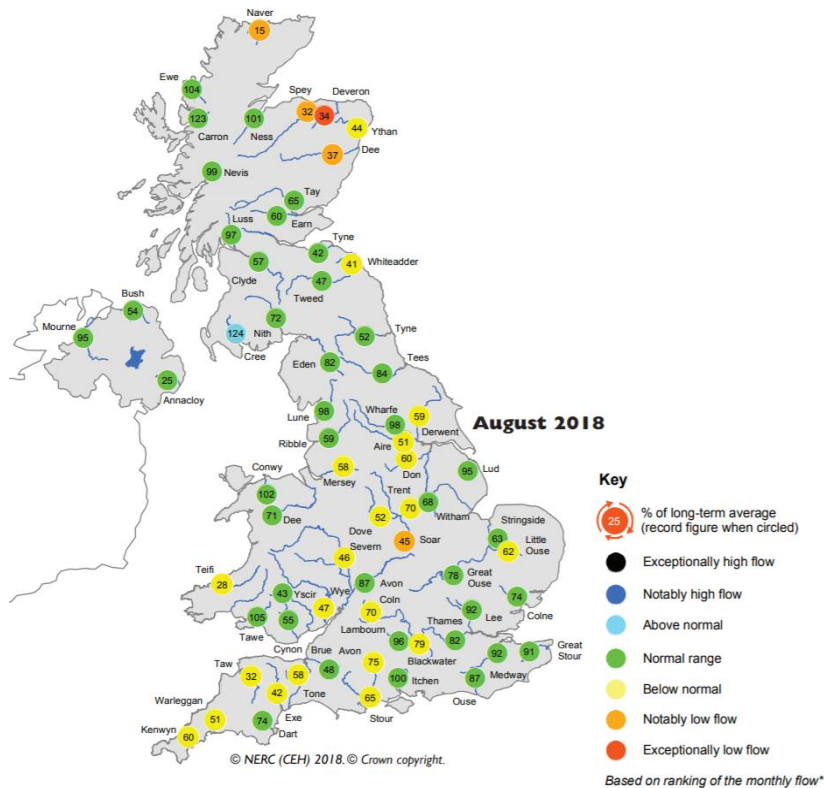
Hydrometric Data in the UK

- Dense hydrometric network
- Considerable growth in 1960/70s
- Main network maintained by four public bodies
- **National River Flow Archive** collates, analyses and disseminates data
- Centralised support/ best practice advice for partner measuring authorities

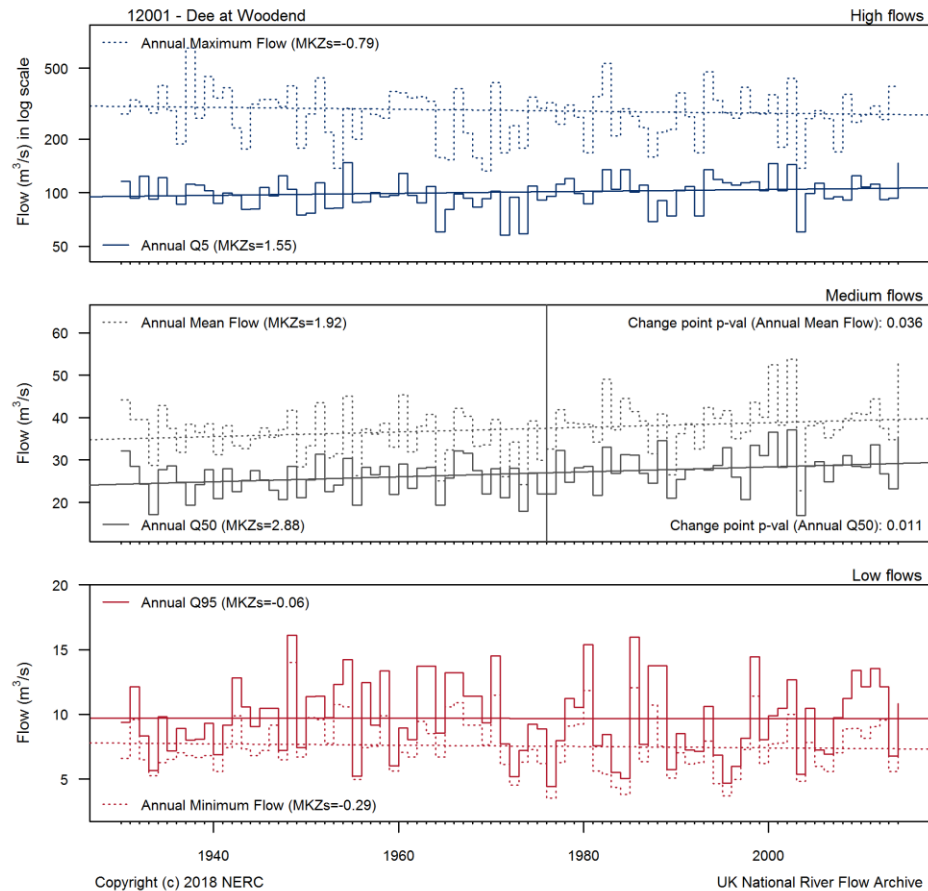


The UK National River Flow Archive (NRFA)

Hydrological Situation Reporting



Trend Analysis



Key: Mann-Kendall test (MKZs) significant at 5% level denoted by (*); Change points given by Pettitt test shown only if significant at the 5% level

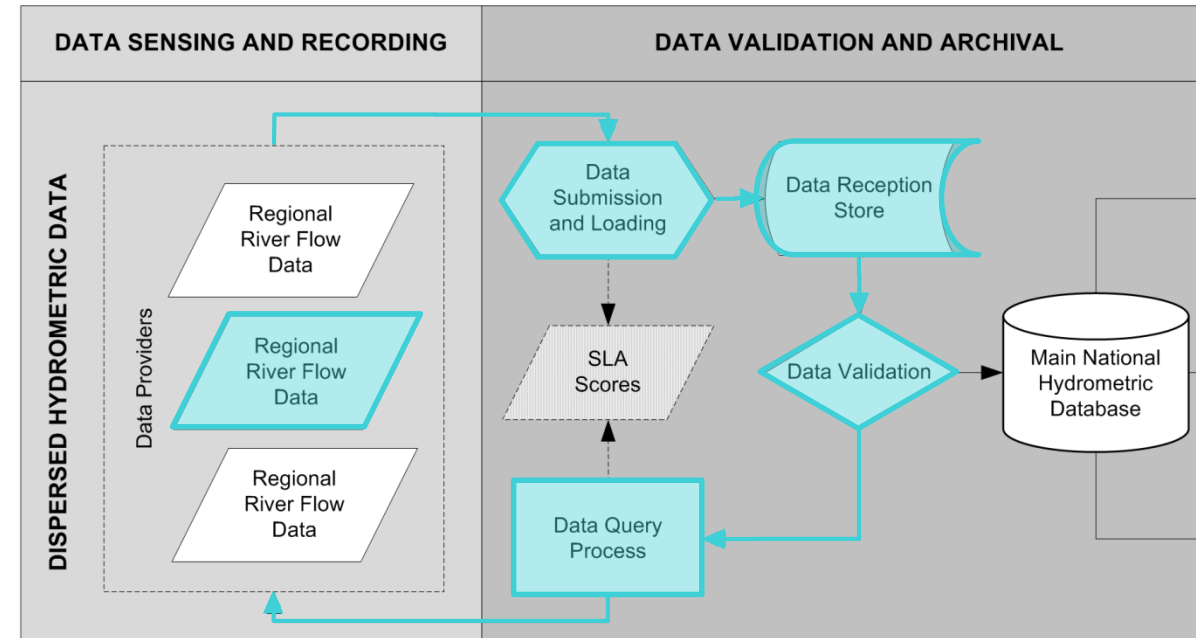
External Data Usage

2017 Statistics

- 44,000+ daily flow / metadata / catchment downloads
- 65,000+ website users
- 750,000+ page views

Data Acquisition

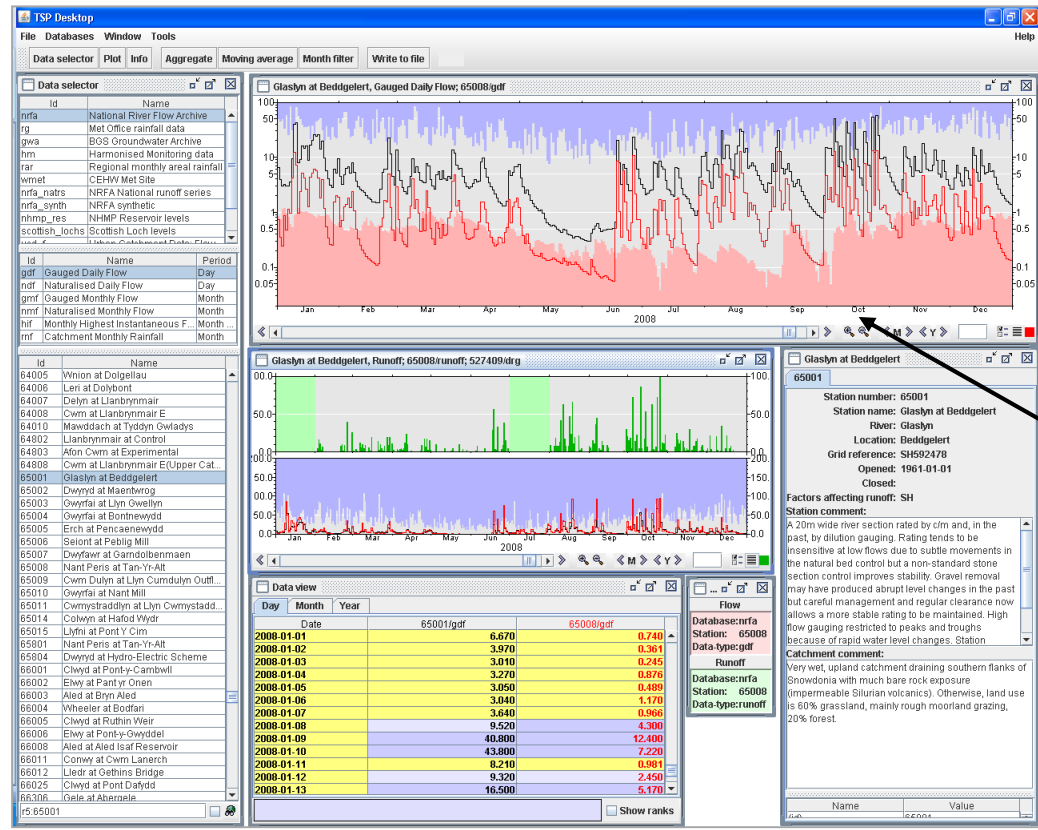
- 1990s: Common problems found in data submissions
- Concerns over data completeness and quality
- Impact on the overall utility of the archive for all users (e.g. research, water management, policy)



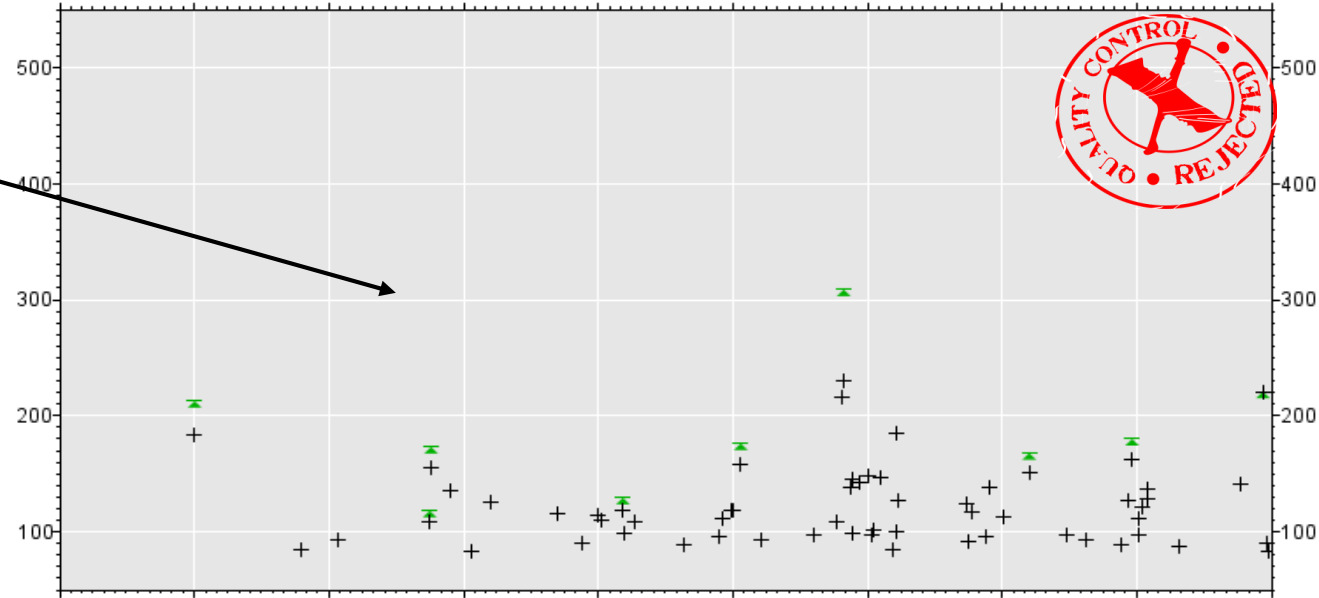
Data Acquisition - Quality Control Methods

Automated

Sense checking, stage flow pairing, rating check



71004 Calder at Whalley Weir, Peaks Over Threshold - Flow 71004 Calder at Whalley Weir, Annual Maxima - Flow



Manual

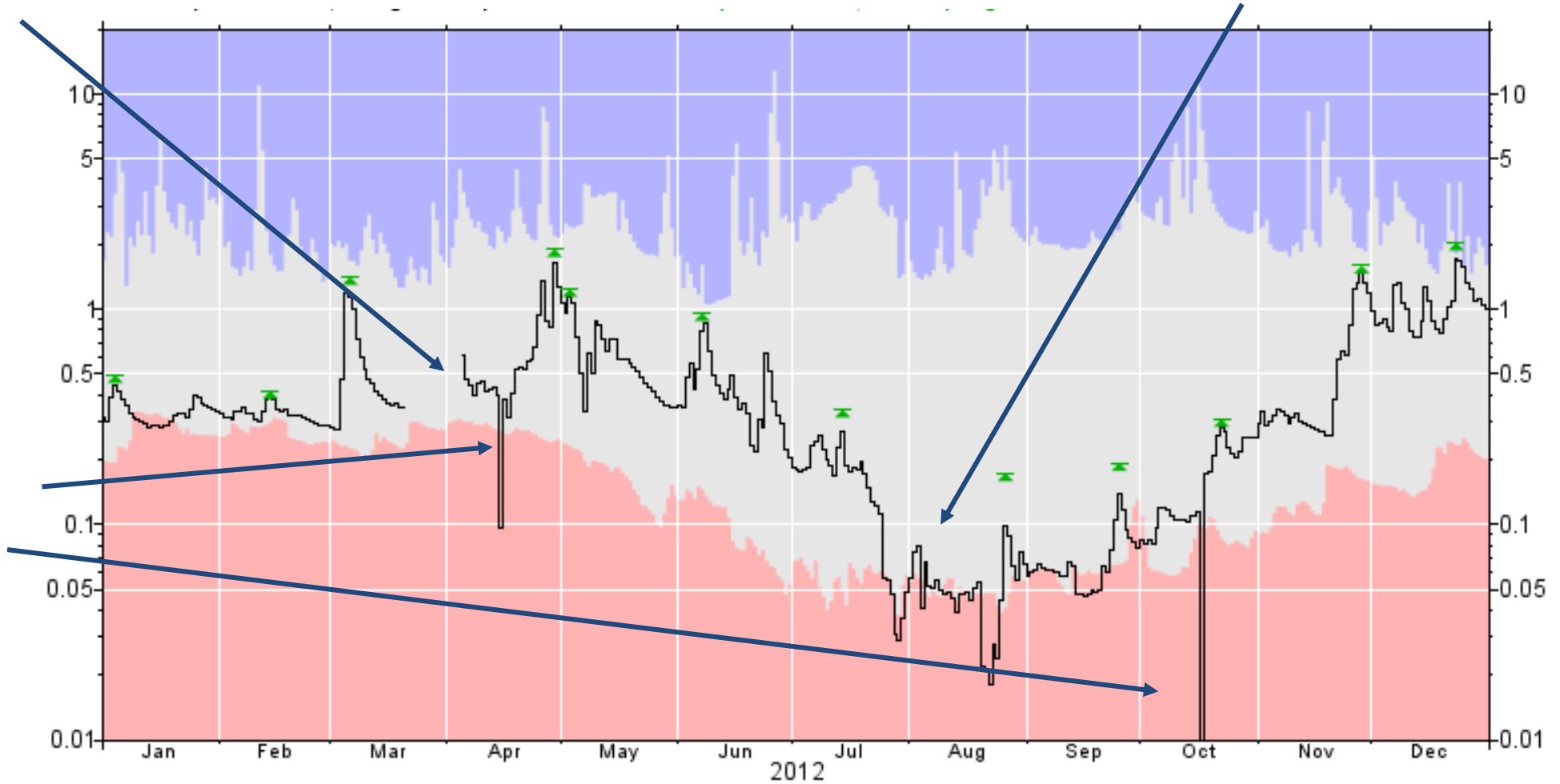
Rainfall, runoff, analogue stations, record homogeneity, known issues, flood frequency analysis

Data Acquisition - Quality Control Methods

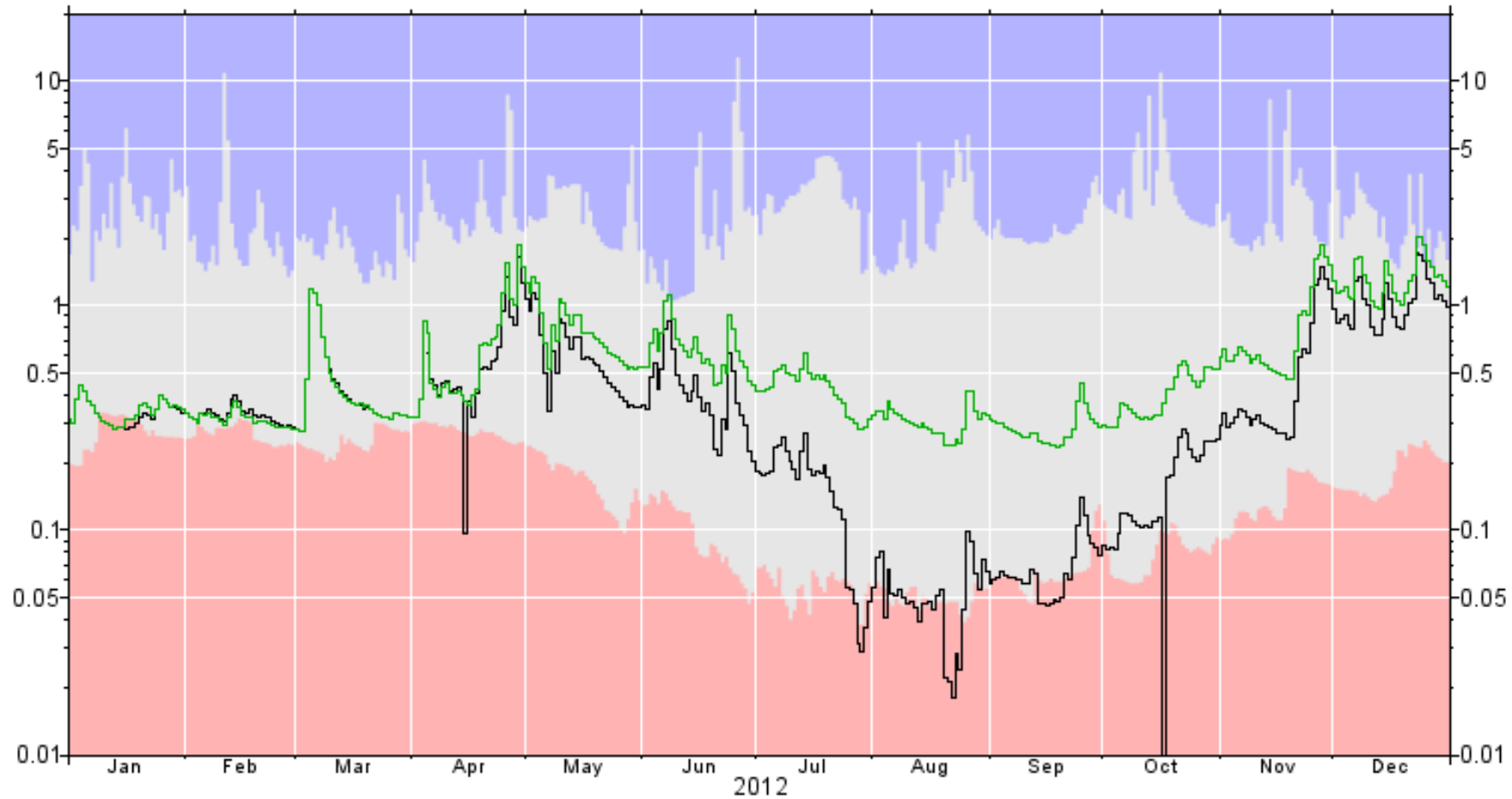
Missing data

Lower flows in July - October

Erroneous drop outs

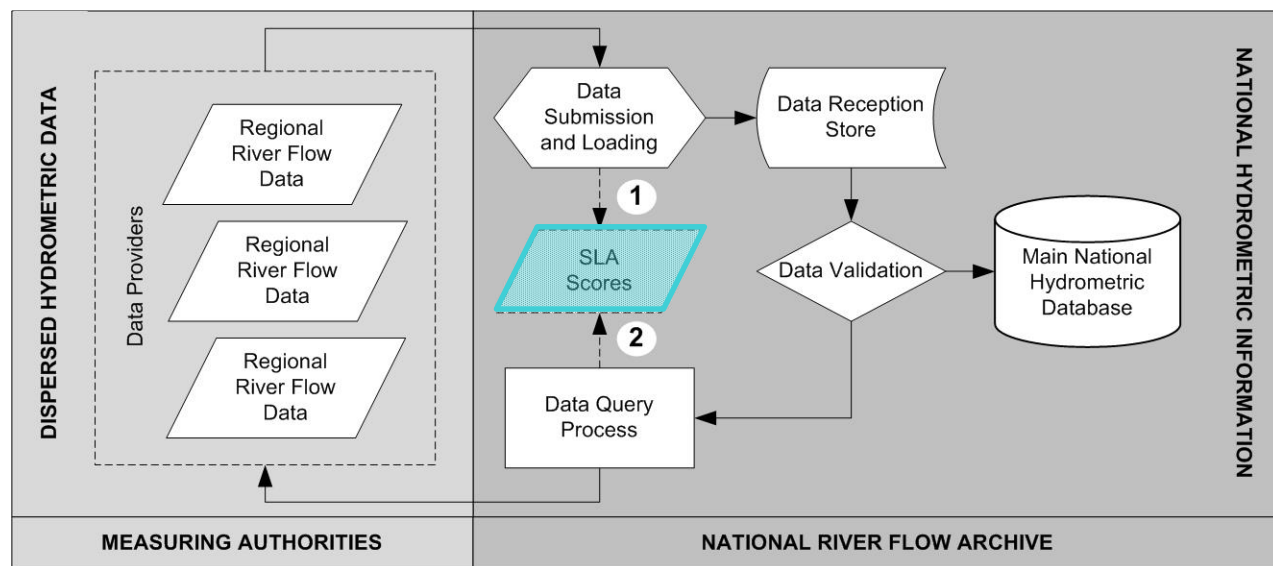


Data Acquisition - Quality Control Methods



- Re-submission of combined series from weir and side-looking acoustic instrument when drowned
- Still under testing, but is an improvement
- Site remains suspended on NRFA until new time series signed off

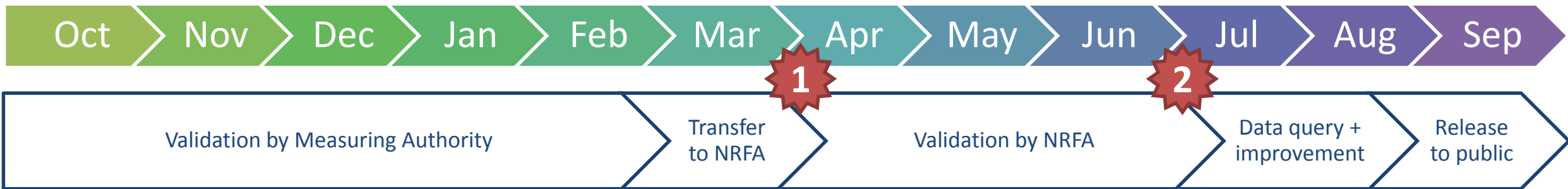
Data Acquisition – Service Level Agreement (SLA)



- SLA introduced in 2002 to control flow of data to the archive
- Key performance indicators calculated on all data submissions for:
 - data provision
 - data completeness
 - data quality
- Scores calculated for each station and reported at Region level in Annual Report

| | |
|--|--|
| Data Submission Time | Number of days a submission is late |
| Flow Data Completeness | Number of missing days of flow data |
| Station Completeness | Percentage of stations with a complete year of data |
| Individual Station Data Quality | Number of flow values where valid queries are identified |
| Network Data Quality | Percentage of stations where valid queries are logged |
| Query Response Time | Time taken to response to queries |

Measuring Data Provision

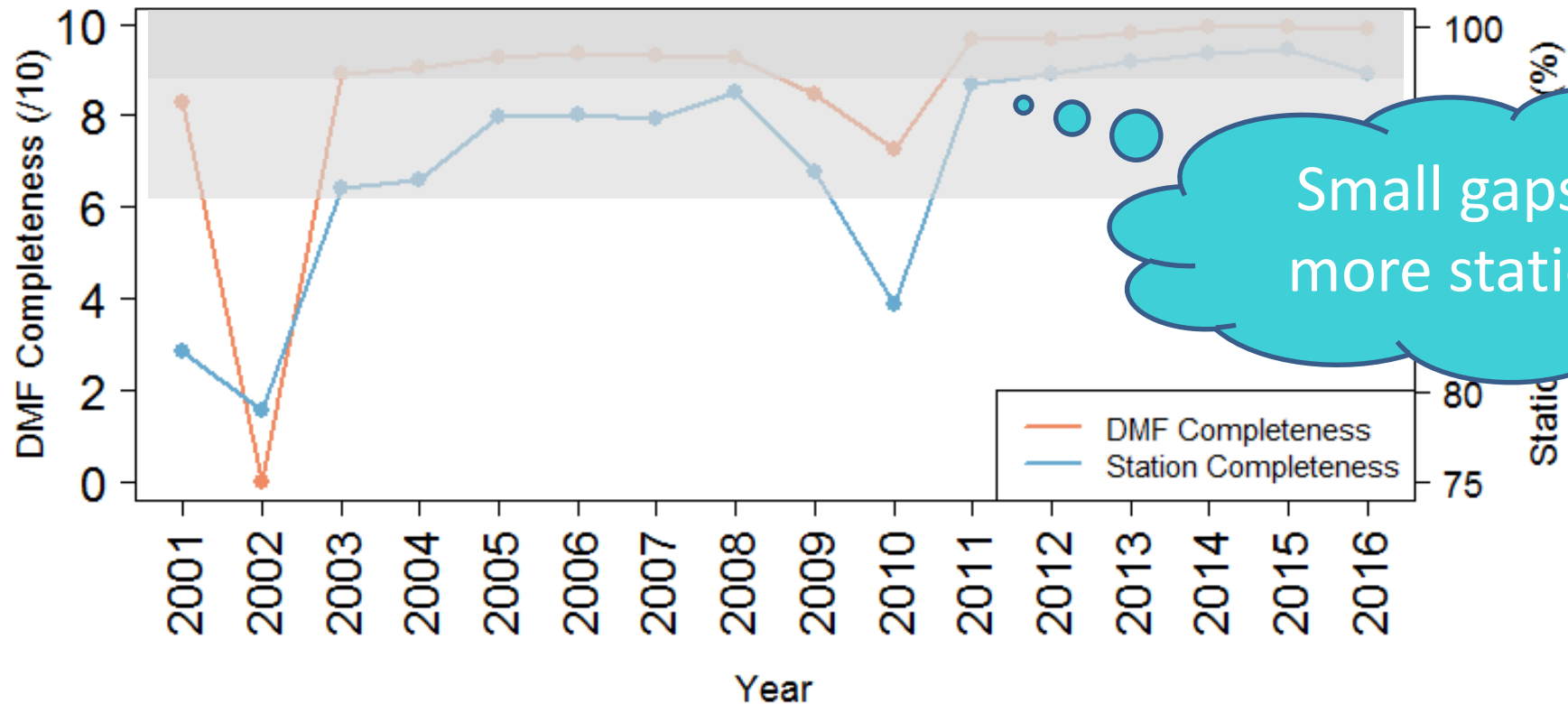


Performance indicators designed to ensure prioritisation of data provision.

- 1. Data Submissions:** All data now submitted to the archive within 10 days of agreed deadline (80% on time)
- 2. Response to Queries:** 68% within agreed window. Complex issues may take longer to solve.

Measuring Data Completeness

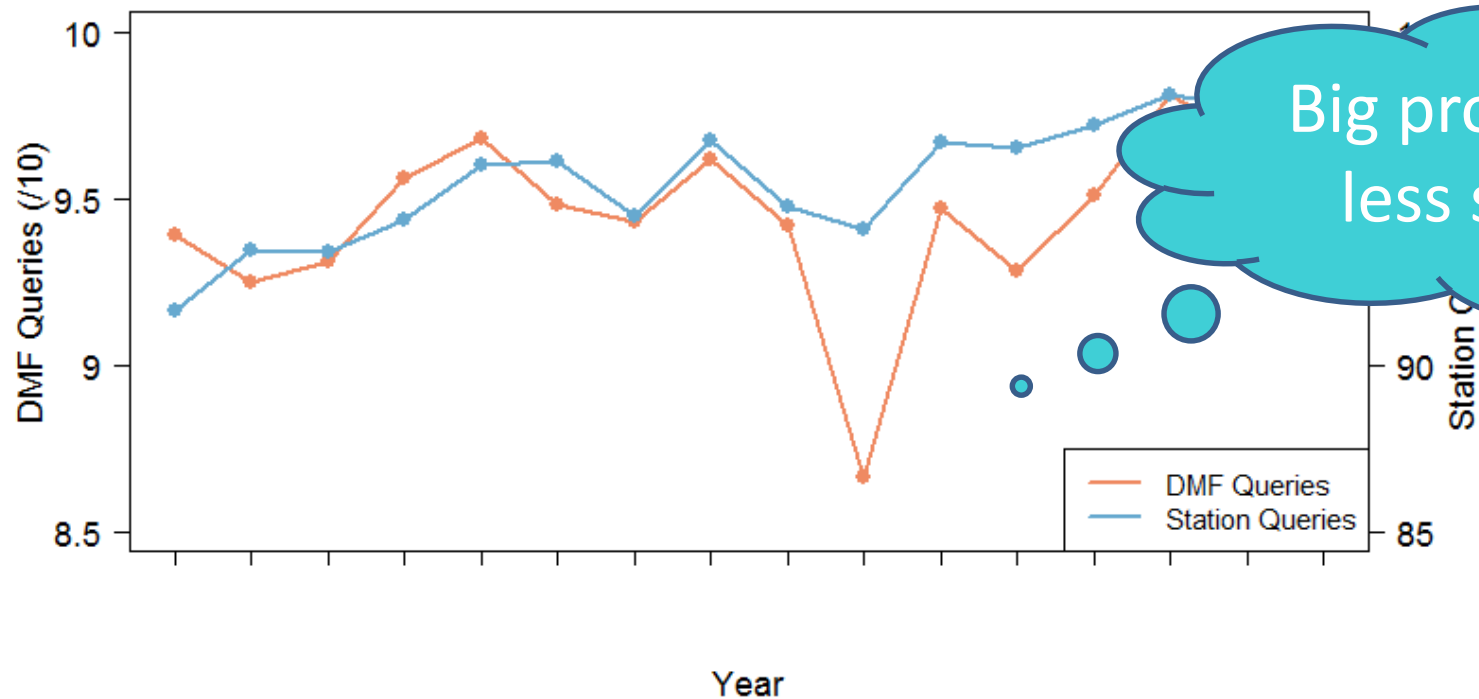
- $\approx 1\%$ of data is missing each year in the submission, spread across 4-10% of the network
- Improvement since SLA started, consistently high in recent years



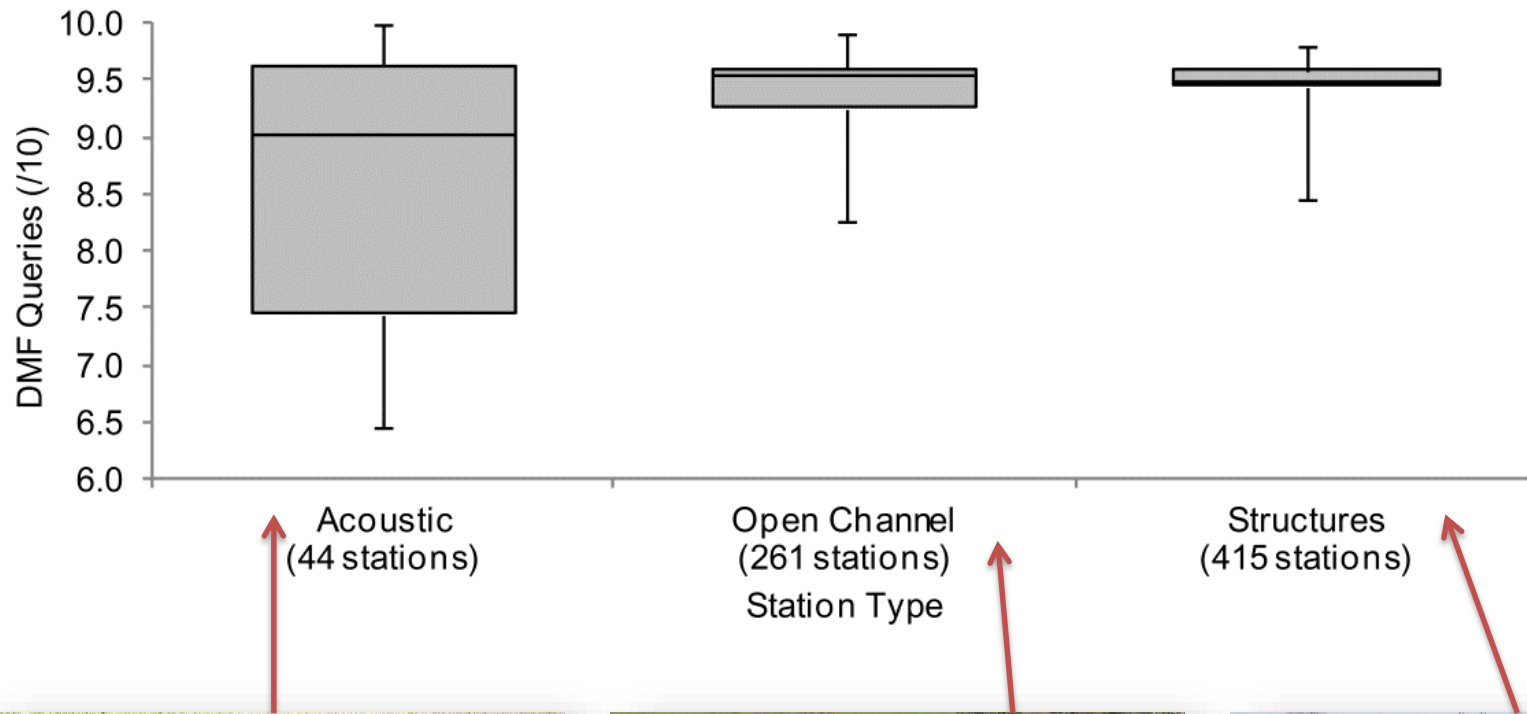
Small gaps at more stations

Measuring Data Quality

- Strong overall performance of the monitoring network:
- >90% of data submitted have no valid queries
- Where problems are observed in data, there is an increasing trend for these to be spread over smaller proportion of the network



Measuring Data Quality



- Increase in number of stations using ultrasonic or acoustic doppler technology
- Generally higher number of data issues identified at such sites



Conclusions

- NRFA Service Level Agreement has improved the quality and completeness of UK hydrometric data over the last 15 years
- Issues are now only at a small % of stations (1% completeness, 4% quality)
- This system is very transferrable to other national hydrometric archives



Thank You

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