

2023 Battelle Sediments Conference
C5. Remedy Cost Allocation Considerations and Alternative Financial Models
Wednesday, January 11, 2023
5:45pm - 7:00pm

Identifying and Managing Uncertainty in Environmental Response Costs at Sediment Sites

Background/Objectives. There is an extremely wide range in the costs to characterize and remediate sediment sites. Some sites may have costs of less than \$10 million, while others, such as certain National Priorities List sites, may have costs in excess of \$1 billion. Predicting where exactly the costs for any given site may land within this wide spectrum is inherently uncertain, and estimating a single discrete cost value without rigorous evaluation of uncertainty may result in a misleading or inaccurate estimate.

Examples of the types of uncertainty associated with sediment sites that may effect costs include the following:

- The nature, extent, and degree of contamination
- Regulatory changes and the feasibility of achieving regulatory criteria
- Remedy scope, timing, and duration
- Advances in remediation technology
- The need for contingent remediation
- Property owner negotiation or property purchases
- 3rd party issues, *e.g.*, Natural Resource Damages, business interruption claims, community involvement, involvement of multiple Potentially Responsible Parties

Additionally, uncertainty may be introduced during the cost estimation process itself. For example, cost volatility, cost escalation, and discount rate assumptions impact cost, even if the response action scope and timing does not change.

Approach/Activities. This presentation will discuss some of the key factors that create scope uncertainty as well as cost uncertainty in environmental response costs at sediment sites. The presentation will then discuss how probabilistic methods can be used to manage the uncertainty inherent to estimating environmental response costs at sediment sites. We will demonstrate how two generally accepted probabilistic methods – 1) decision trees; and 2) stochastic (Monte Carlo) modeling techniques – may be used to prepare a more robust and defensible cost estimate.

Results/Lessons Learned. In developing a cost estimate, one must assume not only what contingent future events will occur, and how likely those events are, but also how much they will cost. Probabilistic methods provide a framework to quantify and manage these uncertainties. Instead of relying on a single discrete cost realization (*i.e.*, a subjective "best estimate"), probabilistic methods provide a mechanism to build uncertainty within the framework of the estimate itself by accounting for many cost realizations. This is particularly relevant at complex sediment sites, where, over the course of years-long characterization and remediation, there may be fundamental changes to the initial understanding of the work. The use of probabilistic models allows for adaptive and responsive results as conditions change.