Sellafield Ltd

Informed Solutions

A Nuclear Management Partners company operated under contract to the NDA

NO MARKING

Data Integration:

Understanding the 'Big Picture' of Groundwater Monitoring

Sellafield Ltd Case Study

Date: 10th July 2013

A Nuclear Management Partners company operated under contract to the NDA

Sellafield Ltd

Informed Solutions

NO MARKING

Presenters

- Nel McKenzie (Sellafield Ltd)
  - Groundwater Manager for Land Quality
- Tom Weeks (Informed Solutions Ltd)
  - Managing Consultant for Energy, Utilities and Natural Resources

Presentation Overview

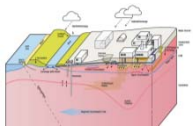
- Part 1: Business Context
- Part 2: Data Landscape and Challenges
- Part 3: How Sellafield Ltd Solved the Problem
- Part 4: Conclusion and Lessons Learned

Part 1: Business Context

Background

- Sellafield Ltd has a requirement to understand, control, manage and remediate the legacy of contaminated land and groundwater at the Sellafield site…

Remediation of contaminated land and groundwater



Develop conceptual models for land and groundwater remediation

Compliance with authorisations, consents and permits

Mitigation of leaks to ground

Land characterisation for projects

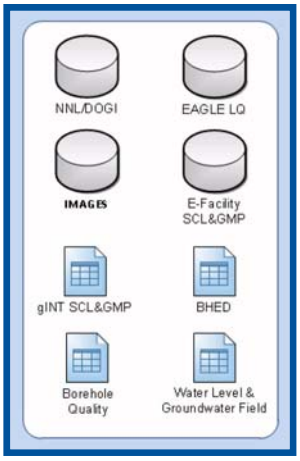
Site History & Monitoring Objectives

- Contaminated land characterisation and groundwater monitoring has been undertaken at Sellafield for >30 years.
  - A wide range of data generated from intrusive/non-intrusive characterisation projects to routine monitoring programmes
- Objectives to monitor changes in groundwater quality both spatially and temporally:
  - Groundwater entering the site
  - Groundwater leaving the site
    - Discharge points to R. Calder, R. Ehen, Irish Sea, West of perimeter
  - Groundwater beneath the site
  - Leak reassurance monitoring
  - Contaminant transport behaviour
    - Based on conceptual model pathways and actual data

Part 2: Data Landscape & Challenges

Data Landscape

- Mixture of live systems, legacy data archives and contractor supplied datasets
- Mixture of structured databases, spreadsheets and other file formats
- Duplication and gaps across data sources
- Range of data quality issues (from high confidence to unknown)
- Complex datasets (700+ fields across 60+ types of record x 30 yrs)

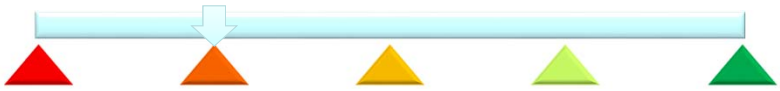


Data Flows

- Data flow is based on the “excavation lifecycle”:
  - *Planning/design* – Borehole spatial location, depth, construction *etc*
  - *Completion* – Geology, water strikes, soil sampling, development
  - *Sampling* – Field measurements (pH, Temperature, EC, ORP *etc*)
  - *Maintenance* – Redevelopment information, construction modifications *etc*
  - *Backfill/decommissioning* – Method (e.g. overdrill, grout *etc*)
- Typical annual groundwater monitoring programme generates ~5000 field records and ~8500 analytical records

Data Quality Challenges

- Challenges posed by variance in data quality
- Variance depending on where data originated, how it was maintained…



Level 1:

Significant mandatory data missing

Significant validation rules not satisfied

Little confidence in data accuracy

Level 5:

All mandatory data present

All validation rules satisfied

Full confidence in data accuracy

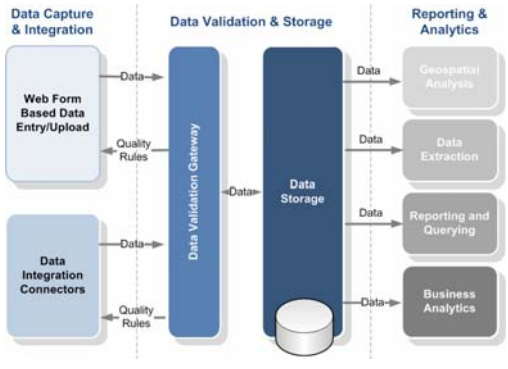
Data Integration Challenges

- Just a few examples:
  - Which data sources hold what data?
  - Which data sources do I trust (where is my 'definitive' data held)?
  - Data from multiple sources needs to be cleaned and combined.
  - Data source A refers to a Borehole by one name, source B by another.
    - Similar issues for Piezometers and determinants
  - Groundwater monitoring sample results don't use consistent units.
  - 'One-off' migration exercises versus on-going integration.
- These add up to create significant challenges for analysis, monitoring and reporting.

Part 3: How Sellafield Ltd Solved the Problem

About the Solution

- Based on Informed Solutions' InformedLANDQUALITY Platform.
- Centralises all historical and future groundwater monitoring data.



Delivery Approach

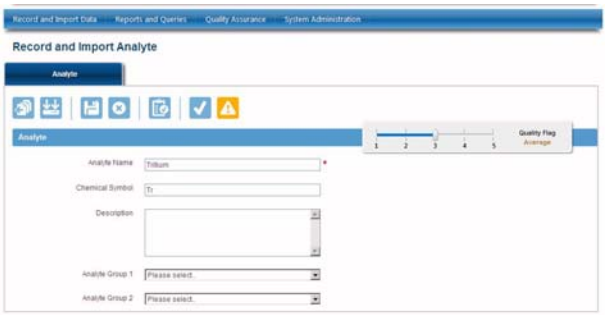
- Treated as a business change (not solely IT) project:
  - On-going engagement with analysts, samplers, administrators etc.
  - Care taken to align workflows with working practices, not the other way around.
  - Worked with the business to define, in practical terms, the data quality rules to enforce.
  - Understand analysis and reporting requirements.
  - Broke down the data integration challenge…

Trial Dataset Migration

- Proved that data integration was feasible before investing heavily:
  - Prioritised some key problems to solve.
    - Consistent Borehole, Piezometer and determinant naming/referencing.
    - Adoption of consistent groundwater monitoring sample result units.
  - Migrated data for a subset of Sellafield Ltd's sampling infrastructure
    - New data.
    - (Very) old data.
    - Known 'problem' data (e.g. due to data availability/completeness).
  - Clearly defined how data needed to be cleansed and transformed.
  - Understood quality improvements that could be automated.
  - Targeted manual effort in the right place.

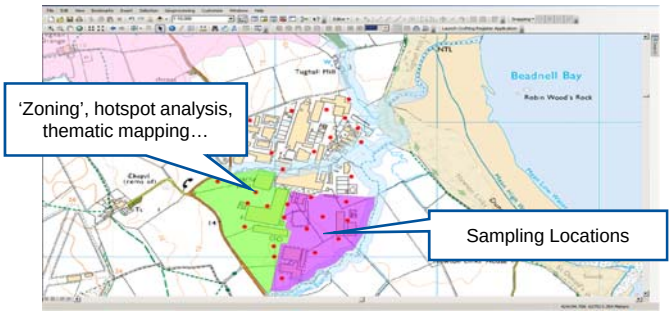
Important Features (1): Data Collection

- Collect and record data easily (manual web entry, bulk import etc).
- Intuitive to different user communities.



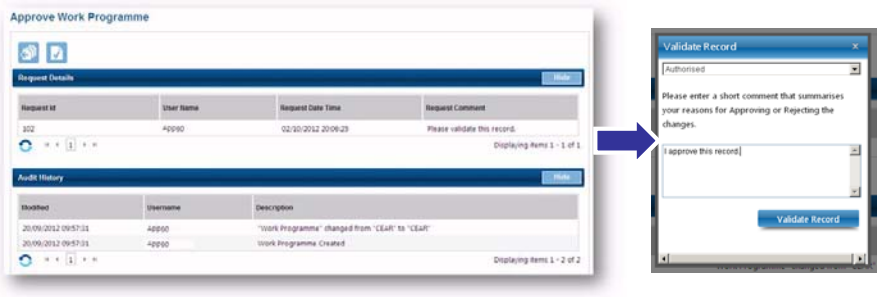
Important Features (2): Spatial Analysis

- Integrate with leading GIS and interpretive software platforms.
- Spatial and temporal analysis and reporting.



Important Features (3): Peer Data QA

- Peer quality review of individuals or groups of records.
- A qualitative sense check of monitoring results and other data.



Important Features (4): Analysis and Reporting

- Full auditing of data changes (what's changed, when and by whom).
- Secure login, BIP0008 compliance...

Important Features (5): Security & Auditability

- Full auditing of data changes (what's changed, when and by whom).
- Secure login, BIP0008 compliance...

Benefits

- ***An authoritative source of data*** – Information in one place
  - Benefits for Digital Continuity and Knowledge Management.
- ***Improved decision support*** – Better targeting of remediation measures;

.

- ***Reduced risk*** – Better understanding of liabilities.
- ***Reduced costs*** – Less data collection and reporting effort needed.
- ***Reduced administrative burden*** – Simpler evidencing of compliance.
- ***Open and flexible*** – Integrates with LIMS, GIS, remote instruments etc.

Part 4: Conclusions & Lessons Learned

Lessons Learned

- Take time to understand how your own data landscape is impacting your ability to analyse, monitor and report.
- Find ways to integrate data that will help you understand the big picture of groundwater monitoring.
- Don't seek perfection in your data
  - Have a clear set of improvement objectives that contribute to an outcome.
  - Understand the key challenges you need to resolve
  - Explore the most feasible way of resolving these challenges.

Questions