

## **Large Diffuse Plume Alternative Approach to Pump & Treat/MCLs: A Sustainable Plume Management Approach Using the Arizona WQARF Model**

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**Background/Objectives.** Many sites impacted with recalcitrant chemicals have completed assessment and feasibility studies and implemented groundwater remedies over the past 30-plus years under the jurisdiction of federal, state, and local regulatory agencies. The basis for deeming remedy completion on these sites is achieving published regulatory cleanup values such as Maximum Contaminant Levels (MCLs). While many small sites often meet these remedial objectives cost-effectively, large-scale groundwater plumes (greater than a half mile in length) pose a significant challenge for remedial technology selection, and as a result, typically default to implementing a pump and treat approach for plume containment. A review of large-scale Environmental Protection Agency (EPA) Superfund site cases indicate that after 20+ years of treatment, over 95 percent have not achieved MCLs, continue to have large diffuse plumes, and pose little to no current human health or ecological risk yet are not likely to achieve MCLs after an additional 25 years of treatment and hundreds of millions of dollars in cost. Further, the current administration has charged EPA with accelerating the cleanup and removal of sites from the National Priorities List, which currently stands at 1,336 sites.

**Approach/Activities.** The State of Arizona, faced with numerous large-scale “orphan” groundwater impact sites and escalating cleanup costs, understood the taxpayer cost and time implications of using conventional MCL-based remedial goals. Working in cooperation with EPA, local agencies, and community members, the State of Arizona developed an alternative resource-focused, protective, cost-effective, and sustainable statute under their Water Quality Assurance Revolving Fund (WQARF), which focuses on human health protection primarily through groundwater management, as opposed to conventional groundwater restoration “throughout the plume.” This innovative approach replaces the pseudo-default of complete groundwater restoration to MCLs with a three-pronged approach that ensures protection of human health and environment by managing impacted groundwater by a “restoration, replacement, or otherwise provide for” approach. A traditional feasibility study approach is used to evaluate the most reasonable and practicable groundwater approach and may include both the traditional remedial “strategies” such as source area remediation, groundwater restoration, and hydraulic control and/or the remedial groundwater management “measures” such as wellhead treatment, well deepening or replacement, and water replacement to address the needs of impacted water providers in an efficient manner.

**Results/Lessons Learned.** To date, this approach has been successfully applied to a handful of large, complex plumes in Arizona, saving tens of millions of dollars, ensuring public safety, and providing a more sustainable model for other agencies to consider. This approach also facilitates all 2017 EPA Superfund Task Force recommendations, including: expediting cleanup and remediation; re-invigorating responsible party cleanup and reuse; encouraging private investment; promoting redevelopment and community revitalization; and engaging partners and stakeholders.