SERDP Strategic Environmental Research and Development Program

Predicting DNAPL Source Zone and Plume Response Using Site-Measured Characteristics

Environmental Restoration
ER-1613

Background:

The difficulty and expense associated with source-zone and plume characterization of dense nonaqueous phase liquid (DNAPL) represents a challenge at Department of Defense (DoD)-contaminated sites. Identification of cost-effective remedial options that decrease human health and ecological risks, provide regulatory compliance, and minimize the need for long-term stewardship is a priority. Predicting the relationship between DNAPL source-zone changes and down-gradient plume response is critical to making informed site management decisions—especially those related to remedial actions. Thus, it is vital that source zone and plume characterization be conducted within a framework that is consistent with appropriate predictive models.

Objective:

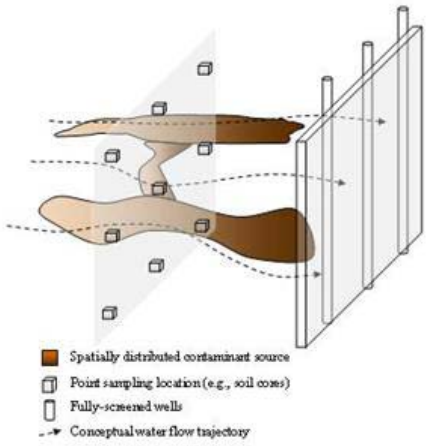
The objective of this project is to demonstrate effective field-scale approaches that forge linkages between characterization, prediction, and decision making at DNAPL sites.

Process/Technology Description:

This project will develop source-strength functions, using existing historical site data supplemented with limited flux- and core-based sampling, for site management purposes. Based on "a priori" characterization of the source zone architecture, researchers also will extend the ability to predict DNAPL source depletion through dissolution to the field-scale. Additionally, this project will characterize near-source plume response to source-mass depletion to provide the understanding needed to predict long-term plume responses and to link characterization of the near-source, short-term responses to likely long-term behavior of the dissolved plume. The knowledge gained from the field site data and experiments will be synthesized to provide guidance on the recommended level of source zone characterization needed to adequately predict source-strength functions and plume response.

Expected Benefits:

Cost-effective approaches to DNAPL site characterization will allow DoD users and site managers to more accurately assess the benefits of costly aggressive source zone treatment technologies. In addition, the accurate assessment of near-source flux changes and the magnitude of "back diffusion" expected will help DoD by avoiding costly remedial efforts with inadequate benefits. Also, guidelines will be produced on site characterization to provide an established methodology for defining the source strength function and how it defines predicted plume responses. (Anticipated Project Completion - 2012)



Source Characterization Using Tracers and Cores

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