WM2014 Conference Panel Report

PANEL SESSION 085: Informed Performance Based Decision Making

Co-Chairs: **Kurt Gerdes,** *Department of Energy*
M. Hope Lee, *Pacific Northwest National Laboratory*

Panel Reporter: Dawn Wellman, *Pacific Northwest National Laboratory*

Panelists:

- **Chuck Newell**, *GSI Environmental Inc.*
- **Carl Spreng**, *Manager at the Colorado Department of Public Health and Environment and co-leader of the Interstate Technology Regulatory Council team for Remediation of Complex Sites*
- **Carol Eddy-Dilek**, *Savannah River National Laboratory*
- **Rula Deeb**, *Principal at Geosyntec Consultants*
- **Mike Truex**, *Pacific Northwest National Laboratory*

An interagency panel was convened at 2013 Waste Management Symposium. The panel brought together top scientific and technical experts to discuss approaches and strategies to address the risks and technical challenges associated with remediation of complex sites. The panel was composed of representatives from DOE and industry leaders responsible for a broad range of remediation challenges. During the session, panelists and audience members provided perspectives and considerations related to complex site remediation. A summary of the panel discussion of concepts, challenges, and opportunities for future efforts and approaches to address complex contamination sites is presented below.

Summary

Remediation of subsurface contamination is a significant challenge facing the nation [1]. Despite nearly 40 years of remediation efforts in the United States and other industrialized countries, remediation of groundwater to a condition allowing for unrestricted use remains a significant challenge [2]. While there are success stories, the majority of waste sites that have been closed were relatively simple compared with the remaining sites. Substantial portions of the remaining sites are owned by DOD and DOE-EM, representing two of the largest soil and groundwater cleanup programs in the world. The U.S. Army Environmental Command funded an NRC study to address technical and management issues arising from barriers to restoration of contaminated groundwater at these complex sites. The NRC examined DOD and DOE cleanup efforts as well as cleanup programs under state purview (e.g., state Superfund programs, voluntary cleanup programs, and brownfields programs) to identify the magnitude of the remaining challenges and trends. The study estimated that roughly more than 126,000 complex facilities or contaminated sites remain at a total cleanup cost between $110 and $127 billion [2]. Residual contamination at these facilities and sites has been documented at levels preventing them from reaching unrestricted closure.

Addressing complex sites will require developing approaches that account for the elements of the site that contribute to the complexity in contaminant behavior, for instance, by describing sites

using systems-based approaches. The NRC study also recognized a need to "transition from active remediation to more passive strategies and provide more cost-effective and protective long-term management of complex sites" [2], including formal transition assessments. Considering the use of remediation endpoints is consistent with these NRC recommendations, whereby a path for cleanup is established that may include intermediate remedial milestones and transition points. It may also consider regulatory alternatives to determining when and where standards-based remediation goals should be attained. This approach should incorporate risk-informed remediation goals or scenarios permitted by regulations that protect human health and the environment during remediation and lead toward an ultimate end state for site closure.

As outlined by Deeb et al. [3], this type of endpoint approach is consistent with federal laws and regulations, including CERCLA, RCRA, and the National Oil and Hazardous Substances Contingency Plan (NCP), as well as other state and local requirements. These laws and regulations are not prescriptive and are subject to interpretation. Goals of CERCLA and the NCP are protecting public health and welfare and the environment, complying with Applicable or Relevant and Appropriate Requirements (ARARs) within in a reasonable period, and considering the particular circumstances at a site. CERCLA is intended to allow flexibility in selecting remedies and ultimately endpoints. Similarly, RCRA has an overall goal of protecting human health and the environment, meeting cleanup objectives, controlling sources to reduce further release of hazardous waste, and complying with applicable standards for waste management. RCRA allows flexibility in setting cleanup standards, points of compliance, time frames for remediation, and use of alternate concentration limits where applicable.

Synopsis of Panel Discussion

During the session, panelists and members of the audience provided perspectives and considerations related to complex site remediation. The purpose of the panel was to foster communication of these perspectives and considerations. This section presents a synopsis of the discussion.

The ultimate goal for the environmental restoration programs has been and remains protection of human health and the environment. Federal, state, and industry responsible parties have finite resources to address these challenging sites; creating a significant opportunity to work collaboratively to develop and implement effective solutions within these constraints. The recent NRC report points to the need to work toward risk-based decisions and protectiveness within these constraints at complex sites [2]. While these concepts are not new, they have been difficult to implement at some sites in the past. This type of approach moves beyond previous remedy and monitoring optimization approaches and focuses on considering the right remedy decision for a site, at the right time and in the right place.

The appropriate approach is not "one size fits all." Site specific considerations are extremely important. Within active DOE sites, there is security and long-term administrative control that should enable longer-term options for remediation approaches and endpoints. Alternative decisions should be considered when properties are transferred out of federal control. Success at most sites has come when teams (site, regulator, and stakeholders) demonstrate mutual trust.

Providing information and guidance on transition points, stepwise plans to reach goals, and similar efforts would help to build this trust (in other teams).

For DOE, managing large facilities that have many individual waste sites and contain long-term radionuclide contaminants raises key questions about future remediation strategies and approaches:

1. For federal government sites with long-term administrative controls, should the primary goal be restoration or protection?
2. Rather than considering "how clean is clean," should we consider how much contamination can remain while still meeting protectiveness goals?
3. Should we be applying concepts from waste tank cleanup such as treatment to the "maximum extent practicable" to subsurface contamination?
4. What if we use primarily passive approaches, especially when there are extremely long distances between contaminants and site borders? If so, what are costs and benefits of long-term management versus active remediation?

Recognizing the long-term management requirements for more passive approaches, key investments in effective monitoring approaches, predictive modeling capability, providing data access (e.g., making data more transparent and available to the public), and developing the scientific underpinnings for remediation endpoints and passive remedies are important for implementation of these approaches.

From an industry perspective, projects are managed using a risk-based process. A key is to begin with the end in mind. To facilitate this approach, a strong technical basis and site conceptual model are key to providing an understanding of the site that leads to selection of an appropriate remediation approach.

Mass flux/discharge concepts may be important elements of understanding remedy performance and making decisions. Use is expected to be site specific, but having approaches to integrate these measures into decisions will be helpful. Considerations for plume management (e.g., in segments with different conditions) may include evaluating actions with respect to cost/mass reduction, cost/mass flux reduction, or cost/risk reduction; however, methods to build these evaluations and decision criteria into remediation action objectives and technology objectives are needed.

Case study examples of plume management and alternative approaches/endpoints would be helpful as part of communicating these concepts and providing guidance for sites to use these approaches. It is also important to recognize that there is sometimes a disconnect between sites preparing technical arguments for a specific approach and regulatory positions with regard to what policies are appropriate in determining the acceptable remedy.

A key element of future consideration will be whether policy level changes are needed—that is, should the policy continue to be cleaning up to reach maximum concentration levels? While current regulations allow for flexibility in records of decision, and there are advocates for this approach within the regulatory community, flexible approaches have been difficult to implement

at many sites. This issue may stem in part from using the same approach that can be successful at simple sites for complex sites; i.e., applying a remedy selection process that leads to a single remedy and standards-based goals. This type of approach may be inappropriate for complex sites, and a policy change to formalize approaches for these situations may help reach remedy decisions at complex sites. However, changing existing policies may become overly burdensome and produce little benefit.

Working within the current policy, with some minor shifts in interpretation, may enable application of more flexible, adaptive remediation approaches (e.g., similar to the successful efforts with green and sustainable remediation). Perhaps the meaning of "beneficial use" should be reconsidered in the context of site specific conditions at complex contaminated sites, weighing the value of protection versus complete restoration, given finite resources. In relation to using remediation metrics, further consideration of where, when, and how to apply ARARs should be an element of the plume management decisions and selection of remedy goals. With protectiveness as a goal and the realization that the maximum concentration levels apply to drinking water, decisions related to compliance with ARARs can be made.

Conclusions

The topic of remediation approaches for complex sites is receiving significant attention within the remediation community. This panel discussion provided a forum for exchanging concepts, challenges, and opportunities related to complex site remediation and consideration of alternative endpoints. As demonstrated by the discussion and consistent with the recent NRC study [2], improved approaches for remediation decision processes are needed at complex sites. These approaches should enable flexibility to accommodate adaptive remedies appropriate for longer-term contamination issues. In addition, incorporating risk-informed decisions into the remedy process is key to addressing complex sites.

References

1. NRC. 2012. *Alternatives for Managing the Nation's Complex Contaminated Groundwater Sites*. National Academy of Sciences, Washington, DC.
2. R. DEEB, E. HAWLEY, L. KELL, and R. O'LASKEY. 2011. *Final Report - Assessing Alternative Endpoints for Groundwater Remediation at Contaminated Sites.* ESTCP Project ER-200832. Prepared for the U.S. Department of Defense, Environmental Security Technology Certification Program by ARACIS/Malcom Pirnie, Inc., Highlands Ranch, CO. Available at http://www.serdp-estcp.org/content/download/10619/130969/file/ER-200832-FR.pdf.