The Reality and Strategies of Conducting PFAS Remedial Investigations in Evolving Uncertainty

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Background/Objectives. PFAS are a global concern gaining monumental attention as environmental practitioners work to manage uncertainty resulting from rapidly evolving science and regulations. A flexible investigation strategy is required to meet the reality of changing best practices and requirements to effectively achieve the objectives of a Remedial Investigation (RI) performed under CERCLA. This presentation discusses the realities of execution, uncertainty management strategies, and initial lessons learned from ongoing RIs of aqueous film forming foam (AFFF) areas at three U.S. Air Force (USAF) Installations.

Approach/Activities. RI project objectives include delineation of PFAS constituents in multiple media to develop the conceptual site model (CSM) and understand contaminant fate and transport in various media. The following challenges to the RIs require agile navigation and pivot strategies that can be employed during the project and communicated with stakeholders.

USEPA revision/development of screening criteria; changing/differing State criteria.

USEPA established a new draft laboratory analytical method, detection limits, and reported analyte list.

Differing policy between USEPA, DoD, State, and local agencies.

Consideration of USEPA naming constituents as RCRA hazardous substances and RCRA requirements under a CERCLA RI framework.

Limited but advancing knowledge of PFAS precursors, reactions, and different transport mechanisms in the environment across the suite of thousands of PFAS constituents.

Recognizing the early phase of remedial technology development and need to collect target data to evaluate bioremediation or other remediation strategies.

Results/Lessons Learned. At this juncture in state of the science, project teams need to expect that the rules and the targets will continue to change and preemptively build flexibility into the project approach, regulatory expectations and maintain focus on advancing both the site and base-wide CSM. While some lessons learned apply to contract elements, the primary key to continue realizing optimal value from data is development and communication of a multi-step, data-driven process with corresponding multi-phase planning documents and CSM iterations presented to stakeholders. Additional tactics for addressing challenges as listed above include:

Early establishment of a data-driven process detailing phases of data collection and interpretation to allow integration of changing criteria or approach. Use of iterative planning documents/addendums at planned junctures for dynamic planning/approvals.
Curation of all site data into Base-wide GIS including legacy contaminant data, hydrogeologic data, deployed remediation techniques, etc. to assess and communicate the CSM with PFAS constituent data for comparison to multiple or changing criteria.

Optimize use of existing monitoring wells and infrastructure in sampling plan.

Include geochemical samples to evaluate subsurface properties, how PFAS constituents may behave, and support potential evaluation of remedial technologies.

Use of environmental sequence stratigraphy or other HRSC tools to visualize transport pathways and identify data gaps to address is next data collection phase.

Recognize comingling between areas and interactions between media (e.g., residual vadose zone mass, groundwater-surface water interactions) and evaluate PFAS constituents present in specific areas (e.g., signature).

Additional lessons learned will be included in the presentation.