Remediation Process Optimization

Our experience has shown that optimizing site exit strategies, physical/mechanical remedial systems, operational practices, and monitoring programs can significantly lower life-cycle costs and accelerate closure.

Areas of Expertise

- Peer Reviews
- Exit Strategy Assessment
- Conceptual Site Models
- Remedy Performance and Data Analytics
- Remedy Cost-Effectiveness
- Remedy Optimization
- Streamlining of Operations and Maintenance
- Full-Service Remediation Construction and System Operations

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Overview

AECOM recognizes that many of our clients face a maturing portfolio of sites where active remedies have been applied for years, oftentimes without consideration of changed subsurface conditions or the quantifiable return on operational expenses. The financial liability associated with a non-optimized system represents a significant loss of capital that would otherwise be directed into our clients' operating budgets. AECOM strives to reduce these financial commitments associated with environmental liability from legacy operations and help our clients focus on their primary business.

Remedial Process Optimization (RPO) is a systematic method for evaluating each step in the lifecycle of a remediation project that maximizes the progression of a site towards regulatory closure for a given spend. RPO is not retrospective or second-guessing the remedial decision making process to date, but is a proactive tool to evaluate and confirm the best path forward, or the "Exit Strategy", given the present status of the remedy, and to mine the present body of information and knowledge gained to date in order to select the optimal (i.e., least-cost) path towards closure.

Our Approach

Our experience has shown that optimizing site exit strategies, physical/mechanical remedial systems, operational practices, and monitoring programs can significantly lower life-cycle costs and accelerate closure.

A robust RPO evaluation should focus on all of the relevant elements of a remedial program; however, it can also be applied to the individual elements listed below. These elements are listed in sequential order, meaning these steps build on one another and a robust RPO evaluation would be started with the first one listed, working through the list and concluding with the last item.

Areas of RPO Expertise and Opportunity

EXIT STRATEGY ASSESSMENT. Is a risk-based closure applicable? Have clear metrics for transition from an active remedy to a future use been established? Has the value of the site increased or decreased, internally as a functioning resource to the owner/operator, or externally as a marketable property? Are remedy goals aligned with the envisioned future property uses? Real estate market forces or anticipated land uses have likely changed since the inception of the remedy selection and remedy endpoint negotiation stages. At this stage, those early assumptions are reassessed with a view towards whether or not current practices, spend rates, cleanup goals, and cleanup timeframes are aligned with today's view of the most economically beneficial use of the property.

CONCEPTUAL SITE MODELS. Each step of remedy implementation and each round of environmental data provide incrementally more information about the true nature, extent, transport, and fate of environmental contaminants. In addition, new tools like Environmental Sequence Stratigraphy (ESS) can bring fresh insight to existing geologic data, and High-

Key AECOM Attributes

- **Our Data Scientists** use a suite of fit-for-purpose tools to cost-effectively and efficiently perform data analytics to understand the underlying data trends, allowing our experts to gain insights into the performance of remediation systems rather than just managing the data
- **AECOM's Risk Assessment Team** seeks to develop risk-based solutions to protect human health and the environment, while minimizing cost
- **Environmental Sequence Stratigraphy** addresses subsurface uncertainties by defining permeable layers based on depositional environment and associated vertical grain-size patterns
- **Green & Sustainable Remediation** utilizes green/sustainable remediation approaches, allowing for evaluation of remedial actions to minimize impact and to identify optimal solutions. One example is our expertise in assessing and implementing Natural Source Zone Depletion (NSZD) of petroleum impacted sites. We also proudly sponsor Sustainable Remediation Forum (SURF)
- **University Collaboration** with University of California, Los Angeles and University of Georgia on remedial treatment technologies for emerging contaminants
- **High Resolution Site Characterization** streamlines the remedial process, easily updating the CSM as new data are collected, making approaches more efficient and effective
- **AECOM's Treatability Study Lab** provides cost-competitive options for performing batch and column treatability studies and physical treatment approaches across the U.S.
- **Full-Service System Construction and Operations** allow for start-to-finish services and use of innovative and conventional technologies to expedite cleanup projects for soil, sediment and groundwater impacts
- **AECOM Field Services**, augmented with remediation experts, provides a cost-effective and technically strong solution for portfolio O&M

Remediation Process Optimization *(continued)*

architecture and transport zones. These tools can bring great clarity to – perhaps – years' worth of monitoring and system operating data and help to powerfully direct remedial decision making towards optimal site solutions.

REMEDY PERFORMANCE. Is the remedy functionally performing as it was intended? Based on actual operating data, can fewer wells be operated or at a lower rate to affect the necessary hydraulic control to the site? Is the designed hydraulic capture zone still necessary given an improved understanding of subsurface conditions or plume shrinkage over time? Mechanically, have concentrations dropped such that unit operations can be taken off line? Operationally, can technical advances like telemetry or tools based on automated data collection or portable electronics be used to reduce operational labor? In addition, is actual remedy operating data aligned with project goals? Or has an operating system demonstrated functionally that initial regulatory or project endpoints are not attainable in the timeframes initially projected? These questions and others can be used to locate areas where remedy performance can be optimized.

REMEDY COST-EFFECTIVENESS. For example, are electrical demands and/or cost per unit of waste treated rising? How do actual labor hours being expended compare to the projected level of effort? Is the system or a major unit operation near the end of its operational lifecycle? Functional inefficiencies brought to light means opportunities for optimizing remedy deployment.

REMEDY OPTIMIZATION. Is the remedy focused on addressing zones with the greatest contaminant mass flux? Can the number of points or monitoring frequency be reduced, or can passive sample collection be used? Can reductions in subsurface contaminant mass or extent be leveraged to reduce pumping rates or pumping locations? Does an evaluation of annual operating costs versus annual contaminant mass removal, through the operating lifespan of the remedial system, demonstrate growing inefficiencies and loss of effectiveness? Should the remedial objectives be renegotiated or land use restrictions be considered? Does it make sense to target a persistent source area? Or to shut down a portion of the remedy to implement MNA?

Sites that can benefit the most from an RPO evaluation include:

- Sites with persistent contaminant sources
- "Asymptotic" subsurface contaminant concentrations or system inlet concentrations
- Sites with complex hydrogeology or geochemistry that limit the effectives of the response action
- Sites for which regulatory negotiations or remedy deployment decisions that date back to a period of time greater than 10 years ago
- Sites where operating data are indicating remedial cleanup goals will not be met within time horizons of about 10 years into the future
- Sites that are conducive to risk-based closures

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