

Butte Workshop

**Performance Monitoring for
Contaminant Remediation
and Stabilization**

Breakout No. 3

General Approach

- Discuss concepts, tools and techniques that represent the emerging state of practice.
 - Case study basis
 - Match techniques to various objectives and varying conditions
 - Identify Requirements, Uncertainties and Limitations
- Assist DOE in their applied environmental research planning for the “2007” time frame

General Questions to be Answered

- What combination of current and innovative tools would be diagnostic of performance?
 - Define examples of essential monitoring
 - Consider joint optimization of monitoring and the remedial systems
 - Examine new opportunities like vadose monitoring and gas phase monitoring
- How can innovative performance monitoring tools and approaches can be applied to enable improved decision making, while meeting regulatory requirements?
- How can monitoring systems be better designed to best measure progress towards meeting cleanup goals? Can cleanup goals be improved?
- What tools can be utilized to reduce the uncertainties associated with performance monitoring?

More Questions

- Where are current PM practices deficient

Designing Performance Monitoring Systems to Make the Best Decisions

- Goal/Objective setting must be done first
- Everything that follows is in this context
 - Characterization to fill data gaps
 - Remediation
 - *Performance Monitoring*
 - Long-term Monitoring

EPA RTDF NAPL Alliance

Decision Process for LNAPL Sites

- Develop long-term vision and goals
- Collect and analyze supplemental data
- Refine conceptual model and long-term vision
 - What you know
 - What you suspect
 - What you don't know
 - Identify and quantify uncertainties
- Develop LNAPL management strategy
- *Define endpoints (metrics)*
- Implement and monitor

Designing the Performance Monitoring System

- Use the context of goals/objectives
- Establish metrics to measure progress towards meeting the objectives
- Consider uncertainties in the design

Breakout Schedule

- Contaminant Remediation and Stabilization Objectives and Goals (Tuesday)
- Mass Balance and Flux Concepts for Plume Monitoring (Wednesday I)
- Geophysics for Monitoring (Wednesday II)
- Push Pull Tests and Hydrology (Wednesday III)
- Optimization and Combination (Wednesday IV)

Breakout Logistics

- Participants are encouraged to provide short presentations on the broad topic areas (outline philosophy and theory, tools and techniques, example results, limitations, uncertainties, etc.)
- Everyone's contributions are welcome
- Final session will be used to blend the ideas from the earlier sessions and develop consensus (and other items of note for the report out)

Wednesday

- Introduction of Breakout Session (12:45)
 - Goals, Expectations, Products
 - Proposed Agenda and Input for Revisions
 - Discussion Ground rules and Approach
- Concurrence on Topics and Identification of “speakers for each topic (1:00)
- Presentations to facilitate discussion of plume monitoring goals (1:20)
 - Forba, Gorder, others

Plume Monitoring Goals

- Forba
- Gorder

Plume Monitoring Goals

- Documenting Plume stability, mass balance and flux
- Minimizing post-treatment migration, release or flux to a predefined limit;
- Maintaining/documenting geochemical conditions to ensure continued stability;
- Minimizing potential flushing during extreme climate conditions;
- Concentration at receptor location; or
- Combinations of above

Flux Monitoring and Mass Balance Concepts

- Looney
- Wood
- Hatfield
- others

Mass Balance and Flux

- Examine the concept of plume stability as a central objective and the resulting significance for monitoring technology
- How much and what type of monitoring is needed to document stability under a variety of conditions (remember what is working from the EPA multiple lines of evidence)?
- What Modeling is needed under a variety of conditions?
- How can approach be implemented to in a graded fashion to provide a high level of protection while not driving up costs?

Geophysics and Other Volumetric Methods

- Kaback
- Rucker
- Versteeg
- Reichhardt
- Fabyshenko
- Farrington
- others

Geophysics

- What are reasonable objectives to set for geophysics (contaminant, geological, plume stability)?
 - Can geophysics be used for monitoring or is it going to be primarily characterization?
 - Can markers or tracers be added to a system to allow more effective use of geophysics for monitoring?

Push Pull Testing and other Hydrologic Methods

- Istok
- Bennett
- Bratton
- Young
- others

Push Pull Testing and other Hydrologic Methods

- What are reasonable objectives to set for hydrologic methods (contaminant, geological, kinetics plume stability)?
- Can hydrologic methods be used for monitoring or primarily for characterization?
- Can markers or tracers be added to a system to allow more effective use of hydrologic methods for monitoring?
- Can we use vadose monitoring or the gas phase for early and sensitive performance indicators?

Consensus

- Chan-Hilton

Consensus

- Discuss optimization and how techniques might be developed to implement “essential monitoring” – a blend of monitoring well network sampling and alternative approaches.
- How can current optimization concepts be adjusted to incorporate non-traditional monitoring data?
- Are there other innovative ideas and approaches for optimization?