

Return on Investigation through Smart Characterization of Mass Flux

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Background/Objectives. The best remediation strategy begins with a new approach to site investigation. Traditional site investigation methods assume a uniformity of conditions in the subsurface, and the result is a conceptual site model based on a relatively small dataset collected from a monitoring well network. Because monitoring wells simply report contaminant concentrations, rather than mass flux, the monitoring well dataset fails to provide the information necessary to accurately evaluate potential risks and liabilities or understand likely clean-up timeframes.

Approach/Activities. We recommend the Smart Characterization approach, which relies on a mass-flux based conceptual site model. By classifying the subsurface into transport, slow advection, and storage zones, we can tailor characterization approaches based on the mass transport behavior. These Smart Characterization methods integrate dynamic, real-time, high-density soil and groundwater sampling with hydrostratigraphic interpretations and permeability mapping in three-dimensions. Because they collect very large volumes of data, the Smart Characterization methods also require a new approach to building and using conceptual site models, as the mass flux datasets quickly overwhelm any traditional approach to evaluating and communicating the data. We are now developing three-dimensional *digital CSMs* using cloud-based or application-based tools, which allow stakeholders to understand all the data underlying the CSM, and can be used to streamline reporting process. The digital CSM is used to communicate the results to stakeholders, and is linked with a business decision framework we call Return On Investigation, or ROI. When applied correctly, Smart Characterization methods result in an ROI through reduced total cost of remediation, better definition of uncertainty and risk, and understanding achievable endpoints before remediation commences.

Results/Lessons Learned. Several case studies will be presented to clearly demonstrate the value of Smart Characterization over a traditional approach, including examples where monitoring wells were missing a significant VOC plume, and high-resolution NAPL mapping to support natural source zone depletion.