WHITE PAPER

# Managing and Visualizing Data for Alternate Source Demonstration Support

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# Introduction

TRC is working nationally to support power delivery clients with development and implementation of Coal Combustion Residual (CCR) compliance programs that include groundwater monitoring and reporting, data management, site investigation, and potential corrective action strategies for their CCR units to comply with federal and rapidly emerging state-specific rules. Groundwater monitoring programs for these sites have been established and, in many cases, ongoing for decades. Subsequent to waste placement, conditions at many of these sites have significantly changed due to construction activities, capping or CCR removal, or changes in regional and local hydrology, often resulting in groundwater chemistry changes that may or may not be related to a release from the regulated CCR unit. The ability to quickly and thoroughly assess the applicability of an alternate source demonstration (ASD) is essential when deciding to enter assessment monitoring or initiate an assessment of corrective measures.

Efficient and reliable data management is a critical component of these groundwater monitoring programs given the large volume of data being generated now and into the foreseeable future. The ability for the entire project team to quickly access and view historical and newly collected data is essential for timely data evaluation, ASD development, and decision making. Updating visuals such as charts, graphs, and dashboards to track current conditions, including changing redox, creates valuable project efficiencies by allowing the team to readily communicate large volumes of data in a digestible format.

## Why the increased focus on ASDs?

Many sites have been performing groundwater compliance monitoring in accordance with State and Federal CCR rules for several years. When a statistically significant increase (SSI) over background is identified during detection monitoring or a statistically significant level (SSL) above the established Groundwater Protection Standard (GWPS) is observed during assessment monitoring, the Federal CCR Rule and many state programs allow owners and operators to demonstrate that the SSI/SSL resulted from:

- A source other than the regulated unit;
- Error in sampling;
- Error in analysis;
- Error in statistical evaluation; or
- Natural variation in groundwater quality.

The ability to quickly and thoroughly assess the applicability of an ASD is essential when deciding to enter assessment monitoring or initiate an assessment of corrective measures. Additionally, the use of ASDs within the CCR compliance program has come under heightened scrutiney given the release of the recent United States Environmental Protection Agency (USEPA) policy interpretations and implications that many ASDs presented are not robust enough.

We continue to gain a better understanding of the conceptual site model (CSM) as more data are collected at a given CCR unit and/or site. A robust CSM is a key foundation for understanding groundwater conditions, which in turn can present opportunities to compile several corroborating lines of evidece in support of an ASD. Several recent communications from the USEPA highlight new CCR compliance expectations and clearly state that several ASDs presented in multiple Federal CCR Part A Rule demonstrations were insufficient and lacked the site-specific facts and data to support the ASD.

Additionally, considerations for ASDs should be made as additional groundwater monitoring and evaluation may soon be required at legacy CCR units that were previously unregulated. More monitoring increases the chances that an ASD evaluation will be needed.

Furthermore, closure activities for CCR units may result in changes in groundwater conditions due to closure activities. Increasing concentration trends during post-closure monitoring do not necessarily mean that the remedy was unsuccessful. Instead, these conditions warrant a closer look at the data to assess alternative sources.

## ASD Considerations

The level of effort for an ASD can vary based on the complexity of the problem; ASDs can be very subjective and many times there is no one correct answer. The applicability of ASDs for the Federal CCR program is further complicated by the self-implementing nature of the rules and the lack of regulatory oversight (except for certain approves states) to provide approval of the burden of proof presented. However, based on recent EPA policy interpretations, owners and operators should be prepared to be challenged and should maximize confidence for stakeholders by providing multiple lines of evidence in support of their ASDs.

## Minimize the Need for ASDs

Some SSIs or SSLs may occur simply due to poor data collection. Owners/Operators can produce accurate and scientifically defendable data by establishing a Data Quality Program and Data Management Plan. Your Data Quality Program starts with sample planning and collection. There are several ways to bolster quaity assurance, such as:

- Perform sampling and analysis using qualified staff and certified laboratories;
- Follow consistent and well-vetted sampling procedures;
- Ensure your Quality Assurance/Quality Control (QA/QC) processes include reviewing field records and laboratory QA packages;
- Develop a Statistical Plan that meets the monitoring program performance standards; and
- Build verification resampling into the statistical process. Considering the CCR Rule time constraints.

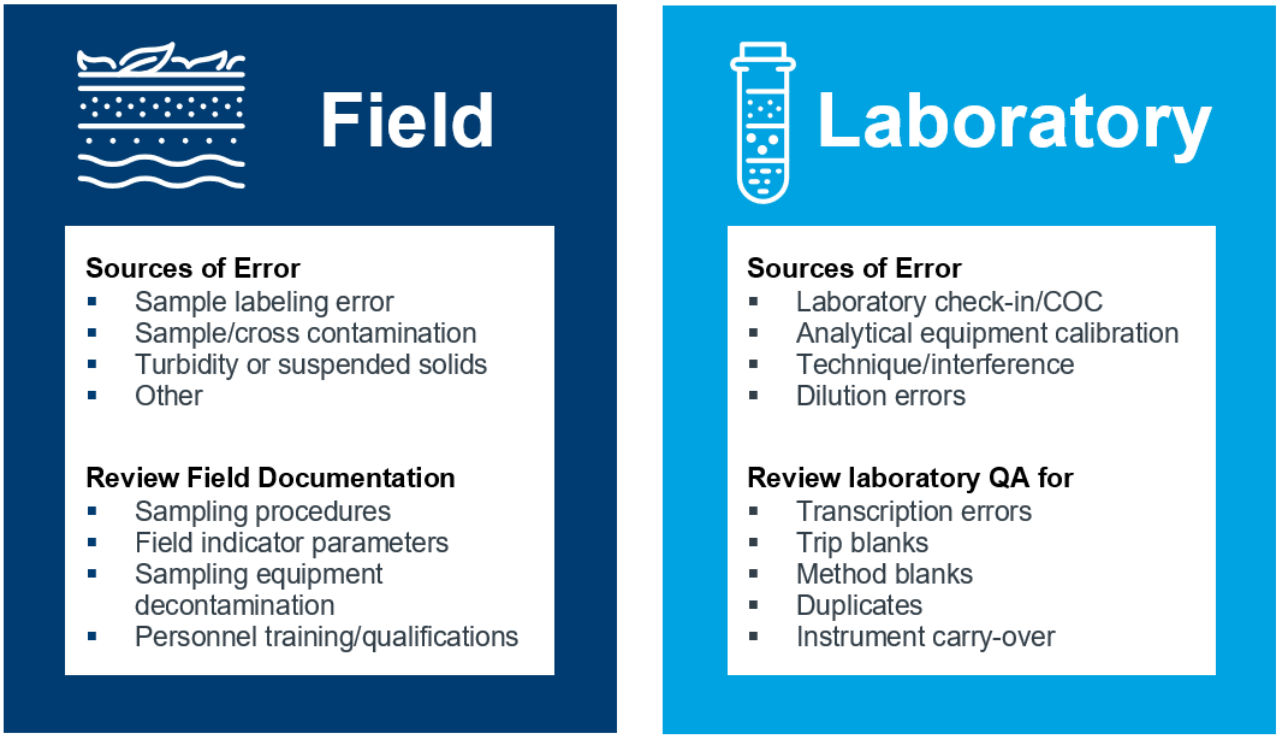


**Figure 1: Considerations for QA/QC within your Data Quality Program.**

A Data Management Plan governs the flow, storage, and use of information on the project. The plan specifies how the information is stored, identifies the roles and responsibilities of everyone on the project team so they can be held accountable, ensures your data quality objectives are met and overall, the plan provides the benefits and efficiencies through automation and quality through data accuracy.

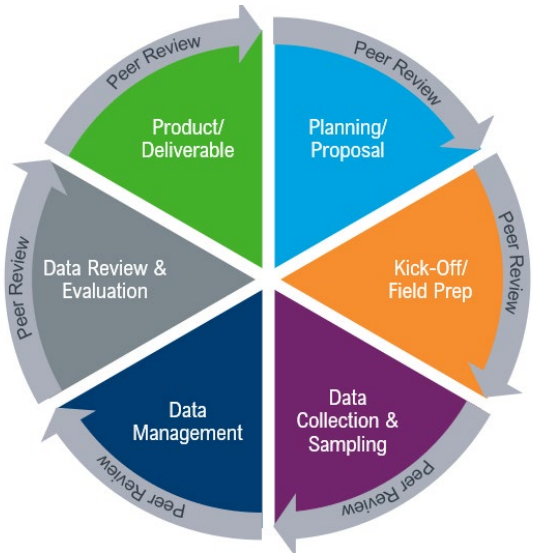


**Figure 2: QA/QC steps are key considerations throughout the course of a project.**

## Importance of the Conceptual Site Model

Development, use, and updating of a CSM is essential for support of ASDs. For example: soil data may exist which would help with understanding naturally occurring metal concentrations or ash leachate testing results may be available for comparison to groundwater testing results. Information such as soil lithology, stratification, and depth to bedrock, as well as groundwater monitoring well construction information including total depth and screen intervals can all be used for subsurface characterization needed to delineate affected groundwater. There is tremendous value to having this data all in one place for developing and updating the CSM.

## Data Visualization Tools

The ability to quickly and effectively access, evaluate, and make decisions based upon the data collected are essential to a sucessful program implementation. Multiple variables influence groundwater conditions and it can be difficult to track changes without the use of a Data Management Plan and thoughtful approach to data visualization. Considerations should be made for:

- Upgradient Conditions:
  - Trends in chemistry or water levels
  - Chemistry and groundwater use/extraction
  - Anthropogenic sources
  - Other CCR units/coal ash use
- Geology
- Groundwater flow direction and rates
- Changes in water levels
- Influence of surface water levels (Great Lakes, rivers, inland lakes, and streams)
- Precipitation
- Seasonality
- Completion of corrective measures
- Timelines for CCR loading, dewatering, removal, capping, etc.
- Changes in redox conditions and/or pH

The selected data management system and data visualization tools streamline analysis and reporting while providing documentation to support their forward-thinking compliance strategies. TRC has selected EQuIS™ (Environmental Quaility Information System) as an integral component of CCR data management processes and workflows. EQuIS™ puts an emphasis on data quality controls, standards, and reports and also provides web-based dashboards for data sharing across the entire project team. These dashboards provide effective visualizations and representations of data to support decision making and release of information to the project team, upper management, and public.

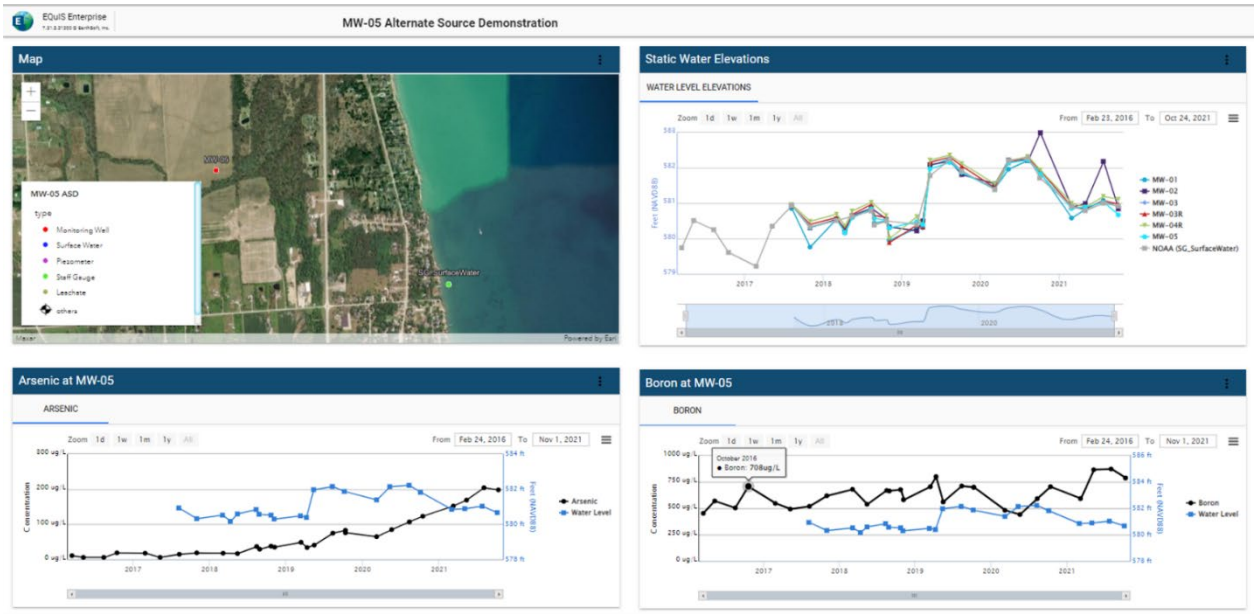


**Figure 3: Example data visualization dashboard with a map widget and time-series plot widgets.**

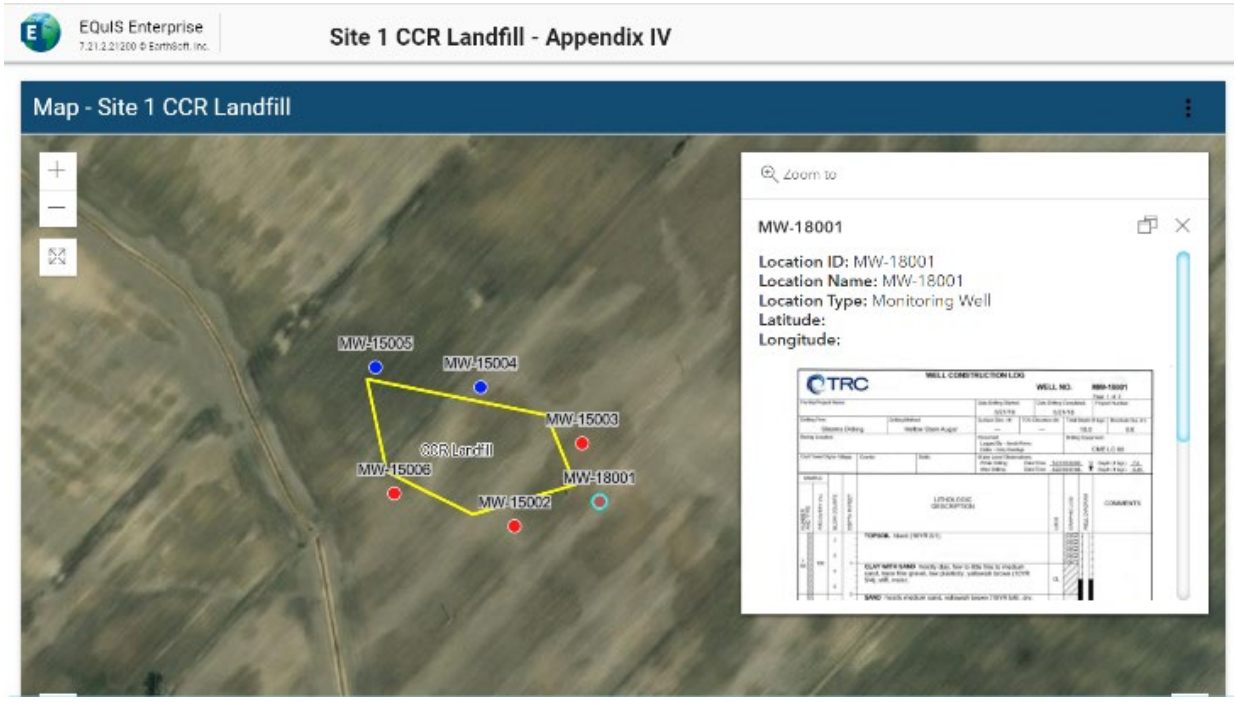


**Figure 4: Example map widget to view monitoring well locations and soil boring logs.**

# Summary

In summary, a thoughtful data management and evaluation strategy is key to a successful ASD by supporting:

- Multiple lines of evidence;
- Data evaluation to update the CSM;
- Correlation/corroboration of hydrogeology and geochemistry;
- Consideration for legacy units/other sources in your montioring program; and
- The effect of closure activites on your groundwater monitoring system.

# Authors

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