Technology Screening and Remedy Selection at Large-Scale, Complex DNAPL Sites: Orica Botany Case Study

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Background/Objectives. "Complex" sites, with large releases in heterogeneous subsurface environments, may present technical and institutional challenges that result in lengthy delays between discovery and implementation of a remedy, and even longer delays in achieving remedial action objectives defined by "restoration," the remedial goal where groundwater is a potential source of drinking water. The technical barriers to aquifer restoration at "complex sites" are now well established, where complex sites are defined by the magnitude of the release, the types of contaminants, and the geologic environment. At these sites, restoration in a reasonable timeframe is unlikely regardless of the remedial technologies applied, and a critical management decision during the remedy selection process is to identify appropriate short- and long-term objectives and appropriately screen remedial technologies in consideration of these objectives. This presentation uses the Orica Botany Groundwater Cleanup Project as a case study to discuss the linkage between remedial goals and remedy selection and the practice of periodically revisiting project objectives to consider remedial modifications based on current site conditions and advances in the state of remediation technologies.

Approach/Activities. At the Orica Botany site, remedial action objectives were developed to contain and remediate constituents of potential concern (COPCs) in groundwater. Specific objectives included monitoring COPC discharge to Botany Bay and Penrhyn Estuary, plume containment, and identification and removal of DNAPL source zones to the extent practicable. A modeling and cost analysis of source zone remediation approaches was conducted in 2007 and concluded that (1) source remediation was likely to result in only limited reductions in the duration of site cleanup, and (2) full-scale application of the most promising source remediation technologies was highly expensive with uncertain prospects for success. Based on the site objectives and analysis of source remediation options, a groundwater extraction and treatment remedy was selected for the site in 2007. As part of the remedy selection, alternative remedial technologies have been piloted at the site since 2007 and an external panel of experts is convened every three years to evaluate progress of the remedy.

Results/Lessons Learned. Monitoring results collected to date suggest that the Botany remedy has been effective with respect to plume containment and mitigating potential COPC discharge to Botany Bay and Penrhyn Estuary. In addition, natural depletion of CVOC sources since 2007 has exceeded expectations, suggesting the decision at the time to not immediately pursue source area remediation was appropriate. Although no transformative remedial approaches have been identified in the periodic reviews completed since 207, the ongoing work to assess alternative approaches has resulted in a wealth of knowledge on natural source zone depletion rates and other factors that will inform future remedy modifications.