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# Abstract

This report presents the results of groundwater and vadose zone monitoring and remediation for fiscal year 2003 (October 2002 through September 2003) on the U.S. Department of Energy's Hanford Site, Washington.

The most extensive contaminant plumes in groundwater are tritium, iodine-129, and nitrate, which all had multiple sources and are very mobile in groundwater. The largest portions of these plumes are migrating from the central Hanford Site to the southeast, toward the Columbia River. Concentrations of tritium, nitrate, and some other contaminants continued to exceed drinking water standards in groundwater discharging to the river in some locations. However, contaminant concentrations in river water remained low and were far below standards.

Carbon tetrachloride and associated organic constituents form a relatively large plume beneath the central part of the Hanford Site. Hexavalent chromium is present in smaller plumes beneath the reactor areas along the river and beneath the central part of the site. Strontium-90 exceeds standards beneath all but one of the reactor areas, and technetium-99 and uranium are present in the 200 Areas. Uranium exceeds standards in the 300 Area in the south part of the Hanford Site. Minor contaminant plumes with concentrations greater than standards include carbon-14, cesium-137, cis-1,2-dichloroethene, cyanide, fluoride, plutonium, and trichloroethene.

Monitoring for the *Comprehensive Environmental Response, Compensation, and Liability Act* is conducted in 11 groundwater operable units. The purpose of this monitoring is to define and track plumes and to monitor the effectiveness of interim remedial actions. Interim groundwater remediation in the 100 Areas continued with the goal of reducing the amount of chromium (100-K, 100-D, and 100-H) and strontium-90 (100-N) reaching the Columbia River. The objective of two interim remediation systems in the 200 West Area is to prevent the spread of carbon tetrachloride and technetium-99/uranium plumes.

*Resource Conservation and Recovery Act* groundwater monitoring continued at 24 waste management areas during fiscal year 2003:

- 15 under interim or final status detection programs and data indicate that they are not adversely affecting groundwater
- 7 under interim status groundwater quality assessment programs to assess contamination
- 2 under final status corrective-action programs.

During calendar year 2003, drillers completed seven new RCRA monitoring wells, nine wells for CERCLA, and two wells for research on chromate bioremediation.

Vadose zone monitoring, characterization, and remediation continued in fiscal year 2003. Remediation and associated monitoring continued at a soil-vapor extraction system in the 200 West Area, which removes gaseous carbon tetrachloride from the vadose zone. Soil vapor also was sampled to locate carbon tetrachloride sites with the potential to impact groundwater in the future. DOE uses geophysical methods to monitor potential movement of contamination beneath single-shell tank farms. During fiscal year 2003, DOE monitored selected boreholes within each of the 12 single-shell tank farms. In general, the contaminated areas appeared to be stable over time. DOE drilled new boreholes at the T Tank Farm to characterize subsurface contamination near former leak sites.

The System Assessment Capability is a set of computer modules simulating movement of contaminants from waste sites through the vadose zone and groundwater. In fiscal year 2003, it was updated with the addition of an atmospheric transport module and with newer versions of models including an updated groundwater flow and transport model.

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This report is available on the Internet through the Groundwater Performance Assessment Project's web site: <http://groundwater.pnl.gov/>. Inquiries regarding this report may be directed to Ms. Mary J. Hartman, Pacific Northwest National Laboratory, P.O. Box 999, Richland, Washington 99352 or by electronic mail to [mary.hartman@pnl.gov](mailto:mary.hartman@pnl.gov).