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Alternatives for Managing the Nation's Complex Contaminated Groundwater Sites (2012)

Water Science and Technology Board (<http://dels.nas.edu/wstb/>)

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Across the United States, thousands of hazardous waste sites are contaminated with chemicals that prevent the underlying groundwater from meeting drinking water standards. These include Superfund sites and other facilities that handle and dispose of hazardous waste, active and inactive dry cleaners, and leaking underground storage tanks; many are at federal facilities such as military installations. While many sites have been closed over the past 30 years through cleanup programs run by the U.S. Department of Defense, the U.S. EPA, and other state and federal agencies, the remaining caseload is much more difficult to address because the nature of the contamination and subsurface conditions make it difficult to achieve drinking water standards in the affected groundwater. This report estimates that at least 126,000 sites across the U.S. still have contaminated groundwater, and their closure is expected to cost at least \$110 billion to \$127 billion. 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. At sites where contaminant concentrations have plateaued at levels above cleanup goals despite active efforts, the report recommends evaluating whether the sites should transition to long-term management, where risks would be monitored and harmful exposures prevented, but at reduced costs.

At a webinar held in December 2012, Michael Kavanaugh, chair of the report-authoring committee, presented the report's findings and, along with other committee members, answered questions from the public. Click here to access a recording of the webinar. (<https://nasevents.webex.com/nasevents/lr.php?AT=pb&SP=EC&ID=6159132&rKey=31ee5aaf93dc5dd4>) A PDF of the presentation given at the webinar is available to download here. (<http://dels.nas.edu/resources/static-assets/materials-based-on-reports/presentations/wstb-groundwater-webinar-presentation.pdf>)

Key Messages

- At least 126,000 sites across the country have residual contamination at levels preventing site closure, and this number is likely an underestimate. About 10 percent of the 126,000 sites are estimated to be complex from a hydrogeological and contaminant perspective. No information is available on the total number of sites with contamination in place above levels allowing for unlimited use and unrestricted exposure, although the total is certainly greater than 126,000.
- Approximately ten percent of Superfund facilities affect or significantly threaten public water supply systems, but similar information from other programs is largely unavailable.
- The estimated "cost to complete" for sites that have not reached closure is \$110-127 billion. This number is highly uncertain and likely to be an underestimate of future liabilities.

Related Resources

Video

[\(/Materials/Videos/Contaminated-Groundwater?bname=\)](#)

About this Report

Primary Board:

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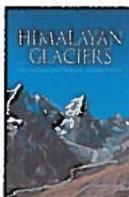
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- For the suite of currently available remedial technologies, significant limitations persist that make widespread achievement of drinking water standards unlikely at most complex groundwater sites in 50–100 years.
- There are limited data with which to compare remedial technology performance. Additional independent reviews of remedial technologies are needed to summarize their performance under a wide range of site characteristics.
- As our understanding of chemical toxicity and dose-response relationships evolves, there could be changes in drinking water and indoor air standards for important contaminants, such as the solvent TCE. Such changes could potentially lead to determinations that existing remedies at some hazardous waste sites are no longer protective of human health and the environment.
- Consideration of the vapor intrusion pathway is needed at all sites where volatile organic chemicals (VOCs) are present in the soil or groundwater aquifer. As a precaution, vapor mitigation could be built into all new construction on or near known VOC groundwater plumes.
- At many complex sites where the effectiveness of site remediation has reached a point of diminishing returns prior to reaching cleanup goals, the transition to passive management (like monitored natural attenuation or MNA) should be considered using a formal evaluation called a Transition Assessment.
- Cost savings are anticipated from implementation of the Transition Assessment *but funding will still be needed to maintain long-term management at these complex sites.*
- New research is needed in many areas to support the shift to long-term management of complex sites, including remediation technology development, tools to better assess vapor intrusion and MNA, and modeling that can incorporate back-diffusion and desorption. Overall research and development have been unable to keep pace with the needs of practitioners trying to conduct remediation on complex sites.

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Build the Best. **Be the Best.**



Southwest Groundwater Treatment Plant

A HOCHTIEF Company

Owner

Jordan Valley Water Conservancy District

Location

West Jordan, UT

Value

\$23,600,000

Market

Water/Wastewater

Start - Completion Dates

11/2009 - 3/2012

- 7 million gallons-per-day reverse osmosis treatment plant
- Construction of 35,000-square-foot process building
- Three reverse osmosis trains and one bypass train utilizing ultraviolet light disinfection technology for water treatment

Project Description

Flatiron is constructing a groundwater reverse osmosis treatment plant in West Jordan, Utah, a suburb of Salt Lake City, next to the Jordan River. Reverse osmosis is a thorough method of water purification that reduces the levels of total dissolved solids and chemical impurities by using pressure to force water through a membrane.

The municipal plant will consist of a 35,000 square-foot process building, three reverse osmosis trains and one bypass train utilizing ultraviolet light disinfection technology, and will process 7 million gallons of water per day. The construction of separate treatment trains is necessary to incorporate deep and shallow groundwater wells, supply wells, pipelines, a byproduct disposal system and associated facilities.

When the reverse osmosis treatment plant is completed in 2012, the Jordan Valley Water Conservancy District anticipates future expansion to increase the plant's capabilities from 7 million gallons per day to 14 million gallons per day.

Company Role

Flatiron is the prime contractor.



TABLE 5-1 Select Natural Resource Damage Settlements

Site	Impacts	NRD Action and Amount
Kennecott Utah Copper mining site in West Jordan Valley, UT	Surface and groundwater southwest of Salt Lake Valley contaminated by metals from mining	<ol style="list-style-type: none"> 1. Kennecott paid \$37 million (\$9 million plus letter of credit for up to \$28 million). 2. Extracted and treated high metals concentration portion of groundwater plume (i.e., performed more remediation than might be required by a CERCLA remedial action). 3. Conveyed 617 acres of land to The Nature Conservancy to resolve its liability for NRD (331 acres and an additional ~286 acres of land as a donation) and paid TNC \$175,000 for the purpose of preserving and managing such land. 4. The final restoration plan is to construct two drinking water treatment plants using reverse-osmosis technology, provide a minimum of 8,235 acre feet per year of drinking water, contain the spread of contamination in the deep aquifer and remediate it within the "affected area," and integrate the CERCLA remedial response with the NRD Consent Decree provisions.
Ensign-Bickford Trojan Facility, Utah	Explosives manufacturing allegedly created a groundwater plume extending approximately three miles from the plant	Ensign-Bickford paid Utah \$2.58 million to replace the water that would have been available had the groundwater not been contaminated.
Six landfills near Bloomington, Indiana	Groundwater contamination	CBS Corp. paid the Interior Department \$1.88 million to restore natural resources that have been injured by ongoing releases of PCBs from the six sites.
South Valley Superfund facility, Albuquerque, NM	Groundwater contamination	New Mexico sought nearly \$1.2 billion in damages from General Electric, but the 10th circuit court of appeals dismissed the state's claim in part because they had difficulty envisioning any significant loss-of-use damage.