

Practical Issues Associated with
Effectively Using Real Time
Measurements for Site Assessment
and Closure

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Introduction

- The ways we think about site assessment and remediation has been largely shaped by CERCLA and RCRA
- But, the growth areas in the environmental industry are not in the CERCLA and RCRA type cleanups.
- We are increasingly focused on quickly and cost effectively returning properties to productive uses.

Introduction (cont.)

- This means the process of site assessment and closure must change from the standard step-wise approaches of the past.
- The emphasis must be placed on remediation (construction) and certification for redevelopment
- Real-time measurements used in a Triad approach are necessary parts of this evolution

Definition of Real Time Measurements

- Measurements for which the results are available in time to optimize the results of the data collection effort while the field team is still mobilized.
 - This definition encompasses a wide range of data collection and analytical techniques from screening technologies to traditional sampling with quick turn-around on the results.

The Value of Real Time Measurements

- The use of real time measurements is particularly well suited to Brownfields projects for at least three reasons:
 - Schedule compression
 - Cost savings
 - Added dimension of quality assurance (i.e., because results are available prior to demobilization corrective actions can be taken)

Schedule Compression for Characterization Efforts

- Assuming that there is only one correct depiction of the nature and extent of contamination and the risk posed by that contamination, the use of real time measurements greatly reduces the time required to document that depiction and move to a construction phase.

Schedule Compression

- In other words, traditional methods often require extended periods of time to receive analytical results and to perform data analyses. This typically means multiple mobilizations to fill data gaps to get to the full depiction of contamination.
- The use of real time measurements compresses this sequence of events.

Schedule Compression for Excavation

- When real time measurements are used to support excavation, unnecessary removal of clean material is minimized resulting in less total soil being removed and therefore less time spent digging.

Cost Savings

- By reducing the total time needed for characterization and minimizing the volume of soil to be excavated, large cost savings can be realized not only as part of the actual remedial effort, but also because the development schedule for the site is expedited.

Issues Associated with Using Real Time Measurements

- Recent advances in environmental characterization technologies and in field deployable computational capacity have permitted large quantities of data to be collected quickly and managed electronically.
- However, this means analysis and decision-making must happen much faster than when traditional approaches to characterization are used.

Issues (cont.)

- This means paradigm shifts are required in two areas where inertia is large:
 - Contracting/subcontracting
 - Project logistics
- It also means that new approaches are required for:
 - Data management and analysis
 - Decision support

Contracting and Logistics

- Typical traditional characterization approaches involved estimating the locations and numbers of samples to be acquired, usually using a very limited understanding of the potential contamination patterns, scoping this estimate in a sampling and analysis plan, establishing the contract value, then executing the plan.
- Usually post-field data analysis would identify data gaps and multiple data gap mobilizations would often result, each one scoped and contracted separately.

Contracting and Logistics(cont.)

- Real time measurements are really only effective when they can be used iteratively in an adaptive sampling strategy.
- While pre-planned locations are always part of a characterization strategy, real time measurements should be used in a dynamic work plan where the ultimate number of locations is initially unknown.

Contracting and Logistics - Example

- A site designed a direct push sampling campaign to identify VOC contamination in groundwater. Analytical results were provided on a two day turn around.
- The estimate of the number of samples to be collected was based on a limited historical evaluation of potential source areas.
- The subcontract was let to collect the samples identified in the estimate.

Contracting and Logistics - Example

(cont.)

- The subcontractor scheduled the necessary resources to accommodate the estimate in the subcontract.
- However, as analysis of the data showed new areas of contamination to be bounded, the subcontractor was unable to extend activities due to follow-on commitments elsewhere.
- This is an example of traditional project planning and contracting used for an adaptive sampling effort.

Contracting and Logistics - Example

(cont.)

- This is a fairly common problem.
- Project costs may have been estimated long before the sampling plan was developed and typical contingency estimates do not account for large increases in extent of contamination. Therefore, project managers are hesitant to consider contracts that allow for large, but unknown increases in the scope of work.

Contracting and Logistics - Example

(cont.)

- The solution appears to be easy, but really isn't.
 - Estimating the appropriate contingency is difficult.
 - Providing assurances that unnecessary samples won't be collected is very important.
 - Scheduling subcontractors with uncertain project durations creates difficulties.

Contracting and Logistics - Example

(cont.)

- A multi-pronged approach must be used:
 - In this instance, a geostatistical model indicating the probability of contamination may have been helpful in predicting areas that may be additional potential areas of contamination,
 - Incentives can be built into contracts that encourages subcontractors to maintain reserve resources if necessary or to demobilize early if necessary, and
 - A great deal of responsibility falls on the technical manager to make sure that excessive samples are not being acquired.

Data Management and Analysis

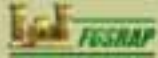
- Data management and analysis must be able to keep up with the rate of data collection.
- This means making decisions early about:
 - The use of unqualified data,
 - How often to update the data base
 - The way in which data and analyses will be distributed to key decision-makers,
 - What level of resources will be dedicated to data management and analysis.

Data Management and Analysis (cont.)

- Early systematic planning should anticipate and carefully specify how data management and analysis will be conducted before, during, and after the field effort. This will help determine the level of resources necessary.
- Dummy data sets should be developed in advance of the project and dry runs should be conducted to shake out the difficulties that may be encountered as data flows from the field to the analysts.

Data Management and Analysis (cont.)

- Web-based dissemination of information is a good way of sharing information with a wide range of users.
- In addition, Web sites dedicated to characterization efforts serve as centralized locations for schedules; personnel contact lists; and document, data, and map libraries.



Remedial Action Project

The former Harshaw Chemical Company, located in Cleveland, Ohio, was contracted by the Manhattan Engineering District (MED) and later the Atomic Energy Commission (AEC) to support the Nation's early atomic energy program. From 1944 to 1959, various forms of uranium were processed in Building G-1 (formerly known as Plant C) for isotopic separation and enrichment at Oak Ridge, Tennessee. In 1960, the site was released for unrestricted use by the AEC, following decontamination efforts by Harshaw, under guidance of the AEC.

In 1974, the Formerly Utilized Sites Remedial Action Program (FUSRAP) was created to ensure radioactive residuals from activities associated with the Nation's early atomic energy program met current guidelines. Under this program, the U.S. Department of Energy (DOE) determined the site is eligible for inclusion into the FUSRAP on June 3, 1999. In accordance with the Memorandum of Understanding between the U.S. Army Corps of Engineers (USACE) and the DOE, responsibility for any necessary remedial actions has been transferred to the USACE.

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Data Links

- [Instrumented Site Survey](#)
- [Reference/Background Areas](#)
- [IA01 - Building G-1](#)
- [IA02 - Other Buildings](#)
- [IA03 - Soil in the Vicinity of Building G-1](#)
- [IA04 - Other Northside Complex Soil](#)
- [IA05 - Southside Complex Soil](#)
- [IA06 - Eastside Soil](#)
- [IA07 - Westside Soil](#)
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- [IA10 - Groundwater](#)
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What's New

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IA07 -- Soil in the Vicinity of Building G-1 Radionuclides



Surface U-238 (2.22 MB) 7/8/03



Total Historical Uranium w/Walkover (2.61 MB) 6/19/03



SubSurface U-238 (2.22 MB) 7/8/03

Decision Support

- Competent decision support is essential when using real time measurement techniques.
- Some areas where difficulties often arise include:
 - Multiple contractors on-site are unaware of how their individual roles relate to overall project objectives,
 - Attention paid to health and safety, daily logistics, procurement, equipment failures, personnel issues, etc. often cause the on-site coordinator to pay too little attention to the technical objectives.

Decision Support (cont.)

- Coordinating contractors:
 - Early on, include contractors in systematic planning.
 - Use EPA's Triad approach and train contractors in implementing this approach.
 - Identify areas where contractors must interact in order to accomplish project objectives.
 - Provide on-site lead agency manager.

Decision Support (cont.)

- Focus on technical decision-making:
 - Provide dedicated on-site technical manager from lead agency to work in tandem with lead agency project manager.
 - Project manager is responsible for all non-technical issues.
 - Provide technical manager with appropriate computational tools and access to Web.

Summary

- Environmental projects are increasingly focused on moving as quickly to site closure and re-use as possible.
- The Triad approach and the use of real time measurements are essential to the success of these projects.

Summary (cont.)

- Practical issues arise that require moving away from the standard methods for establishing contracts, conducting project logistics, and managing and analyzing site information.
- In addition, the level of decision support must be increased at the field level.

Modeling Experience

- Nakdong Basin, South Korea
 - Basin covers approximately 2/3 of country
 - Water quality issues (DO, nutrients, flow)
 - Modeled
 - Existing conditions
 - Proposed changes to system
 - Industrialization
 - impacts of future diversions on water quality and water supply.
 - - future effluent impacts
 - Still using model today for water resource and management decisions

Modeling Experience

- Green River, Utah and Colorado
 - Modeled release patterns and downstream flows and stages for four hydropower operational patterns for the Flaming Gorge Reservoir
 - Used three different methods to compare sediment transport for the four operational patterns

Other Water Quality Support

- Green Lake, WI – TMDL Planning
- External reviewers for EPA on HSPS v.12 which includes improved groundwater/surface water interaction
- TAPS environmental impacts to surface water
- NRC surface and ground water issues related nuclear power plant re-licensing

Integrated Data Collection and Decision Making

- Integrated data collection plans
 - Develop decision objectives
 - Determine the type, timing, and quality of data required to satisfy decision objectives
 - Develop data management options for optimum transfer and analysis of data

Integrated Data Collection and Decision Making

- Triad
- Joint effort with USEPA, USACE, and Argonne to develop Federal guidance on
 - Systematic Planning
 - Dynamic Sampling
 - Field Analytical methods