Scientific Opportunities for Monitoring of Environmental Remediation Sites

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The US Department of Energy (DOE) is responsible for risk reduction and cleanup of its nuclear weapons complex. This challenge remains one of the most technologically difficult and financially costly problems facing DOE's Office of Environmental Management. DOE maintains the largest cleanup program in the world—currently involving over a million acres in 13 states. The inventory contains approximately 90 million gallons of radioactive waste, 1.7 trillion gallons of contaminated groundwater, and 40 million cubic meters of contaminated soil and debris. The sheer mass of contaminated soils and groundwater makes it impractical to completely restore many sites to predisposal conditions. Moreover, there are realistic physical constraints that will, in some cases, leave contamination in difficult to access places, albeit at levels calculated not to pose a significant risk. This will require continued monitoring to ensure protection of human health and environment. There is a critical need to advance monitoring approaches that move away from the cost and labor intensive point-source monitoring to leading edge, flux-based monitoring strategies that incorporate early indicator parameters. Research and development to-date has focused primarily on remediation methods with little effort on developing improved monitoring methods. Yet, monitoring will be the largest life-cycle cost. It is critical to identify innovative monitoring approaches and techniques that reduce costs and improve performance and protection.

This presentation will identify opportunities and present an approach for advancing the current state of contaminant site monitoring that includes:

- Identifying scientific, technical, and practical challenges that currently impede informative, timely, and cost-effective monitoring to support remediation actions;
- Developing a scientific framework that combines regulatory drivers, point- and volume-averaged strategies, and techniques into an advanced characterization and monitoring program that includes flux- and risk-based approaches and transitions throughout the monitoring life of the facility; and
- Providing prioritized science and technology strategies that meet current needs for the most challenging environments.