

Report: Cleanup of some contaminated groundwater sites unlikely for decades

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At least 126,000 sites across the U.S. have contaminated groundwater that requires remediation, and about 10 percent of these sites are considered "complex," meaning restoration is unlikely to be achieved in the next 50 to 100 years due to technological limitations, says a new report from the National Research Council. The report adds that the estimated cost of complete cleanup at these sites ranges from \$110 billion to \$127 billion, but the figures for both the number of sites and costs are likely underestimates.

Several national and state groundwater cleanup programs developed over the [last three decades](#) under various federal and state agencies aim to mitigate the human health and [ecological risks](#) posed by underground contamination. These programs include cleanup at Superfund sites; facilities that treat, store, and dispose of hazardous wastes; leaking underground storage tanks; and federal facilities, such as military installations. The U.S. Department of Defense has already spent approximately \$30 billion in hazardous waste remediation to address past legacies of its industrial operations. DOD sites represent approximately 3.4 percent of the total active remediation sites, but many of these sites present the greatest technical challenges to restoration with very high costs. Therefore, the agency asked the National Research Council to examine the future of groundwater remediation efforts and the challenges facing the U.S. Army and other responsible agencies as they pursue site closures.

"The complete removal of contaminants from groundwater at possibly

thousands of complex sites in the U.S. is unlikely, and no technology innovations appear in the near time horizon that could overcome the challenges of restoring contaminated groundwater to drinking water standards," said Michael Kavanaugh, chair of the committee that wrote the report and a principal with Geosyntec Consultants, Inc. in Oakland, Calif. "At many of these complex sites, a point of diminishing returns will often occur as contaminants in groundwater remain stalled at levels above drinking water standards despite continued active remedial efforts. We are recommending a formal evaluation be made at the appropriate time in the life cycle of a site to decide whether to transition the sites to active or passive long-term management."

The estimated range of remediation costs do not account for technical barriers to complete cleanup at complex sites or the costs of cleanup at future sites where groundwater may become contaminated, the committee said. A substantial portion of the costs will come from public sources as some of complex sites are "orphan" sites and many other complex sites are the responsibility of federal or state agencies.

The committee said that the nomenclature for the phases of site cleanup and cleanup progress are inconsistent among public and private sector organizations, which could confuse the public and other stakeholders about the concept of "site closure." For example, many sites thought of as "closed" and considered "successes" still have contamination and will require continued oversight and funding over extended timeframes in order to maintain protectiveness, including 50 percent of the contaminated groundwater sites evaluated by the committee that have been deleted from the Superfund list. More consistent and transparent terminology that simply and clearly explains the different stages of cleanup and progress would improve communication with the public.

"The central theme of this report is how the nation should deal with those sites where residual contamination will remain above levels needed

to achieve restoration," Kavanaugh stated. "In the opinion of the committee, this finding needs to inform decision making at these complex sites, including a more comprehensive use of risk assessment methods, and support for a national research and development program that leads to innovative tools to ensure protectiveness where residual contamination persists. In all cases, the final end state of these sites has to be protective of human health and the environment consistent with the existing legal framework, but a more rapid transition will reduce life-cycle costs. Some residual contamination will persist at these sites and future national strategies need to account for this fact."

The committee said that if a remedy at a site reaches a point where continuing expenditures bring little or no reduction of risk prior to attaining drinking water standards, a reevaluation of the future approach to cleaning up the site, called a transition assessment, should occur. The committee concluded that cost savings are anticipated from timelier implementation of the transition assessment process but funding will still be needed to maintain long-term management at these complex sites.

Provided by National Academy of Sciences

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