

Abstract

The U.S. Department of Energy's Hanford Site in southeastern Washington State was a weapons production facility from 1943 until the 1980s. During operations, process chemicals and radioactively contaminated water were released to the soil and migrated through the vadose zone to the groundwater. Since 1989, the primary mission at the Hanford Site has been remediation of the site, including the groundwater. This report presents the results of groundwater monitoring at the Hanford Site during the 12-month period from January 1, 2010, through December 31, 2010, and is produced for the U.S. Department of Energy. The results of ongoing groundwater remediation activities and vadose zone characterization and monitoring results are summarized, and the status of well drilling, maintenance, and decommissioning is provided.

This report meets the annual reporting requirements for *Resource Conservation and Recovery Act of 1976* (RCRA) groundwater monitoring at 24 waste management areas:

- Fourteen waste management areas under interim or final status contaminant indicator evaluation or detection monitoring programs, with the objective of determining whether these units have adversely affected groundwater
- Eight waste management areas under interim status groundwater quality assessment programs to assess the rate and extent of contaminant migration
- Two waste management areas under final status corrective action programs.

Results of monitoring for RCRA indicated that one additional site, the single-shell tank Waste Management Area A-AX Tank Farms, will be monitored under a groundwater quality assessment program due to the impact of dangerous constituents to groundwater from the unit. Groundwater flow evaluations have continued in the 200 East Area, where the hydraulic gradient is extremely low, and the existing groundwater networks are currently believed to be capable of meeting monitoring requirements. The monitoring network at Low-Level Waste Management Area 3 in 200 West Area is not currently compliant because there is no upgradient well; however, a new upgradient well is planned for installation in 2011.

Monitoring for the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* is conducted in twelve groundwater interest areas. The purpose of this monitoring is to define and track plumes and to monitor the effectiveness of remedial actions. One groundwater operable unit in the southern portion of the Hanford Site, the 1100-EM-1 Operable Unit, was previously removed from the National Priorities List (40 CFR 300, Appendix B) because final remediation goals were reached. Interim groundwater remediation in the 100-K, 100-D, and 100-H Areas, using a combination of pump-and-treat and in situ methods, continued to reduce the amount of chromium reaching the Columbia River. An in situ treatment system for sequestering or immobilizing strontium-90 is being used in the 100-N Area. A pump-and-treat system for technetium-99 and uranium in the 200-UP-1 Operable Unit, near the 216-U-1/2 Cribs in the 200 West Area, operated during the reporting period, as did a pump-and-treat system near Waste Management Area T in the 200-ZP-1 Operable Unit. A pump-and-treat system for the capture of carbon tetrachloride in the upper aquifer, also located in the 200-ZP-1 Operable Unit (west of Waste Management Area TX-TY), operated for most of the reporting period.

Groundwater contaminant plumes underlie an area of ~186 square kilometers at concentrations exceeding one or more drinking water standards. The largest groundwater plumes with concentrations above background are tritium, iodine-129, and nitrate. These contaminants originate from multiple sources. The largest plumes

extend from the Hanford Site's Central Plateau to the southeast, toward the Columbia River, with maximum concentrations within the plumes generally declining. Carbon tetrachloride and associated organic constituents form a large plume that exceeds drinking water standards beneath the west-central portion of the site, originating in the 200 West Area. Other constituents forming significant plumes exceeding drinking water standards are hexavalent chromium, strontium-90, technetium-99, and uranium. These constituents exist beneath the reactor areas along the Columbia River and beneath the west-central portion of the site, as well as the Central Plateau and the 300 Area. Small contaminant plumes with concentrations greater than their respective drinking water standards include carbon-14, cesium-137, cis-1,2-dichloroethene, cyanide, fluoride, plutonium, sulfate, and trichloroethene.

Levels of some contaminants exceed drinking water standards in water samples collected from aquifer sampling tubes along the Columbia River shore. The greatest exceedances were strontium-90 in the 100-N Area, chromium in the 100-D Area, and uranium in the 300 Area.

Highlights for the reporting period include the following:

- Release of the draft remedial investigation/feasibility study and proposed plan documents for the 200-UP-1 Operable Unit within the Central Plateau, meeting Milestone M-015-17A of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al., 1989)
- Expansion of pump-and-treat systems for chromium remediation in the 100-D and 100-H Areas
- Optimization of pump-and-treat systems for chromium remediation in the 100-K Area
- Submittal of the draft treatability test plan, *Treatability Test Plan for the 200-BP-5 Groundwater Operable Unit* (DOE/RL-2010-74), to the U.S. Environmental Protection Agency, completing Tri-Party Agreement Milestone M-015-082
- Approval and issuance of remedial investigation/feasibility study work plans and initiation of field studies in the 100 and 300 Areas.

During the reporting period, drillers completed 282 new wells for monitoring, remediation, or characterization. One hundred eighty-two soil tube well installations were decommissioned (filled with grout).

This report is available on the Internet through the Hanford Site Soil and Groundwater Remediation Project (<http://www.hanford.gov/rl/?page=1334&parent=1333>).