C21 Should Environmental Forensics Just Be About the Liability for the Past or Can It Help Us Avoid Liability in the Future?

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After attending this presentation, attendees will leave this presentation with a better understanding of the issues facing those addressing "long term" containment of hazardous materials and wastes, some of the approaches that are available and knowledge of the case studies used to develop a framework for the authors' analysis.

This research goes to the heart of what forensic discussions of long- term contaminant isolation and this presentation will impact the forensic community and/or humanity by demonstrating the need to address in the future and will aid forensic scientists, designers of such facilities, monitors of such facilities, and/or litigants concerning such facilities.

The field of environmental forensics emerged from litigation involving past waste management practices that are now understood not to be protective of human health and the environment. In the wake of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund), the need arose to use the best science available to determine the sources of past hazardous chemical and radionuclide releases and the times when those releases occurred. Current environmental forensics practitioners have at their disposal a variety of source identification and release dating tools including chemical fingerprinting, "reverse" modeling, times of commercial availability, and isotopic identification and dating techniques.

For the past several years, the authors have been engaged in research on another component that is emerging as a very important piece as well, viz., the long-term management of so-called legacy hazardous and nuclear waste sites. All across the U.S. and abroad current waste site remediation approaches are not able to leave the property suitable for unrestricted use due to technological and economic limitations. Residual hazards will be left in place hopefully isolated by the implementation of engineered barriers and institutional controls, the purpose of which is to preclude intrusion into or migration from the waste materials being isolated. The processes by which the decisions about how these sites will be remediated and monitored are subject to considerable political, regulatory and potentially litigious discussion currently and this is expected to continue into the future. Given the long times for which the contaminants being isolated will remain hazardous, these "contaminant isolation systems" will need to perform effectively for 100s perhaps 1000s of years.

Case studies of several sites have been used to identify the types of engineering and institutional controls currently in use. The information from the case studies has been used to define an analytical framework and "precursors to failure" can be identified using fault or event tree analysis. Institutional responsibilities can then be focused on monitoring and maintenance of both the engineered barriers and the institutional controls with emphasis on selected precursors to system failure.

The presentation will provide background information on the need for sustainable long-term environmental protection of legacy hazardous and radioactive waste sites, the results of the case studies and fault tree analyses to date, observations, and conclusions, and recommendations for further research.

Environmental Forensics, Engineered Barriers, Institutional Controls

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