PNNL-14111

Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

Fiscal Year 2003 Integrated Monitoring Plan for the Hanford Groundwater Monitoring Project

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P. E. Dresel
J. W. Lindberg
J. P. McDonald
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November 2002

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RL01830

PACIFIC NORTHWEST NATIONAL LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC06-76RL01830

Printed in the United States of America

Available to DOE and DOE contractors from the
Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831;
prices available from (615) 576-8401.

Available to the public from the National Technical Information Service,
U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161

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Summary

Groundwater is monitored at the Hanford Site to fulfill a variety of state and federal regulations: the *Atomic Energy Act of 1954* and its implementing orders, the *Resource Conservation and Recovery Act*, the *Comprehensive Environmental Response, Compensation, and Liability Act*, and Washington Administrative Code. Separate monitoring plans are prepared for various requirements, but sampling is coordinated and data are shared among users to avoid duplication of effort. The U.S. Department of Energy manages these activities through the Hanford Groundwater Monitoring Project.

This document is an integrated monitoring plan for the groundwater project. It documents well and constituent lists for monitoring required by the *Atomic Energy Act of 1954* and its implementing orders, includes other established monitoring plans by reference, and appends a master well/constituent/frequency matrix for the entire site.

The objectives of monitoring fall into three general categories: plume and trend tracking, treatment/storage/disposal unit monitoring, and remediation performance monitoring. Criteria for selecting wells, constituents, and sampling frequencies for the latter two categories are documented in site-specific plans. Criteria for selecting *Atomic Energy Act of 1954* monitoring networks include locations of wells in relation to known plumes or contaminant sources, well depth and construction, historical data, proximity to the Columbia River, water supplies, or other areas of special interest and well use for other programs. Constituent lists were chosen based on known plumes and waste histories, historical groundwater data, and, in some cases, statistical modeling. Sampling frequencies were based on regulatory requirements, variability of historical data, and proximity to key areas. For sitewide plumes, most wells are sampled every 3 years. Wells monitoring specific waste sites or in areas of high variability will be sampled more frequently.

A total of 744 wells, aquifer tubes, and seeps are scheduled to be sampled in fiscal years 2003, 2004, or 2005 for surveillance or long-term *Comprehensive Environmental Response, Compensation, and Liability Act* monitoring. A total of 1,278 wells are scheduled to be sampled in fiscal years 2003, 2004, or 2005 for all programs combined.

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1.0 Introduction

Groundwater is monitored in hundreds of wells at the Hanford Site to fulfill a variety of requirements. Separate monitoring plans are prepared for various requirements, but sampling is coordinated and data are shared among users. The U.S. Department of Energy (DOE) manages these activities through the Hanford Groundwater Monitoring Project ("groundwater project"), which is the responsibility of Pacific Northwest National Laboratory (PNNL). The groundwater project integrates monitoring for various objectives into a single sampling schedule to avoid redundancy of effort and to improve efficiency of sample collection. Some monitoring is required to meet the objectives of projects managed by other site contractors such as monitoring to assess performance of groundwater remediation associated with active facilities. These requirements are transmitted to PNNL for inclusion in the integrated monitoring plan.

This document is an integrated monitoring plan for the groundwater project and contains: well and constituent lists for monitoring required by the *Atomic Energy Act of 1954* and its implementing orders ("surveillance monitoring") and a master well/constituent/frequency matrix for the entire Hanford Site. This plan references other established plans for *Resource Conservation and Recovery Act* (RCRA), *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), and state permits. Sampling requirements established for those plans are included in the well/constituent/frequency matrix.

Recently, monitoring required to meet objectives of the *Atomic Energy Act of 1954* has been incorporated into monitoring plans for some of the CERCLA Operable Units. This consolidation of effort is reflected in this integrated plan and further consolidation is planned for fiscal year 2003. A number of wells continue to be scheduled independently of the CERCLA monitoring plans, for example in upgradient parts of the Site. In addition, interim action performance monitoring for CERCLA remediation is defined separately and incorporated into the integrated monitoring network.

1.1 Purpose

The purpose of this plan is to describe how the groundwater project integrates various requirements for groundwater monitoring on the Hanford Site. Specific objectives of this plan are the following:

- design and describe monitoring well networks, constituent lists, sampling frequency, and quality assurance/quality control for the surveillance monitoring network; explain criteria used to design the program
- encompass RCRA, CERCLA, Washington Administrative Code (WAC) regulations, and other monitoring plans by reference
- describe the flow of information between projects and how sampling and analysis are integrated
- provide well, constituent, and sampling frequency lists for all groundwater monitoring on the site.

This plan is subordinate to the *Environmental Monitoring Plan*, *U.S. Department of Energy, Richland Operations Office* (DOE 2000a), which is required by DOE Orders. This plan describes how DOE will implement the groundwater monitoring requirements described in that document.

1.2 Objectives of Groundwater Monitoring

The environmental monitoring plan (DOE 2000a) lists the purposes and objectives of groundwater monitoring and the groundwater project. These purposes and objectives fall into three general categories: (1) plume and trend tracking, (2) monitoring of treatment/storage/disposal units, and (3) independent assessment of performance monitoring for groundwater remediation activities (Table 1.1).

Table 1.1. Objectives of Groundwater Monitoring

Plume and Trend Tracking
Determine baseline conditions of groundwater quality and quantity.
Characterize and define hydrogeologic, physical, and chemical trends in the groundwater system.
Identify existing and potential groundwater contamination sources.
Assess existing and emerging groundwater quality problems.
Evaluate existing and potential offsite impact of groundwater contaminants.
Provide data on which decisions can be made concerning land-disposal practices and management and protection of groundwater resources.
Treatment/Storage/Disposal Unit Monitoring
Demonstrate compliance with applicable regulations and orders (RCRA, WAC).
Provide data to permit early detection of groundwater pollution or contamination.
Groundwater Remediation Performance Monitoring
Provide continuing, independent assessment of groundwater remediation activities (groundwater remediation and performance monitoring were conducted by Bechtel Hanford, Inc. until June 2002, and subsequently Fluor Hanford, Inc.; groundwater project provides independent assessment).

Plume and trend tracking are the primary objectives of surveillance monitoring and of long-term CERCLA monitoring. Treatment/storage/disposal unit monitoring includes units regulated under RCRA or state codes (recently active sites), CERCLA (past-practice sites), and the *Atomic Energy Act of 1954*. Monitoring associated with groundwater remediation activities was performed by Bechtel Hanford Inc. until June 2002, and subsequently by Fluor Hanford, Inc. The groundwater project monitors and evaluates the extent of contamination in all areas of the Hanford Site and is responsible for "providing continuing, independent assessment of groundwater remediation activities" (DOE 2000a).

1.3 Organization of This Plan

A brief overview of the hydrogeology of the Hanford Site is provided in Chapter 2 as background for the remainder of the plan. Chapter 3 describes the monitoring program, with an explanation of criteria for choosing well networks, constituent lists, and sampling frequency. Chapters 4 through 10 describe the waste sites, monitoring history, and a conceptual model of the movement of contaminants for each geographic region of the site. Chapter 11 describes the sampling and analysis plan, including methods for sampling and analysis, quality assurance, and quality control. Chapter 12 describes the water-level-monitoring program; Chapter 13 describes data management, compliance issues, and reporting; followed by Chapter 14, the references cited herein.

An integrated monitoring matrix is presented in the Appendix, showing the wells to be sampled in fiscal year 2003. The appendix is updated annually.

2.0 Hydrogeology

The hydrogeology of the Hanford Site has been described in many documents (e.g., Chapter 3 in Hartman 2000). A brief summary is provided here for the reader's convenience.

The uppermost aquifer beneath most of the Hanford Site is unconfined and composed of unconsolidated to semiconsolidated sands and gravels deposited on basalt bedrock. In some areas, deeper parts of the aquifer are locally confined by layers of silt and clay. Confined aquifers occur within the underlying basalt flows and associated sedimentary interbeds. A simplified stratigraphic column is illustrated in Figure 2.1.

Groundwater in the unconfined aquifer system generally moves from recharge areas along the western boundary of the site to the east and north toward the Columbia River, which is the major discharge area. This natural flow pattern was altered by the formation of groundwater mounds created by large volumes of artificial recharge at wastewater-disposal facilities. These mounds are declining, and groundwater flow is gradually returning to earlier patterns. Figure 2.2 shows a water-table map for March 2001.

The extent of major radionuclide contaminants in groundwater in fiscal year 2001 is illustrated in Figure 2.3. Iodine-129, strontium-90, technetium-99, tritium, and uranium were present at levels above drinking water standards. Carbon-14, cesium-137, and plutonium exceeded standards in smaller areas. The extent of major hazardous chemical constituents in fiscal year 2001 is shown in Figure 2.4. The most significant of these include carbon tetrachloride, chromium, and nitrate. Arsenic, cyanide, fluoride, and trichloroethene also are elevated in smaller areas.

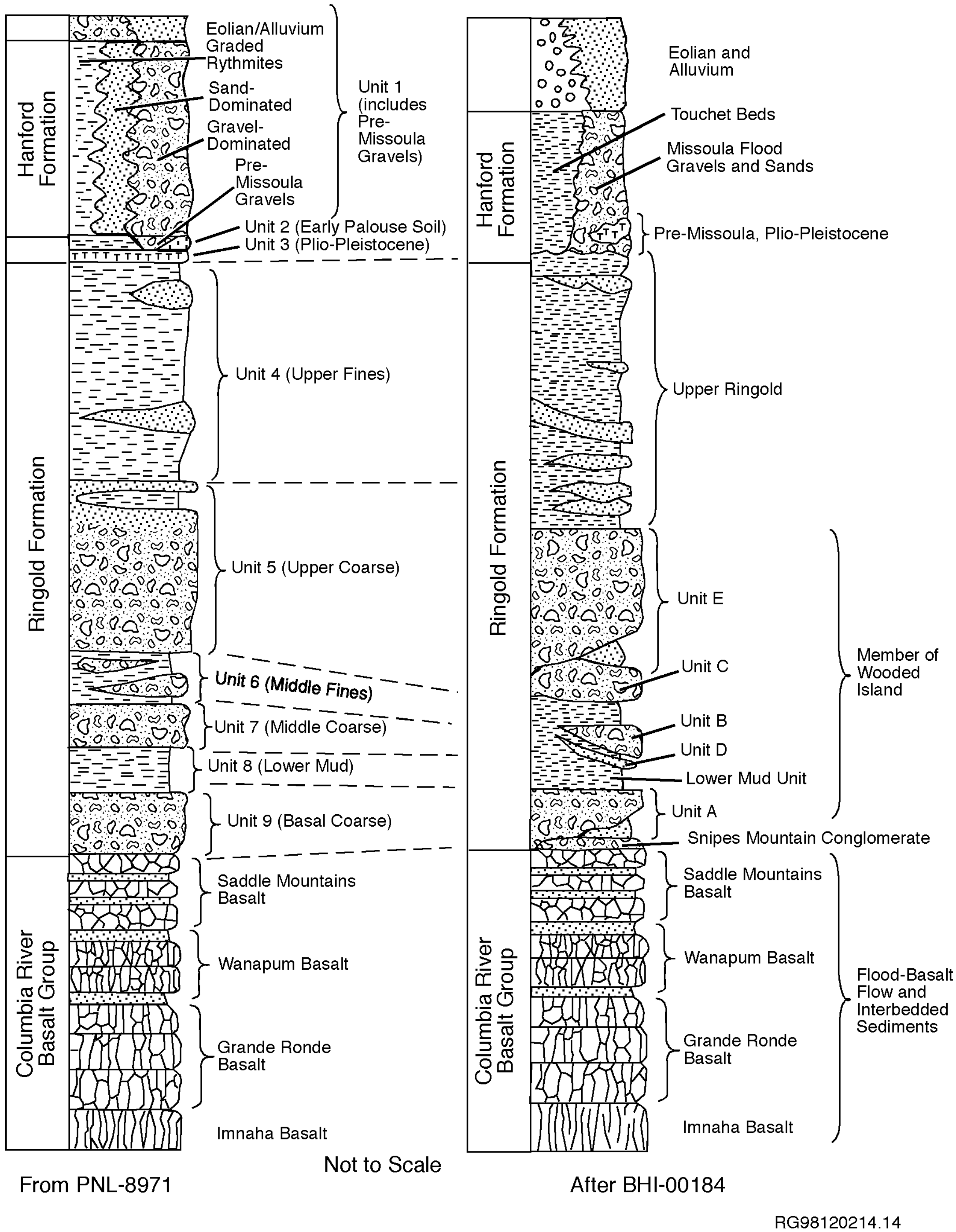

Figure 2.1. Comparison of Generalized Hydrogeologic and Geologic Stratigraphy

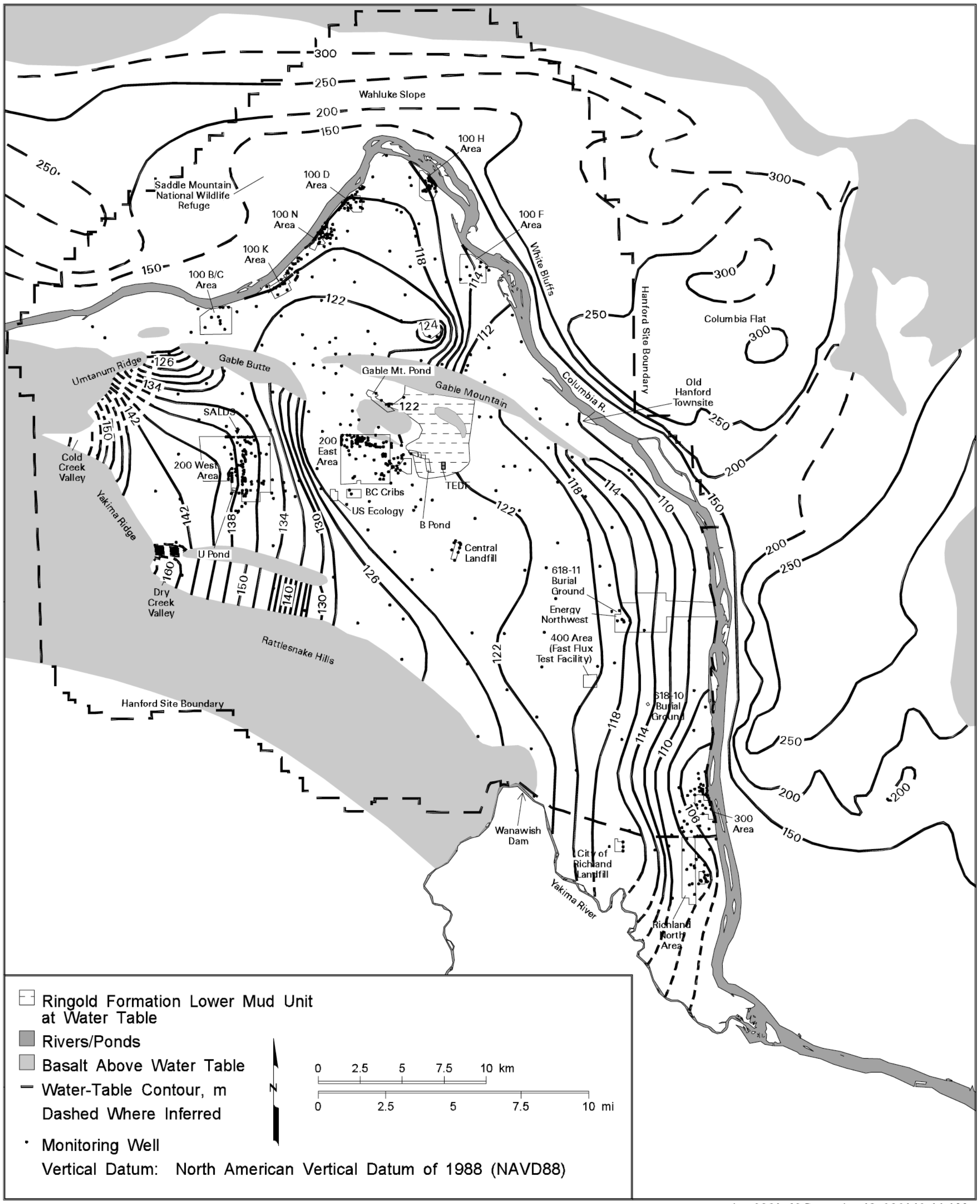

Figure 2.2. Hanford Site and Outlying Areas Water-Table Map, March 2001

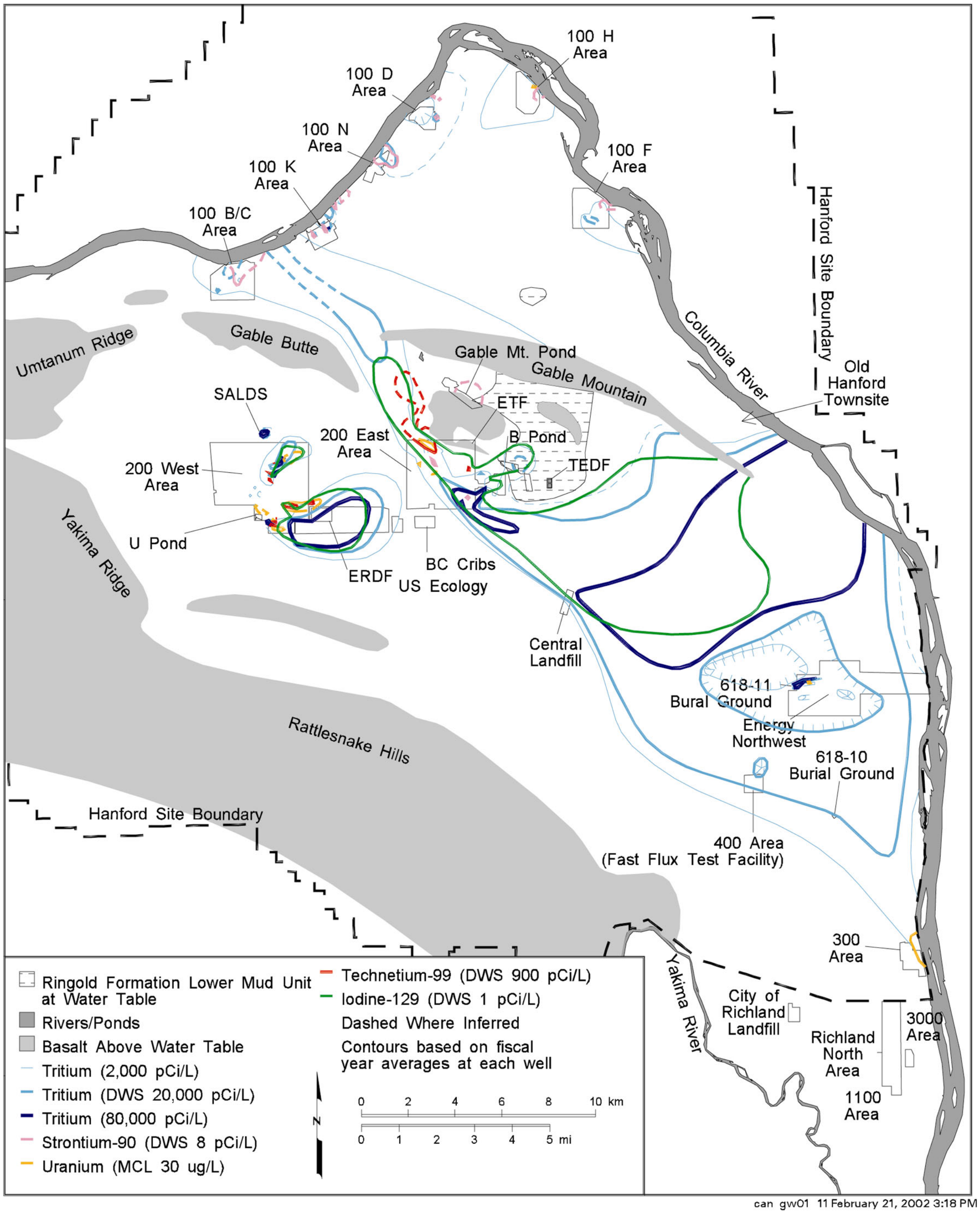

Figure 2.3. Distribution of Major Radionuclides in Groundwater at Concentrations Above Maximum Contaminant Levels or Interim Drinking Water Standards, Fiscal Year 2001

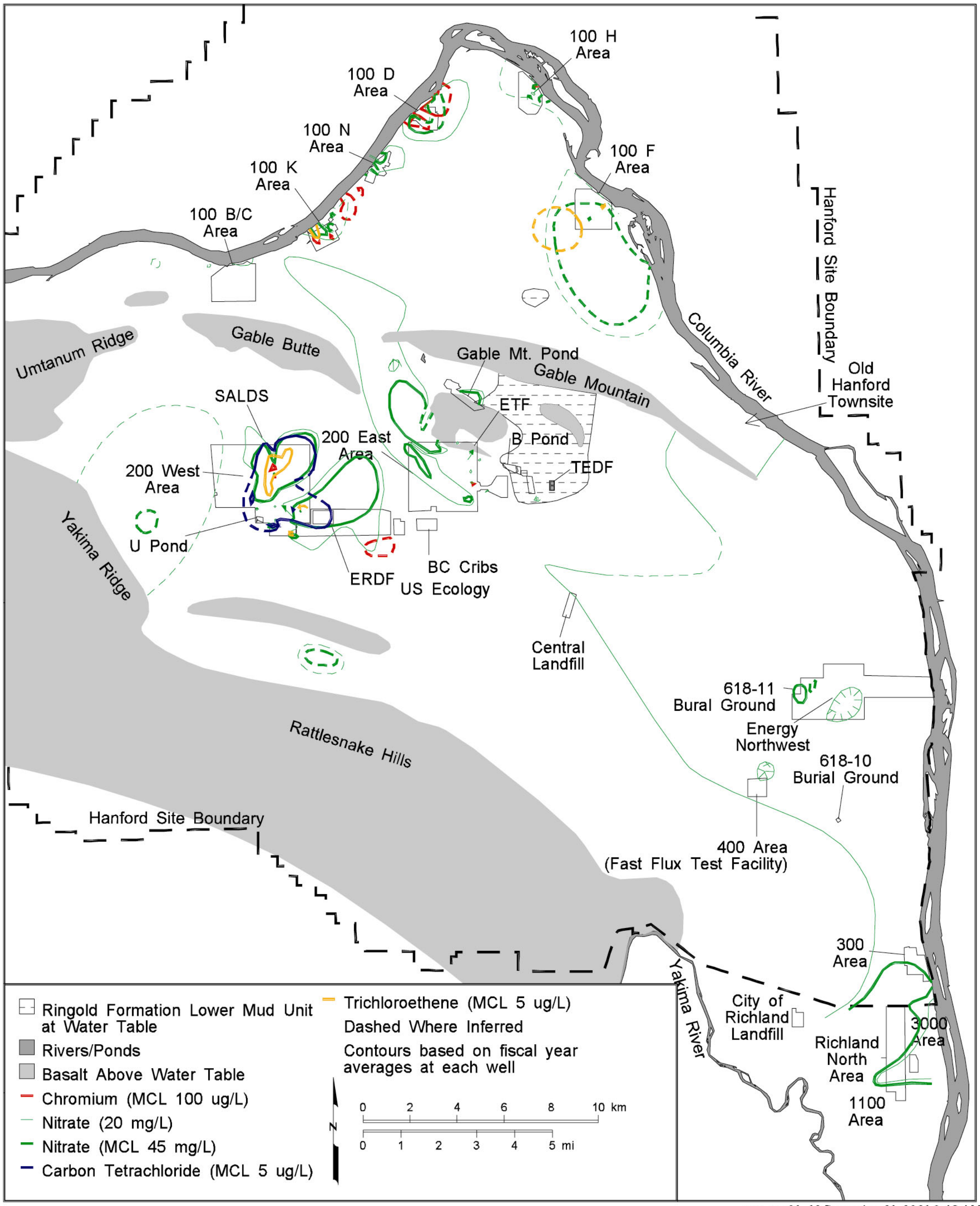

Figure 2.4. Distribution of Major Hazardous Chemicals in Groundwater at Concentrations Above Maximum Contaminant Levels, Fiscal Year 2001

3.0 Monitoring Program

Hanford Site monitoring wells are sampled for requirements of RCRA, CERCLA, the *Atomic Energy Act of 1954*, and state permits. Many wells are sampled to meet the objectives of two or more regulations. The groundwater project coordinates sampling and analyses to avoid duplication by scheduling all user's needs in a project database. When analytical results are returned from the laboratory, the groundwater project loads the data into Hanford Environmental Information System (HEIS) for use by all.

Whenever possible, well networks are designed to maximize use of wells that are already being sampled for another project. However, the two projects may have different constituent lists or sampling frequencies based on differing monitoring objectives. In some cases, co-sampling is not feasible because a well's location or depth cannot fulfill the monitoring objectives of both projects.

The integrated sampling and analysis matrix for the groundwater project is given in the Appendix. The matrix was designed for use in fiscal year 2003, but also includes wells that will be sampled every 2 or 3 years, as discussed in Section 3.3. The matrix includes well name, program, project, sampling frequency, and constituents to be monitored. Additional details, such as schedule, analytical methods, etc., reside in a project database.

3.1 Groundwater Monitoring Network

Wells on the Hanford Site are monitored in compliance with: (1) the *Atomic Energy Act of 1954* and its implementing orders ("surveillance monitoring"), (2) CERCLA and RCRA past-practice operable units, (3) remedial action performance assessment, (4) RCRA Treatment Storage and Disposal Facility monitoring requirements, (5) CERCLA landfill monitoring, and (6) WAC permits. The criteria for choosing wells for surveillance and operable unit monitoring are discussed in the following paragraphs. Monitoring networks for items 2 through 6 are defined in monitoring or sampling and analysis plans, interim records of decision, or permits or change agreements listed in Chapters 4 through 10. These monitoring networks are included in the monitoring matrix in the Appendix.

1. Defining plumes — A representative areal distribution of wells within the plume is monitored, with an emphasis on wells with the highest concentrations of contaminants and wells near plume boundaries. Some wells in uncontaminated areas between plumes also are monitored to help control interpretation of plume boundaries and to monitor plume migration. Plumes migrating onto the site from offsite sources also are monitored (e.g., agricultural effects, Framatome ANP). A geostatistical approach was employed to determine which wells should be sampled to track major plumes from the 200 West and 200 East Areas (discussed in Chapters 5 and 6).

2. Monitoring contaminant sources — Waste-disposal facilities not regulated by RCRA or the WAC are included in surveillance monitoring (e.g., 100-K Basins). Wells downgradient of these facilities are monitored to detect their impact on groundwater.

3. Interval monitored — Most of the groundwater contamination on the Hanford Site is contained in the uppermost (unconfined) aquifer, so most of the monitoring wells are screened there. Newer wells

installed for RCRA and CERCLA are screened across the water table and monitor the top 3 to 10 meters of the unconfined aquifer. Wells that monitor a longer interval are less desirable because contaminants could be diluted from representative concentrations to below detection limits. A few wells monitor deeper intervals of the suprabasalt sediments or confined aquifers in the basalt. These wells are sampled to monitor whether contamination has migrated deeper in the hydrologic system.

4. Historical data — Previous groundwater chemistry or water-level data in a well are useful for monitoring trends and for determining sampling frequency and constituent lists. Wells with historical data are preferable to those without.

5. Adequacy of well construction — Wells with poor seals, broken casing, or other problems may not provide representative data, and will be remediated or decommissioned.

6. Amount of water in the well — Declining water levels are causing some wells to go dry. Wells that are likely to contain sufficient water for sampling are chosen for the network.

7. Proximity to the Columbia River — In some cases, it is desirable to monitor wells very near the river shore to assess what concentrations of contaminants are entering the river. In other cases, it is more advantageous to choose wells farther inland to avoid fluctuations in concentration caused by bank storage effects.

8. Multiple use — Wells that meet multiple requirements of the groundwater project (e.g., RCRA, CERCLA) are used in the surveillance networks where possible, for a more cost-effective program.

9. "Guard wells" — Key areas have been identified as being of special interest: bands of wells in Gable Gap and southeast of the 200 East Area were chosen to monitor contamination migrating out of the 200 Areas (discussed in Chapter 6), wells near the Columbia River, wells in the southern portion of the site near the city of Richland's North Well Field and recharge basins.

10. Evaluating offsite migration of contaminants — Special emphasis is placed on determining whether contaminants are migrating beyond Site boundaries.

11. Performance assessment — The contractor responsible for pump-and-treat operations (formerly Bechtel Hanford, Inc.; currently Fluor Hanford, Inc.) conducts performance assessment monitoring in conjunction with remedial actions. The groundwater project is responsible for providing independent assessment of remedial actions, so wells near the remedial actions are included.

3.2 Constituents

Constituents are included in the sampling matrix of the Appendix. This matrix is an abbreviated version of the sampling matrix maintained by the groundwater project, which specifies various methods of analysis for some constituents.

The following criteria were considered to determine what analyses should be run on the samples for surveillance monitoring:

1. Proximity to known plumes or waste sites — If a well is located in a contaminant plume or downgradient of a plume, it is generally sampled for that contaminant.

2. Historical data in well — Wells are generally not sampled for constituents that have not been detected or are below some level of interest (e.g., drinking water standards) unless they are monitoring movement of a nearby plume.

3. Statistical modeling (discussed in Chapter 6).

4. Use for other requirements — If there is a choice of analytical method for a desired constituent, the method used for other monitoring purposes is chosen if it is satisfactory for surveillance monitoring.

5. Washington State Department of Health constituents — Constituents, including total alpha, anions, total beta, gamma, iodine-129, technetium-99, tritium, and uranium isotopes, are co-sampled to provide a quality control check.

The choice of constituents for RCRA, CERCLA, and other monitoring requirements are based on waste history, permit conditions, and constituents of concern, as discussed in their monitoring plans.

3.3 Sampling Frequency

Sampling frequency for RCRA, CERCLA, and other monitoring requirements are determined by regulation, permits, or other agreements. Frequency for plume and trend tracking are based on the following criteria:

1. Variability of historical data — If previous concentrations are level or are on a steady trend, less-frequent sampling (every 3 years) is sufficient. Wells with larger variability generally are sampled more frequently (annually or more often).

2. Proximity to key areas — Guard wells (see Section 3.1) and wells monitoring source areas are sampled more frequently.

3. Mobility of contaminants in groundwater — Contaminants with greater mobility (e.g., tritium) may be sampled more frequently than those that are not very mobile in groundwater (e.g., strontium-90).

4. Aquifer monitored — The basalt-confined aquifer requires less frequent monitoring because it is less contaminated and mobility of contaminants is lower.

3.4 Changes to Monitoring Program

As data are received and evaluated, changes will be made to the program, as needed. For example, if the concentration of a contaminant in a well increases suddenly, an additional sample may be collected and analyzed to confirm or refute the initial result. The groundwater project records mid-year changes in a scheduling database.

Each year the well/constituent matrix in this plan will be reviewed for adequacy and revised for the following fiscal year. These revisions will incorporate any changes made to monitoring plans for RCRA, CERCLA, and other requirements.

4.0 100 Areas

For the purposes of this plan, "100 Areas" describes that portion of the Hanford Site north of Gable Mountain and Gable Butte, and south of the Columbia River and includes the six reactor areas (B/C, K, N, D, H, and F, upstream to downstream) and the 600 Area in between.

4.1 Background

Hundreds of waste sites have been identified in the 100 Areas, including fuel storage or retention basins that leaked; effluent disposal cribs, ditches, and drains; and various spills or other unplanned releases. Those with site-specific monitoring requirements and those that appear to have affected groundwater quality are listed in Table 4.1.

4.1.1 Waste Sites, Discharges, and Groundwater Operable Units

Inactive radiological or mixed waste sites in the 100 Areas are cleaned up or monitored under the requirements of CERCLA or as RCRA past-practice sites.[1] Four sites are regulated under RCRA because they were more recently active and contained dangerous waste constituents (116-N-1, 116-N-3, and 120-N-1 facilities). Another former RCRA site, 120-D-1 ponds, was "clean-closed," and no longer requires monitoring. Two sites currently discharge non-dangerous effluent to the ground (sanitary waste and filter backwash in the 100-N Area). Septic system discharges to the ground also occur at the 100-K Area.

Groundwater beneath the reactor areas and surrounding areas is divided into five groundwater operable units: 100-BC-5 (100-B/C Area), 100-KR-4 (100-K Area), 100-NR-2 (100-N Area), 100-HR-3 (100-D and 100-H Area), and 100-FR-3 (100-F Area). Pump-and-treat systems are active in the 100-K, 100-D, and 100-H Areas for chromium and in the 100-N Area for strontium-90. An in situ treatment system is active in the 100-D Area to chemically reduce hexavalent chromium to insoluble chromium compounds (redox manipulation). All of these remediation systems are considered interim actions; final remedial actions have not yet been selected.

4.1.2 Groundwater Monitoring Requirements and History

Limited groundwater monitoring has been conducted in the reactor areas since the 1940s. Very few monitoring wells existed in the early decades but more were installed in the 100-K, 100-N, and 100-H Areas in the 1970s and monitored for DOE requirements. RCRA monitoring began in the late 1980s in the 100-N and 100-H Areas, and in the early 1990s in the 100-D Area, so additional wells were installed. CERCLA investigations and cleanup actions in the 1990s resulted in the installation of dozens more wells, spread among the reactor areas and the intervening 600 Area between the 100-D and 100-H Areas.

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[1] For simplicity, this document refers to any type of operable unit monitoring as "CERCLA."

Table 4.1. Selected Waste Sites in the 100 Areas[(a)]

Waste Site ID/Facility (period of use)	Waste Type	Constituents of Interest for Groundwater Monitoring	Type of Site (monitoring plan reference)
100-B/C Area (100-BC-5 Groundwater Operable Unit)			
116-B-11 (1944-1968) and 116-C-5 (1952-1969) retention basins	Reactor coolant effluent; leaks known	Radionuclides, metals strontium-90, chromium	Past-practice (Federal Facility Agreement and Consent Order Change Control Form M-15-99-03, July 14, 1999; Sweeney 2000a; sampling and analysis plan to be updated in fiscal year 2003)
116-B-1 (1950-1968) and 116-C-1 (1952-1968) waste-disposal trenches	Coolant effluent from fuel-element failure (highly radioactive)	Radionuclides	
116-B-5 crib (1950-1968)	Process effluent	Tritium	
118-B-6 burial ground (1950-1953)	Contaminated equipment	High-level tritium	
Storage tanks and transfer facilities (1944-1969)	Sodium dichromate leakage from water-treatment facilities	Chromium	
100-K Area (100-KR-4 Groundwater Operable Unit)			
Fuel storage basins in reactor buildings fuel-storage basins (KE: 1955-1971; 1975-present. KW: 1955-1971; 1981-present)	Radionuclide-contaminated water; significant leakage occurred from KE Basin in 1976-1979 and 1993	Tritium, strontium-90	Active (Peterson 2002)
118-K-1 solid waste burial ground (1955 to 1971)	Solid waste from 100-K reactor plant operations; irradiated metals from 100-N	Tritium	Peterson 2002
116-KE-3 (1955-1971) and 116-KW-2 (1955-1970) french drain/reverse well	Effluent from fuel-storage basin drainage collection	Tritium, strontium-90	Past-practice (pump-and-treat: ROD 1996a; DOE 1997a. Additional monitoring: National Priorities List Change Control Form 108, November 20, 1996)
116-KE-1 (1955-1971) and 116-KW-1 (1955-1971) cribs	Reactor condensate	Tritium, carbon-14	
116-K-2 trench (1955-1971)	Reactor coolant water, decontamination liquids	Chromium, strontium-90	
116-KW-3 (1954-1970) and 116-KE-4 (1955-1971) retention basins	Reactor coolant; leaks known	Chromium, radionuclides	
Storage tanks and transfer facilities	Sodium dichromate leakage from 183-KE and 183-KW water-treatment facilities	Chromium	

Table 4.1. (contd)

Waste Site ID/Facility (period of use)	Waste Type	Constituents of Interest for Groundwater Monitoring	Type of Site (monitoring plan reference)
100-N Area (100-NR-2 Groundwater Operable Unit)			
Various sources	Reactor coolant, demineralizer effluent, petroleum hydrocarbons	Strontium-90, tritium, petroleum products, sulfate, nitrate	Past-practice (pump-and-treat and additional monitoring: Borghese et al. 1996; DOE 2002a); RCRA (Hartman 2002)
116-N-1 and 116-N-3 (1301-N and 1325-N) cribs (1963-1985) (1983-1989)	Reactor coolant	Strontium-90, tritium Minor hazardous constituents[b,c]	
120-N-1 (1324-NA) percolation pond (1986-1990)	Treated demineralizer effluent	pH[c] , sulfate, sodium	RCRA (Hartman 2002)
Fuel station	Fuel tank leaks confirmed	Hydrocarbons	Past-practice (Borghese et al. 1996; DOE 2002a)
N Reactor basins	Fuel-storage basins	Radionuclides	Inactive
183-N backwash discharge pond (1983-present)	Filter backwash	None	Active
124-N-10 sewage lagoon (1987-present)	Sanitary waste	Nitrate, coliform	Active; WAC permitted
100-D Area (100-HR-3 Groundwater Operable Unit)			
116-D-7 (1944-1967) and 116-DR-9 (1950-1967) retention basins	Reactor coolant; leaks known	Radionuclides, chromium	Past-practice (pump-and-treat: ROD 1996a, DOE 1997a. In Situ Redox Manipulation: ROD 1999, DOE 2000b. Additional monitoring: National Priorities List Change Control Form 107, November 20, 1996)
116-D-1 (1947-1967) and 116-DR-2 (1950-1967) trenches	Highly radioactive coolant from fuel-element failure	Radionuclides	
Reactor cribs, drains	Water and sludges from fuel-storage basins; decontamination solutions; condensate from inert gas system	Nitrate, strontium-90	
Storage tanks and transfer facilities	Sodium dichromate leakage from corrosion inhibitor	Chromium	
120-D-1 ponds (1977-1994)	Effluent from water treatment	pH, mercury[c]	RCRA clean closed[d]

Table 4.1. (contd)

Waste Site ID/Facility (period of use)	Waste Type	Constituents of Interest for Groundwater Monitoring	Type of Site (monitoring plan reference)
100-H Area (100-HR-3 Groundwater Operable Unit)			
116-H-7 (107-H) retention basin (1949-1965)	Reactor coolant; leaks known	Tritium, strontium-90	Past-practice (pump-and-treat: ROD 1996a, DOE 1997a. Additional monitoring: National Priorities List Change Control Form 107, November 20, 1996)
116-H-1 (107-H) trench (1952-1965)	Highly radioactive coolant from reactor fuel-element failure	Tritium, strontium-90, nitrate	
Reactor cribs, drains	Water and sludge from fuel-storage basins; decontamination solutions	Chromium	
116-H-6 (183-H) solar evaporation basins (1973-1985)	Neutralized acid etch solutions	Technetium-99, uranium, nitrate, chromium, fluoride	RCRA[e] (Hartman 1997)
100-F Area (100-FR-3 Groundwater Operable Unit)			
116-F-14 retention basin and pipelines (1945-1965)	Reactor coolant; leaks known	Strontium-90, chromium	Past-practice (Federal Facility Agreement and Consent Order Change Control Form M-15-99-02, July 14, 1999; Sweeney 2000b; sampling and analysis plan to be updated in fiscal year 2003)
116-F-2 trench (1950-1965)	Highly radioactive coolant		
116-F-9 trench (1963-1976)	Cleaning waste from experimental animal laboratories	Radionuclides	
116-F-3 (1947-1951) and 116-F-6 (1952-1965) trenches	Reactor coolant and sludge		
116-F-1 trench (1953-1965)	Liquid waste from reactor and associated buildings	Radionuclides, metals, uranium, strontium-90, nitrate	
118-F-1 (1954-1965) and 118-F-6 (1965-1973) solid waste-burial grounds	Contaminated equipment, animal waste, coal ash	Tritium, plutonium	

(a) Sites with specific groundwater monitoring requirements and those that appear to have affected groundwater quality.
(b) Radionuclides monitored under the *Atomic Energy Act of 1954* or CERCLA. Groundwater to be remediated under CERCLA.
(c) Known or suspected in waste; not significantly detected in groundwater to date.
(d) Clean closed in 1999 (no waste left in place). No further RCRA monitoring required.
(e) Groundwater beneath 183-H solar evaporation basins to be remediated under CERCLA.

CERCLA interim remedial actions in the 100-K, 100-N, 100-D, and 100-H Areas include specific monitoring requirements. CERCLA operable unit monitoring networks have also been defined for these areas and for the 100-B/C and 100-F Areas. The K Basins, where irradiated spent nuclear reactor fuel is stored, have leaked in the past and are monitored under DOE Order 5400.1. Monitoring plans for the K Basins, CERCLA, and RCRA are referenced in Table 4.1.

The *Atomic Energy Act of 1954* and DOE Order 5400.1 also require sitewide surveillance monitoring to track contaminant plumes. This document serves as the monitoring plan for surveillance monitoring performed per DOE orders.

4.2 Conceptual Model

The most widespread contaminants of concern in 100 Areas' groundwater are hexavalent chromium, nitrate, and tritium. Groundwater is locally contaminated with carbon-14, hydrocarbons, strontium-90, sulfate, technetium-99, trichloroethene, and uranium. Groundwater also flows into the 100 Areas through the gap between Gable Mountain and Gable Butte, carrying contamination from the 200 Areas, which includes nitrate, technetium-99, and tritium.

Contaminated effluent from leaking retention basins and disposal trenches has infiltrated the soil in the 100 Areas for ~50 years. Radionuclides with short half-lives decayed in the retention basins or in the vadose zone. Non-radioactive constituents and longer-lived radionuclides were carried down through the vadose zone beneath the waste sites. Some of these sorbed to sediment, some remained in the moisture in the vadose zone, and large quantities were carried into the groundwater (Figure 4.1).

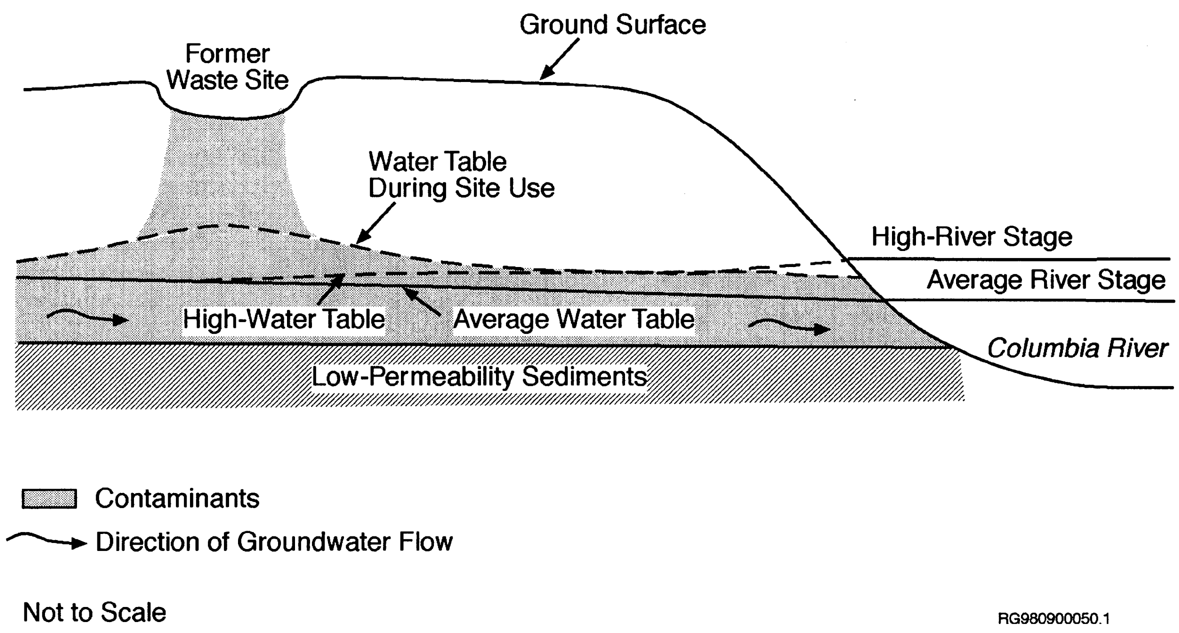


Figure 4.1. Conceptual Model of Subsurface Contamination in the 100 Areas

When the reactors were active, huge volumes of water were discharged to the ground, creating large groundwater mounds that disrupted the natural patterns of groundwater flow. The contaminants moved outward on these mounds, contaminating a larger area in the saturated zone than in the vadose zone. The mounds dissipated after discharges ceased, and groundwater flow resumed its normal pattern (i.e., toward the river). Groundwater beneath the 100 Areas continues to carry contaminants to the Columbia River, where it discharges from springs, seeps, and through the riverbed below the water line. Groundwater nearest the river often has lower concentrations of contaminants because of dilution. When river stage is high, the water table may rise into the former mound areas and mobilize some constituents (see Figure 4.1) or it may dilute contaminants further. This influx of river water also temporarily disrupts the direction and rate of groundwater flow. Locally, groundwater extraction and injection also affect flow directions and intercept contaminants before they reach the river.

The vertical component of groundwater flow in the 100 Areas is generally upward, and most of the contamination is limited to the unconfined aquifer. However, it is likely that when groundwater mounds were present, there was a significant downward gradient, and several wells that monitor the confined Ringold or basalt-confined aquifers appear to be contaminated.

Contaminant concentrations are expected to decrease with time because of dispersion, radioactive decay, remediation, and discharge to the river. There are no new sources of contamination, but concentrations will vary because of plume movement and mobilization of vadose zone contamination.

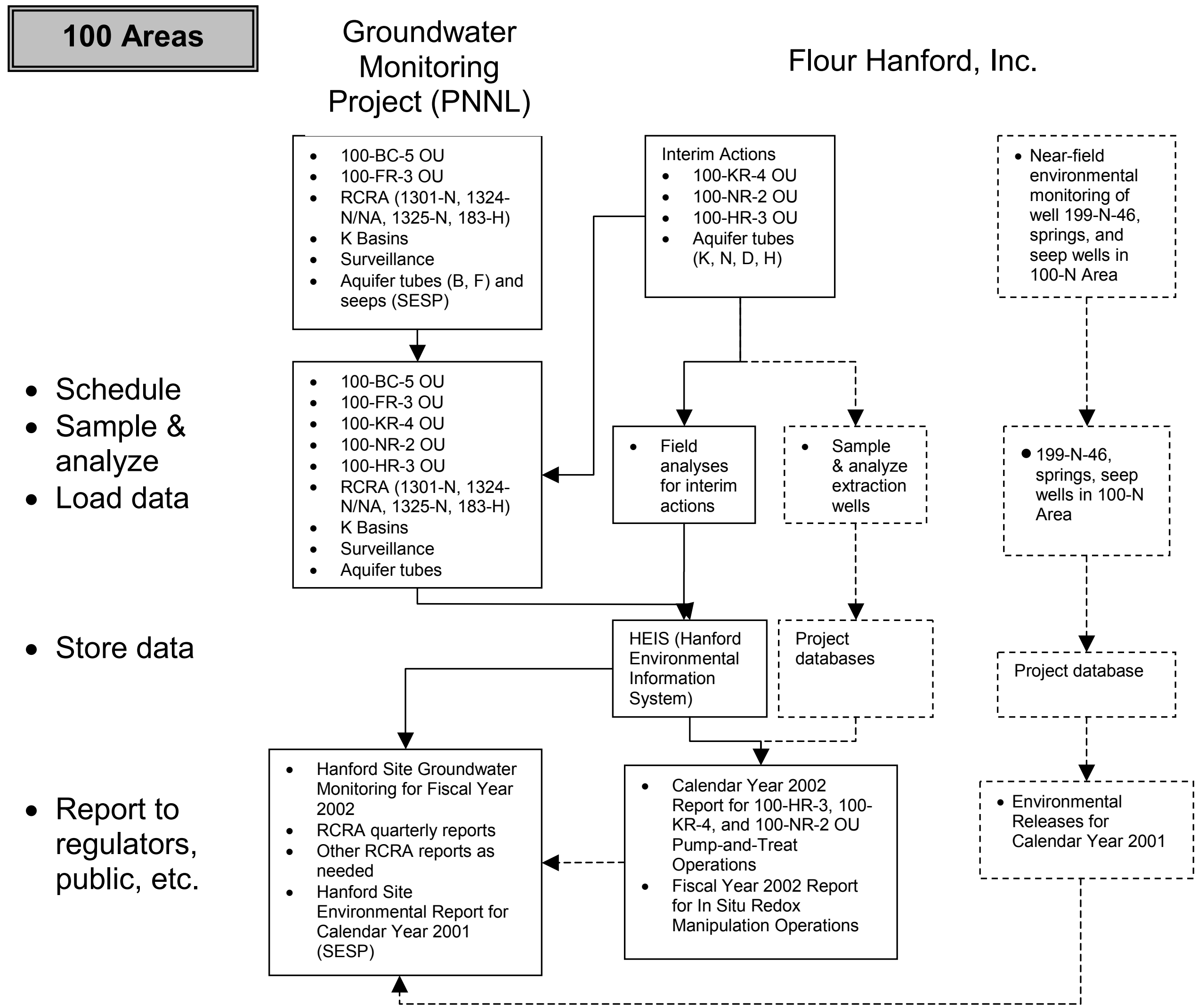
4.3 Monitoring Program

Wells in the 100 Areas are sampled for requirements of RCRA, CERCLA, and the *Atomic Energy Act of 1954* (see Table 4.1). Many wells are sampled to meet the objectives of two or more regulations, as indicated in the Appendix. The groundwater project coordinates sampling and analyses to avoid duplication by scheduling all user's needs in a project database (Figure 4.2). When analytical results are returned from the laboratory, the groundwater project loads the data into HEIS for use by all. There are two exceptions to this data flow in the operable units with ongoing interim actions. Routine field chromium analyses are performed by Fluor Hanford, Inc. staff, who also load the results into HEIS. Pump-and-treat system operators sample extraction wells to help assess system performance and the data are stored in a project database, not in HEIS. In the 100-N Area, Fluor Hanford, Inc. staff sample one well, several springs, and 13 seep wells as part of near-facility environmental monitoring associated with the 1301-N and 1325-N facilities. Data from those samples are maintained and reported separately from the groundwater project, but are summarized in the annual groundwater monitoring report.

Locations of monitoring wells for the 100 Areas are illustrated in Figure 4.3, Figure 4.4, Figure 4.5, Figure 4.6, Figure 4.7, Figure 4.8, and Figure 4.9. Those sampled for long-term CERCLA and *Atomic Energy Act of 1954* monitoring are shown with solid symbols. In the 100-K, 100-N, 100-D, and 100-H Areas, many of the wells also are sampled for RCRA and/or interim action objectives. Wells sampled for RCRA or interim action requirements but not for plume tracking are shown with open symbols in the figures.

In addition to the shallow unconfined wells, the surveillance network includes most of the few available deeper wells (completed in the confined Ringold or the basalt-confined aquifer). Most of the

600 Area wells are sampled for surveillance every 2 or 3 years. Wells in the reactor areas are sampled every year, except for those wells near the river or wells with highly variable concentrations; these are sampled more frequently. Wells monitoring the in situ redox manipulation remedial action in the 100-D Area are monitored quarterly.



OU = operable unit
RCRA = Resource Conservation and Recovery Act of 1976
SESP = Surface Environmental Surveillance Project
Solid arrows indicate primary information flow, dashed arrows indicate secondary data flow

Figure 4.2. Responsibilities and Flow of Information for Groundwater Monitoring in the 100 Areas

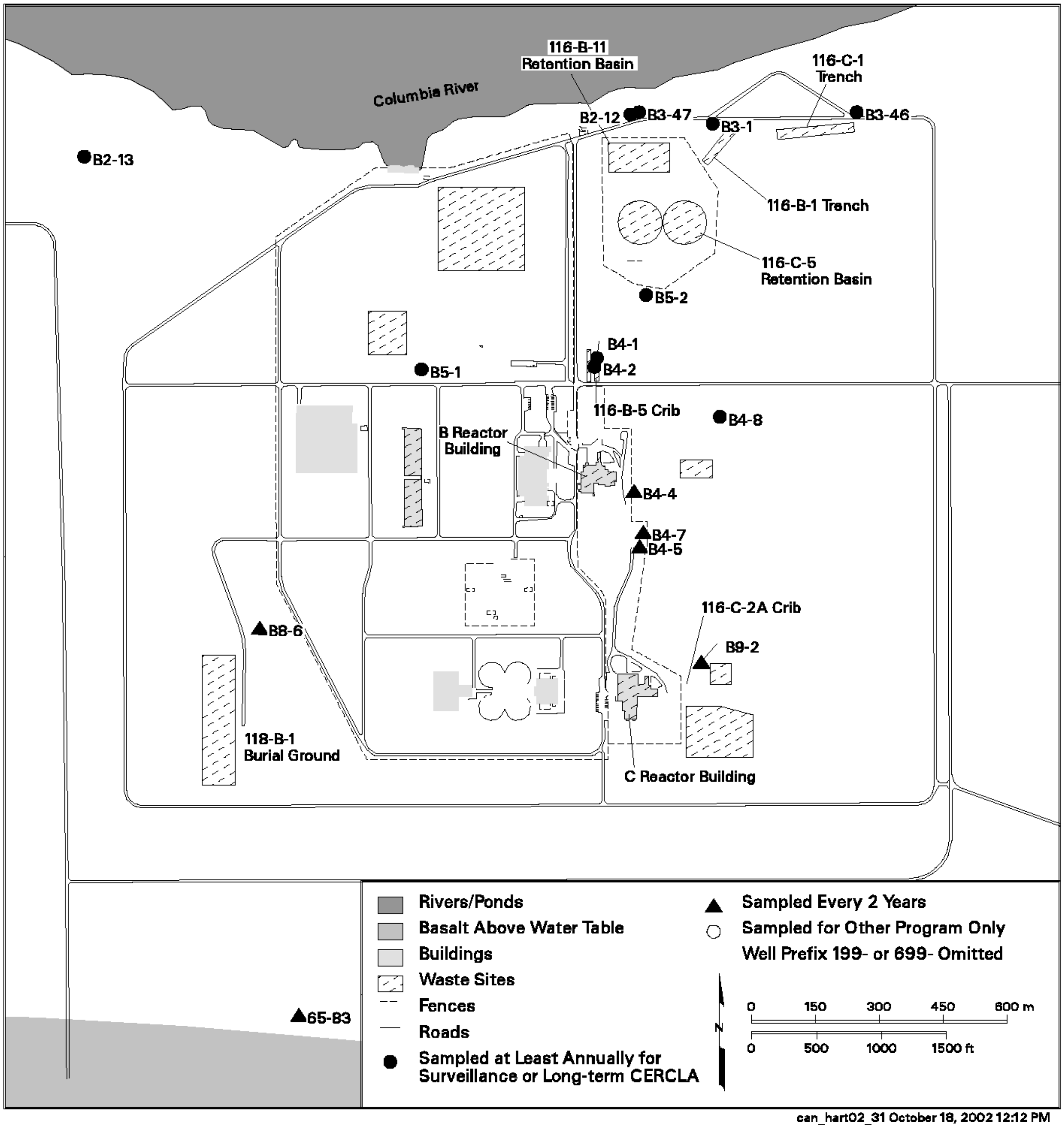


Figure 4.3. Groundwater Project Well Locations: 100-B/C Area

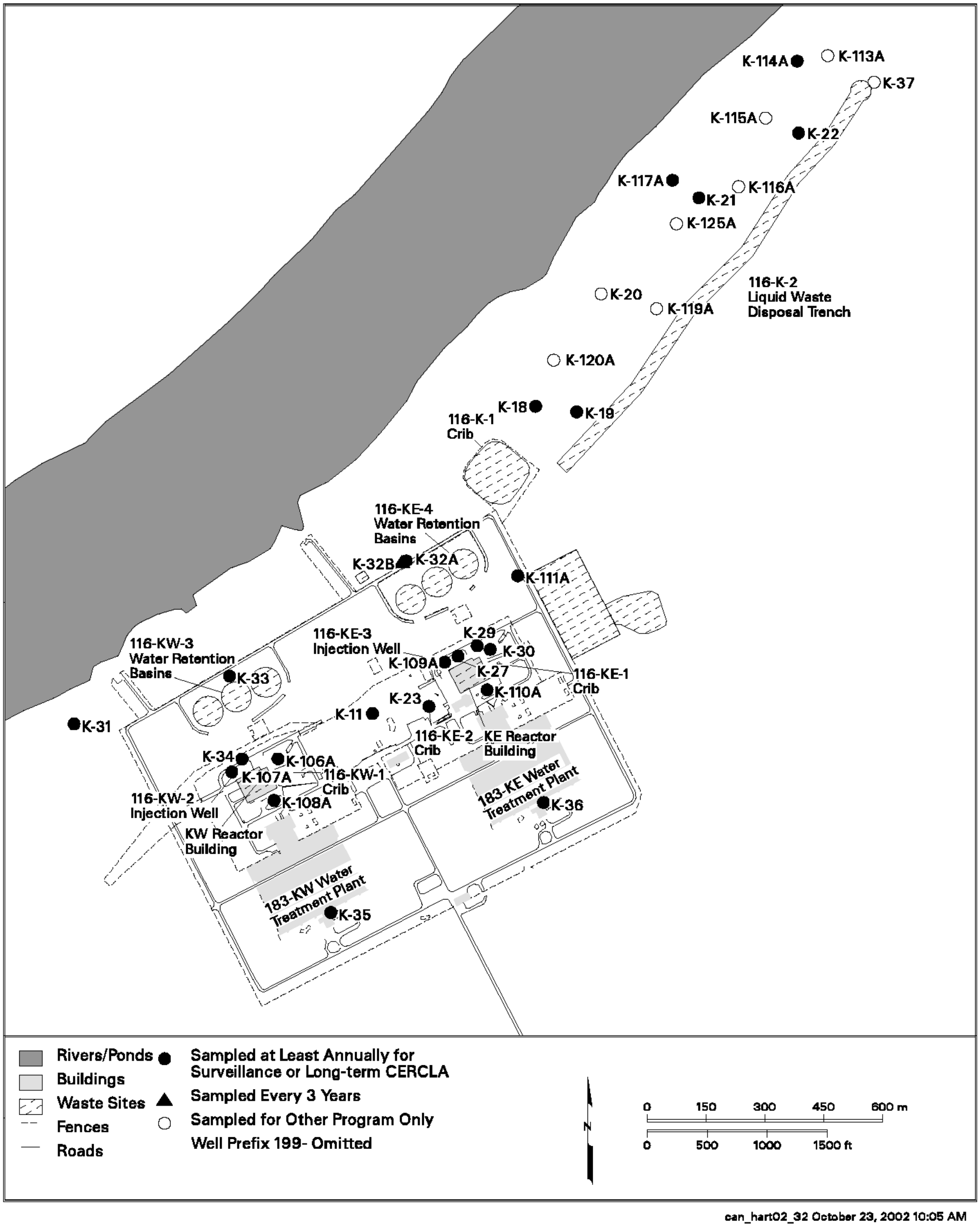


Figure 4.4. Groundwater Project Well Locations: 100-K Area

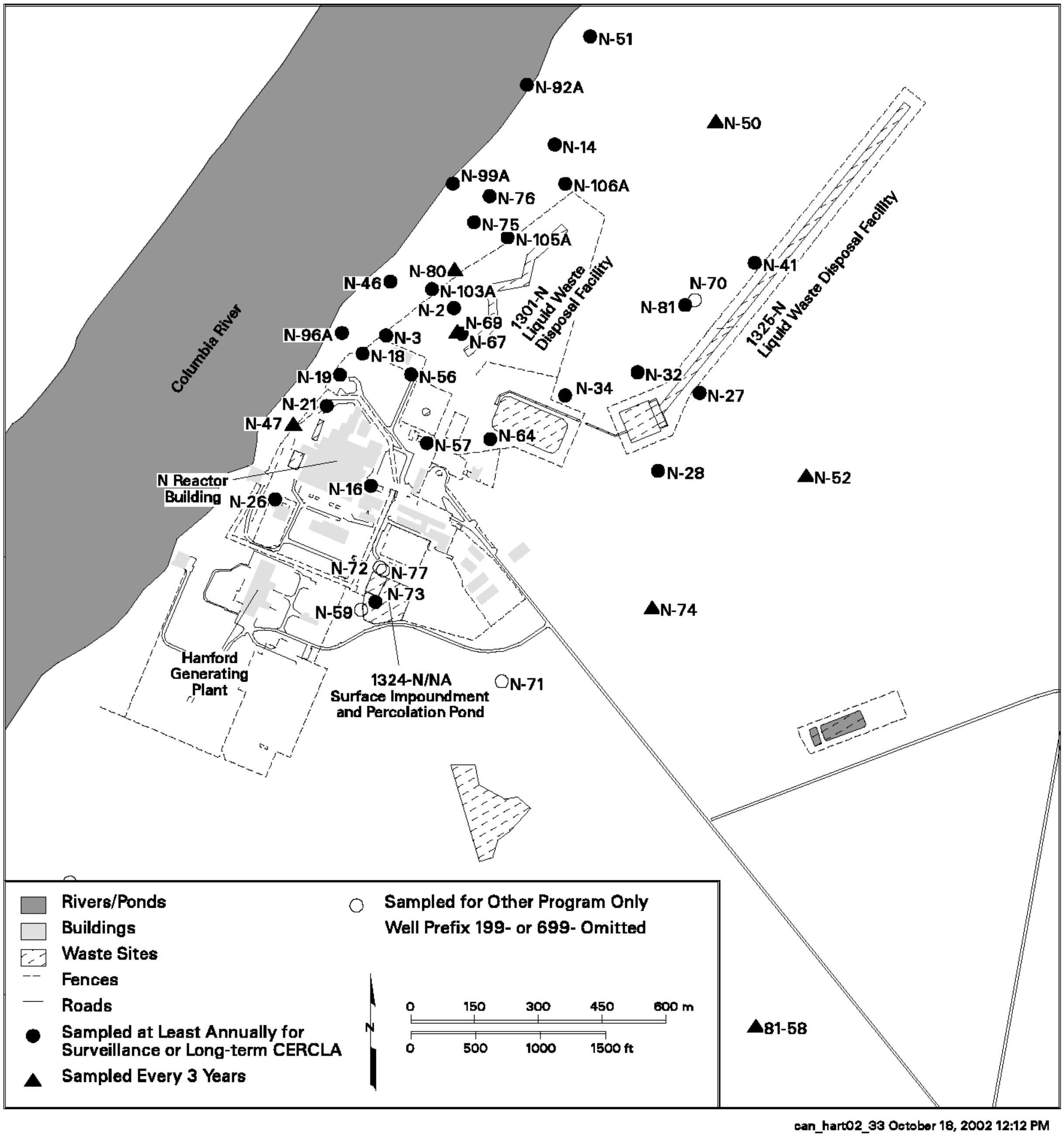


Figure 4.5. Groundwater Project Well Locations: 100-N Area

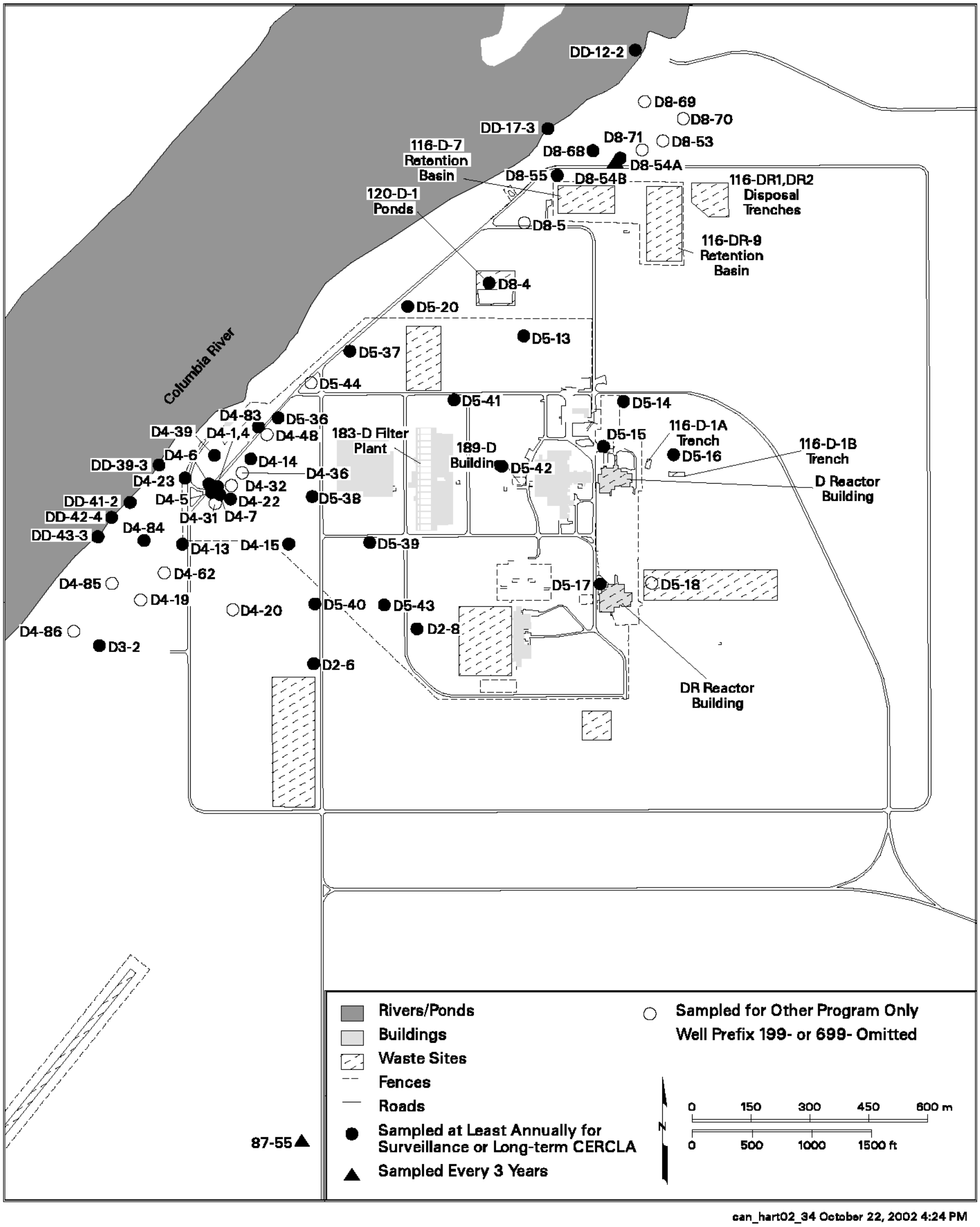


Figure 4.6. Groundwater Project Well Locations: 100-D Area

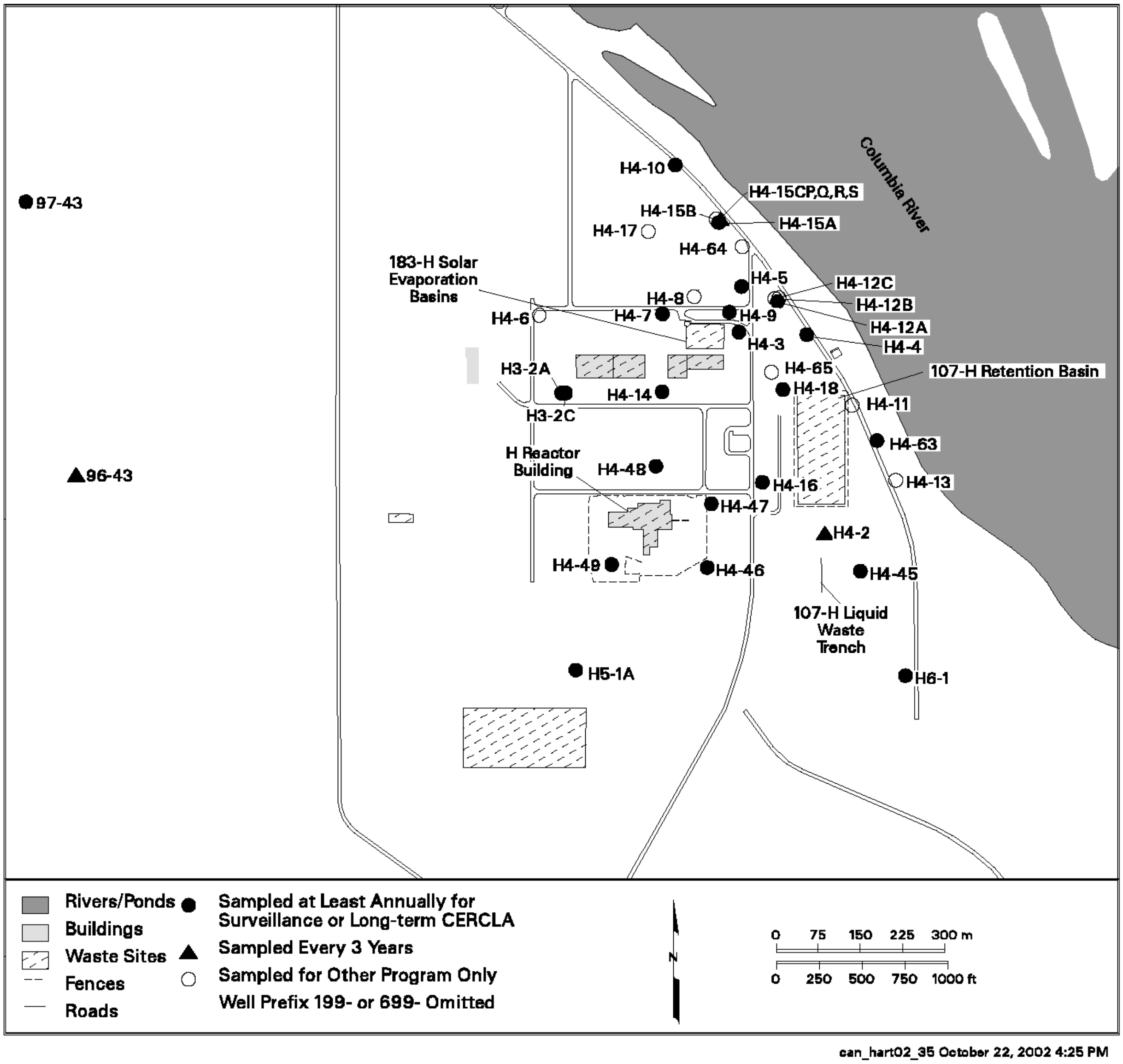


Figure 4.7. Groundwater Project Well Locations: 100-H Area

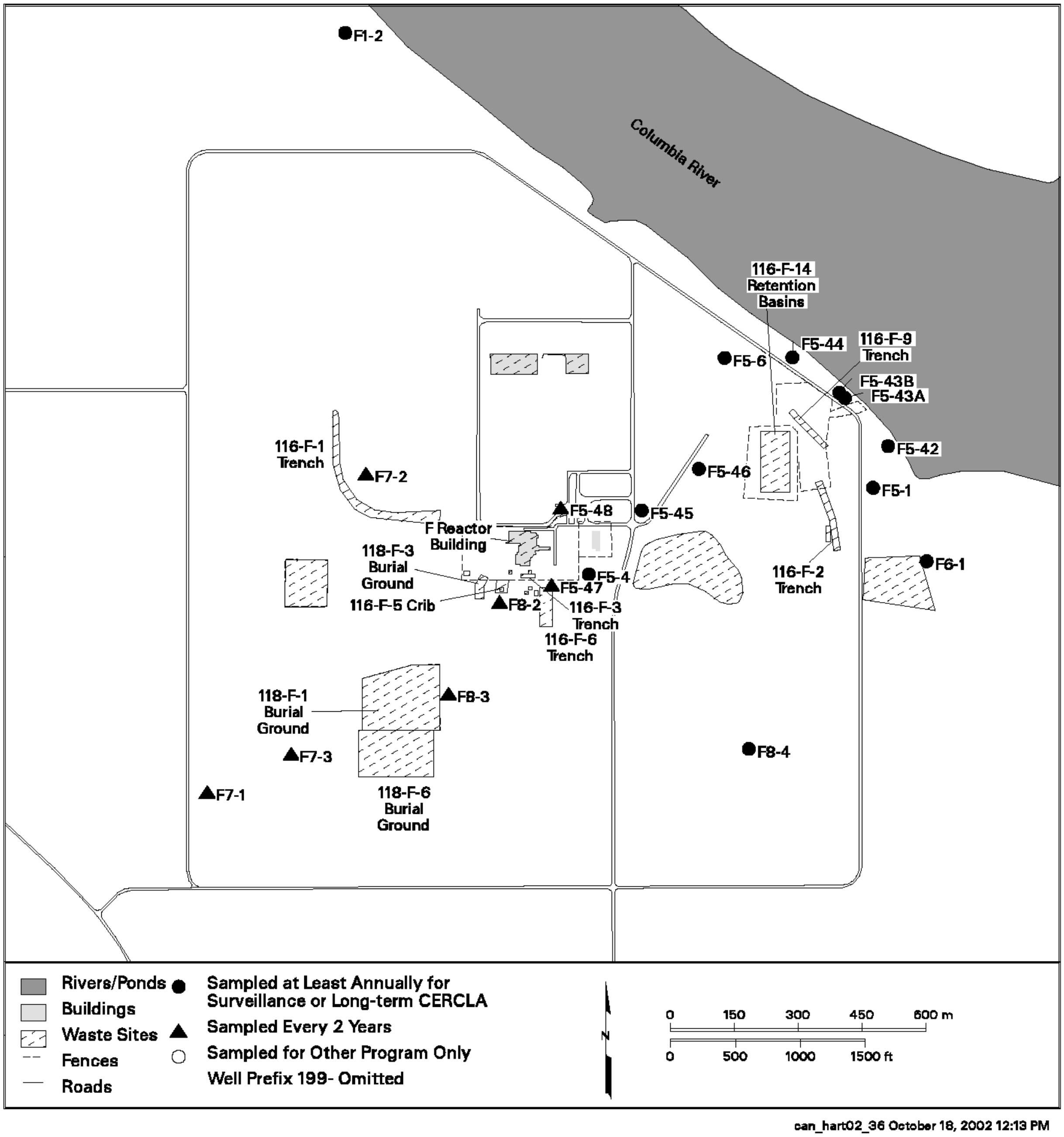


Figure 4.8. Groundwater Project Well Locations: 100-F Area

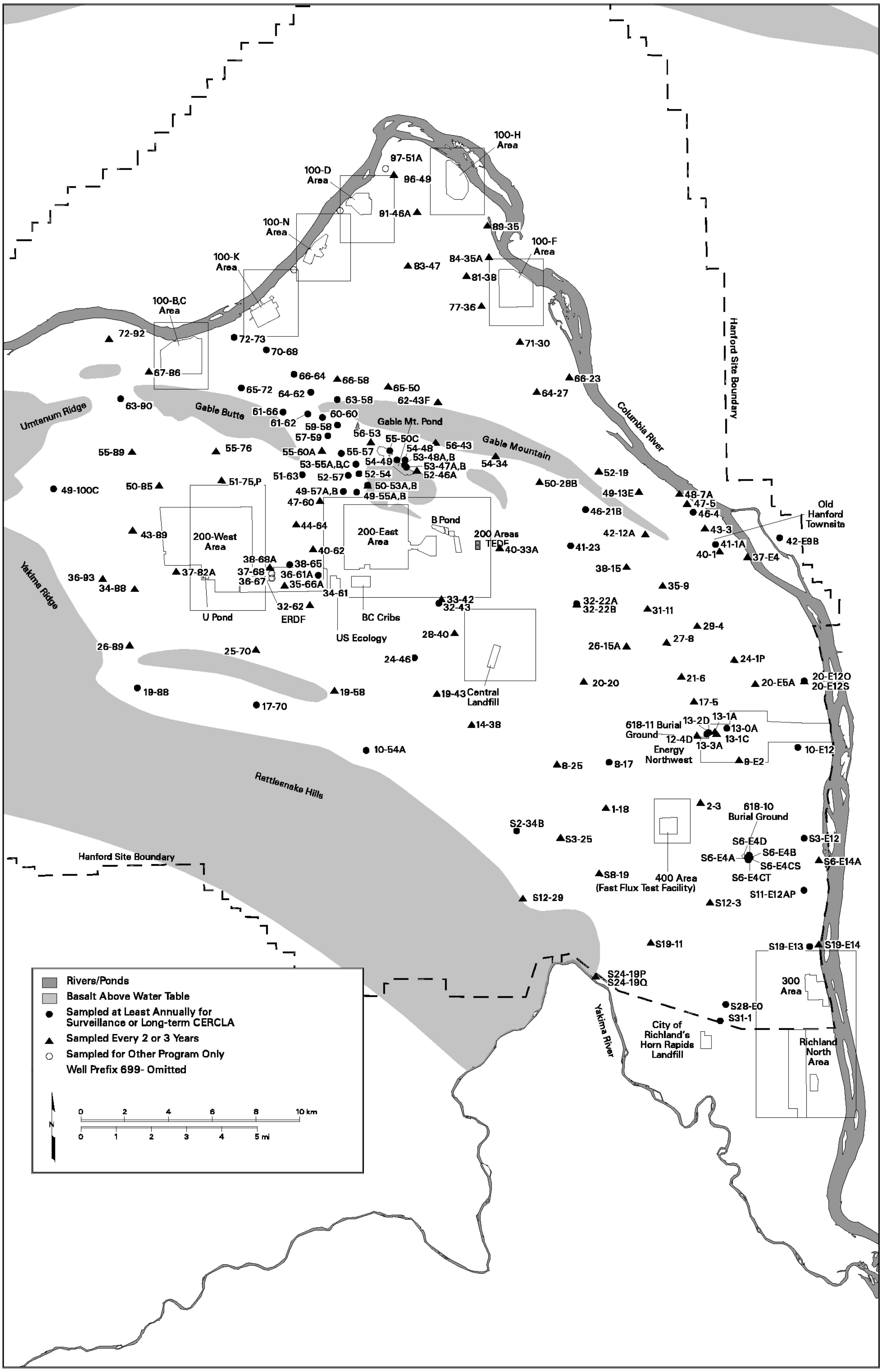


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Figure 4.9. Groundwater Project Well Locations: 600 Area

5.0 200 West Area

The 200 West Area is located on the Central Plateau of the Hanford Site. Portions of the 600 Area upgradient and downgradient of the 200 West Area also are included in the surveillance monitoring network. Most of the surveillance monitoring has been integrated with the CERCLA monitoring for the 200-ZP-1 and 200-UP-1 Operable Units. Additional monitoring is performed in the 600 Area surrounding the 200 West Area and in deeper parts of the aquifer.

Two low-level burial grounds, four single-shell tank farms, and two liquid waste disposal facilities within the 200 West Area are monitored under RCRA requirements. In addition, selected radionuclides are monitored in groundwater at the low-level waste management areas as part of the Performance Assessment Monitoring required under DOE orders for continued operation of the disposal trenches. Other monitoring in the 200 West Area is performed for interim action performance monitoring of the 200-ZP-1 and 200-UP-1 pump-and-treat remediation systems, for monitoring the State-Approved Land Disposal Site to the north of the 200 West Area, and for monitoring of the CERCLA Environmental Restoration Disposal Facility landfill, east of the area.

5.1 Background

The 200 West Area has been used since the 1940s. Activities within this area have included irradiated nuclear fuel processing and liquid and solid waste storage and disposal.

5.1.1 Waste Sites, Discharges, and Groundwater Operable Units

Several processing facilities in the 200 West Area have contributed to groundwater contamination through disposal of radioactive and hazardous liquid waste in ponds, cribs, ditches, and underground storage tanks. Large quantities of solid waste, both from on and off the site, have been disposed of in numerous burial grounds in the 200 West Area. The sites with specific monitoring requirements and those that appear to have affected groundwater quality are listed in Table 5.1. Additional information is provided in Hartman (2000), and more complete site inventories are included in reports listed in the bibliography of Hartman et al. (2002). A number of facilities are regulated under RCRA because they were more recently active and contain, or contained, dangerous chemical waste constituents. Six RCRA units have groundwater monitoring requirements, including two low-level burial grounds, which are the only sites actively receiving waste within the 200 West Area. Four single-shell tank waste management areas located in the 200 West Area also are monitored under RCRA; the tanks currently are used to store mixed waste. The 616-A crib, also known as the State-Approved Land Disposal Site, is an active facility located just north of the 200 West Area. The site consists of a drain field that is used to dispose of liquid waste containing tritium from the Effluent Treatment Facility in the 200 East Area. Nitrate contamination in some of the wells upgradient of the 200 West Area originated from offsite agricultural practices.

Two CERCLA groundwater operable units relate to 200 West Area contamination. The 200-UP-1 Operable Unit generally covers the groundwater in the southeastern part of the area, where a CERCLA interim action is remediating technetium-99 and uranium contamination near U Plant. The 200-ZP-1

Operable Unit generally covers groundwater contamination originating in the northwestern part of the 200 West Area, where interim actions are in place to remediate carbon tetrachloride contamination.

Table 5.1. Selected Waste Sites in the 200 West Area[a]

Facility	Waste Type	Constituents of Interest for Groundwater Monitoring	Type of Site (monitoring plan reference)
200-ZP-1 Operable Unit			
T Plant liquid waste disposal facilities (e.g. 216-T-26, -28, -19, -25)	Diverse chemical and radiological waste	Tritium, iodine-129, technetium-99, nitrate, chromium, carbon tetra-chloride, chloroform, trichloroethene, fluoride	Past-practice (DOE 2002c)
Single-shell tank farms (Waste Management Areas T and TX-TY)	Radioactive/chemical slurries	Sodium hydroxide, sodium salts, ferro-cyanide, radionuclides[b]	RCRA (WMA T: Hodges and Chou 2001a. WMA TX-TY: Hodges and Chou 2001b)
Plutonium Finishing Plant disposal facilities (e.g., 216-Z-1A and -Z-9)	Transuranic and chemical waste	Nitrate, carbon tetra-chloride, chloroform, trichloroethene	Past-practice (DOE 2002c)
Low-level burial grounds (Waste Management Areas 3 and 4)[c]	Radioactive and mixed solid waste	Various chemical and radioactive constituents[b,d]	RCRA (Last and Bjornstad 1989). Permit application submitted 2002. Performance Assessment (DOE 2000b).
200-UP-1 Operable Unit			
U Plant disposal facilities (216-U-12 and other cribs and retention trenches)	Supernatant from scavenged waste	Nitrate, trichloroethene, iodine-129, technetium-99, uranium[b]	Past-practice (ROD 1997; DOE 2002b) U-12: RCRA (Jensen et al. 1990; Williams and Chou 1993)
Reduction-Oxidation Plant disposal facilities (including 216-S-10 pond/ ditch)	Diverse chemical and radiological waste	Nitrate, trichloroethene, iodine-129, strontium-90, technetium-99, tritium, uranium[b]	Past-practice (ROD 1997; DOE 2002b). S-10: RCRA (Airhart et al. 1990)
Single-shell tank farms (Waste Management Areas S-SX and U)	Radioactive/chemical slurries	Sodium hydroxide, sodium salts, ferro-cyanide, radionuclides[b]	RCRA (WMA S-SX: Johnson and Chou 1999; WMA U: Smith et. al 2001)

Table 5.1. (contd)

Facility	Waste Type	Constituents of Interest for Groundwater Monitoring	Type of Site (monitoring plan reference)
600 Area			
616A crib (State-Approved Land Disposal Site)	Treated liquid effluent	Tritium	Active; WAC permitted (Barnett 2000a)[(e)]
Environmental Restoration Disposal Facility	Excavated, contaminated soil and debris (potentially radioactive and/or hazardous)	None anticipated (double-lined facility)	Active (Weeks et al. 1996)[(e)]

(a) Sites with specific groundwater monitoring requirements and those that appear to have affected groundwater quality.
(b) Radionuclides monitored under AEA and CERCLA.
(c) Low-Level Waste Management Area 4 extends south into the 200-UP-1 Operable Unit but will be considered with 200-ZP-1 Operable Unit for the purposes of this plan.
(d) Present in waste; not found in groundwater.
(e) Groundwater monitored independently of groundwater project.

5.1.2 Groundwater Monitoring Requirements and History

The first groundwater monitoring wells in the 200 West Area were installed to monitor specific disposal facilities in the mid-1940s. The *Atomic Energy Act of 1954* and DOE Order 5400.1 require monitoring to identify and track contaminant plumes. This document serves as the monitoring plan for monitoring per DOE Orders. Starting in fiscal year 2003, much of the monitoring of contaminant plumes within the 200 West Area has been integrated into expanded CERCLA and RCRA past-practice operable unit sampling and analysis plans. However, limited monitoring of contamination continues in deep parts of the aquifer, not covered in the operable unit sampling and analysis plans. Under CERCLA, several injection and extraction wells have been drilled to support interim-action pump-and-treat systems. Specific requirements for monitoring performance of the pump and treat systems will be documented in letters of instruction from Fluor Hanford, Inc. to PNNL. RCRA monitoring wells were installed beginning in 1987. Requirements for RCRA monitoring are defined in site-specific monitoring plans (see Table 5.1).

5.2 Conceptual Model

The most widespread hazardous chemical contaminants of concern in 200 West Area groundwater are nitrate, carbon tetrachloride, and trichloroethene. Smaller plumes of chromium and fluoride, also are present. Chloroform is present through a large area within the carbon tetrachloride plume, but generally at levels below the drinking water standard. Iodine-129, technetium-99, tritium, and uranium are the most significant radionuclides in groundwater.

Contaminated effluent has infiltrated the soil from cribs, trenches, tile fields, surface impoundments, and leaking tanks associated with T Plant, Reduction-Oxidation Plant, U Plant, and Plutonium Finishing Plant. Radionuclides with short half-lives decayed in the vadose zone, while non-radioactive constituents and longer-lived radionuclides were carried deeper. Some of the radioactive and chemical contaminants sorbed to sediment, some remained in the moisture in the vadose zone, and large quantities were carried into the groundwater.

The regional direction of groundwater flow beneath the southern portion of the 200 West Area is to the east. Groundwater flows to the northeast beneath the northern part of the area. In the past, waste-disposal practices created groundwater mounds that caused westward flow of contaminants in some parts of the area. Contaminants moved outward from these mounds, contaminating a larger area in the saturated zone than in the vadose zone. These mounds are still present but are declining, and the westward flow has ceased. Interim remedial action systems, where groundwater is extracted, treated, and reinjected, locally perturb groundwater flow directions near the Plutonium Finishing Plant and east of U Plant.

The few shallow and deep well pairs indicate that the vertical flow gradient in the unconfined aquifer is downward in the 200 West Area. Contamination in the deeper parts of the unconfined aquifer appears to be considerably less than in the upper portion of the aquifer. However, very few wells monitor the deeper portions of the aquifer, and at some locations certain contaminants are found in greater concentrations at depth than at the water table.

Contaminant concentrations are expected to decrease with time because of dispersion, radioactive decay, and remediation. With the exception of the State-Approved Land Disposal Site, there are no new sources of contamination, but concentrations will vary because of plume movement, mobilization of vadose zone contamination, and remediation activities.

5.3 Monitoring Program

Wells in the 200 West Area are sampled for requirements of RCRA, CERCLA, the *Atomic Energy Act of 1954*, and a state permit (see Table 5.1). Many wells are sampled to meet the objectives of two or more regulations, as indicated in the Appendix. Except for monitoring associated with the State-Approved Land Disposal Site and interim actions, the groundwater project coordinates sampling and analysis to avoid duplication by scheduling all user's needs in a project database (Figure 5.1). When analytical results are returned from the laboratory, the groundwater project loads the data into HEIS for use by all. Routine field analyses of organic constituents associated with ongoing interim actions are performed by Fluor Hanford, Inc. staff, who also load the results into HEIS. Pump-and-treat system operators sample extraction wells to help assess system performance and the data are stored in a project database, not in HEIS. At the State-Approved Land Disposal Site, an active disposal site regulated under a state permit, Fluor Hanford, Inc. staff sample the wells, analyze the samples, and load the results into the Liquid Effluent Monitoring Information System database. The groundwater project then downloads the data into HEIS.

The primary objective of surveillance monitoring in the 200 West Area is to monitor the extent of plumes originating from 200 West Area waste sites, and to provide an independent assessment of the effectiveness of the groundwater and vadose zone interim remedial actions. Most of the sites have ceased operation, and many wells monitoring the widespread plumes are sampled annually since plume dimensions and concentrations continue to change significantly in this vicinity. Other wells are sampled more frequently.

Another objective of surveillance monitoring is to monitor hazardous waste sites that ceased operation before 1985 and radioactive waste sites, which are not regulated by RCRA. Wells are monitored near the most significant sources to determine whether contaminants are declining as expected and to detect contaminants migrating from the vadose zone. These wells are monitored annually or more frequently. In particular, performance assessment monitoring of the active low-level burial grounds is integrated into the surveillance monitoring and is coordinated closely with RCRA monitoring requirements.

The carbon tetrachloride network for monitoring the top of the aquifer was reevaluated using a geostatistical analysis in fiscal years 2000 and 2001. These analyses were described in previous revisions of this integrated monitoring plan (Hartman et al. 2000; Hartman et al. 2001). The results of the simulations were used to reduce the monitoring network where possible. The geostatistical analysis was updated and incorporated into the current 200-UP-1 and 200-ZP-1 Sampling and Analysis Plans.

Locations of monitoring wells for the 200 West Area are illustrated in Figure 5.2 (600 Area wells were shown in Figure 4.9). Those sampled for long-term CERCLA and *Atomic Energy Act of 1954* monitoring are shown with solid symbols. Many of the wells also are sampled for RCRA, State-Approved Land Disposal Site, and/or interim action objectives. Wells sampled for other requirements but not for surveillance or long-term CERCLA monitoring are shown with open symbols in the figures. Wells and constituents required for each type of monitoring are listed in the Appendix.

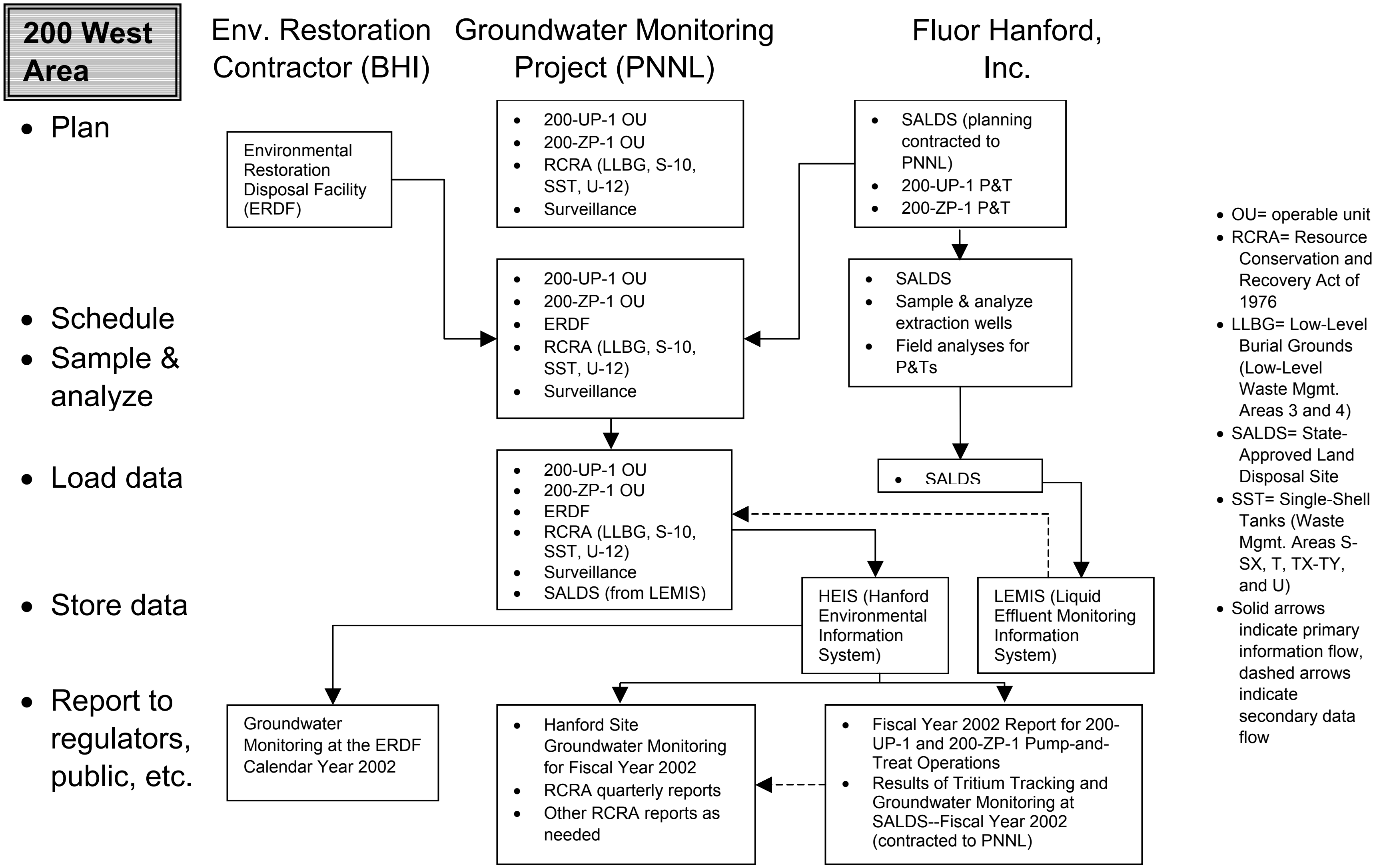


Figure 5.1. Responsibilities and Flow of Information for Groundwater Monitoring in the 200 West Area

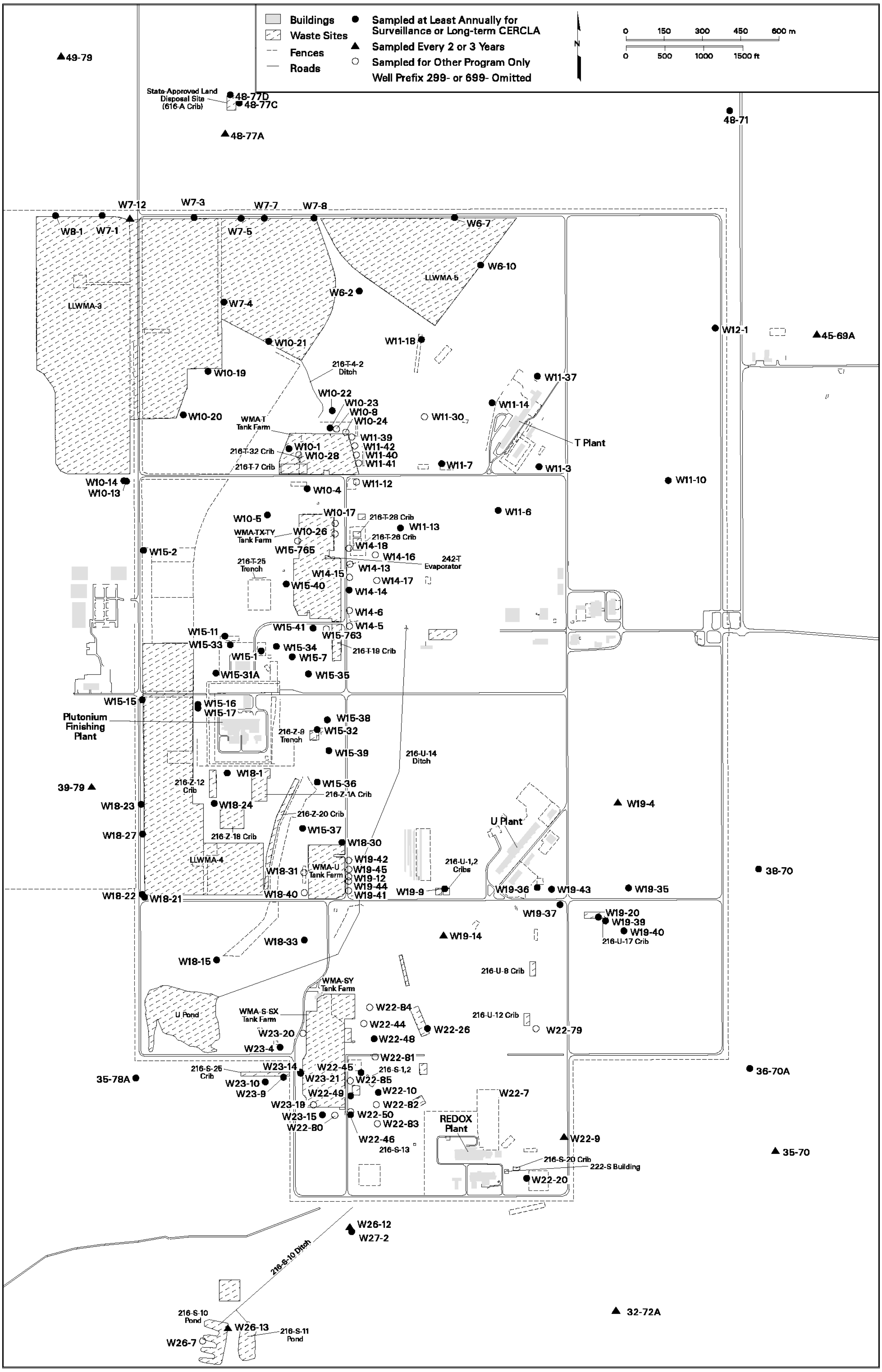


Figure 5.2. Groundwater Project Well Locations: 200 West Area

6.0 200 East Area

For the purposes of this plan, “200 East Area” describes that portion of the Hanford Site including the 200 East Area itself, north to Gable Mountain, and a large part of the 600 Area to the south and east where groundwater shows effects of contaminants originating in the 200 East Area. The 200 Area Treated Effluent Disposal Facility also falls generally within this part of the site but is monitored under the specific requirements of its state waste-discharge permit. The Central Landfill also is included, because it falls within the footprint of the 200-PO-1 Operable Unit. However, it is monitored under RCRA and WAC 173-304.

6.1 Background

Hundreds of waste sites have been identified in the 200 East Area, including radioactive and mixed waste-storage tanks; low-level burial grounds; effluent disposal cribs, ditches, drains, and ponds; and various spills or other unplanned releases. Sites with specific monitoring requirements and those that appear to have affected groundwater quality are listed in Table 6.1. Additional information is provided in Hartman (2000). A number of facilities are regulated under RCRA because they were more recently active and contain, or contained, dangerous waste constituents.

Table 6.1. Selected Waste Sites in and Downgradient of the 200 East Area[a]

<table>
<tr><th>Facility (period of use)</th><th>Waste Type</th><th>Constituents of Interest for Groundwater Monitoring</th><th>Type of Site (monitoring plan reference)</th></tr>
<tr><td colspan="4">200-BP-5 Operable Unit</td></tr>
<tr><td>Single-shell tank farms (Waste Management Areas B-BX-BY, C)</td><td>Radioactive/chemical slurries</td><td>Sodium hydroxide, sodium salts, ferro-cyanide, radionuclides[b]</td><td>RCRA (WMA B-BX-BY: Narbutovskih 2000; WMA C: Horton and Narbutovskih 2001)</td></tr>
<tr><td>216-B-7A, -7B, -8 cribs</td><td>Supernatant from settling tanks</td><td rowspan="2">Sodium hydroxide, sodium salts, ferro-cyanide, radionuclides</td><td rowspan="5">Past-practice (Federal Facility Agreement and Consent Order Change Control Form M-15-01-02; sampling and analysis plan to be written in fiscal year 2003)</td></tr>
<tr><td>216-B-37 trench</td><td>Concentrated waste from tank bottoms</td></tr>
<tr><td>216-B-5 injection well (1945-1946)</td><td>Hot cell drainage; super-natant from settling tanks</td><td>Strontium-90, cesium-137, plutonium</td></tr>
<tr><td>BY cribs and trench (1954-1955)</td><td>Uranium-recovery waste supernatant</td><td>Ferrocyanide, radionuclides</td></tr>
<tr><td>Gable Mountain Pond (1957-1987)</td><td>200 East Area liquid waste</td><td>Strontium-90, cesium-137, ruthenium-106</td></tr>
</table>

Table 6.1. (contd)

Facility (period of use)	Waste Type	Constituents of Interest for Groundwater Monitoring	Type of Site (monitoring plan reference)
216-B-63 trench (1970-1992)	Steam condensate	Sulfuric acid, sodium hydroxide, radionuclides[b]	RCRA (Sweeney 2002)
Low-level burial grounds (Waste Management Areas 1 and 2)	Radioactive solid waste	Various chemical and radioactive waste[b,d]	Active: RCRA (Last and Bjornstad 1989). Permit application submitted 2002.
Liquid Effluent Retention Facility	242-A evaporator process condensate	Ammonium, acetone, aluminum, 1-butanol, 2-butanone, cesium-137, strontium-90, ruthenium-106, tritium[b, d]	Active: RCRA (Schmid 1990)
200-PO-1 Operable Unit			
BC cribs and trenches (1956-1958)	Uranium recovery waste supernatant	Ferrocyanide, radionuclides	Past-practice (sampling and analysis plan to be written in fiscal year 2003)
Plutonium-Uranium Extraction Plant waste-disposal cribs	Process distillate	Nitrate, radionuclides[b] (especially tritium, iodine-129, strontium-90)	216-A-10, -36B, -37-1: RCRA (Lindberg 1997). Others past-practice (DOE 1997b; sampling and analysis plan to be written in fiscal year 2003)
Single-shell tank farms (Waste Management Area A-AX)	Radioactive/chemical slurries	Sodium hydroxide, sodium salts, ferro-cyanide, radionuclides	RCRA (Narbutovskih and Horton 2001)
216-A-29 ditch	Plutonium-Uranium Extraction Plant chemical waste	Sodium hydroxide, sulfuric acid	RCRA (Sweeney 1999)
216-B-3 pond (B Pond)	B Plant steam condensate and chemical waste; Plutonium-Uranium Extraction Plant chemical waste	Aluminum nitrate, nitric acid, potassium hydroxide, sulfuric acid, tritium[b]	RCRA (Barnett et al. 2000)

Table 6.1. (contd)

Facility (period of use)	Waste Type	Constituents of Interest for Groundwater Monitoring	Type of Site (monitoring plan reference)
200 Area Treated Effluent Disposal Facility	Treated liquid effluent from 200 Areas	Trihalomethane	Active: WAC permitted (Barnett 2000b)[(c)]
600 Area Facilities			
Solid Waste Landfill	Solid waste, sewage, garage wash water	Organics	WAC permitted (Lindberg and Chou 2000)
Nonradioactive Dangerous Waste Landfill	Asbestos, laboratory waste, solvents, batteries, mercury	Organics and specific conductance	RCRA (Lindberg and Hartman 1999)

(a) Sites with specific groundwater monitoring requirements and those that appear to have affected groundwater quality.
(b) Radionuclides monitored under AEA and CERCLA.
(c) Present in waste; not found in groundwater.
(d) Groundwater monitored independently of groundwater project.

6.1.1 Waste Sites, Discharges, and Groundwater Operable Units

The 200 Area Treated Effluent Disposal Facility, located east of the 200 East Area proper, is the only active liquid disposal facility in the area. As mentioned above, this facility is monitored under a state waste discharge permit. The permitted discharge does not include radioactive or hazardous constituents. Low-Level Waste Management Areas 1 and 2 are burial grounds regulated under RCRA that continue to receive radioactive solid waste. Three single-shell tank waste management areas, also regulated under RCRA, no longer actively receive waste but currently store mixed waste.

Groundwater in the northern part of the 200 East Area forms the 200-BP-5 Operable Unit, while the southern part of the site is in the 200-PO-1 Operable Unit. Remediation of the 200-BP-5 Operable Unit is being performed under CERCLA regulations, and the 200-PO-1 Operable Unit is being remediated under RCRA past-practice regulations.[1] Two groundwater extraction treatability tests were performed in the 200-BP-5 Operable Unit – the first near the 216-B-5 injection well and the second just north of the northwestern corner of the 200 East Area in an area of contamination originating in the BY cribs. Currently, there is no active groundwater remediation in the 200 East Area. The interim action recommended in the *Hanford Sitewide Groundwater Remediation Strategy* (DOE 1995a) is natural attenuation and decay of contaminant plumes. There is, however, no interim or final record of decision for the operable units in the 200 East Area.

[1] For simplicity, this document refers to any type of operable unit monitoring as "CERCLA."

6.1.2 Groundwater Monitoring Requirements and History

Groundwater monitoring has been conducted in the 200 East Area since the 1940s. Very few monitoring wells existed in the early decades but more were installed in the 1970s and monitored for DOE requirements. Approximately 100 new wells were installed when RCRA monitoring began in the late 1980s. CERCLA investigations in the 1990s resulted in the installation of several wells but relied primarily on data from existing groundwater monitoring networks and additional wells installed in support of RCRA.

The *Atomic Energy Act of 1954* and DOE Order 5400.1 require monitoring to identify and track contaminant plumes. This document serves as the monitoring plan for surveillance monitoring per DOE orders. Beginning in fiscal year 2003, the groundwater project is responsible for groundwater monitoring in the 200-BP-5 and 200-PO-1 Operable Units. Wells required for this monitoring will be defined in sampling and analysis plans (see Table 6.1). The groundwater project monitors additional wells and constituents within or near the operable units to support surveillance monitoring.

6.2 Conceptual Model

The most widespread groundwater contaminants of concern originating from the 200 East Area are iodine-129, nitrate, and tritium. These contaminants extend east and southeast of the 200 East Area to the Columbia River and northwest to the gap between Gable Mountain and Gable Butte. A significant plume of technetium-99 at levels above the drinking water standards extends northwest from the 200 East Area fence line toward the gap. This plume also contains low levels of cobalt-60 and cyanide. Arsenic is found at levels above drinking water standards in the eastern part of the 200 East Area. Groundwater is locally contaminated with strontium-90 at high levels near Gable Mountain Pond (decommissioned) and at low levels near cribs south of the Plutonium-Uranium Extraction Plant. Contamination with cesium-137, plutonium, and strontium-90 is found in the immediate vicinity of the 216-B-5 injection well. Localized uranium and chromium contamination is also found.

The most extensive contaminant plumes are attributable predominantly to liquid discharges to cribs, with some contribution from ponds, ditches, and other sources. Most pond discharge, however, was more dilute and did not contribute to the highest levels of contamination. The ponds, particularly 216-B-3 pond (B Pond), did have a large influence on contaminant migration because the large amounts of water that went to the ponds affected flow directions. Contamination from tank leaks, unplanned releases, and specific retention trenches appears to have produced groundwater contamination of limited extent, though considerable inventory may remain in the vadose zone. No groundwater impact from low-level waste-burial grounds in the 200 East Area has been identified.

Contaminant levels are declining through much of the 200 East Area. Many short-lived radionuclides detected in the past, such as cobalt-60 and ruthenium-106, are no longer detected or are detected at much lower concentrations. Tritium concentrations near the source areas are declining because waste discharges have ended and the radionuclide is dispersing and decaying. Data indicate that residual contamination in the vadose zone at many of the sources continues to drain into the groundwater. It is expected that the amount of transport to groundwater will decline with time. Some contaminants that have been retarded by sorption to sediment or that never reached groundwater because of limited discharge volumes (i.e., specific retention trenches) may break through to the water table, and concentrations then could increase. In addition, any uncontrolled discharge, such as leaks from water lines, may enhance transport of contaminants to the groundwater from the vadose zone. The major tritium plume, which is flowing eastward and southeastward from the 200 East Area toward the Columbia River, ceased expanding laterally (southward) into the 300 Area in about 1995 because of dispersion and decay. Tritium is still detected in the northern part of the 300 Area, but the concentrations are no longer increasing.

Vertical migration of contaminants to deeper parts of the unconfined aquifer or deeper aquifers may have occurred through several mechanisms. Significant groundwater mounds developed at a number of facilities. The greatest mounding occurred at B Pond, where monitoring evidence indicates there was some movement of contamination down to the upper basalt-confined aquifer. This mounding produced vertical gradients that transported contamination downward in the sedimentary sequence. Poorly sealed wells may have produced conduits, thus enhancing vertical migration.

Another mechanism for vertical migration is the intersection of the water table by confining layers in the suprabasalt sediments. The lower Ringold mud intersects the water table downgradient of B Pond and dips approximately to the south. This serves to induce downward flow to the sediment below the confining mud. The lower part of the Ringold Formation sediment, therefore, forms a confined aquifer in this area. Although relatively few wells are completed below the lower Ringold mud, this interval is monitored where wells are available. Several wells near B Pond and the 200 Area Treated Effluent Disposal Facility are completed below the lower mud.

6.3 Monitoring Program

Wells in the 200 East Area are sampled for requirements of RCRA, CERCLA, the *Atomic Energy Act of 1954*, and a state permit (see Table 6.1). Many wells are sampled to meet the objectives of two or more regulations, as indicated in the Appendix. Except for monitoring associated with the 200 Area Treated Effluent Disposal Facility, the groundwater project coordinates sampling and analysis to avoid duplication by scheduling all user's needs in a project database (Figure 6.1). When analytical results are returned from the laboratory, the groundwater project loads the data into HEIS for use by all. At the 200 Area Treated Effluent Disposal Facility, an active disposal site regulated under a state permit, Fluor Hanford, Inc. staff sample the wells, analyze the samples, and load the results into the Liquid Effluent Monitoring Information System database. The groundwater project then downloads the data into HEIS.

The surveillance monitoring program in the 200 East Area has been designed to monitor the extent of plumes emanating from 200 East Area waste sites and to complement the RCRA and 200 Area Treated Effluent Disposal Facility monitoring networks. In particular, performance assessment monitoring of the active low-level burial grounds is integrated into the surveillance monitoring and is coordinated closely with RCRA monitoring requirements. Most of these sites have ceased operation, and it is expected that the monitoring network will be suitable to track the rate of dissipation and attenuation of the plumes. A combination of geostatistical assessment and site knowledge was used to develop the plume-monitoring system. CERCLA monitoring of the 200-BP-5 and 200-PO-1 Operable Units share this objective, and appropriate well networks will be identified in sampling and analysis plans in fiscal year 2003.

The large contaminant plumes downgradient (east to southeast) of the 200 East Area do not change rapidly. Therefore, many of the wells are sampled at 1 to 3 year intervals rather than more frequently.

Three bands of guard wells will be monitored annually for a longer list of constituents to assure that the nature of contamination found downgradient of the operational and waste disposal areas has been sufficiently characterized. These bands are shown in Figure 6.2; the wells are listed in Table 6.2. One band is located in the gap between Gable Mountain and Gable Butte and serves to detect contaminant movement to the north. The second band is located to the southeast of the 200 East Area and detects contamination moving into the southern and eastern parts of the site. The third band is along the Columbia River to provide assurance that offsite effects are identified. In addition to the known contaminants, wells in these bands will be monitored for inductively coupled-plasma metals, anions, gross alpha, gross beta, gamma, strontium-90, technetium-99, tritium, total organic halides, total organic carbon, and alkalinity.

The *Atomic Energy Act of 1954* monitoring network is also designed to complement the RCRA detection and assessment monitoring of contaminant sources. RCRA-monitoring networks monitor hazardous waste sources that were operational after 1985. RCRA and past-practice source monitoring helps determine if contaminant concentrations are declining near the most significant sources, and would detect breakthrough of new contamination from the vadose zone if it occurs.

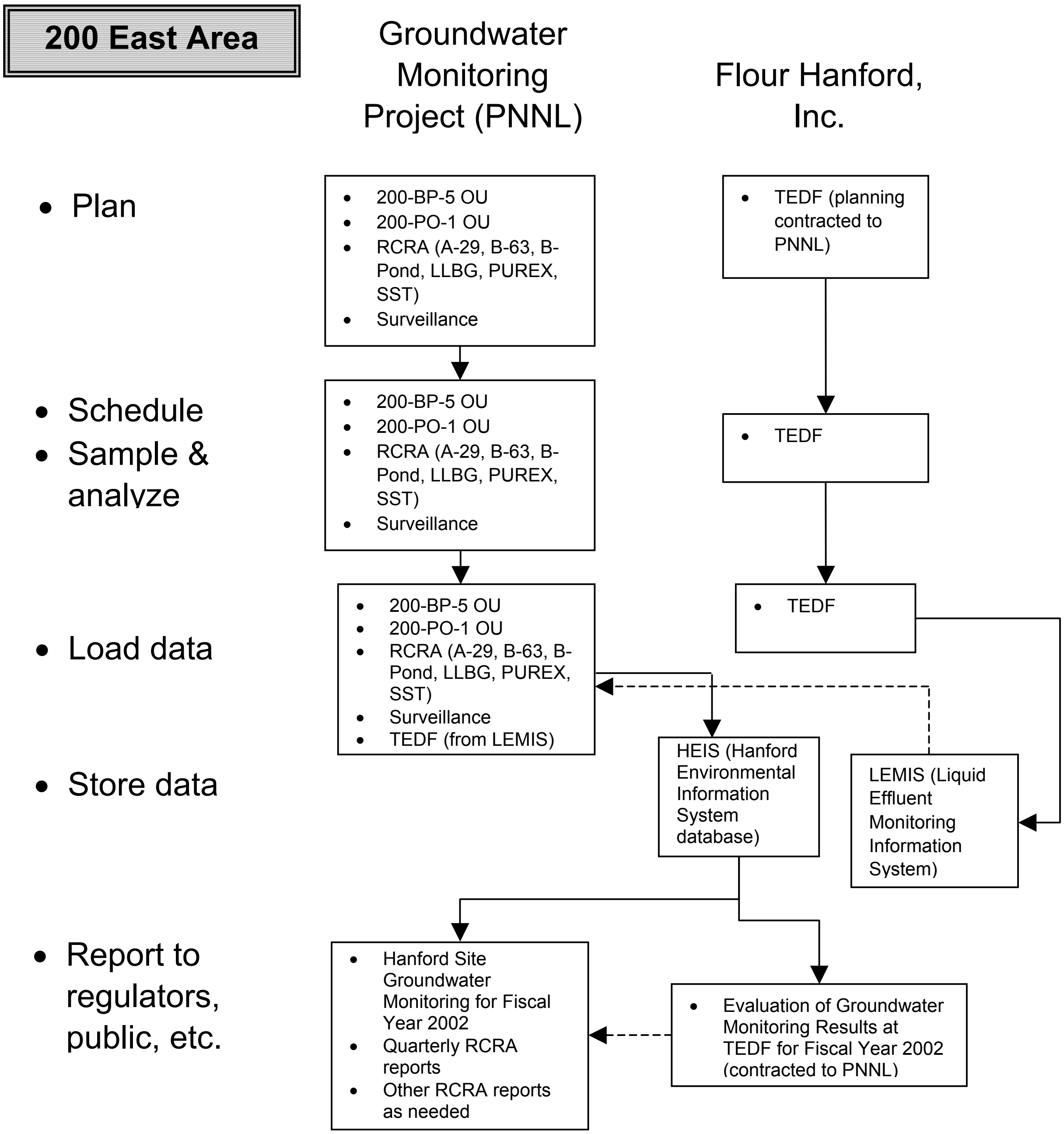
Locations of monitoring wells for the 200-East Area are illustrated in Figure 6.3 (600 Area wells were shown in Figure 4.9). Well locations for the Central Landfill are shown in Figure 6.4. Wells sampled for long-term CERCLA and *Atomic Energy Act of 1954* monitoring are shown with solid symbols. Many of the wells also are sampled for RCRA or 200 Area Treated Effluent Disposal Facility. Wells sampled for other requirements but not for surveillance or long-term CERCLA monitoring are shown with open symbols in the figures. Wells and constituents required for each type of monitoring are listed in the Appendix.

Table 6.2. 200 East Area Guard Wells

Gap	Southeast	River
699-57-59[a]	699-10-54A[b]	699-10-E12[a,c]
699-59-58	699-24-46[d]	699-20-E12O
699-60-60	699-26-33	699-41-1A
699-61-62	699-31-31	699-46-4
699-61-66	699-32-22A	699-S3-E12[c]
699-64-62[c]	699-32-43	699-S19-E13[c,e]
	699-41-23[f]	
	699-46-21B[g]	

Constituent list: alkalinity, anions, gross alpha, gross beta, gamma, inductively coupled-plasma (ICP) metals, iodine-129, strontium-90, technetium-99, total organic carbon, total organic halides, tritium.

(a) Scheduled for surveillance projects "2BP5-S" or "2PO1-S" instead of transects.
(b) Alkalinity, gamma, ICP metals, strontium-90, technetium-99, total organic carbon, total organic halides triennially.
(c) No iodine-129.
(d) Iodine-129 triennially; others annually.
(e) Alkalinity, anions, tritium semiannually; others annually.
(f) Anions, gross alpha, gross beta, iodine-129, tritium annually; others triennially.
(g) Anions, gross alpha, gross beta annually; others triennially.



OU = operable unit
RCRA = Resource Conservation and Recovery Act of 1976
LLBG = Low-Level Burial Grounds (Low-Level Waste Management Areas 1 and 2)
TEDF = Treated Effluent Disposal Facility
SST = Single-Shell Tanks (Waste Management Areas A-AX, B-BX-BY, and C)
Solid arrows indicate primary information flow, dashed arrows indicate secondary data flow

Figure 6.1. Responsibilities and Flow of Information for Groundwater Monitoring in the 200 East Area

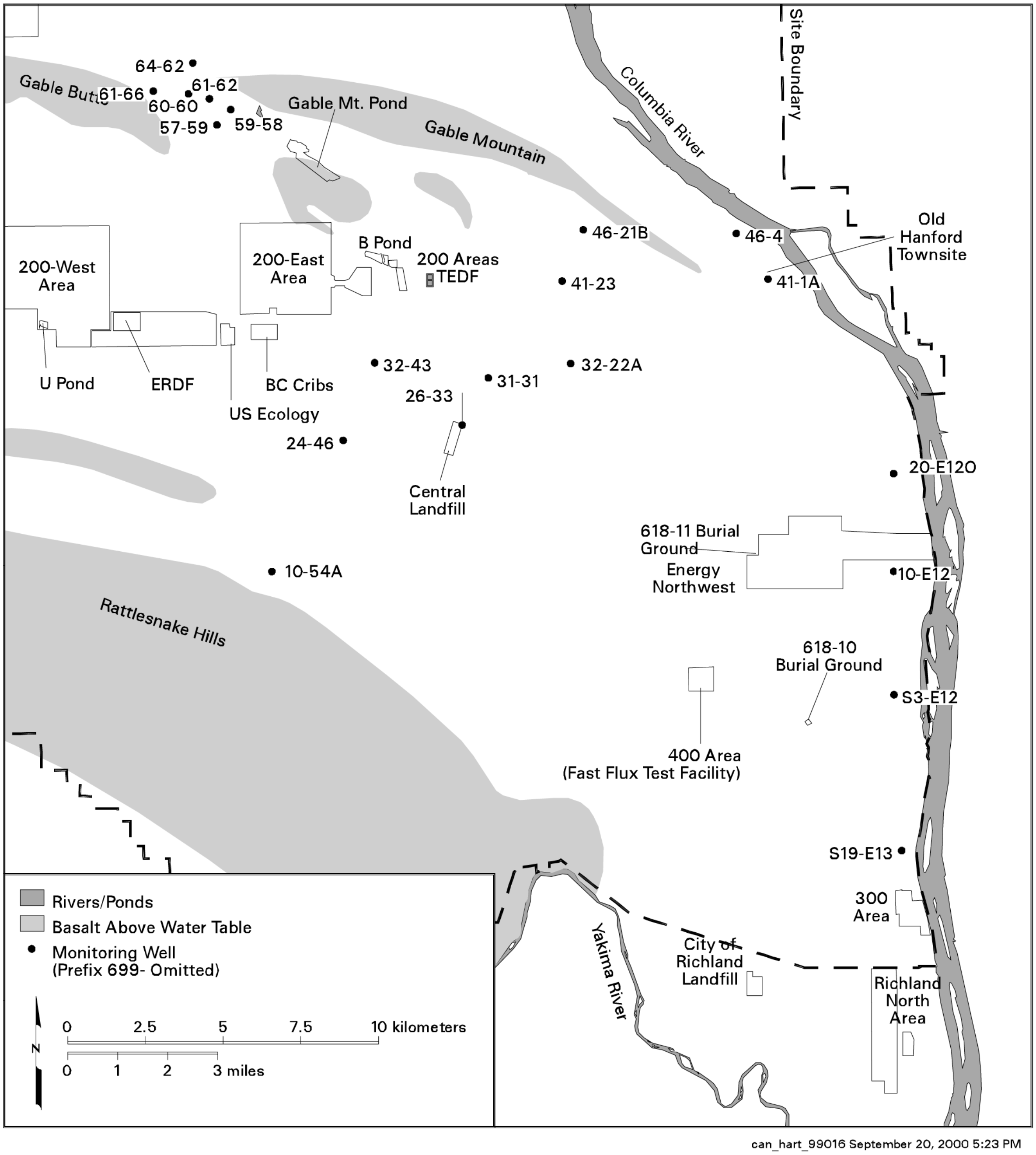


Figure 6.2. Locations of 200 East Area Guard Wells

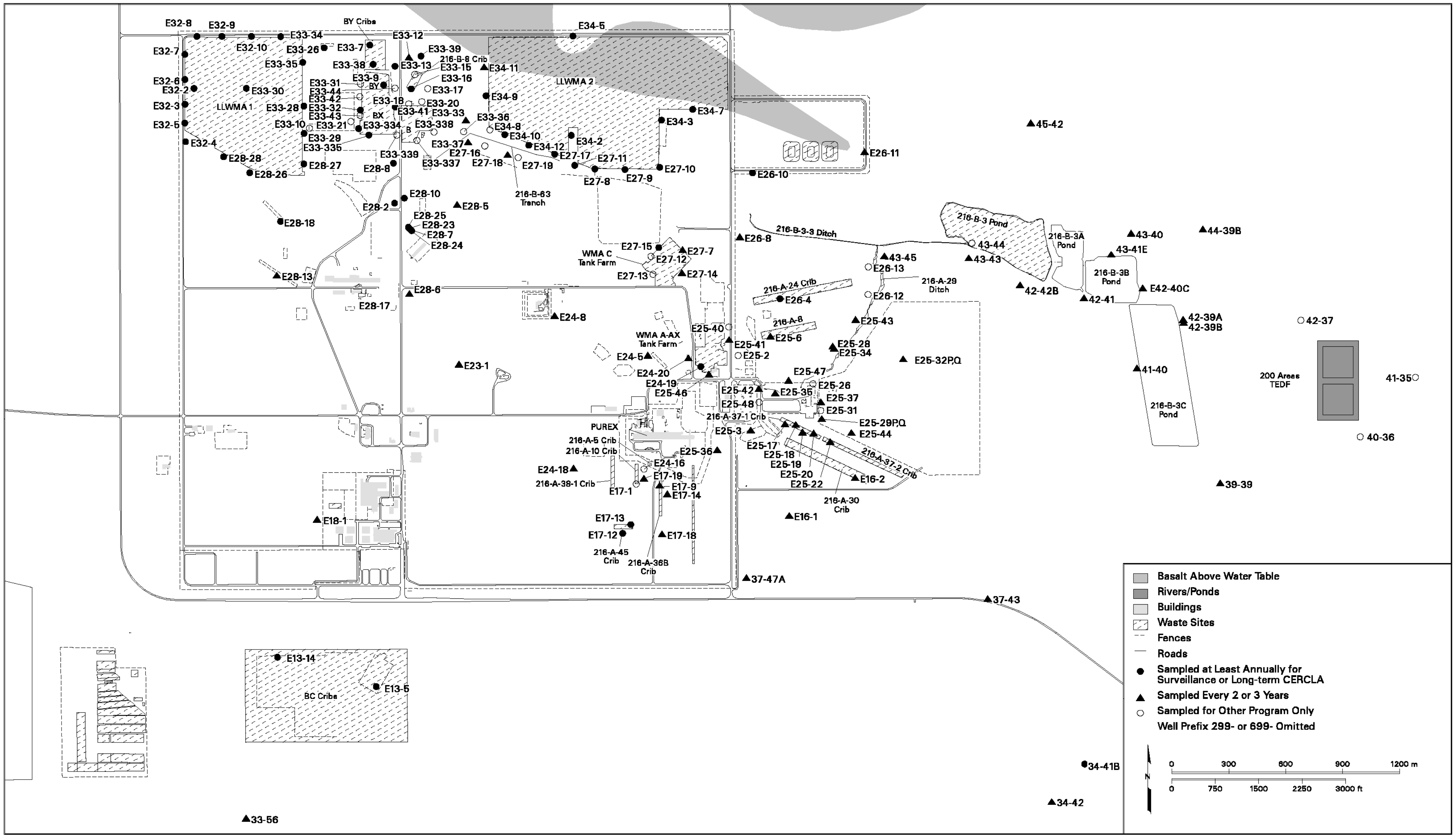


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Figure 6.3. Groundwater Project Well Locations: 200 East Area

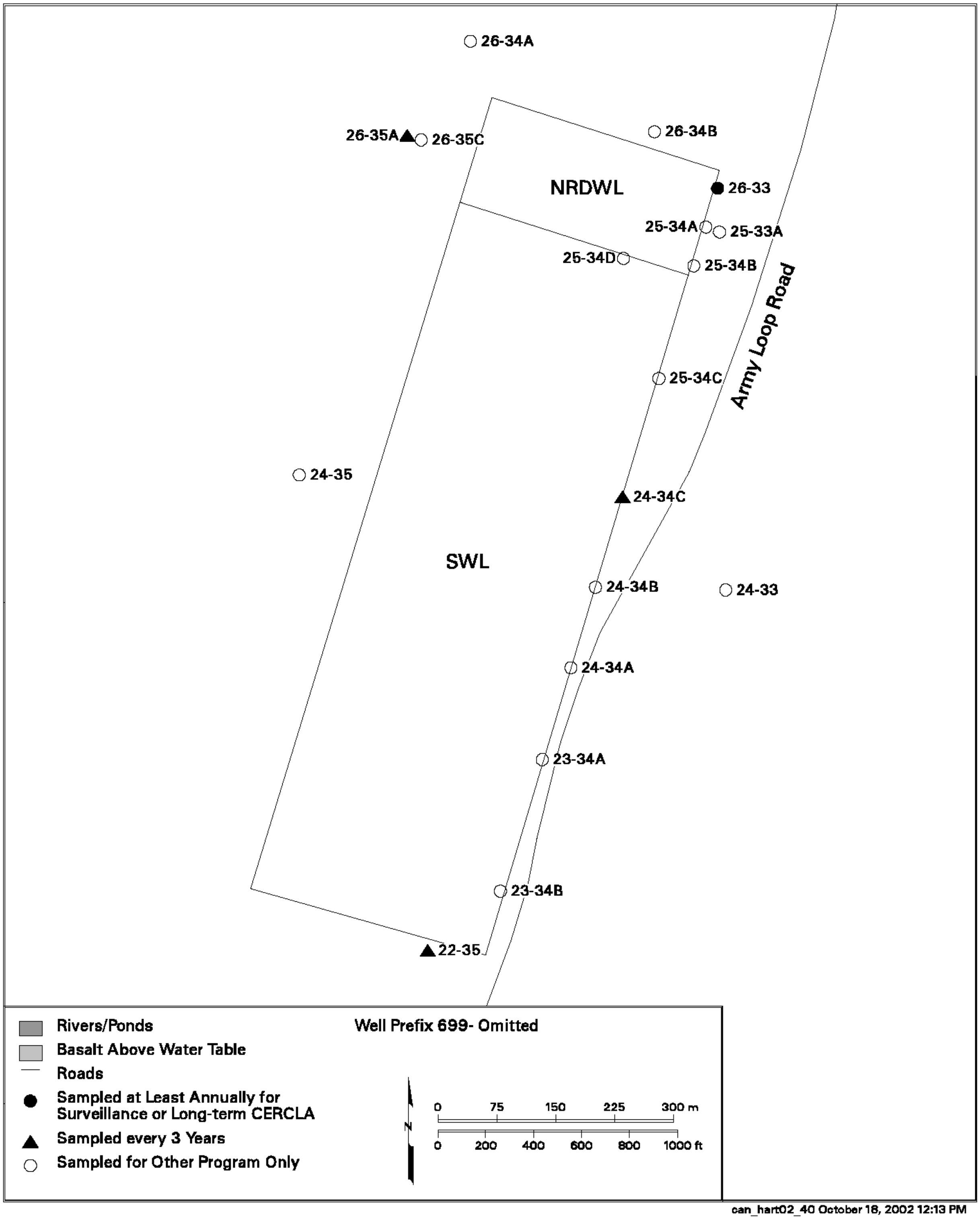


Figure 6.4. Groundwater Project Well Locations: Central Landfill

7.0 400 Area

7.1 Background

This section covers activities in the 400 Area, the location of the Fast Flux Test Facility, a liquid sodium-cooled reactor. DOE is currently deactivating the facility.

Primary local groundwater monitoring activities include the area around the 4608 B/C ponds (also called the 400 Area process ponds), which receive wastewater effluent. The 400 Area process ponds are located north of the 400 Area perimeter fence and are unlined infiltration ponds that receive wastewater from the 400 Area facilities (Figure 7.1). The waste stream consists primarily of cooling water and intermittent small contributors such as sinks and drains. The water supply for the 400 Area, including the drinking water supply, also is monitored by sampling wells completed in the unconfined aquifer system.

7.2 Conceptual Model

Water-level contours indicate that groundwater generally flows from west to east across the 400 Area. In addition, nitrate and tritium plumes, which originate in the 200 East Area, indicate that groundwater flows toward the east to southeast. The tritium plume is detected in the 400 Area water-supply wells, as discussed above. Tritium levels are lower in the vicinity of the 400 Area process ponds as a result of dilution effects. However, nitrate levels are currently elevated in the vicinity of the process ponds, apparently from the former disposal of sanitary sewage to a nearby lagoon. Since discharge of process water to the ponds is monitored under a state waste discharge permit, migration of contaminants from the ponds to the groundwater is not expected to be significant.

7.3 Monitoring Program

Wells in the 400 Area and vicinity are monitored for requirements of the *Atomic Energy Act of 1954*, a state permit, and drinking water supply wells, all under the groundwater project. Some of the wells are sampled to meet more than one requirement, as indicated in the Appendix. The groundwater project coordinates sampling and analysis to avoid duplication, and loads the data into HEIS (Figure 7.2). Well locations are shown in Figure 7.1.

The 400 Area process ponds are monitored in accordance with State Waste Discharge Permit ST4501, issued on August 1, 1996 and modified on February 10, 1998. This integrated groundwater monitoring plan provides requirements for sampling activities and quality assurance/quality controls to assure that the data needs of various users are satisfied. The primary objective of groundwater monitoring at this facility is to assure that wastewater entering the ponds meets acceptable standards and does not adversely affect local groundwater quality. The monitoring network includes two downgradient wells (699-2-6A and 699-2-7), shown in Figure 7.1, and an upgradient well (699-8-17), shown in Figure 4.9. Constituents analyzed in quarterly groundwater samples, as specified by the discharge permit, include unfiltered metals (cadmium, chromium, lead, mercury, and manganese), pH, sulfate, and total organic carbon. In addition, the wells are co-sampled for surveillance monitoring for other constituents, as indicated in the Appendix.

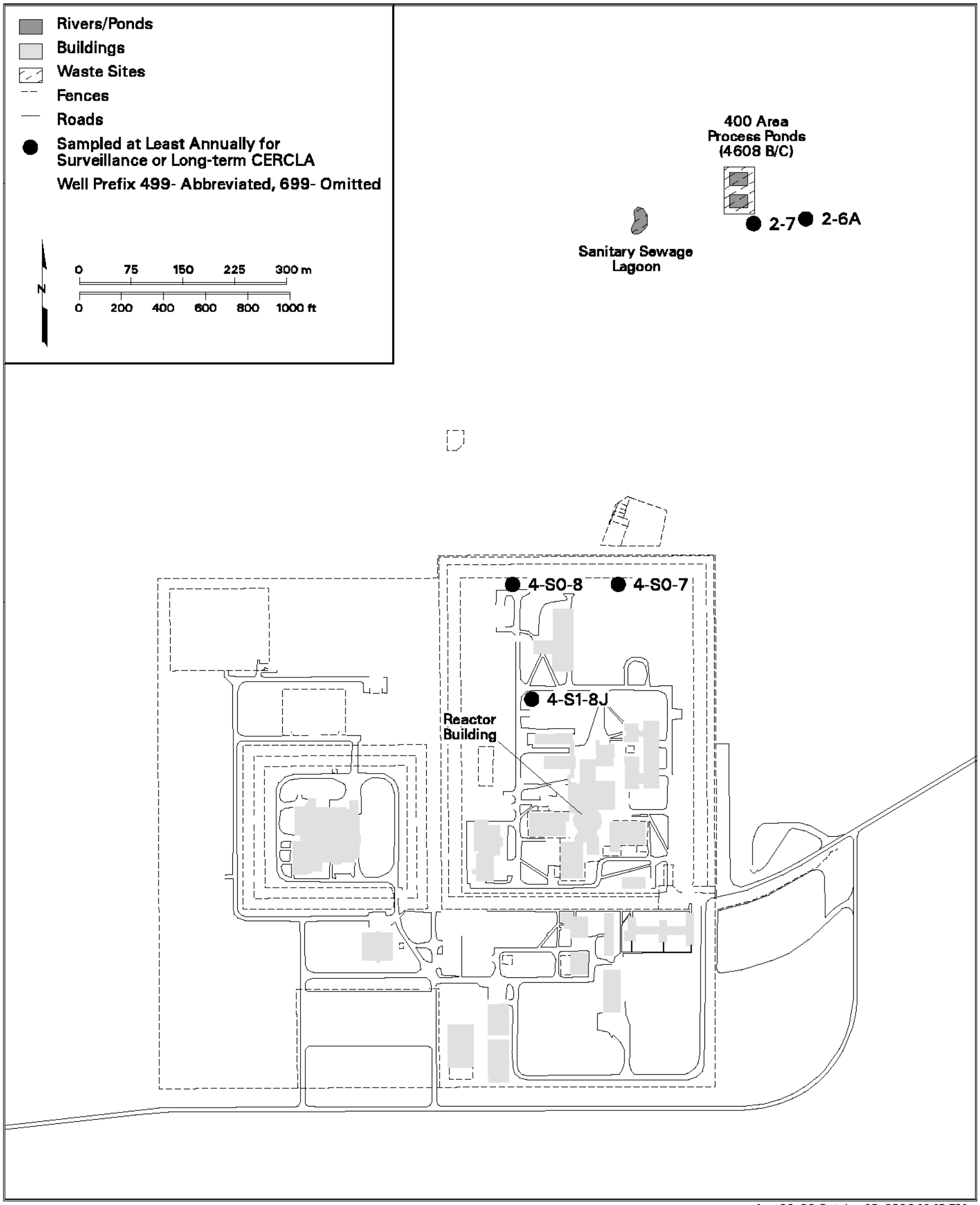
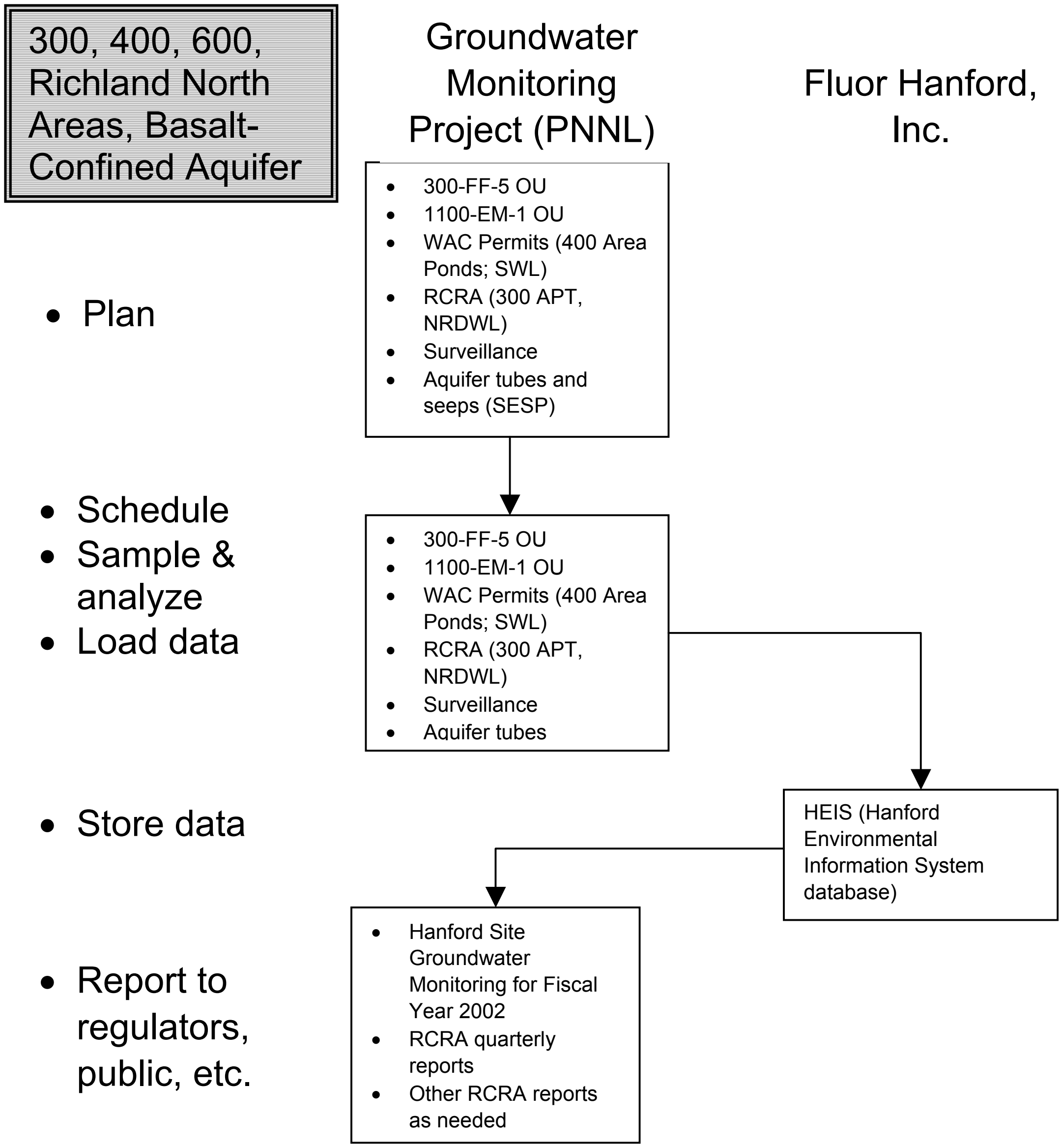


Figure 7.1. Groundwater Project Well Locations: 400 Area



300 APT = 300 Area Process Trenches
NRDWL = Nonradioactive Dangerous Waste Landfill
OU = operable unit
RCRA = Resource Conservation and Recovery Act of 1976
SESP = Coordinated with Surface Environmental Surveillance Project
SWL = Solid Waste Landfill
Solid arrows indicate primary information flow

Figure 7.2. Responsibilities and Flow of Information for Groundwater Monitoring in the 300, 400, 600, and Richland North Areas and Basalt-Confined Aquifer

Nitrate is the only contaminant that has been identified consistently at concentrations above regulatory limits in the local groundwater monitoring network for the 400 Area process ponds, where it has been monitored in well 699-2-7 since 1986. This is attributed to a sanitary sewage lagoon formerly located immediately west and upgradient of the ponds and later to a drainfield associated with septic tanks located southwest of the ponds. Disposal to the lagoon was discontinued in 1983 or 1984 and to the drainfield in April 1997, and nitrate concentrations in well 699-2-7 are declining. Nitrate concentrations in well 699-2-6A are relatively low, apparently due to the low nitrate content of the effluent disposed to the ponds.

The primary groundwater monitoring compliance issue related to the 400 Area water supply is associated with tritium. Wells 499-S0-7 and 499-S0-8, the original water-supply wells, were completed near the top of the unconfined aquifer and have been monitored since 1972. When tritium contamination was detected in the water supply, an additional well (499-S1-8J) was drilled in the lower unconfined aquifer in 1985. Tritium levels of water samples collected from well 499-S1-8J are well below the interim 20,000 pCi/L drinking water standard and this well is currently used as the primary water-supply well. Wells 499-S0-7 and 499-S0-8 are still used for backup supply and emergency uses, but based on DOE direction may not be used as a potable water supply when the drinking water standard is exceeded.

8.0 300 Area

The 300 Area is located along the Columbia River in the southeastern portion of the Hanford Site. This chapter also includes smaller areas to the north of the 300 Area that are included in the 300-FF-5 Operable Unit, which includes the 618-10 and 618-11 burial grounds and the 316-4 cribs.

8.1 Background

The 300 Area has been used for research-and-development and nuclear fuel-fabrication process activities associated with uranium fuel elements for nuclear reactors.

8.1.1 Waste Sites, Discharges, and Groundwater Operable Units

In the 300 Area, inactive facilities known to have received liquid waste containing uranium and other known or suspected contaminants include the 316-5 process trenches and the 316-1 and 316-2 process ponds (DeFord et al. 1994). These are the primary sites affecting groundwater contamination (Table 8.1). Other sites that received waste include sanitary septic systems, trenches, and tile fields; ash pits; filter backwash ponds; and a number of solid waste burial grounds. The 300 Area also contained underground tanks for storing gasoline and diesel fuels.

Table 8.1. Selected Waste Sites in the 300 Area[(a)]

Facility (period of use)	Waste Type	Constituents of Interest for Groundwater Monitoring	Type of Site (monitoring plan reference)
300 Area (300-FF-5 Operable Unit)			
316-5 process trenches (1975-1994)	Variety of chemical and uranium waste	Uranium, trichloroethene, cis-1,2-dichloroethene, metals	RCRA (Lindberg and Chou 2001)
316-1 (south) and 316-2 (north) process ponds (1940s-1975)	Variety of chemical and uranium waste	Uranium, trichloroethene, cis-1,2-dichloroethene	Past-practice (ROD 1996b; DOE 2002d)
316-3 disposal trenches (307 trenches) (1953-1963)	Process waste including uranium, plutonium, and beta emitters	Uranium, strontium-90	
300-FF-5 Operable Unit Satellite Areas			
618-10 and -11 burial grounds and 316-4 crib (1948-1962)	Low- to high-activity radioactive waste	Tritium, nitrate, hexone, organic waste	Past-practice (DOE 2002d)
(a) Sites with specific groundwater monitoring requirements and those that appear to have affected groundwater quality.			

The 316-5 process trenches require groundwater monitoring to meet RCRA requirements because the trenches are regulated as dangerous waste surface impoundments. The process trenches were modified as part of a CERCLA expedited response action in 1991, and discharges to the trenches ceased in late 1994. The 316-1 and 316-2 process ponds, monitored to meet CERCLA requirements, received uranium-contaminated wastewater until 1975 when the process trenches began receiving the wastewater. The storage tanks were monitored under the state's underground storage tank program in the early 1990s, but monitoring is no longer required by the state.

The 618-10 burial ground and adjacent 316-4 cribs are located northwest of the 300 Area proper. The 618-11 burial ground is located even farther north, immediately northwest of Energy Northwest (see Figure 4.9). The burial grounds operated from 1954 to 1963 and received a variety of low- to high-activity radioactive solid waste, which included mostly fission products and some plutonium-contaminated material (Demiter and Greenhalgh 1997; DOE 1996). This waste was disposed to trenches and vertical cylindrical structures (caissons and "vertical pipe units"), and may have included liquid and solid waste forms. The 316-4 crib was designed for liquid effluents and began receiving uranium-bearing waste solutions in 1948. It continued to receive nitrate, hexone, and organic waste periodically through at least 1962. All of these sites and the 300 Area itself are part of the 300-FF-5 Operable Unit (see Table 8.1).

8.1.2 Groundwater Monitoring Requirements and History

Groundwater monitoring has been conducted in the 300 Area as far back as 1975, when the 316-5 process trenches replaced the 316-1 and 316-2 process ponds as the main facility to dispose of uranium-contaminated wastewater. In 1985, interim status groundwater monitoring of the process trenches was initiated under RCRA, which required additional wells to be installed. The RCRA program went into final-status groundwater monitoring in 1996 and currently is in a corrective action program to determine if contaminants of concern (uranium and volatile organics) are attenuating by natural processes at expected rates (ROD 1996b). CERCLA activities were initiated in the early 1990s and included additional groundwater monitoring. An expedited response action was implemented in 1991 to remove sources of uranium contamination, and resulted in lower contaminant concentrations in groundwater downgradient from the process trenches. An interim remedial action (ROD 1996b) required continued groundwater monitoring of contaminants in the 300 Area, as described in the operations and maintenance plan (DOE 2002e).

In 1993, DOE issued a proposal for an expedited response action for the 618-11 burial ground (DOE 1993). One well was installed in 1995 to support this action. In January 1999, a groundwater sample from this well was analyzed for tritium for the first time. The tritium concentration was 1.8 million pCi/L, much higher than surrounding wells. Subsequent samples confirmed the high result and indicated that the burial ground was the source of tritium. A comprehensive soil gas and investigation was conducted to better define the extent of the tritium plume (Olsen et al. 2001). The 618-11 burial ground and other waste sites nearby are included in the 300-FF-2 and 300-FF-5 Operable Units (EPA 2000). Currently, there is no active groundwater remediation in the 300-FF-5 Operable Unit, although source waste sites are being remediated. The 1996 record of decision (ROD 1996b) for interim action calls for monitoring the rate of natural attenuation and decay of contaminant plumes. Beginning in October 2001, the groundwater project became responsible for groundwater monitoring associated with this operable unit as described in the sampling and analysis plan (DOE 2002d). The project monitors additional wells and constituents within or near the operable units to support surveillance monitoring.

8.2 Conceptual Model

Groundwater in the uppermost aquifer flows into the 300 Area from the northwest, west, and southwest. A tritium plume from past wastewater disposal in the 200 East Area extends to the 300 Area. Tritium migrates across the northeastern portion of the 300 Area from the northwest and enters the Columbia River. In recent years, tritium levels have generally been steady with time in and north of the 300 Area. The southward migration of tritium is limited because of recharge patterns (see Section 9.2).

In the 300 Area, wastewater effluent, containing uranium and chlorinated solvent compounds, percolated through the soil from leaking process trenches and ponds for ~50 years. These constituents were driven down through the soil in the vadose zone beneath the waste sites by subsequent effluent discharges and natural recharge. As the constituents were carried downward, some were sorbed to sediment and trapped in soil moisture and some reached groundwater. Uranium in groundwater migrates toward and enters the Columbia River. The cis-dichloroethene plume is extremely limited in areal scope and is detected at levels above the drinking water standard (70 μg/L) at only one well, which is screened at the base of the uppermost aquifer. Trichloroethene is detected in both the upper and lower portions of the unconfined aquifer at concentrations below the drinking water standard (5 μg/L) and has two sources: (1) from a source offsite to the southwest and (2) from the 300 Area wastewater effluent.

Uranium concentrations in groundwater fluctuate in response to river-stage changes. As the river stage rises, groundwater near the river rises into the lower portion of the vadose zone. As a result, uranium is desorbed from the sediment and mobilized, temporarily increasing the uranium concentrations in groundwater. As the groundwater levels drop, uranium concentrations decrease because of the high mobility of uranium in groundwater and because the thickness of the saturated sediment from which uranium desorbs decreases.

The highest concentrations of chlorinated solvent compounds generally are found in the deeper portion of the unconfined aquifer beneath the process trenches and ponds. These higher concentrations have been found in the upper portion of the unconfined aquifer for brief periods (e.g., tetrachloroethene in 1998) and at lower concentrations for longer periods. Two conceptual model hypotheses have been suggested for the deeper occurrences. One hypothesis is that dissolved chlorinated compounds in groundwater were transported by a downward vertical hydraulic gradient created when discharged effluent to the ponds and trenches recharged the aquifer. This hypothesis requires a very low groundwater flow rate in the lower portions of the unconfined aquifer because these dissolved compounds are very mobile. The second hypothesis is that an immiscible phase that is denser than water was driven to the bottom of the unconfined aquifer by density (or the high downward vertical hydraulic gradient mentioned earlier) and rests on top of the silty clay unit that forms the base of the unconfined aquifer. A portion of the dense phase would then dissolve into the aqueous phase with time. This hypothesis is supported by the apparent natural degradation product, cis-dichloroethene, following trichloroethene that was observed in deeper 300 Area wells.

The 618-10 burial ground and the 316-4 cribs have contaminated groundwater locally with uranium and organic compounds. The 618-11 burial ground has contaminated the vadose zone and groundwater with high levels of tritium, but the extent of contamination is limited.

8.3 Monitoring Program

Wells in the 300 Area and 300-FF-5 Operable Unit are sampled for requirements of RCRA, CERCLA, and the *Atomic Energy Act of 1954* (see Table 8.1). Many wells are sampled to meet the objectives of two or more regulations, as indicated in the Appendix. The groundwater project coordinates sampling and analysis to avoid duplication by scheduling all user's needs in a project database (see Figure 7.2). When analytical results are returned from the laboratory, the groundwater project loads the data into HEIS for use by all.

Locations of monitoring wells for the 300 Area are illustrated in Figure 8.1 (600 Area wells, including those monitoring the 618-10 and 618-11 burial grounds, were shown in Figure 4.9). Those sampled for long-term CERCLA and *Atomic Energy Act of 1954* monitoring are shown with solid symbols. Some of the wells also are sampled for RCRA. Wells sampled for RCRA but not for surveillance or long-term CERCLA monitoring are shown with open symbols in Figure 8.1. Wells and constituents required for each type of monitoring are listed in the Appendix. Most of the wells are sampled annually.

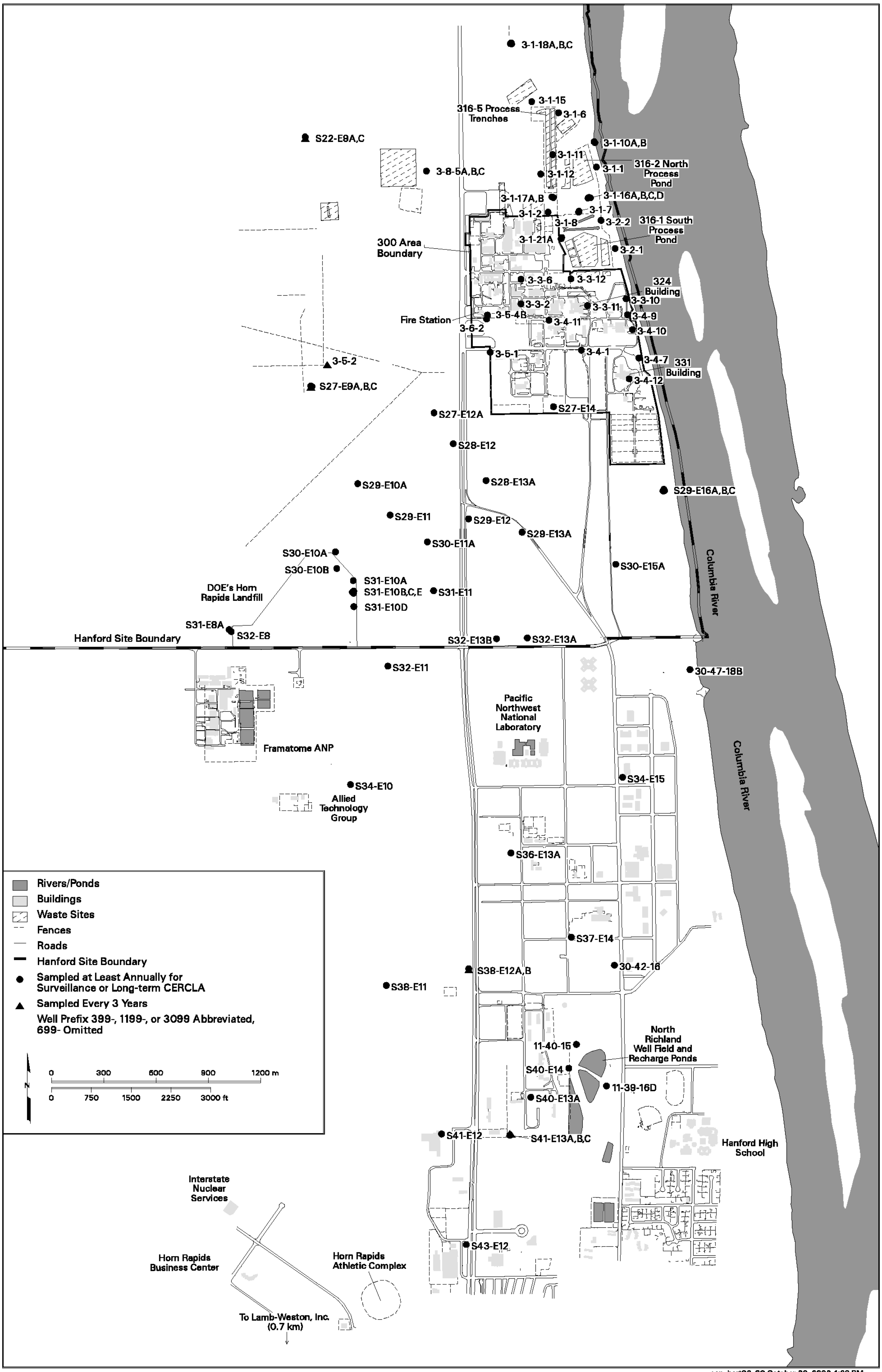


Figure 8.1. Groundwater Project Well Locations: 300 and Richland North Area

9.0 Richland North Area

The Richland North Area, though not formally defined, includes the former 1100 Area and the 3000 Area, part of the 600 Area, and parts of nearby Richland.

9.1 Background

The Richland North Area consists of a variety of both onsite and offsite land uses, including municipal, industrial, and agricultural. Municipal and industrial facilities and agricultural activities in the Richland North Area influence groundwater. Offsite facilities of particular interest with respect to groundwater include the city of Richland's North Well Field and recharge basins, the ORV Park, Framatome ANP (formerly Siemens Power Corporation), the city of Richland's active Horn Rapids Landfill (formerly Richland Landfill), Lamb-Weston Richland Plant, Interstate Nuclear Services, and Allied Technology Group. Offsite agricultural irrigation influences groundwater over a wide area in the Richland North Area. Onsite facilities include DOE's inactive Horn Rapids Landfill in the 600 Area.

9.1.1 Waste Sites, Discharges, and Groundwater Operable Units

Waste sites in the Richland North Area include the inactive DOE Horn Rapids Landfill in the 600 Area and a number of disposal pits and underground storage tanks in the former 1100 Area. Groundwater associated with these waste sites is monitored to meet CERCLA requirements. The 1100-EM-1 Operable Unit record of decision (ROD 1993) required groundwater monitoring at a point of compliance downgradient from the inactive Horn Rapids Landfill. The groundwater project performs this monitoring, which is described in a field sampling plan (DOE 1995b; Newcomer 1999). There are no DOE waste sites requiring RCRA groundwater monitoring in the Richland North Area. Table 9.1 lists the waste sites in the Richland North Area that have specific monitoring requirements and those sites that affected groundwater quality.

9.1.2 Offsite Sources

Probable sources of groundwater contamination that originated from the Richland North Area off the Hanford Site include Framatome ANP, agricultural irrigation, and Lamb-Weston Richland Plant. Framatome ANP is located adjacent to the Hanford Site boundary southwest of DOE's Horn Rapids Landfill, and a surface impoundment system at the site contributed to solvent and nitrate contamination in groundwater. Fertilizers applied to the agricultural fields upgradient (south) of Framatome ANP and potato-processing waste from the Lamb-Weston Richland Plant are probable sources of nitrate. The city of Richland's Horn Rapids Landfill is a source of organic solvent compound contamination of groundwater in the immediate vicinity of the landfill. This contamination is currently not impacting groundwater in the Richland North Area or the Hanford Site. Interstate Nuclear Services and Allied Technology Group are not known to contribute to groundwater contamination on the Hanford Site.

Table 9.1. Selected Waste Sites in the Richland North Area[a]

Facility (period of use)	Waste Type	Constituents of Interest for Groundwater Monitoring	Type of Site (monitoring plan reference)
1100-EM-1 Operable Unit			
DOE's Horn Rapids Landfill (1950s-1970)	Office and construction waste, asbestos, sewage sludge, fly ash	Trichloroethene, breakdown products of trichloroethene (vinyl chloride, 1,1-dichloroethylene), technetium-99, nitrate	Past-practice (ROD 1993; DOE 1995b; Newcomer 1999)
Offsite Sources			
Framatome ANP process lagoons (1971-present)	Ammonia, fluoride, nitrate, radionuclides (primarily uranium)	Trichloroethene, nitrate	Active RCRA; Siemens (1996)[b]
Lamb-Weston	Potato-processing waste	Nitrate	Active
Agriculture	Fertilizers	Nitrate	Active

(a) Sites with specific groundwater monitoring requirements and those that appear to have affected groundwater quality.
(b) Groundwater monitored independently of groundwater project.

The city of Richland's North Well Field and recharge basins, located in the south-central part of the Richland North Area, are the primary influence on changes in groundwater elevation in the area. The well field serves as a secondary water supply for the city of Richland, and the basins recharge the unconfined aquifer with Columbia River water. The net recharge causes a groundwater mound to form in this area and decreases nitrate levels in groundwater to less than ambient.

Irrigation applied to agricultural fields contributes to groundwater recharge during the growing season. As a result, this contributes to groundwater flow to the northeast, east, and southeast.

9.1.3 Groundwater Monitoring Requirements and History

Groundwater well installation and monitoring began in the 1100-EM-1 Operable Unit in 1988 after limited groundwater sampling in 1986 revealed low levels of contaminants. The monitoring program expanded between 1989 and 1992 to determine the nature and extent of groundwater contamination. In response to a record of decision (ROD 1993), additional well installation and monitoring were implemented at DOE's inactive Horn Rapids Landfill (DOE 1995b). The ROD required the monitoring of trichloroethene in groundwater downgradient of DOE's inactive Horn Rapids Landfill. The ROD also required monitoring of trichloroethene breakdown products and nitrate. The monitoring of nitrate was needed because its concentrations were above the maximum contaminant levels for nitrate. A five-year review was conducted by EPA (2001) and no groundwater monitoring changes were required at DOE's inactive Horn Rapids Landfill.

The surface impoundment system at Framatome ANP consists of six lagoons, which are regulated under the Revised Code of Washington, Title 70, Chapter 105 (Siemens Power Corporation 1997). The lagoons no longer receive liquid waste, however the lagoons still contain liquid waste from disposal in the past. Framatome ANP has monitored groundwater at their facility since 1994 to meet the requirements of RCRA interim status facilities.

9.2 Conceptual Model

A tritium plume from past wastewater disposal in the 200 East Area extends to the southeastern Hanford Site, and wells in Richland North are monitored for tritium. However, the southward migration of tritium is limited because of the following factors:

- Groundwater is recharged by the Yakima River, and flows generally from southwest to northeast, and discharges to the Columbia River.

- Recharge from agricultural irrigation and an unlined artificial pond at the ORV Park between the Yakima River and the former 1100 Area contributes to eastward groundwater flow.

- Net recharge at the city of Richland's North Well Field has resulted in a groundwater mound that directs groundwater flow outward, including a component to the north.

A nitrate plume is migrating through the Richland North Area from the southwest toward the Columbia River. Nitrate contamination is the result of offsite industrial and agricultural uses. Wastewater effluent containing ammonia was discharged in the past to lagoons at Framatome ANP. Effluent has apparently leaked to the underlying soil from the lagoons, and some of the ammonia reached groundwater. Under aerobic conditions, the ammonia degrades relatively quickly to nitrate, which is highly mobile in groundwater. In agricultural areas to the southwest, fertilizers containing nitrate are applied during the growing season. As irrigation is applied, the dissolved nitrate is carried down through the soil and is taken up by crops in the root zone. However, some of the nitrate is carried below the root zone by recharge of excess irrigation and reaches groundwater.

The Richland North Area also contains a trichloroethene plume. Trichloroethene contamination is suspected to be the result of offsite industrial solvent use at Framatome ANP. Solvents were used during installation, cleaning, and repairing of lagoon liners over a 10-year period between 1978 and 1988. Excess solvents entered the soil by spillage and were driven down into the vadose zone and reached groundwater, which is very shallow in this area. On reaching groundwater, trichloroethene is very mobile and formed a localized plume that migrated downgradient to the northeast across DOE's Horn Rapids Landfill. The highest concentrations were found near Framatome ANP and DOE's Horn Rapids Landfill. Trichloroethene concentrations were measured as high as 420 μg/L in the late 1980s, but decreased to less than 5 μg/L by fiscal year 2001. One hypothesis has been suggested that natural attenuation may have reduced the mass of the trichloroethene in groundwater. It is likely that the trichloroethene is volatilizing, dispersing, and perhaps biodegrading. During early monitoring of the plume, measurable trichloroethene concentrations were observed in soil gas in vicinity of DOE's inactive Horn Rapids Landfill (Evans 1989).

9.3 Monitoring Program

Wells in the Richland North Area and vicinity are monitored for requirements of CERCLA and the *Atomic Energy Act of 1954*, both under the groundwater project (see Table 9.1). Some of the wells are sampled to meet more than one requirement, as indicated in the Appendix. The groundwater project coordinates sampling and analysis to avoid duplication, and loads the data into HEIS (see Figure 7.2). Well locations were shown in Figure 8.1.

One objective of monitoring the Richland North Area is to assess the extent of groundwater contamination in the Richland North Area to assure that contaminants have not migrated offsite and have not affected wells in the city of Richland. This requires intensive monitoring near the leading edges of the plumes, in areas along the site boundary, and in areas where concentrations are low. Monitoring in areas where levels are low provides a baseline from which to determine concentration changes and, thus, early detection of offsite migration. The monitoring network includes wells completed in the deeper part of the unconfined aquifer. These wells are sampled every 3 years for low-level tritium analyses. An enrichment technique is used to measure tritium at lower detection limits (~10 pCi/L) than provided by the standard method.

Another objective of monitoring the Richland North Area is to define plumes that have migrated onto the site from offsite sources. This monitoring is needed to show impacts to onsite groundwater and to show that groundwater contamination attributed to these plumes is not from onsite waste sites.

10.0 Offsite and Basalt-Confined Aquifer Monitoring Activities

10.1 Background

This section describes monitoring of chemistry and hydraulic head within basalt-confined aquifers, and hydraulic head monitoring off the Hanford Site. The groundwater project occasionally monitors offsite groundwater quality, but it is not routine except in confined-aquifer well 699-42-E9B.

Monitoring of groundwater levels and contaminant concentrations in the basalt-confined aquifer helps determine if contamination is moving from the unconfined aquifer into the basalt-confined aquifers, where it possibly could travel offsite.

10.2 Conceptual Model

Hanford contaminants have been detected in a few wells near the 200 Areas that monitor the basalt-confined aquifer, but there is no evidence that contamination is moving offsite. The hydraulic gradient appears to be directed upward beneath most of the Hanford Site, limiting potential downward migration of contaminants. The gradient is downward beneath the western portion of the site.

Water-level elevations north and east of the Columbia River are much greater than on the Hanford Site. The water-table elevation to the east of the Columbia River is currently 50 to 150 meters higher than on the Hanford Site. Groundwater flow in the unconfined aquifer system north and east of the Columbia River follows the bedrock structure and is toward the Columbia River. The water-table configuration in these areas largely reflects recharge from irrigation.

10.3 Monitoring Program

Wells in the basalt-confined aquifer are sampled for the requirements of the *Atomic Energy Act of 1954* every 3 years, except well 699-42-E9B, which is located east of the Columbia River and is monitored annually. The groundwater project is responsible for sampling, analysis, and loading the data into HEIS (see Figure 7.2). Well locations are shown in Figure 10.1.

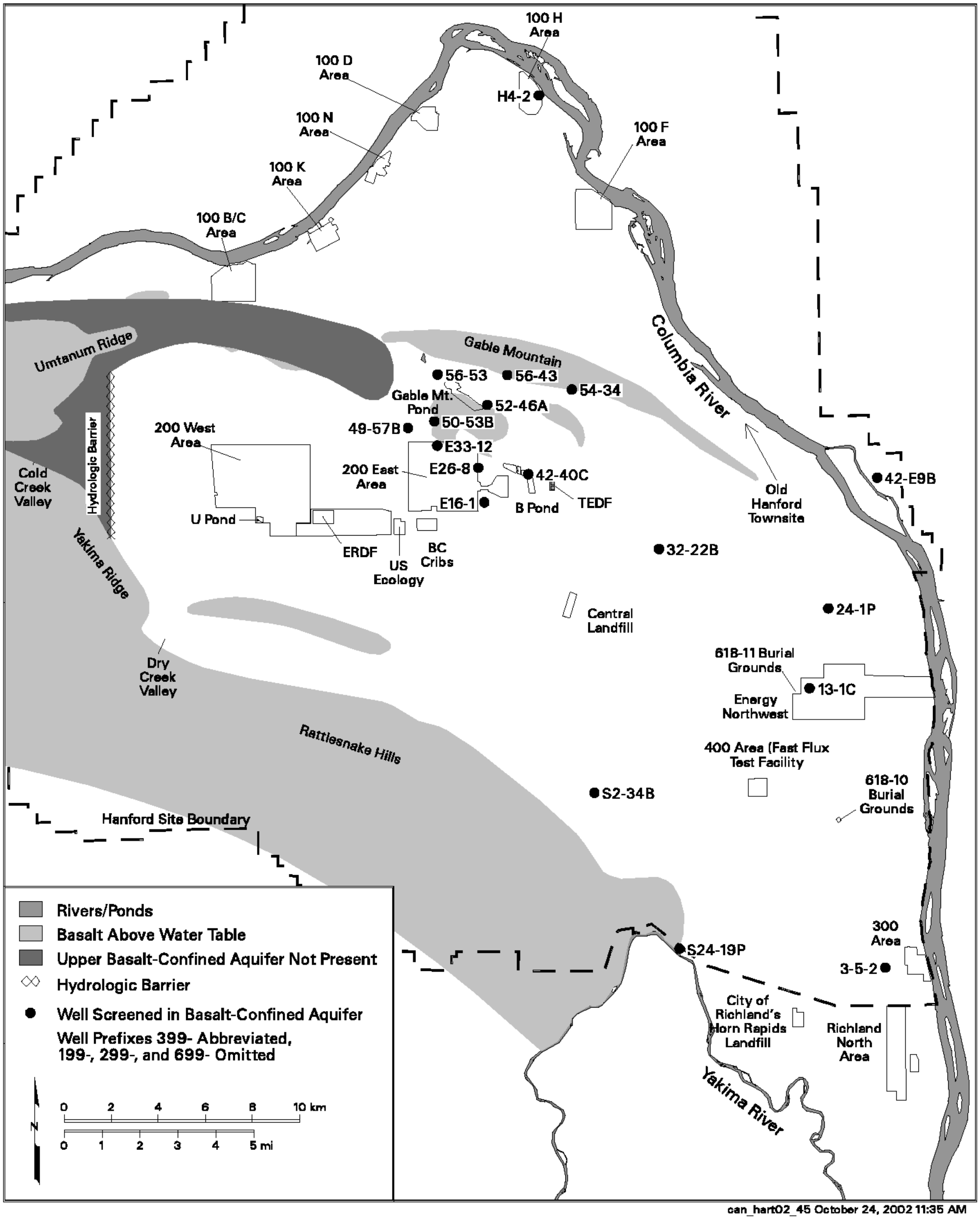


Figure 10.1. Groundwater Project Well Locations: Basalt-Confined Aquifer

11.0 Sampling and Analysis

11.1 Sampling and Analysis Protocol

Employees and subcontractors of Pacific Northwest National Laboratory sample wells for the groundwater project. Procedures for groundwater sampling, documentation, sample preservation, shipment, and chain-of-custody requirements are described in PNNL or subcontractor manuals. Quality requirements are provided in the quality assurance plan (ETD-012[1] latest revision). Samples generally are collected after three casing volumes of water have been purged from the well or after field parameters (pH, temperature, specific conductance, and turbidity) have stabilized. For routine groundwater samples, preservatives are added to the collection bottles before their use in the field. Samples to be analyzed for metals are usually filtered in the field so that results represent dissolved metals.

Procedures for field measurements are specified in the subcontractor's or manufacturer's manuals. Analytical methods are specified in contracts with laboratories, and most are standard methods from *Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods* (EPA 1986). Alternative procedures meet the guidelines of EPA (1986), Chapter 10. Analytical methods are described in Hartman (2000).

11.2 Quality Assurance and Quality Control

The quality assurance and quality control practices used by the groundwater project assure the reliability and validity of field and laboratory measurements conducted to support these programs. The primary components used to assess data quality are accuracy, precision, and detection. Representativeness, completeness, and comparability may also be used. These parameters are evaluated through laboratory quality control checks (e.g., matrix spikes, laboratory blanks), replicate sampling and analysis, analysis of blind samples and blanks, and interlaboratory comparisons. Acceptance criteria have been established for each of these parameters. When a parameter is outside the criteria, corrective actions are taken to prevent a future occurrence. Quality control practices for the groundwater project and results for fiscal year 2001 are described in Hartman et al. (2002, Appendix B).

A scientist familiar with the hydrogeology of a particular location of a site or region reviews new data every two weeks. Staff conduct a more formal review quarterly according to a Pacific Northwest National Laboratory procedure to assure the data are complete and representative. The review includes verification of the data in the HEIS database, evaluation of data from field quality control samples (e.g., blanks, duplicates) and laboratory quality control samples. If the data review identifies suspect data, they are investigated to establish whether they reflect true conditions or an error, according to Pacific Northwest National Laboratory's "request for data review" procedure. Groundwater data associated with out-of-range quality control data or identified as suspect during the technical review are flagged in the database.

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[1] Available from the Hanford Site Groundwater Monitoring Project, Pacific Northwest National Laboratory, Richland, Washington.

12.0 Water-Level Monitoring

Water levels in the groundwater system are monitored on the Hanford Site primarily to help determine the direction and rate of groundwater flow. This information is used to interpret observed contaminant plume movements and to predict future plume movements. Other uses of water-level information include the identification of recharge and discharge areas, assessing the interaction between groundwater and surface water, assessing the interaction between aquifers or hydrogeologic units, calibration of groundwater flow models, assessing the impact of liquid effluent disposal practices on groundwater flow, and optimizing monitoring networks. McDonald et al. (1999) provides a list of wells used for water-level measurements, criteria for their selection, hydrogeologic units monitored, and describes procedures used to collect the data.

13.0 Data Evaluation

13.1 Data Management

Results of groundwater sampling and analysis are accessible in the HEIS database. Analytical results from all Hanford Site groundwater monitoring are stored in this common database, with the exception of some data collected for limited special projects that may not be directly comparable to standard data. HEIS data are available to federal and state regulators for retrieval and are included electronically with the annual groundwater monitoring report (e.g., Hartman et al. 2002).

The HEIS programmers and HEIS data owners, including the groundwater project, assure database integrity and data consistency through participation in the onsite HEIS technical advisory group and other ad hoc groups. The majority of data are loaded into the database from electronic files provided by the analytical laboratories under standard protocols. This minimizes data-entry errors and reduces the cost of data management.

As discussed in Section 11.2, a data validation and verification process results in flags and qualifiers based on quality control data and a technical review by a scientist. These flags are stored with the data in HEIS.

13.2 Compliance Issues and Data Evaluation

Data collected for the groundwater project are used to comply with a variety of requirements, including the *Atomic Energy Act of 1954* (and associated DOE Orders), RCRA, CERCLA, and WAC permits. After data are validated and verified (see Section 11.2), the acceptable data are used to interpret groundwater conditions at the site. Interpretive techniques include:

- Hydrographs — graph water levels versus time to determine decreases, increases, seasonal, or manmade fluctuations in groundwater levels.

- Water-table maps — use water-table elevations from multiple wells to construct contour maps to estimate flow directions. Groundwater flow is assumed to be perpendicular to lines of equal potential.

- Trend plots — graph concentrations of chemical or radiological constituents versus time to determine increases, decreases, and fluctuations. May be used in tandem with hydrographs and/or water-table maps to determine if concentrations relate to changes in water level or in groundwater flow directions.

- Plume maps — map distributions of chemical or radiological constituents areally in the aquifer to determine extent of contamination. Changes in plume distribution over time aid in determining movement of plumes and direction of flow.

- Contaminant ratios — can sometimes be used to distinguish between different sources of contamination.

- Concentration limits — contaminant concentrations are compared to drinking water standards, statistically-derived threshold values, or other concentration limits established in state or federal regulations or agreements (Table 13.1).

Table 13.1. Compliance Issues and Methods of Evaluation

Requirement	Evaluation
DOE Order 5400.1	Compare groundwater concentrations to drinking water standards, derived concentration guides, and historical trends. Produce maps of contaminant distribution.
RCRA interim status units	Indicator evaluation - Compare average downgradient concentrations of indicator parameters to background critical mean values. Assessment - Evaluate rate and extent of contamination (methods described in site-specific monitoring plans).
RCRA final status units	Detection - Compare downgradient concentrations of contaminants of interest to baseline concentrations. Compliance - Compare downgradient concentrations to background, maximum concentration limits, or alternate concentration limits (methods described in site-specific monitoring plans and site permit). Corrective action - Track progress of cleanup and compare downgradient concentrations of constituents to background, maximum concentration limits, or alternate concentration limits (methods described in site-specific monitoring plans and site permit).
WAC-permitted units (216 permits)	Compare to conditions of permit.
CERCLA operable units (including performance assessment monitoring)	Compare concentrations to levels defined in record of decision, interim records of decision, or other agreements.

13.3 Reporting

Results of Hanford Site groundwater monitoring are reported annually (e.g., Hartman et al. 2002). That report presents contaminant-distribution maps, water-level maps, and concentration trend plots of contaminants and wells of interest and meets the annual reporting requirements of RCRA and DOE orders. The report summarizes results of monitoring associated with groundwater remediation.

Certain conditions require reporting to DOE as unusual occurrences or off-normal events (DOE Order 232.1-1A). The groundwater project follows DOE/RL's guidance on reporting levels.

Reporting requirements for WAC-permitted facilities are described in their permits.

14.0 References

Airhart, S. P., J. V. Borghese, and S. Dudziak. 1990. *Interim-Status Ground Water Monitoring Plan for the 216-S-10 Pond and Ditch*. WHC-SD-EN-AP-018, prepared by Pacific Northwest Laboratory for Westinghouse Hanford Company, Richland, Washington.

Atomic Energy Act of 1954, as amended, Ch. 1073, 68 Stat. 919, 42 USC 2011 et seq.

Barnett, D. B. 2000a. *Groundwater Monitoring and Tritium-Tracking Plan for the 200 Area State-Approved Land Disposal Site.* PNNL-13121, Pacific Northwest National Laboratory, Richland, Washington.

Barnett, D. B. 2000b. *Groundwater Monitoring Plan for the Hanford Site 200 Area Treated Effluent Disposal Facility.* PNNL-13032, Pacific Northwest National Laboratory, Richland, Washington.

Barnett, D. B., R. M. Smith, and C .J. Chou. 2000. *Groundwater Monitoring Plan for the Hanford Site 216-B-3 Pond RCRA Facility*. PNNL-13367, Pacific Northwest National Laboratory, Richland, Washington.

Borghese, J. V., M. J. Hartman, S. P. Luttrell, C. J. Perkins, J. P. Boric, and S. C. Tidal. 1996. *100-N Pilot Project: Proposed Consolidated Groundwater Monitoring Program*. HI-00725, Bechtel Hanford, Inc., Richland, Washington.

CERCLA - *Comprehensive Environmental Response, Compensation, and Liability Act*. 1980. Public Law 96-510, as amended, 94 Stat. 2767, 42 USC 9601 et seq.

DeFord, D. H., R. W. Carpenter, and M. W. Einan. 1994. *300-FF-2 Operable Unit Technical Baseline Report.* BHI-00012, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

Demiter, J. A. and W. O. Greenhalgh. 1997. *Characterization of the 618-11 Solid Waste Burial Ground, Disposed Waste, and Description of the Waste-Generating Facilities.* HNF-EP-0649, SESC, prepared for Waste Management Federal Services, Inc., Richland, Washington.

DOE. 1993. *618-11 Burial Ground Expedited Response Action Proposal*. DOE/RL-93-49, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE. 1995a. *Hanford Sitewide Groundwater Remediation Strategy.* DOE/RL-94-95, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE. 1995b. *Additional Monitoring Well Installation and Field Sampling Plan for Continued Groundwater Monitoring at the Horn Rapids Landfill*. DOE/RL-95-50, prepared by the Department of the Army, Walla Walla District, Corps of Engineers, Walla Walla, Washington for the U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE. 1996. *Limited Field Investigation Report for the 300-FF-2 Operable Unit*. DOE/RL-96-42, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE. 1997a. *Interim Action Monitoring Plan for the 100-HR-3 and 100-KR-4 Operable Units*. DOE/RL-96-90, prepared by CH2M HILL Hanford, Inc. for U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE. 1997b. *RCRA Corrective Measure Study for the 200-PO-1 Operable Unit*. DOE/RL-96-66, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE. 2000a. *Environmental Monitoring Plan United States Department of Energy Richland Operations Office*. DOE/RL-91-50, Rev. 3, U.S. Department of Energy, Richland, Washington.

DOE. 2000b. *Performance Assessment Monitoring Plan for the Hanford Site Low-Level Burial Grounds*. DOE/RL-2000-72 Rev. 0. U.S. Department of Energy, Richland, Washington.

DOE. 2002a. *Remedial Design Report/Remedial Action Work Plan for the 100-NR-2 Operable Unit*. DOE/RL-2001-27, U.S. Department of Energy, Richland, Washington.

DOE. 2002b. *Sampling and Analysis Plan for the 200-UP-1 Groundwater Monitoring Well Network*. DOE/RL-2002-10, U.S. Department of Energy, Richland, Washington.

DOE. 2002c. *Sampling and Analysis Plan for the 200-ZP-1 Groundwater Monitoring Well Network*. DOE/RL-2002-17, U.S. Department of Energy, Richland, Washington.

DOE. 2002d. *300-FF-5 Operable Unit Sampling and Analysis Plan*. DOE/RL-2002-11, U.S. Department of Energy, Richland, Washington.

DOE. 2002e. *Operation and Maintenance Plan for the 300-FF-5 Operable Unit.* DOE/RL-95-73, Rev. 1, U.S. Department of Energy, Richland, Washington.

DOE Order 232.1. *Occurrence Reporting and Processing of Operations Information*. U.S. Department of Energy, Washington, D.C.

DOE Order 5400.1. *General Environmental Protection Program*. U.S. Department of Energy, Washington, D.C.

EPA. 1986. *Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods, SW-846*, *3rd Edition*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

EPA. 2000. *Explanation of Significant Difference for the 300-FF-5 Record of Decision, June 2000.* U.S. Environmental Protection Agency, Region 10; and U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA. 2001. *USDOE Hanford Site First Five Year Review Report*. U.S. Environmental Protection Agency Region 10, Hanford Project Office, Seattle, Washington.

Evans, J. C. 1989. *1100-EM-1 Soil Gas Survey Final Report*. WHC-MR-0072, Westinghouse Hanford Company, Richland, Washington.

Hartman, M. J. 1997. *Groundwater Monitoring Plan for the 183-H Solar Evaporation Basins.* PNNL-11573, Pacific Northwest National Laboratory, Richland, Washington.

Hartman, M. J. (ed.). 2000. *Hanford Site Groundwater Monitoring: Setting, Sources, and Methods.* PNNL-13080, Pacific Northwest National Laboratory, Richland, Washington.

Hartman, M. J. 2002. *Groundwater Monitoring Plan for the 1301-N, 1324-N/NA, and 1325-N RCRA Facilities.* PNNL-13914, Pacific Northwest National Laboratory, Richland, Washington.

Hartman, M. J., P. E. Dresel, J. W. Lindberg, D. R. Newcomer, and E. C. Thornton. 2000. *Integrated Monitoring Plan for the Hanford Groundwater Monitoring Project.* PNNL-11989, Rev. 2, Pacific Northwest National Laboratory, Richland, Washington.

Hartman, M. J., P. E. Dresel, J. W. Lindberg, D. R. Newcomer, and E. C. Thornton. 2001. *FY 2002 Integrated Monitoring Plan for the Hanford Groundwater Monitoring Project*. PNNL-13698, Pacific Northwest National Laboratory, Richland, Washington.

Hartman, M. J., L. F. Morasch, and W. D. Webber (eds.). 2002. *Hanford Site Groundwater Monitoring for Fiscal Year 2001.* PNNL-13788, Pacific Northwest National Laboratory, Richland, Washington.

Hodges, F. N. and C. J. Chou. 2001a. *RCRA Assessment Plan for Single-Shell Tank Waste Management Area T at the Hanford Site*. PNNL-12057, Pacific Northwest National Laboratory, Richland, Washington.

Hodges, F. N. and C. J. Chou. 2001b. *RCRA Assessment Plan for Single-Shell Tank Waste Management Area TX-TY at the Hanford Site*. PNNL-12072, Pacific Northwest National Laboratory, Richland, Washington.

Horton D. G. and S. M. Narbutovskih. 2001. *RCRA Groundwater Monitoring Plan for Single-Shell Tank Waste Management Area C at the Hanford Site*. PNNL-13024, Pacific Northwest National Laboratory, Richland, Washington.

Jensen, E. J., M. A. Chamness, S. M. Goodwin, S. H. Hall, and D. R. Newcomer. 1990. *Interim-Status Ground-Water Monitoring Plan for the 216-U-12 Crib.* WHC-SD-EN-AP-019, prepared by Pacific Northwest Laboratory for Westinghouse Hanford Company, Richland, Washington.

Johnson, V. G. and C. J. Chou. 1999. *RCRA Assessment Plan for Single-Shell Tank Waste Management Area S-SX at the Hanford Site*. PNNL-12114, Pacific Northwest National Laboratory, Richland, Washington.

Last, G. V. and B. N. Bjornstad. 1989. *Revised Ground-Water Monitoring Plan for the 200 Areas Low-Level Burial Grounds*. WHC-SD-EN-AP-015, prepared by Pacific Northwest Laboratory for Westinghouse Hanford Company, Richland, Washington.

Lindberg, J. W. 1997. *Combination RCRA Groundwater Monitoring Plan for the 216-A-10, 216-A-36B, and 216-A-37-1 PUREX Cribs*. PNNL-11523, Pacific Northwest National Laboratory, Richland, Washington.

Lindberg, J. W. and M. J. Hartman. 1999. *Groundwater Monitoring Plan for the Nonradioactive Dangerous Waste Landfill*. PNNL-12227, Pacific Northwest National Laboratory, Richland, Washington.

Lindberg, J. W. and C. J. Chou. 2000. *Groundwater Monitoring Plan for the Solid Waste Landfill*. PNNL-13014, Pacific Northwest National Laboratory, Richland, Washington.

Lindberg, J. W. and C. J. Chou. 2001. *Groundwater Monitoring Plan for the 300 Area Process Trenches*. PNNL-13645, Pacific Northwest National Laboratory, Richland, Washington.

McDonald, J. P., M. A. Chamness, and D. R. Newcomer. 1999. *Water-Level Monitoring Plan for the Hanford Groundwater Monitoring Project*. PNNL-13021, Pacific Northwest National Laboratory, Richland, Washington.

Narbutovskih, S. M. 2000. *Groundwater Quality Assessment Plan for Single-Shell Waste Management Area B-BX-BY at the Hanford Site*. PNNL-13022, Pacific Northwest National Laboratory, Richland, Washington.

Narbutovskih, S. M. and D. G. Horton. 2001. *RCRA Groundwater Monitoring Plan for Single-Shell Tank Waste Management Area A-AX at the Hanford Site*. PNNL-13023, Pacific Northwest National Laboratory, Richland, Washington.

Newcomer, D. R. 1999. *Sampling and Analysis Plan Update for Groundwater Monitoring - 1100-EM-1 Operable Unit*. PNNL-12220, Pacific Northwest National Laboratory, Richland, Washington.

Olsen, K. B., P. E. Dresel, and J. C. Evans. 2001. *Measurement of Helium-3/Helium-4 Ratios in Soil Gas at the 618-11 Burial Ground.* PNNL-13675, Pacific Northwest National Laboratory, Richland, Washington.

Peterson, R. E. 2002. *Groundwater Monitoring and Assessment Plan for the 100-K Area Fuel Storage Basins.* PNNL-14033, Pacific Northwest National Laboratory, Richland, Washington.

Peterson, R. E. and R. F. Raidl. 1996. *Groundwater Monitoring Implementation Plan for the 100-BC-5, 100-KR-4, 100-HR-3, and 100-FR-3 Operable Units*. BHI-00916, Rev. 0, prepared by CH2M HILL Hanford, Inc. for Bechtel Hanford, Inc., Richland, Washington.

RCRA - *Resource Conservation and Recovery Act*. 1976. Public Law 94-580, as amended, 90 Stat. 2795, 42 USC 6901 et seq.

Record of Decision (ROD). 1993. *Record of Decision, USDOE Hanford 1100 Area, Hanford Site, Richland, Washington (1100-EM-1, 1100-EM-2, 1100-EM-3 and 1100-IU-1 Operable Units)*. Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Record of Decision (ROD). 1996a. *Declaration of the Record of Decision, USDOE Hanford 100 Area, 100-HR-3 and 100-KR-4 Operable Units, Hanford Site, Benton County, Washington, April 1996*. Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Record of Decision (ROD). 1996b. *Declaration of the Record of Decision for the 300-FF-1 and 300-FF-5 Operable Units*. Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Record of Decision (ROD). 1997. *Declaration of the Record of Decision, U.S. DOE Hanford 200 Area, Hanford Site, Benton County, Washington (200-UP-1)*. Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Record of Decision (ROD). 1999. *Amended Record of Decision, Decision Summary and Responsiveness Summary for the 100-HR-3 Operable Unit*. U.S. Environmental Protection Agency, Region X, Seattle, Washington.

Revised Code of Washington, Title 70, Chapter 105, *Hazardous Waste Management*.

Schmid, J. S. 1990. *Interim Status Groundwater Monitoring Plan for the 200 East Area Liquid Effluent Retention Facility*. WHC-SD-EN-AP-024, Westinghouse Hanford Company, Richland, Washington.

Siemens Power Corporation. 1996. *Groundwater Quality Assessment Plan, Surface Impoundment System*. EMF-96-194, Richland, Washington.

Siemens Power Corporation. 1997. *1996 Annual RCRA Report, Groundwater Quality Assessment Program*. EMF-1933, Richland, Washington.

Smith, R. M., F. N. Hodges, and B. A. Williams. 2001. *Groundwater Quality Assessment Plan for Single-Shell Tank Waste Management Area U*. PNNL-13612, Pacific Northwest National Laboratory, Richland, Washington.

Spane, Jr., F. A. and W. D. Webber. 1995. *Hydrochemistry and Hydrogeologic Conditions Within the Hanford Upper Basalt Confined Aquifer System*. PNL-10817, Pacific Northwest Laboratory, Richland, Washington.

Sweeney, M. D. 1999. *Groundwater Monitoring Plan for the 216-A-29 Ditch*. PNNL-13407, Pacific Northwest National Laboratory, Richland, Washington.

Sweeney, M. D. 2000a. *Groundwater Sampling and Analysis Plan for the 100-BC-5 Operable Unit*. PNNL-13326, Pacific Northwest National Laboratory, Richland, Washington.

Sweeney, M. D. 2000b. *Groundwater Sampling and Analysis Plan for the 100-FR-3 Operable Unit*. PNNL-13327, Pacific Northwest National Laboratory, Richland, Washington.

Sweeney, M. D. 2002. *Interim-Status Groundwater Monitoring Plan for the 216-B-63 Trench.* PNNL-14112, Pacific Northwest National Laboratory, Richland, Washington.

Weeks, D. C., G. K. Jager, W. J. McMahon, and B. H. Ford. 1996. *Groundwater Protection Plan for the Environmental Restoration Disposal Facility*. BHI-00079, Bechtel Hanford, Inc., Richland, Washington.

Williams, B. A. and C. J. Chou. 1993. *Interim-Status Groundwater Quality Assessment Plan for the 216-U-12 Crib*. WHC-SD-EN-AP-103, Westinghouse Hanford Company, Richland, Washington.

Appendix

Sampling Matrix for Hanford Site Groundwater Monitoring

Appendix

Sampling Matrix for Hanford Site Groundwater Monitoring

This appendix contains the integrated sampling and analysis matrix for the Hanford Site (Table A.1). The matrix was designed for use in fiscal year 2003, but also includes wells that will be sampled every 2 or 3 years (as discussed in Section 3.3 of the main text). The matrix includes well, aquifer tube, or seep names, program and project requesting the sample, and frequency that individual constituents will be monitored. Additional details, such as schedule, analytical methods, etc., reside in a project database. The Hanford Groundwater Monitoring Project samples most of the wells, and other contractors sample wells for the State-Approved Land Disposal Site, the Treated Effluent Disposal Facility, and for operation of pump-and-treat systems.

Table A.1 also includes aquifer sampling tubes and seeps (shoreline springs) sampled for the *Comprehensive Environmental Response, Compensation, and Liability Act* or the Surface Environmental Surveillance Project. Tubes and seeps are sampled in the fall (generally October and November), when river stage is low. Aquifer sampling tubes are small diameter polyethylene tubes that have a screen at the lower end. The tubes were implanted in the aquifer through temporary steel casings. Staff attempted to install one tube near the bottom of the unconfined aquifer, one near the water table (at low river flow), and one at mid-depth. More information on the sampling program is available in the *Sampling and Analysis Plan for Aquifer Sampling Tubes* (DOE 2000).

KEY for TABLE A.1

WELL: Wells are listed in numerical order. Wells with a 199- prefix are in reactor areas, 299- in 200 Areas, 399- in 300 Area, 499- in 400 Area, 699- in 600-Area, 1199- in 1100 Area, and 3099- in Richland North Area (formerly called 3000 Area). For 699-xx-yy wells, xx and yy designate Hanford north and west coordinates in thousands of feet north and west from an origin in the southeastern part of the site. An "S" or "E" in these coordinates indicate wells south or east of the origin.

Multiple listings for a single well indicate that the well is used for more than one monitoring requirement and data are shared among users. Proposed new wells are listed with temporary designations PROJ-new-#. Seeps are designated with the prefixes SB, SK, etc.

Most of the wells monitor the uppermost aquifer. Wells that monitor deeper units are noted in the OTHER/COMMENTS field.

PROG (program): This column indicates the requirements the well is being sampled for.

CERCLA	=	*Comprehensive Environmental Response, Compensation, and Liability Act*
DOH	=	Washington State Department of Health
FFTF	=	Fast Flux Test Facility (400 Area process ponds)

FH	=	Fluor Hanford, Inc.
LTMC	=	long-term monitoring, CERCLA
PA	=	DOE Performance assessment monitoring for low-level burial grounds
RCRA	=	*Resource Conservation and Recovery Act*
SESP	=	Sitewide Environmental Surveillance Project
SURV	=	sitewide surveillance (plume and trend tracking).

PROJ (project): This column gives the subsets of the programs listed above. Project names under SURV or LTMC programs use an abbreviated form of the operable unit name and a suffix. A "C" suffix indicates monitoring required for CERCLA (or RCRA past-practice) operable units, as documented in a record of decision or monitoring plan. The "S" suffix indicates that additional wells or constituents are being monitored for surveillance monitoring in or near the same operable unit. For example, surveillance may include a larger region, deeper wells, or more constituents than are included in CERCLA documentation.

Project Designation	Explanation
	SURV or LTMC programs
1BC5-C	100-BC-5 Operable Unit
1BC5-S	Surveillance monitoring to supplement operable unit monitoring
1FR3-C	100-FR-3 Operable Unit
1FR3-S	Surveillance monitoring to supplement operable unit monitoring
1HR3-D-S	Surveillance monitoring to supplement operable unit monitoring in 100-D Area
1HR3-H-S	Surveillance monitoring to supplement operable unit monitoring in 100-H Area
1K-Basins	100-K Fuel Storage Basin monitoring
1NR2-S	Surveillance monitoring to supplement operable unit monitoring
2BP5-C	200-BP-5 Operable Unit (sampling and analysis plan due December 2002)
2BP5-S	Surveillance monitoring to supplement operable unit monitoring
2PO1-C	200-PO-1 Operable Unit
2PO1-S	Surveillance monitoring to supplement operable unit monitoring
2UP1-C	200-UP-1 Operable Unit

Project Designation	Explanation
2UP1-S	Surveillance monitoring to supplement operable unit monitoring
2ZP1-C	200-ZP-1 Operable Unit
2ZP1-PT	200-ZP-1 pump-and-treat operational monitoring (not Hanford Groundwater Monitoring Project)
2ZP1-S	Surveillance monitoring to supplement operable unit monitoring
300-APT	300 Area process trenches (316-5)
3FF5-C	300-FF-5 Operable Unit
3FF5-S	Surveillance monitoring to supplement operable unit monitoring
11EM1-C	1100-EM-1 Operable Unit monitoring
11EM1-City-S	Surveillance monitoring to supplement operable unit monitoring, city of Richland wells
11EM1-S	Surveillance monitoring to supplement operable unit monitoring
400	400 Area surveillance monitoring
Aquifer	Aquifer sampling tubes
Basalt	Wells monitoring basalt-confined aquifers
	CERCLA Program
100HR3IAM(1) or (2)	100-HR-3 Operable Unit
100HR3-PT	100-HR-3 pump-and-treat operational monitoring (not Hanford Groundwater Monitoring Project)
100KR4IAM(1) or (2)	Interim action monitoring for 100-KR-4 Operable Unit
100KR4-PT	100-KR-4 pump-and-treat operational monitoring (not Hanford Groundwater Monitoring Project)
100NR2IAM	100-NR-2 Operable Unit
ERDF	Environmental Restoration Disposal Facility
ISRM	Monitoring for in situ redox manipulation site, 100-HR-3 Operable Unit
	RCRA Program
1301N	1301-N liquid waste disposal facility
1324N	1324-N surface impoundment and 1324-NA percolation pond
1325N	1325-N liquid waste disposal facility

Project Designation	Explanation
183H	183-H solar evaporation basins
A-29	216-A-29 ditch
B-63	216-B-63 trench
BPOND	216-B-3 pond
LERF	Liquid effluent retention facility
LLBG(1..4)	Low-level burial ground, Waste Management Areas 1 through 4
NRDW	Nonradioactive Dangerous Waste Landfill
PUREX	Plutonium-Uranium Extraction Plant waste facilities
S-10	216-S-10 pond and ditch
SST(A)	Single-shell tanks, Waste Management Area A-AX
SST(B)	Single-shell tanks, Waste Management Area B-BX-BY
SST(C)	Single-shell tanks, Waste Management Area C
SST(S) or (SX)	Single-shell tanks, Waste Management Area S-SX
SST(T)	Single-shell tanks, Waste Management Area T
SST(TX/TY)	Single-shell tanks, Waste Management Area TX-TY
SST(U)	Single-shell tanks, Waste Management Area U
U-12	216-U-12 crib
	Other programs
100, 200, 300, 400, or 600 DOH	Department of Health monitoring in 100, 200, 300, 400, and 600 Areas
LLBG(1..4)-PA	Performance Assessment Monitoring for low-level burial grounds, Waste Management Areas 1 through 4
NFEM	Near-Field Environmental Monitoring (not Hanford Groundwater Monitoring Project)
SALDS	State-Approved Land Disposal System (not Hanford Groundwater Monitoring Project)
Spring Seep	Riverbank seep site
SWL	Solid Waste Landfill
TEDF	Treated Effluent Disposal Facility (not Hanford Groundwater Monitoring Project)
Transect river	Columbia River samples

The next 20 constituents are analyzed for most commonly. Some constituents may be analyzed by several methods; however, those details are not specified in this plan but are included in the project database. The constituents include:

- Alkalinity
- Alpha (gross alpha activity)
- Anions (bromide, chloride, fluoride, nitrate, nitrite, phosphate, sulfate)
- Arsenic
- Beta (gross beta activity)
- Cr6+ (hexavalent chromium)
- Cyanide
- Gamma (commonly-reported isotopes are antimony-127, cesium-137, cobalt-60, and ruthenium-106,)
- Hg & Pb (mercury and lead)
- I-129 (iodine-129)
- ICP (metals by the inductively coupled-plasma method: aluminum, antimony, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, potassium, silver, sodium, strontium, vanadium, and zinc)
- Phenols
- Sr-90 (strontium-90)
- Tc-99 (technetium-99)
- TDS (total dissolved solids)
- TOC (total organic carbon)
- TOX (total organic halides)
- Tritium
- Uranium (total)
- VOA (volatile organic constituents).

Letters in the constituents column indicate the frequency of sampling for that constituent:

A = annually
B = biennially (every two years)
M = monthly
Q = quarterly
S = semiannually (twice each year)
T = triennially (every three years).

OTHER/COMMENTS: This field includes the additional constituents not listed in the previous columns, hydrologic unit monitored if other than the unconfined aquifer, and the schedule year for sampling biennial or triennial constituents. Metals are listed by their standard abbreviations. Other constituents are abbreviated as follows:

Amm = ammonium
C14 = carbon-14

COD = chemical oxygen demand
Col = coliform bacteria
NO3 = nitrate
O&G = oil and grease
PCB = polychlorinated biphenyl
Puis = isotopic plutonium
Ra = radium
TPH = total petroleum hydrocarbons
Uiso = isotopic uranium
SO4 = sulfate
PCB = polychlorinated biphenyls.

References

CERCLA - *Comprehensive Environmental Response, Compensation, and Liability Act*. 1980. Public Law 96-510, as amended, 94 Stat. 2767, 42 USC 9601 et seq.

DOE. 2000. *Sampling and Analysis Plan for Aquifer Sampling Tubes*. DOE/RL-2000-59, U.S. Department of Energy, Richland, Washington.

McDonald, J. P., M. A. Chamness, and D. R. Newcomer. 1999. *Water-Level Monitoring Plan for the Hanford Groundwater Monitoring Project*. PNNL-13021, Pacific Northwest National Laboratory, Richland, Washington.

RCRA - *Resource Conservation and Recovery Act*. 1976. Public Law 94-580, as amended, 90 Stat. 2795, 42 USC 6901 et seq.

Table A.1. Integrated Sampling and Analysis Matrix for the Hanford Site (A key on pages A.1 through A.6 provides an explanation of this table.)

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
199-B2-12	LTMC	1BC5-C		A	A		A						A		A					A			
199-B2-12	SURV	1BC5-S	T		T								T							T			FY05
199-B2-13	SURV	1BC5-S	A		A								A							A			
199-B3-1	LTMC	1BC5-C		A	A		A						A		A					A			
199-B3-46	LTMC	1BC5-C		A	A		A						A		A					A			
199-B3-47	LTMC	1BC5-C		A	A		A	A					A		A					A			
199-B4-1	LTMC	1BC5-C		A	A		A						A		A					A			
199-B4-2	SURV	1BC5-S		A	A		A						A		A					A			
199-B4-4	LTMC	1BC5-C		B	B		B						B		B					B			FY04
199-B4-5	LTMC	1BC5-C		B	B		B						B		B					B			FY04
199-B4-7	LTMC	1BC5-C		B	B		B						B		B					B			FY04
199-B4-8	SURV	1BC5-S	A		A								A										
199-B5-1	LTMC	1BC5-C		A	A		A	A					A		A					A			
199-B5-2	LTMC	1BC5-C		A	A		A						A		A					A			
199-B8-6	LTMC	1BC5-C		B	B		B						B		B					B			FY04
199-B9-2	LTMC	1BC5-C		B	B		B						B		B					B			FY04
199-D2-6	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D2-6	CERCLA	ISRM			A			Q													A		Q:SO4
199-D2-6	SURV	1HR3-D-S	A		A								A							A			
199-D2-8	SURV	1HR3-D-S	A		A			S					A										
199-D3-2	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D3-2	CERCLA	ISRM			S			Q					S								S		Q:SO4
199-D3-2	SURV	1HR3-D-S	A		A								A							A			
199-D4-1	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-4	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-4	SURV	1HR3-D-S	A		A			Q					A										
199-D4-5	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-5	SURV	1HR3-D-S	A		A			Q					A										
199-D4-6	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-6	SURV	1HR3-D-S	A		A			Q					A										
199-D4-7	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-7	SURV	1HR3-D-S	A		A			Q					A										
199-D4-13	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D4-13	SURV	1HR3-D-S	A		A								A										
199-D4-14	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D4-14	SURV	1HR3-D-S	A		A								A										
199-D4-15	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D4-15	CERCLA	ISRM			A			M					A								A		Q:SO4
199-D4-15	SURV	1HR3-D-S	A		A								A										
199-D4-19	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
199-D4-20	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D4-20	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-22	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D4-22	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-22	SURV	1HR3-D-S	A		A			Q					A										
199-D4-23	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D4-23	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-23	SURV	1HR3-D-S	A		A			Q					A										
199-D4-26	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-31	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-32	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-36	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-38	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-38	SURV	1HR3-D-S	A		A			Q					A										
199-D4-39	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-39	SURV	1HR3-D-S	A		A			Q					A										
199-D4-48	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-62	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-78	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-83	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-83	SURV	1HR3-D-S	A		A			Q					A										
199-D4-84	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-84	SURV	1HR3-D-S	A		A								A										
199-D4-85	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D4-86	CERCLA	ISRM			A			Q					A								A		Q:SO4
199-D5-13	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			
199-D5-13	SURV	1HR3-D-S	A		A								A							A			
199-D5-14	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Former extraction well
199-D5-14	SURV	1HR3-D-S	A		A								A										Former extraction well
199-D5-15	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Former extraction well
199-D5-15	SURV	1HR3-D-S	A		A								A		A					A			Former extraction well
199-D5-16	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Former extraction well
199-D5-16	SURV	1HR3-D-S													A					A			Former extraction well
199-D5-17	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-D5-17	SURV	1HR3-D-S	A		A								A							A			
199-D5-18	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY03
199-D5-19	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY04
199-D5-20	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			
199-D5-20	SURV	1HR3-D-S	A		A			Q					A										
199-D5-36	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D5-36	CERCLA	ISRM			A			Q					A								A		Q:SO4

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
199-D5-36	SURV	1HR3-D-S	A		A								A										
199-D5-37	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D5-37	SURV	1HR3-D-S	A		A			Q					A										
199-D5-38	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D5-38	CERCLA	ISRM			A			M					A								A		M:SO4
199-D5-38	SURV	1HR3-D-S	A		A			Q					A										
199-D5-39	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D5-39	CERCLA	ISRM			A			M					A								A		M:SO4
199-D5-39	SURV	1HR3-D-S	A		A			Q					A										
199-D5-40	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D5-40	SURV	1HR3-D-S	A		A			Q					A										
199-D5-41	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D5-41	SURV	1HR3-D-S	A		A			Q					A										
199-D5-42	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D5-42	SURV	1HR3-D-S	A		A								A										
199-D5-43	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D5-43	CERCLA	ISRM			A			M					A								A		M:SO4
199-D5-43	SURV	1HR3-D-S	A		A			Q					A										
199-D5-44	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			Q:SO4
199-D8-4	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-D8-4	SURV	1HR3-D-S	A		A								A										
199-D8-5	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-D8-53	FH	100HR3 PT						Q							S					S			Extraction well.
199-D8-54A	FH	100HR3 PT						Q							S					S			Extraction well.
199-D8-54A	SURV	1HR3-D-S						A							A								Extraction well
199-D8-54B	CERCLA	100HR3IAM(1)						S					A										Confined Ringold[(a)]
199-D8-54B	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-D8-54B	SURV	1HR3-D-S	T		T								T							T			FY05
199-D8-55	CERCLA	100HR3IAM(2)		A	A		A	Q					A							A			
199-D8-55	SURV	1HR3-D-S													A								
199-D8-68	CERCLA	100HR3IAM(1)						M							A					A			
199-D8-68	SURV	1HR3-D-S	A		A								A		A								
199-D8-69	CERCLA	100HR3IAM(1)						M							A					A			
199-D8-70	CERCLA	100HR3IAM(1)						M							A					A			3 depth intervals for Cr6+
199-D8-71	CERCLA	100HR3IAM(1)						S															
199-F1-2	LTMC	1FR3-C		A	A		A						A		A					A		A	
199-F5-1	DOH	100F DOH		A	A		A			A		A			A	A				A	A		
199-F5-1	LTMC	1FR3-C	A	A	A		A						A		A					A		A	
199-F5-4	LTMC	1FR3-C		A	A		A						A		A					A		A	
199-F5-6	LTMC	1FR3-C		A	A		A						A		A					A		A	
199-F5-42	LTMC	1FR3-C		A	A		A						A		A					A		A	
199-F5-43A	LTMC	1FR3-C	A	A	A		A						A		A					A		A	

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
199-F5-43B	LTMC	1FR3-C	A	A	A		A						A		A					A		A	Deep unconfined
199-F5-44	LTMC	1FR3-C		A	A		A						A		A					A		A	
199-F5-45	LTMC	1FR3-C		B	Q		B						B		B					B		B	FY03
199-F5-46	LTMC	1FR3-C		A	A		A	Q					A		A					A		A	
199-F5-47	LTMC	1FR3-C		B	B		B						B		B					B		B	FY04
199-F5-48	LTMC	1FR3-C		B	B		B						B		B					B		B	FY04
199-F6-1	LTMC	1FR3-C		A	A		A						A		A					A		A	
199-F7-1	LTMC	1FR3-C		B	B		B						B		B					B		B	FY04
199-F7-2	LTMC	1FR3-C		B	B		B						B		B					B		B	FY04
199-F7-3	LTMC	1FR3-C		B	B		B						B		B					B		B	FY03
199-F8-2	LTMC	1FR3-C		B	B		B						B		B					B		B	FY04
199-F8-3	LTMC	1FR3-C		B	B		B						B		B					B		B	FY03
199-F8-4	LTMC	1FR3-C		A	A		A						A		A					A		A	A:C14
199-H3-2A	CERCLA	100HR3IAM(2)		A	A		A						A							A			Extraction well
199-H3-2A	FH	100HR3 PT						Q							S	S				S	S		S: NO3. Extraction well.
199-H3-2A	SURV	1HR3-H-S	A		A								A							A			Extraction well
199-H3-2C	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY04. Deep unconfined.
199-H3-2C	SURV	1HR3-H-S	A		A								A							A			Deep unconfined
199-H4-2	SURV	Basalt	T	T	T		T						T							T			FY03; Rattlesnake Ridge interbed[a]
199-H4-3	CERCLA	100HR3IAM(1)						S															
199-H4-3	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-H4-3	RCRA	183H	A		A								A			A					A		
199-H4-3	SURV	1HR3-H-S	A		A								A			A					A		
199-H4-4	CERCLA	100HR3IAM(1)			A			M							A	A				A	A		
199-H4-4	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-H4-4	DOH	100H DOH		A	A		A			A		A				A				A	A		A: Uiso
199-H4-4	SURV	1HR3-H-S	A	A	S		A			A		A	A		A	S					S		
199-H4-5	CERCLA	100HR3IAM(1)			A			M							A	A				A	A		
199-H4-5	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-H4-5	SURV	1HR3-H-S	A		A								A			A					A		
199-H4-6	CERCLA	100HR3IAM(1)						S															
199-H4-6	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY03
199-H4-7	FH	100HR3 PT						Q							S	S				S	S		S: NO3. Extraction well.
199-H4-7	RCRA	183H	A		A								A			A					A		Extraction well
199-H4-7	SURV	1HR3-H-S	A		A								A			A					A		Extraction well
199-H4-8	CERCLA	100HR3IAM(1)						S															
199-H4-8	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY03
199-H4-9	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY04
199-H4-9	SURV	1HR3-H-S	A		A								A			A					A		
199-H4-10	CERCLA	100HR3IAM(1)						S															

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
199-H4-10	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-H4-10	SURV	1HR3-H-S	A		A								A										
199-H4-11	FH	100HR3 PT						Q							S	S				S	S		S: NO3. Extraction well.
199-H4-12A	FH	100HR3 PT						Q							S	S				S	S		S: NO3. Extraction well.
199-H4-12A	RCRA	183H	A		A								A			A					A		Extraction well
199-H4-12A	SURV	1HR3-H-S	A		A								A			A					A		Extraction well
199-H4-12B	CERCLA	100HR3IAM(1)						S															Mid-depth of clusters
199-H4-12C	CERCLA	100HR3IAM(1)						S															Deep unconfined[(a)]
199-H4-12C	CERCLA	100HR3IAM(2)		A	A		A						A							A			Deep unconfined[(a)]
199-H4-12C	RCRA	183H	A		A								A			A					A		Deep unconfined[(a)]
199-H4-13	CERCLA	100HR3IAM(1)						S															
199-H4-13	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-H4-14	CERCLA	100HR3IAM(1)						S															
199-H4-14	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY03
199-H4-14	SURV	1HR3-H-S	A		A								A										
199-H4-15A	FH	100HR3 PT						Q							S	S				S	S		S: NO3. Extraction well.
199-H4-15A	SURV	1HR3-H-S	A		A								A			A					A		Extraction well
199-H4-15B	CERCLA	100HR3IAM(1)						S															Mid-depth of cluster
199-H4-15CP	SURV	1HR3-H-S	T		T								T			T				T	T		FY05. Top of basalt.[(a)]
199-H4-15CQ	SURV	1HR3-H-S	T		T								T										FY05. Confined Ringold.[(a)]
199-H4-15CR	SURV	1HR3-H-S	T		T								T										FY05. Deep unconfined.
199-H4-15CS	CERCLA	100HR3IAM(1)						S															Deep unconfined[(a)]
199-H4-15CS	SURV	1HR3-H-S	T		T								T			T				T	T		FY05
199-H4-16	CERCLA	100HR3IAM(1)						S															
199-H4-16	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY03
199-H4-16	SURV	1HR3-H-S	A		A								A		A								
199-H4-17	CERCLA	100HR3IAM(1)						S															
199-H4-17	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY03
199-H4-18	CERCLA	100HR3IAM(1)						S															
199-H4-18	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-H4-18	SURV	1HR3-H-S	A		A								A		A	A				A	A		
199-H4-45	CERCLA	100HR3IAM(1)						S															
199-H4-45	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-H4-45	SURV	1HR3-H-S	A		A								A		A								
199-H4-46	CERCLA	100HR3IAM(1)						S															
199-H4-46	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY03
199-H4-46	SURV	1HR3-H-S	A		A								A		A								

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
199-H4-47	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY04
199-H4-47	SURV	1HR3-H-S	A		A								A		A								
199-H4-48	CERCLA	100HR3IAM(1)						S															
199-H4-48	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY04
199-H4-48	SURV	1HR3-H-S	A		A								A										
199-H4-49	CERCLA	100HR3IAM(1)						S															
199-H4-49	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY04
199-H4-49	SURV	1HR3-H-S	A		A								A										
199-H4-63	CERCLA	100HR3IAM(1)			A			M							A	A				A	A		
199-H4-63	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-H4-63	SURV	1HR3-H-S	A		A								A		A								
199-H4-64	CERCLA	100HR3IAM(1)			A			M							A	A				A	A		
199-H4-64	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-H4-65	FH	100HR3 PT						Q							S	S				S	S		S: NO3. Extraction well.
199-H5-1A	CERCLA	100HR3IAM(1)						S															
199-H5-1A	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY04
199-H5-1A	SURV	1HR3-H-S	A		A								A										
199-H6-1	CERCLA	100HR3IAM(2)		A	A		A						A							A			
199-H6-1	SURV	1HR3-H-S	A		A								A		A								
199-K-11	CERCLA	100KR4IAM(2)		B	B		B			B			B							B			FY03
199-K-11	SURV	1KR4-S			A		A						A							A			A:C14
199-K-18	CERCLA	100KR4IAM(1)						M							A					A			
199-K-18	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			
199-K-18	SURV	1KR4-S			A								A							A			
199-K-19	CERCLA	100KR4IAM(1)						S															
199-K-19	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			
199-K-19	SURV	1KR4-S			A		A						A							A			
199-K-20	CERCLA	100KR4IAM(1)						M							A					A			
199-K-20	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			
199-K-21	CERCLA	100KR4IAM(1)						S															
199-K-21	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			
199-K-21	SURV	1KR4-S													A								
199-K-22	CERCLA	100KR4IAM(1)						S															
199-K-22	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			
199-K-22	SURV	1KR4-S			A								A		A					A			
199-K-23	CERCLA	100KR4IAM(2)		B	B		B			B			B							B			FY03
199-K-23	SURV	1KR4-S			A		A						A										
199-K-27	CERCLA	100KR4IAM(2)		A	A		A			A			A		Q					A			
199-K-27	DOH	100K DOH		S	S		S			S										S			
199-K-27	SURV	1K-Basins		Q	Q		Q						S		A	A				Q			
199-K-29	SURV	1K-Basins		Q	Q		Q													Q			A:C14
199-K-29	SURV	1KR4-S	A										A										
199-K-30	CERCLA	100KR4IAM(2)		B	B		B			B			B		Q					B			B:C14; FY03

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
199-K-30	SURV	1K-Basins		Q	Q		Q						S							Q			A:C14
199-K-30	SURV	1KR4-S	A																				
199-K-31	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			
199-K-31	SURV	1KR4-S			A		A						A			A				A			
199-K-32A	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			A:C14
199-K-32A	SURV	1K-Basins		Q	Q		Q									A				Q			A:C14
199-K-32B	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			Deep unconfined
199-K-32B	SURV	1KR4-S	T		T								T							T			FY05. Deep unconfined.
199-K-33	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			A:C14
199-K-33	SURV	1K-Basins		S	S		S						S							S			A:C14
199-K-33	SURV	1KR4-S																				A	A:C14
199-K-34	CERCLA	100KR4IAM(2)		B	B		B			B			B							B			B:C14; FY03
199-K-34	SURV	1K-Basins		Q	Q		Q						S		A	A				Q			A:C14
199-K-35	CERCLA	100KR4IAM(2)		B	B		B			B			B							B			FY03
199-K-35	SURV	1KR4-S			A								A							A			
199-K-36	CERCLA	100KR4IAM(2)		A	A		A	Q		A	A		A							A			
199-K-36	SURV	1KR4-S			A								A							A			
199-K-37	CERCLA	100KR4IAM(1)						S															
199-K-37	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			
199-K-106A	CERCLA	100KR3IAM(2)		B	B		B			B			B							B			FY04; B:C14
199-K-106A	SURV	1K-Basins		Q	Q		Q						S							Q			A:C14
199-K-106A	SURV	1KR4-S	A																			A	
199-K-107A	CERCLA	100KR4IAM(2)		A	A		A	Q		A			A							A			
199-K-107A	SURV	1K-Basins		Q	Q		Q						S		A	A				Q			
199-K-107A	SURV	1KR4-S																					A:C14
199-K-108A	CERCLA	100KR4IAM(2)		A	A		A	Q		A			A							A			A:C14
199-K-108A	SURV	1K-Basins		S	S		S						S							S			
199-K-108A	SURV	1KR4-S																					A:C14
199-K-109A	CERCLA	100KR4IAM(2)		A	A		A			A			A		Q					A			
199-K-109A	DOH	100K DOH		S	S		S			S					S					S			S:C14, Puis
199-K-109A	SURV	1K-Basins		Q	Q		Q						S		A	A				Q			
199-K-109A	SURV	1KR4-S																					A:C14
199-K-110A	CERCLA	100KR3IAM(2)		B	B		B			B			B							B			FY04
199-K-110A	SURV	1K-Basins		S	S		S						A							S			
199-K-110A	SURV	1KR4-S																					A:C14
199-K-111A	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			A:C14
199-K-111A	SURV	1K-Basins		Q	Q		Q						A			A				Q			A:C14
199-K-112A	FH	100KR4 PT						Q							S					S			Extraction well.
199-K-113A	FH	100KR4 PT						Q							S					S			Extraction well.
199-K-114A	CERCLA	100KR4IAM(1)						M							A					A			
199-K-114A	SURV	1KR4-S													A								
199-K-115A	FH	100KR4 PT						Q							S					S			Extraction well.
199-K-116A	FH	100KR4 PT						Q							S					S			Extraction well.

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
199-K-117A	CERCLA	100KR4IAM(1)						M							A					A			4 depth inter-vals for Cr6+
199-K-117A	SURV	1KR4-S			A								A		A								
199-K-119A	FH	100KR4 PT						Q							S					S			Extraction well.
199-K-120A	FH	100KR4 PT						Q							S					S			Extraction well.
199-K-125A	FH	100KR4 PT						Q							S					S			Extraction well.
199-K-126	CERCLA	100KR4IAM(1)						M							A					A			
199-N-2	CERCLA	100NR2IAM			A		A						A		A					A			
199-N-2	RCRA	1301N	A		A								A					S	S				
199-N-2	SURV	1NR2-S	A		A					S			A		A								
199-N-3	CERCLA	100NR2IAM			S		S						S		S					S			
199-N-3	RCRA	1301N	A		A								A					S	S				
199-N-3	SURV	1NR2-S	A		A								A		A					A			A:0&G, TPH
199-N-14	CERCLA	100NR2IAM			S		S						S		S					S			
199-N-14	DOH	100N DOH		S	S		S			S					S					S			
199-N-14	SURV	1NR2-S	A		S								A		S					S			
199-N-16	CERCLA	100NR2IAM			A		A						A		A								A:0&G, TPH
199-N-16	SURV	1NR2-S	A		A								A										
199-N-18	CERCLA	100NR2IAM																					A:0&G, TPH
199-N-18	SURV	1NR2-S	A		A								A										S:0&G, TPH
199-N-19	SURV	1NR2-S													A								A:0&G, TPH
199-N-21	CERCLA	100NR2IAM			A								A										
199-N-21	SURV	1NR2-S	A		A					A			A										
199-N-26	SURV	1NR2-S	A		A								A										
199-N-27	CERCLA	100NR2IAM		A	A					A			A							A			
199-N-27	SURV	1NR2-S													A								
199-N-28	RCRA	1325N	A		A								A					S	S				
199-N-28	SURV	1NR2-S	A		A								A		A					A			
199-N-32	CERCLA	100NR2IAM			S		S			S			S		S					S			
199-N-32	RCRA	1325N	S		S								S					S	S				
199-N-32	SURV	1NR2-S	A		A								A							A			
199-N-34	RCRA	1301N	A		A								A					S	S				
199-N-34	SURV	1NR2-S	A		A								A		A					A			
199-N-41	RCRA	1325N	A		A								A					S	S				
199-N-41	SURV	1NR2-S	A		A								A		A					A			
199-N-46	FH	NFEM								A					A					A			
199-N-46	SURV	1NR2-S													S					S			
199-N-47	SURV	1NR2-S	T		T								T										FY05
199-N-50	CERCLA	100NR2IAM					A													A			
199-N-50	SURV	1NR2-S	T		T								T							T			FY05
199-N-51	CERCLA	100NR2IAM					A													A			
199-N-51	SURV	1NR2-S																		A			
199-N-52	SURV	1NR2-S	T		T								T							T			FY05
199-N-56	SURV	1NR2-S													A								

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
199-N-57	RCRA	1301N	A		A								A					S	S				
199-N-57	SURV	1NR2-S	A		A								A		A								
199-N-59	RCRA	1324N	S	S	S								S					S	S				Dry when water table low
199-N-64	CERCLA	100NR2IAM			A		A						A		A					A			
199-N-64	SURV	1NR2-S	A		A								A		A					A			
199-N-67	CERCLA	100NR2IAM		S	S		S						S		S								Little water remains
199-N-67	SURV	1NR2-S	A		A					Q			A		Q					A			Little water remains
199-N-69	SURV	1NR2-S													T					T			FY05. Bottom upper aquifer.
199-N-70	CERCLA	100NR2IAM		A	A		A			A			A		A					A			Bottom upper aquifer
199-N-71	RCRA	1324N	A		A								A					S	S				
199-N-72	RCRA	1324N	A		A								A					S	S				
199-N-73	RCRA	1324N	A		A								A					S	S				
199-N-73	SURV	1NR2-S	A		A								A										
199-N-74	CERCLA	100NR2IAM		A			A			A			A										
199-N-74	RCRA	1325N	A		A								A					S	S				
199-N-74	SURV	1NR2-S	T		T		T						T		T					T			FY05
199-N-75	CERCLA	100NR2IAM			S		S						S		S					S			Extraction well
199-N-75	SURV	1NR2-S	A		A								A		A								Extraction well
199-N-76	CERCLA	100NR2IAM			S		S			S			S		S					S			
199-N-76	SURV	1NR2-S													A								
199-N-77	RCRA	1324N	A	A	A								A					S	S				Bottom upper aquifer
199-N-80	CERCLA	100NR2IAM		A	A		A			A			A		A					A			Confined Ringold
199-N-80	SURV	1NR2-S	T		T								T		T					T			FY05. Confined Ringold.
199-N-81	CERCLA	100NR2IAM			A		A						A		A					A			
199-N-81	RCRA	1325N	A		A								A					S	S				
199-N-81	SURV	1NR2-S								S					S								
199-N-92A	CERCLA	100NR2IAM			A		A						A		A					A			
199-N-92A	SURV	1NR2-S													A					A			
199-N-96A	CERCLA	100NR2IAM			A		A						A		A					A			
199-N-96A	SURV	1NR2-S			A								A		A			A		A		A	A:0&G, TPH
199-N-99A	CERCLA	100NR2IAM			A		A						A		A					A			
199-N-99A	SURV	1NR2-S													A					A			
199-N-103A	SURV	1NR2-S								S					S								Extraction well
199-N-105A	RCRA	1301N	A		A								A					S	S				Backup extraction well
199-N-105A	SURV	1NR2-S	A		A					S			A		S								Backup extraction well
199-N-106A	SURV	1NR2-S													S								Extraction well
299-E13-5	SURV	2PO1-S		A	A		A			A		A	A		A					A			
299-E13-14	DOH	200E DOH		A	A		A			A		A			A					A			A: Puis

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
299-E13-14	SURV	2PO1-S		A	A		A			A			A		A					A	A		
299-E16-1	SURV	Basalt	T	T	T		T					T	T							T			FY03, Elephant Mt interflow[a]
299-E16-2	LTMC	2PO1-C			T	T						T								T			FY04
299-E17-1	RCRA	PUREX	S	S	S	S	S					S	S	S	S					S			S:Amm
299-E17-9	LTMC	2PO1-C			T	T						T								T			FY04
299-E17-9	RCRA	PUREX	S	S	S	S	S					S	S	S	S					S			S:Amm
299-E17-12	LTMC	2BP5-C		A	A	A	A					A	A							A			
299-E17-13	LTMC	2BP5-C	A	A	A	A	A					A	A		A					A			
299-E17-14	LTMC	2PO1-C			T	T						T								T			FY04
299-E17-14	RCRA	PUREX	Q	Q	Q	Q	Q					Q	Q	Q	Q					Q			Q:Amm
299-E17-18	LTMC	2PO1-C			T	T						T								T			FY04
299-E17-18	RCRA	PUREX	S	S	S	S	S					S	S	S	S					S			S:Amm
299-E17-19	LTMC	2PO1-C			T	T						T								T			FY04
299-E17-19	RCRA	PUREX	S	S	S	S	S					S	S	S	S					S			S:Amm
299-E18-1	SURV	2PO1-S			T	T						T	T							T			FY04
299-E23-1	LTMC	2PO1-C			T	T						T								T			FY04
299-E24-5	LTMC	2PO1-C			T	T						T								T			FY04
299-E24-8	SURV	2BP5-S		T	T	T	T			T		T								T			FY04
299-E24-16	RCRA	PUREX	Q	Q	Q	Q	Q					Q	Q	Q	Q					Q			Q:Amm
299-E24-18	LTMC	2PO1-C			T	T						T								T			FY04
299-E24-18	RCRA	PUREX	S	S	S	S	S					S	S	S	S					S			S:Amm
299-E24-19	LTMC	2BP5-C		A	A		A																
299-E24-19	RCRA	SST(A)	S		S		S			A		A	S	A	A	S		S	S	A	A		
299-E24-20	LTMC	2PO1-C			T	T						T								T			FY04
299-E24-20	RCRA	SST(A)	S		S		S			A		A	S	A	A	S		S	S	A	A		
299-E25-2	RCRA	SST(A)	S		S		S			A		A	S	A	A	S		S	S	A	A		
299-E25-3	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-6	LTMC	2PO1-C		T	T	T	T			T		T				T				T	T		FY04
299-E25-17	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-17	RCRA	PUREX	S	S	S	S	S					S	S	S	S					S			S:Amm
299-E25-18	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-19	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-19	RCRA	PUREX	Q	Q	Q	Q	Q					Q	Q	Q	Q					Q			Q:Amm
299-E25-20	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-22	SURV	2PO1-S			T	T						T								T			FY04
299-E25-26	RCRA	A-29	S		S								A	A				S	S				
299-E25-28	RCRA	A-29	S		S								A	A				A	A				Deep unconfined
299-E25-28	SURV	2PO1-S			T	T						T								T			FY04. Deep unconfined.
299-E25-29P	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-29Q	SURV	2PO1-S			T	T						T								T			FY04
299-E25-31	RCRA	PUREX	S	S	S	S	S					S	S	S	S					S			S:Amm
299-E25-32P	LTMC	2PO1-C			T	T						T								T			FY04

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
299-E25-32P	RCRA	A-29	S		S								A	A				S	S				
299-E25-32Q	SURV	2PO1-S	T		T	T						T	T							T			FY04
299-E25-34	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-34	RCRA	A-29	S		S								A	A				S	S				
299-E25-35	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-35	RCRA	A-29	S		S								A	A				S	S				
299-E25-36	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-37	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-40	RCRA	SST(A)	S		S		S			A		A	S	A	A	S		S	S	A	A		
299-E25-41	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-41	RCRA	SST(A)	S		S		S			A		A	S	A	A	S		S	S	A	A		
299-E25-42	LTMC	2PO1-C			T	T						T								T			FY04
299-E25-43	LTMC	2PO1-C			T							T								T			FY04
299-E25-44	LTMC	2PO1-C										T								T			FY04
299-E25-46	LTMC	2PO1-C			T							T								T			FY04
299-E25-46	RCRA	SST(A)	S		S		S			A		A	S	A	A	S		S	S	A	A		
299-E25-47	LTMC	2PO1-C			T							T								T			FY04
299-E25-48	RCRA	A-29	S		S								A	A				S	S				
299-E26-4	LTMC	2BP5-C		A	A	A	A			A		A	A							A			
299-E26-8	SURV	Basalt	T	T	T		T					T	T							T			FY03; Rattle-snake Ridge interbed[(a)]
299-E26-10	RCRA	LERF	A	Q	S	A	Q						S	A						A		S	S:Amm
299-E26-10	SURV	2BP5-S			A	A						A								A			
299-E26-11	RCRA	LERF	A	S	A		S						A	A								S	S:Amm
299-E26-11	SURV	2BP5-S			T	T						T								T			FY04
299-E26-12	RCRA	A-29	S		S								A	A				S	S				
299-E26-13	RCRA	A-29	S		S								A	A				S	S				
299-E27-7	RCRA	SST(C)	Q		Q		Q		Q	Q			Q	A		Q		Q	Q		A		
299-E27-7	SURV	2BP5-S			T	T						T				T				T			FY04
299-E27-8	PA	LLBG(2)-PA										S				S					S		
299-E27-8	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E27-8	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-E27-9	PA	LLBG(2)-PA										S				S					S		
299-E27-9	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E27-9	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-E27-10	PA	LLBG(2)-PA										S				S					S		
299-E27-10	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-E27-10	SURV	2BP5-S			T	T						T								T			FY04
299-E27-11	PA	LLBG(2)-PA										S				S					S		
299-E27-11	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E27-11	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-E27-12	RCRA	SST(C)	Q		Q		Q		Q	Q			Q	A		Q		Q	Q		A		
299-E27-13	RCRA	SST(C)	Q		Q		Q		Q	Q			Q	A		Q		Q	Q		A		
299-E27-14	RCRA	SST(C)	Q		Q		Q		Q	Q			Q	A		Q		Q	Q		A		

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
299-E27-14	SURV	2BP5-S			T	T						T								T			FY04
299-E27-15	RCRA	SST(C)	Q		Q		Q		Q	Q			Q	A		Q		Q	Q		A		
299-E27-15	SURV	2BP5-S		A	A		A						A			A							
299-E27-16	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E27-17	PA	LLBG(2)-PA										S				S					S		
299-E27-17	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E27-17	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-E27-17	SURV	2BP5-S			T	T						T								T			FY04
299-E27-18	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E27-18	SURV	2BP5-S			T	T						T								T			FY04
299-E27-19	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E28-2[b]	LTMC	2BP5-C								A					A								A:Puis
299-E28-2[b]	SURV	2BP5-S	A	A	A	A	A			A		A	A		A	A				A			A:Puis
299-E28-5	SURV	2BP5-S		T	T	T	T			T		T			T					T	T		FY04; T: Am, Np, Puis
299-E28-6	SURV	2BP5-S		T	T	T	T			T		T			T					T	T		FY04; T: Puis
299-E28-7[b]	LTMC	2BP5-C		A						A					A								A:Puis
299-E28-7[b]	SURV	2BP5-S	A	A	A	A	A			A		A	A		A	A				A			A:Puis
299-E28-8	LTMC	2BP5-C														A							
299-E28-8	RCRA	SST(B)	Q		Q				S	S		A	Q			Q				Q	S		
299-E28-8	SURV	2BP5-S			A					A					A	A					A		A:Puis, Uiso
299-E28-10[b]	LTMC	2BP5-C													A								
299-E28-10[b]	SURV	2BP5-S		A	A	A	A			A		A			A					A	A		A:Am, Np, Puis, Uiso
299-E28-13	SURV	2BP5-S		T	T	T	T					T								T	T		FY04
299-E28-18[b]	LTMC	2BP5-C																			A		
299-E28-18[b]	SURV	2BP5-S			A	A	A					A								A	A		
299-E28-23[b]	LTMC	2BP5-C								A					A								A:Puis
299-E28-23[b]	SURV	2BP5-S		A			A			A					A						A		A:Am, Np, Puis, Uiso
299-E28-24[b]	LTMC	2BP5-C								A					A								A:Puis
299-E28-24[b]	SURV	2BP5-S		A			A			A					A					A	A		A:Am, Np, Puis, Uiso
299-E28-25[b]	LTMC	2BP5-C								A					A								A:Puis
299-E28-25[b]	SURV	2BP5-S		A	A	A	A			A		A			A					A	A		A:Am, Np, Puis, Uiso
299-E28-26	PA	LLBG(1)-PA														S							
299-E28-26	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E28-26	SURV	2BP5-S			T	T						T								T			FY04
299-E28-27	PA	LLBG(1)-PA														S							
299-E28-27	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E28-27	SURV	2BP5-S			T	T						T								T			FY04
299-E28-28	PA	LLBG(1)-PA														S							
299-E28-28	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E28-28	SURV	2BP5-S			T							T								T			FY04
299-E32-2	PA	LLBG(1)-PA														S							

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
299-E32-2	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E32-2	SURV	2BP5-S			T							T								T			FY04
299-E32-3	PA	LLBG(1)-PA														S							
299-E32-3	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E32-4	PA	LLBG(1)-PA														S							
299-E32-4	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E32-4	SURV	2BP5-S			T							T								T			FY04
299-E32-5	PA	LLBG(1)-PA														S							
299-E32-5	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E32-5	SURV	2BP5-S			T							T								T	T		FY04
299-E32-6	PA	LLBG(1)-PA														S							
299-E32-6	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E32-6	SURV	2BP5-S			T							T								T	T		FY04
299-E32-7	PA	LLBG(1)-PA														S							
299-E32-7	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E32-7	SURV	2BP5-S			T							T								T			FY04
299-E32-8	PA	LLBG(1)-PA														S							
299-E32-8	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E32-8	SURV	2BP5-S			T							T								T			FY04
299-E32-9	LTMC	2BP5-C														A							
299-E32-9	PA	LLBG(1)-PA														S							
299-E32-9	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E32-9	SURV	2BP5-S			T				T			T								T			FY04
299-E32-10	PA	LLBG(1)-PA														S							
299-E32-10	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E32-10	SURV	2BP5-S			T	T	T		T	T		T				T				T	T		FY04
299-E33-7	LTMC	2BP5-C			A				A	A						A							
299-E33-7	RCRA	SST(B)	Q		Q		Q		Q	Q			Q			Q				Q	Q		
299-E33-7	SURV	2BP5-S		A	A		A		A	A		A				A				A	A		
299-E33-9[b]	LTMC	2BP5-C			A				A	A						A					A		
299-E33-9	RCRA	SST(B)	Q	Q	Q		Q		Q	Q			Q		A	Q		A		Q	Q		
299-E33-10	RCRA	SST(B)	S		S				S			A	S			S				S	S		
299-E33-12[b]	LTMC	2BP5-C														T							FY03; Rattle-snake Ridge interbed[a]
299-E33-12	SURV	Basalt	T	T	T		T		T	T		T	T			T				T	T		FY04; Rattle-snake Ridge Interbed[a]
299-E33-13	LTMC	2BP5-C			A				A	A						A							
299-E33-15	RCRA	SST(B)	S		S		S		S	S			S			S				S	S		
299-E33-16[b]	LTMC	2BP5-C			A											A							
299-E33-16	RCRA	SST(B)	Q		Q		Q		Q	Q			Q			Q				Q	Q		
299-E33-17	RCRA	SST(B)	S		S		S		S				S			S				S	S		
299-E33-18	RCRA	SST(B)	Q	Q	Q		Q		Q				Q			Q				Q	Q		
299-E33-20	RCRA	SST(B)	S		S				S				S			S				S	S		
299-E33-21	RCRA	SST(B)	S		S				S				S			S				S	S		

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
299-E33-26[(b)]	LTMC	2BP5-C							A	A						A							
299-E33-26	RCRA	SST(B)	Q	Q	Q		Q		Q	Q			Q			Q				Q	Q		
299-E33-26	SURV	2BP5-S		T	T		T		T	T		T				T				T	T		FY04
299-E33-28	PA	LLBG(1)-PA														S							
299-E33-28	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E33-28	RCRA	SST(B)	Q		Q		Q		Q			A	Q			Q				Q			
299-E33-29[(b)]	LTMC	2BP5-C			A											A							
299-E33-29	PA	LLBG(1)-PA														S							
299-E33-29	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E33-29	RCRA	SST(B)	Q		Q		Q		Q			A	Q			Q				Q			
299-E33-29	SURV	2BP5-S			T	T						T								T			FY04
299-E33-30	PA	LLBG(1)-PA														S							
299-E33-30	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E33-31	RCRA	SST(B)	Q	Q	Q		Q		Q	Q			Q		A	Q		A		Q	Q		
299-E33-32[(b)]	LTMC	2BP5-C			A											A							
299-E33-32	RCRA	SST(B)	Q		Q		Q		Q	Q		A	Q		A	Q		A		Q	Q		
299-E33-32	SURV	2BP5-S			T	T						T								T			FY04
299-E33-33	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E33-33	SURV	2BP5-S			T	T						T								T	T		FY04
299-E33-34[(b)]	LTMC	2BP5-C							A	A						A							
299-E33-34	PA	LLBG(1)-PA														S							
299-E33-34	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E33-34	SURV	2BP5-S			T	T			T			T				T				T			FY04
299-E33-35[(b)]	LTMC	2BP5-C														A							
299-E33-35	PA	LLBG(1)-PA														S							
299-E33-35	RCRA	LLBG(1)	S	S	S		S				S		S	A				S	S	S	S		
299-E33-35	SURV	2BP5-S		T	T	T	T		T	T		T				T				T	T		FY04
299-E33-36	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E33-37	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E33-37	SURV	2BP5-S			T	T						T								T			FY04
299-E33-38[(b)]	LTMC	2BP5-C			A				A	A						A					A		
299-E33-38	RCRA	SST(B)	Q	Q	Q		Q		Q	Q			Q			Q				Q	Q		
299-E33-38[(b)]	SURV	2BP5-S		A	A	A	T		T	A		A			A	T				A	A		A:Am, Np, Puis, Uiso; FY04
299-E33-39	RCRA	SST(B)	Q		Q				Q				Q			Q				Q	Q		
299-E33-39	SURV	2BP5-S			A	A			A			A				A				A	A		
299-E33-41[(b)]	LTMC	2BP5-C														A							
299-E33-41	RCRA	SST(B)	Q	Q	Q		Q		Q	Q			Q		A	Q		A		Q	Q		
299-E33-41	SURV	2BP5-S		T	T	T	T		T	T		T				T				T	T		FY04
299-E33-42	RCRA	SST(B)	Q	Q	Q		Q		Q	Q			Q		A	Q		A		Q	Q		
299-E33-43	RCRA	SST(B)	Q		Q		Q		Q			A	Q		A	Q		A		Q	Q		
299-E33-44	RCRA	SST(B)	Q	Q	Q		Q		Q	Q			Q		A	Q		A		Q	Q		
299-E33-334	LTMC	2BP5-C			A											A							
299-E33-334	RCRA	SST(B)	Q		Q				Q			A	Q			Q		A		Q	Q		

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
299-E33-334	SURV	2BP5-S														A					A		A:Puis
299-E33-335	RCRA	SST(B)	Q		Q				Q			A	Q			Q		A		Q	Q		
299-E33-335	SURV	2BP5-S														A							A:Puis, Uiso
299-E33-337	RCRA	SST(B)	Q		Q				Q			A	Q		A	Q		A		Q	Q		
299-E33-338	RCRA	SST(B)	Q		Q				Q				Q		A	Q		A		Q	Q		
299-E33-339	RCRA	SST(B)	Q		Q				Q			A	Q		A	Q		A		Q	Q		
299-E34-2	PA	LLBG(2)-PA										S				S					S		
299-E34-2	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-E34-2	SURV	2BP5-S			A	A						A								A			
299-E34-3	PA	LLBG(2)-PA										S				S					S		
299-E34-3	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-E34-5	PA	LLBG(2)-PA										S				S					S		
299-E34-5	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-E34-5	SURV	2BP5-S			T							T								T			FY04
299-E34-7	PA	LLBG(2)-PA										S				S					S		
299-E34-7	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-E34-7	SURV	2BP5-S		A	A		A													A			
299-E34-8	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E34-9	PA	LLBG(2)-PA										S				S					S		
299-E34-9	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-E34-9	SURV	2BP5-S		T	T	T	T					T								T			FY04
299-E34-10	PA	LLBG(2)-PA										S				S					S		
299-E34-10	RCRA	B-63	A	S	A		S						A	A				S	S				
299-E34-10	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-E34-11	SURV	2BP5-S		T	T	T	T					T								T			FY04
299-E34-12	PA	LLBG(2)-PA										S				S					S		
299-E34-12	RCRA	LLBG(2)	S	S	S		S				S		S	A				S	S	S			S:PCB
299-W6-2	LTMC	2ZP1-C			S							S								S		S	S:Cd
299-W6-6	FH	SALDS																		A			Deep unconfined[(a)]
299-W6-7	FH	SALDS																		A			
299-W6-7	LTMC	2ZP1-C			A							A								A		A	A:Cd
299-W6-8	FH	SALDS																		A			
299-W6-10	LTMC	2ZP1-C			A							A								A	A	A	A:Cd
299-W6-11	FH	SALDS																		A			
299-W6-12	FH	SALDS																		A			
299-W7-1	FH	SALDS																		A			
299-W7-1	PA	LLBG(3)-PA										S				S					S		
299-W7-1	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	
299-W7-3	FH	SALDS																		S			
299-W7-3	PA	LLBG(3)-PA										S				S					S		
299-W7-3	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	Deep unconfined
299-W7-4	LTMC	2ZP1-C			A																	A	
299-W7-4	PA	LLBG(3)-PA										S				S					S		

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
299-W7-4	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	
299-W7-5	FH	SALDS																		S			
299-W7-5	PA	LLBG(3)-PA										S				S					S		
299-W7-5	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	
299-W7-6	FH	SALDS																		S			
299-W7-7	FH	SALDS																		S			
299-W7-7	LTMC	2ZP1-C			A															A		A	
299-W7-7	PA	LLBG(3)-PA										S				S					S		
299-W7-7	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	
299-W7-8	FH	SALDS																		A			
299-W7-8	LTMC	2ZP1-C			B															B		B	FY03
299-W7-8	PA	LLBG(3)-PA										S				S					S		
299-W7-8	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	
299-W7-9	FH	SALDS																		A			
299-W7-11	FH	SALDS																		S			
299-W7-12	FH	SALDS																		A			
299-W7-12	LTMC	2ZP1-C			B															B		B	FY03
299-W7-12	PA	LLBG(3)-PA										S				S					S		
299-W7-12	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	
299-W8-1	FH	SALDS																		A			
299-W8-1	LTMC	2ZP1-C			B															B		B	FY03
299-W8-1	PA	LLBG(3)-PA										S				S					S		
299-W8-1	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	
299-W10-1	LTMC	2ZP1-C			A	A							A							A		A	
299-W10-1	RCRA	SST(T)	Q	S	Q		S						Q			Q				Q			
299-W10-4	LTMC	2ZP1-C			S	S						S	S			S				S		S	
299-W10-4	RCRA	SST(T)	Q	S	Q		S						Q			Q				Q			
299-W10-5	LTMC	2ZP1-C			A								A			A				A		A	A:Cd
299-W10-8	RCRA	SST(T)	Q	S	Q		S						Q			Q				Q			
299-W10-13	LTMC	2ZP1-C			B																	B	FY03
299-W10-13	PA	LLBG(3)-PA										S				S					S		
299-W10-13	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	
299-W10-14	PA	LLBG(3)-PA										S				S					S		Deep unconfined
299-W10-14	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	Deep unconfined
299-W10-19	LTMC	2ZP1-C			A																	A	A:Cd
299-W10-19	PA	LLBG(3)-PA										S				S					S		
299-W10-19	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	
299-W10-20	LTMC	2ZP1-C			B																	B	FY03
299-W10-20	PA	LLBG(3)-PA										S				S					S		
299-W10-20	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	
299-W10-21	LTMC	2ZP1-C			A															A		A	A:Cd
299-W10-21	PA	LLBG(3)-PA										S				S					S		
299-W10-21	RCRA	LLBG(3)	S	S	S		S				S		S	A				S	S	S		S	

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
299-W10-22	LTMC	2ZP1-C			S							S	S			S				S	S	S	
299-W10-22	RCRA	SST(T)	S		S								S			S				S			
299-W10-23	LTMC	2ZP1-C			A	A						A	A			A				A	A	A	A:Cd
299-W10-23	RCRA	SST(T)	Q	S	Q		S						Q			Q				Q			
299-W10-24	RCRA	SST(T)	Q	S	Q		S			S			Q		A	Q				Q			
299-W10-26	RCRA	SST(TX/TY)	Q	S	Q		S			S		Q	Q			Q				Q			
299-W10-27	RCRA	SST(TX/TY)	Q	S	Q		S			S			Q		A	Q				Q			
299-W10-28	RCRA	SST(T)	Q	S	Q		S						Q			Q				Q			
299-W11-3	LTMC	2ZP1-C			S							S								S	S	S	
299-W11-6	LTMC	2ZP1-C			S							S									S	S	
299-W11-7	LTMC	2ZP1-C			A	A						A	A			A					A	A	A:Cd
299-W11-7	RCRA	SST(T)	S		S								S			S				S			
299-W11-10	LTMC	2ZP1-C			S																	S	
299-W11-12	RCRA	SST(T)	Q	S	Q		S						Q			Q				Q			
299-W11-13	LTMC	2ZP1-C			S	S						S	S			S				S		S	S:Cd
299-W11-14	SURV	2ZP1-S								A		A				A				A	A	A	A:Ra
299-W11-18	LTMC	2ZP1-C			A							A	A			A				A	A	A	A:Cd
299-W11-30	RCRA	SST(T)	S		S								S			S				S			
299-W11-37	LTMC	2ZP1-C			S							S								S	S	S	
299-W11-39	RCRA	SST(T)	Q	S	Q		S			S			Q		A	Q				Q			
299-W11-40	RCRA	SST(T)	Q	S	Q		S						Q			Q				Q			
299-W11-41	RCRA	SST(T)	Q	S	Q		S			S		A	Q			Q				Q			
299-W11-42	RCRA	SST(T)	Q	S	Q		S			S			Q		A	Q				Q			
299-W12-1	LTMC	2ZP1-C			A							A								A		A	
299-W14-5	RCRA	SST(TX/TY)	Q	S	Q		S						Q			Q				Q			
299-W14-6	RCRA	SST(TX/TY)	Q	S	Q		S						Q			Q				Q			
299-W14-13	RCRA	SST(TX/TY)	Q	S	Q		S			S		Q	Q		A	Q				Q			
299-W14-14	LTMC	2ZP1-C			A							A	A			A				A		A	A:Cd
299-W14-14	RCRA	SST(TX/TY)	Q	S	Q		S			S			Q			Q				Q			
299-W14-15	RCRA	SST(TX/TY)	Q	S	Q		S					Q	Q			Q				Q			
299-W14-16	RCRA	SST(TX/TY)	Q	S	Q		S					Q	Q			Q				Q			
299-W14-17	RCRA	SST(TX/TY)	Q	S	Q		S						Q			Q				Q			
299-W14-18	RCRA	SST(TX/TY)	Q	S	Q		S			S		Q	Q			Q				Q			
299-W15-1	LTMC	2ZP1-C			S																	S	
299-W15-2	LTMC	2ZP1-C			A											A						A	
299-W15-7	LTMC	2ZP1-C			S											S						S	
299-W15-11	LTMC	2ZP1-C			S											S				S		S	
299-W15-15	LTMC	2ZP1-C			A																	A	A:Cd
299-W15-15	PA	LLBG(4)-PA										S				S					S		
299-W15-15	RCRA	LLBG(4)	S	S	S		S				S		S	A				S	S	S		S	
299-W15-16	LTMC	2ZP1-C			A								A									A	A:Cd
299-W15-16	PA	LLBG(4)-PA										S				S					S		
299-W15-16	RCRA	LLBG(4)	S	S	S		S				S		S	A				S	S	S		S	

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
299-W15-17	PA	LLBG(4)-PA										S				S					S		Bottom unconfined[(a)]
299-W15-17	RCRA	LLBG(4)	S	S	S		S				S		S	A				S	S	S		S	Deep unconfined[(a)]
299-W15-31A	LTMC	2ZP1-C			S																	S	
299-W15-32	FH	200ZP1 PT																				BW	Extraction well
299-W15-32	LTMC	2ZP1-C			A								A									A	A:Cd; extraction well
299-W15-33	FH	200ZP1 PT																				BW	Extraction well
299-W15-33	LTMC	2ZP1-C			A																	A	Extraction well
299-W15-34	FH	200ZP1 PT																				BW	Extraction well
299-W15-34	LTMC	2ZP1-C			A											A						A	Extraction well
299-W15-35	FH	200ZP1 PT																				BW	Extraction well
299-W15-35	LTMC	2ZP1-C			A								A			A						A	Extraction well
299-W15-36	FH	200ZP1 PT																				BW	Extraction well
299-W15-36	LTMC	2ZP1-C			A																	A	Extraction well
299-W15-37	FH	200ZP1 PT																				BW	Former extraction well
299-W15-37	LTMC	2UP1-C			A	A															A	S	A:Cd; former extraction well
299-W15-38	LTMC	2ZP1-C			A								A									A	
299-W15-39	LTMC	2ZP1-C			A																	A	
299-W15-40	LTMC	2ZP1-C			S								S			S				S		S	S:Cd
299-W15-40	RCRA	SST(TX/TY)	Q	S	Q		S						Q			Q				Q			
299-W15-41	LTMC	2ZP1-C			A											A				A		A	A:Cd
299-W15-41	RCRA	SST(TX/TY)	Q	S	Q		S					S	Q		A	Q				Q			
299-W15-763	RCRA	SST(TX/TY)	Q	S	Q		S			S			Q			Q				Q			
299-W15-765	RCRA	SST(TX/TY)	Q	S	Q		S					Q	Q			Q				Q			
299-W18-1	LTMC	2ZP1-C			A																	A	A:Cd
299-W18-15	LTMC	2UP1-C			S	S															S	S	
299-W18-21	LTMC	2UP1-C			A	A															A	A	
299-W18-21	PA	LLBG(4)-PA										S				S					S		
299-W18-21	RCRA	LLBG(4)	S	S	S		S				S		S	A				S	S	S		S	
299-W18-22	PA	LLBG(4)-PA										S				S					S		Bottom unconfined
299-W18-22	RCRA	LLBG(4)	S	S	S		S				S		S	A				S	S	S		S	Deep unconfined[(a)]
299-W18-23	LTMC	2ZP1-C			A																	A	A:Cd
299-W18-23	PA	LLBG(4)-PA										S				S					S		
299-W18-23	RCRA	LLBG(4)	S	S	S		S				S		S	A				S	S	S		S	
299-W18-24	LTMC	2ZP1-C			A																A	A	A:Cd
299-W18-24	PA	LLBG(4)-PA										S				S					S		
299-W18-24	RCRA	LLBG(4)	S	S	S		S				S		S	A				S	S	S		S	
299-W18-27	LTMC	2ZP1-C			A																A	A	A:Cd
299-W18-30	LTMC	2UP1-C			A	A						A									A	A	
299-W18-30	RCRA	SST(U)	Q	A	Q					A		A	Q			Q				A		A	

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
299-W18-31	RCRA	SST(U)	Q	A	Q					A		A	Q			Q				A		A	
299-W18-33	LTMC	2UP1-C			S	S														S	S	S	
299-W18-40	RCRA	SST(U)	Q	A	Q					A		A	Q			Q				A		A	
299-W19-4	LTMC	2UP1-C			B							B				B					B	B	FY03
299-W19-9	LTMC	2UP1-C			A	A						A				A					A	A	
299-W19-12	RCRA	SST(U)	Q	A	Q					A		A	Q			Q				A		A	
299-W19-14	LTMC	2UP1-C			B	B						B				B				B	B	B	FY03
299-W19-20	LTMC	2UP1-C			A							A				A					A	A	A:Cd
299-W19-35	LTMC	2UP1-C			A							A				A					A	A	A:Cd
299-W19-36	LTMC	2UP1-C			A							A				A					A	A	
299-W19-37	LTMC	2UP1-C			A							A				A					A	A	A:Cd
299-W19-39	LTMC	2UP1-C			A							A				A					A	A	Extraction well
299-W19-40	LTMC	2UP1-C			A							A				A				A	A	A	
299-W19-41	RCRA	SST(U)	Q	A	Q					A		A	Q			Q				A		A	
299-W19-42	RCRA	SST(U)	Q	A	Q					A		A	Q			Q				A		A	
299-W19-43	LTMC	2UP1-C			S							S				S					S	S	
299-W19-44	RCRA	SST(U)	Q	A	Q					A		A	Q			Q				A		A	
299-W19-45	RCRA	SST(U)	Q	A	Q					A		A	Q			Q				A		A	
299-W22-9	LTMC	2UP1-C			B							B			B					B	B	B	FY03
299-W22-10	SURV	2UP1-S		A	A							A			A	A				A			
299-W22-20	LTMC	2UP1-C			A							A			A	A				A	A	A	
299-W22-26	LTMC	2UP1-C			A							A								A	A	A	A:Cd
299-W22-44	RCRA	SST(S)	Q		Q								Q			Q				Q	Q		
299-W22-45	LTMC	2UP1-C			A							A			A					A	A	A	A:Cd
299-W22-45	RCRA	SST(S)	Q		Q								Q			Q				Q	Q		
299-W22-46	LTMC	2UP1-C			A							A			A	A				A	A	A	
299-W22-46	RCRA	SST(S)	Q		Q								Q			Q				Q	Q		
299-W22-48	LTMC	2UP1-C			S	S						S			S					S	S	S	S:Cd
299-W22-48	RCRA	SST(SX)	Q		Q								Q			Q				Q	Q		
299-W22-49	LTMC	2UP1-C			S							S			S	S				S	S	S	S:Cd
299-W22-49	RCRA	SST(SX)	Q		Q								Q			Q				Q	Q		
299-W22-50	RCRA	SST(SX)	Q		Q								Q			Q				Q	Q		
299-W22-79	RCRA	U-12	A		Q							S	A			Q				A			
299-W22-80	RCRA	SST(SX)	Q		Q								Q			Q				Q	Q		
299-W22-81	RCRA	SST(SX)	Q		Q								Q			Q				Q	Q		
299-W22-82	RCRA	SST(SX)	Q		Q								Q			Q				Q	Q		
299-W22-83	RCRA	SST(SX)	Q		Q								Q			Q				Q	Q		
299-W22-84	RCRA	SST(S)	Q		Q								Q			Q				Q	Q		
299-W22-85	RCRA	SST(SX)	Q		Q								Q			Q				Q	Q		
299-W23-4	LTMC	2UP1-C			S	S														S	S	S	
299-W23-9	LTMC	2UP1-C			A											A				A	A	A	
299-W23-10	LTMC	2UP1-C			S											S				S	S	S	
299-W23-14	LTMC	2UP1-C			A	A										A				A	A	A	A:Cd
299-W23-15	LTMC	2UP1-C			S											S				S	S	S	

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
299-W23-15	RCRA	SST(S)	Q		Q								Q			Q				Q	Q		
299-W23-19	RCRA	SST(SX)	Q		Q		Q			A			Q			Q				Q	Q		
299-W23-20	RCRA	SST(SX)	Q		Q								Q			Q				Q	Q		
299-W23-21	RCRA	SST(SX)	Q		Q								Q			Q				Q	Q		
299-W23-21	SURV	2UP1-S		A	A											A				A			
299-W26-7	RCRA	S-10	A	A	A		A	S					A	A				S	S			S	
299-W26-12	LTMC	2UP1-C			B							B				B				B	B	B	FY03
299-W26-13	LTMC	2UP1-C			B							B								B	B	B	FY03
299-W26-13	RCRA	S-10	A	A	A		A	S					A	A				S	S			S	
299-W27-2	RCRA	S-10	A		A			S					A									S	Base of unconfined
299-W27-2	SURV	2UP1-S			A							A								A	A	A	
399-1-1	LTMC	3FF5-300-C	S		S																S	S	
399-1-2	LTMC	3FF5-300-C	S		S																S	S	
399-1-6	LTMC	3FF5-300-C	S		S																S	S	
399-1-7	LTMC	3FF5-300-C	S																		S	S	
399-1-7	RCRA	300-APT																			Q	Q	
399-1-8	LTMC	3FF5-300-C	S																		S	S	
399-1-8	RCRA	300-APT																			S	S	
399-1-8	SURV	3FF5-300-S																			A	A	
399-1-10A	LTMC	3FF5-300-C	S		S																S	S	
399-1-10A	RCRA	300-APT																			Q	Q	
399-1-10A	SURV	3FF5-300-S	S		S								S									S	
399-1-10B	LTMC	3FF5-300-C	S																	S	S	S	
399-1-10B	RCRA	300-APT																			S	S	
399-1-10B	SURV	3FF5-300-S																		A			
399-1-11	LTMC	3FF5-300-C	S																		S	S	
399-1-11	RCRA	300-APT																			Q	Q	
399-1-12	LTMC	3FF5-300-C	S																		S	S	
399-1-15	LTMC	3FF5-300-C	S	S			S														S	S	
399-1-16A	LTMC	3FF5-300-C	S		S																S	S	
399-1-16A	RCRA	300-APT																			Q	Q	
399-1-16A	SURV	3FF5-300-S	S		S								S										
399-1-16B	LTMC	3FF5-300-C	S																		S	S	Deep unconfined
399-1-16B	RCRA	300-APT																			Q	Q	Deep unconfined
399-1-16C	SURV	3FF5-300-S																		A			Confined Ringold
399-1-17A	DOH	300 DOH		S	S		S			S										S	S		S: Uiso
399-1-17A	LTMC	3FF5-300-C	S	S	S		S													S	S	S	
399-1-17A	RCRA	300-APT																			Q	Q	
399-1-17A	SURV	3FF5-300-S	S	S	S		S					A	S							A	S	A	S: Uiso
399-1-17B	LTMC	3FF5-300-C	S																		S	S	Deep unconfined
399-1-17B	RCRA	300-APT																			S	S	Deep unconfined

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
399-1-17B	SURV	3FF5-300-S	S																				Deep unconfined
399-1-18A	LTMC	3FF5-300-C	S		S																		
399-1-18A	SURV	3FF5-300-S			A																		
399-1-18B	LTMC	3FF5-300-C	S																	S			Deep unconfined[(a)]
399-1-18B	SURV	3FF5-300-S																		A			Deep unconfined[(a)]
399-1-18C	SURV	3FF5-300-S																		A			Confined Ringold
399-1-21A	LTMC	3FF5-300-C	S																	S	S	S	
399-1-21A	RCRA	300-APT																			S	S	
399-1-21A	SURV	3FF5-300-S			A															A			
399-1-21B	LTMC	3FF5-300-C	S																		S	S	
399-1-21B	RCRA	300-APT																			S	S	
399-2-1	LTMC	3FF5-300-C	S																		S	S	
399-2-1	SURV	3FF5-300-S																				A	
399-2-2	LTMC	3FF5-300-C	S																		S	S	
399-3-2	LTMC	3FF5-300-C	S																			S	
399-3-6	LTMC	3FF5-300-C	S		S															S	S	S	
399-3-10	LTMC	3FF5-300-C	S																		S	S	
399-3-10	SURV	3FF5-300-S																			A	A	
399-3-11	LTMC	3FF5-300-C	S	S	S		S								S					S	S	S	
399-3-11	SURV	3FF5-300-S		A	A		A								A						A		
399-3-12	LTMC	3FF5-300-C	S		S															S	S	S	
399-3-12	SURV	3FF5-300-S			A															A			
399-4-1	LTMC	3FF5-300-C	S		S															S	S	S	
399-4-1	SURV	3FF5-300-S			A															A		A	
399-4-7	SURV	3FF5-300-S																		A			
399-4-9	LTMC	3FF5-300-C	S		S															S	S	S	
399-4-10	SURV	3FF5-300-S																			A	A	A:Ra, Uiso
399-4-11	SURV	3FF5-300-S																				A	
399-4-12	LTMC	3FF5-300-C	S		S															S	S	S	
399-4-12	SURV	3FF5-300-S			A															A			
399-5-1	SURV	3FF5-300-S			A																		
399-5-2	SURV	Basalt	T	T	T		T						T							T			FY04. Levey & Elephant Mt. Interflow.
399-5-4B	LTMC	3FF5-300-C	S																	S		S	
399-5-4B	SURV	3FF5-300-S																				A	
399-6-2	SURV	3FF5-300-S																				A	
399-8-5A	LTMC	3FF5-300-C	S	S	S		S													S	S	S	
499-S0-7	LTMC	2PO1-C			A																		
499-S0-7	SURV	400	A	A	A		A					A	A							Q			A:Amm
499-S0-8	LTMC	2PO1-C			A																		
499-S0-8	SURV	400	A	A	A		A					A	A							Q			

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
499-S1-8J	DOH	400 DOH		A	A		A			A					A	A				A	A		A:Uiso; Drinking water well; deeper aquifer (unit unknown)
499-S1-8J	SURV	400		A	A		A			A		A	A		A	A				Q	A	A	A:Amm, Uiso; Drinking water well; deeper aquifer (unit unknown)
699-1-18	LTMC	2PO1-C			T															T			FY04
699-2-3	LTMC	2PO1-C			T							T								T			FY04
699-2-6A	FFTF	400 FFTF									Q		Q				Q	Q					Q:Cd, Cr, SO4
699-2-6A	SURV	400	Q	A	Q		A				A		A					Q		A			A:Col
699-2-7	FFTF	400 FFTF									Q		Q				Q	Q					Q:Cd, Cr, SO4
699-2-7	SURV	400	Q	A	Q		A				A		A					Q		A			A:Col
699-8-17	FFTF	400 FFTF									Q		Q				Q	Q					Q:Cd, Cr, SO4
699-8-17	LTMC	2PO1-C																					
699-8-17	SURV	400	Q	A	Q		A				A	A	A					Q		A			A:Col
699-8-25	LTMC	2PO1-C			T							T								T			FY04
699-9-E2	SURV	3FF5-North-S		T	T		T			T		T								T			FY04
699-10-54A	SURV	2PO1-S		A	A		A													A			
699-10-54A	SURV	Transects	T							T			T		T	T		T	T				FY04
699-10-E12	SURV	2PO1-S	A	A	A		A			A			A		A			A	A	A			
699-12-2C	LTMC	3FF5-North-C	S	Q	S		Q			Q		S	A							Q	Q	A	
699-12-4D	SURV	3FF5-North-S			T							T								T			FY04
699-13-0A	LTMC	3FF5-North-C	S	Q	S		Q			Q		S	A							Q	Q	A	
699-13-1A	SURV	3FF5-North-S		T	T		T					T								T			FY04
699-13-1C	SURV	Basalt	T	T	T		T						T							T			FY03; Elephant Mt interflow & Rattlesnake Ridge interbed[(a)]
699-13-1E	LTMC	3FF5-North-C	S	Q	S		Q			Q		S	A							Q	Q	A	
699-13-2D	LTMC	3FF5-North-C	S	Q	S		Q			Q		S	A							Q	Q	A	
699-13-3A	LTMC	3FF5-North-C	S	Q	S		Q			Q		S	A							Q	Q	A	
699-13-3A	SURV	3FF5-North-S								A												A	
699-14-38	SURV	2PO1-S			T								T							T			FY04
699-17-5	LTMC	2PO1-C	T	T	T		T			T		T	T		T	T				T		T	FY04
699-17-70	SURV	2ZP1-S			A															A			
699-19-43	SURV	2PO1-S			T							T	T							T			FY04
699-19-58	SURV	2UP1-S	T		T								T							T			FY04; T:Uiso
699-19-88	SURV	2ZP1-S	A	A	A		A						A							A	A	A	A:Ra, Uiso
699-20-20	LTMC	2PO1-C		T	T		T			T		T	T			T				T			FY04
699-20-E5A	LTMC	2PO1-C			T															T			FY04
699-20-E12O	LTMC	2PO1-C			A															A			
699-20-E12O	SURV	Transects	A	A	A		A			A		A	A		A	A		A	A	A			
699-20-E12S	SURV	2PO1-S	T		T															T			FY04. Deep unconfined.[(a)]
699-21-6	LTMC	2PO1-C			T							T								T			FY04

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
699-22-35	RCRA	SWL			Q	Q							Q					Q				Q	Q:Amm, COD, Col
699-22-35	SURV	2PO1-S			T							T								T			FY04
699-23-34A	RCRA	SWL			Q	Q							Q					Q				Q	Q:Amm, COD, Col
699-23-34B	RCRA	SWL			Q	Q							Q					Q				Q	Q:Amm, COD, Col
699-24-1P	SURV	Basalt	T	T	T		T						T							T			FY04. Rattle-snake Ridge Interbed & Pomona basalt.[a]
699-24-33	RCRA	SWL			Q	Q							Q					Q				Q	Q:Amm, COD, Col
699-24-34A	RCRA	SWL			Q	Q							Q					Q				Q	Q:Amm, COD, Col
699-24-34B	RCRA	SWL			Q	Q							Q					Q				Q	Q:Amm, COD, Col
699-24-34C	LTMC	2PO1-C			T							T								T			FY04
699-24-34C	RCRA	SWL			Q	Q							Q					Q				Q	Q:Amm, COD, Col
699-24-35	RCRA	SWL			Q	Q							Q					Q				Q	Q:Amm, COD, Col
699-24-46	SURV	2PO1-S			A															A			
699-24-46	SURV	Transects	A	A	A		A			A		T	A		A	A		A	A	A			FY04
699-25-33A	RCRA	NRDW			S								A	A				S	S			S	Bottom unconfined
699-25-34A	RCRA	NRDW			S								A	A				S	S			S	
699-25-34B	RCRA	NRDW			S								A	A				S	S			S	
699-25-34C	RCRA	SWL			Q	Q							Q					Q				Q	Q:Amm, COD, Col
699-25-34D	RCRA	NRDW			S								A	A				S	S			S	
699-25-70	SURV	2UP1-S			T							T	T							T			FY03
699-26-15A	LTMC	2PO1-C			T							T								T			FY04
699-26-33	DOH	600 DOH		A	A		A			A					A	A				A			
699-26-33	LTMC	2PO1-C			A															A			
699-26-33	RCRA	NRDW			S								A	A				S	S			S	
699-26-33	SURV	Transects	A	A	A		A			A		A	A		A	A		A	A	A			
699-26-34A	RCRA	NRDW			S								A	A				S	S			S	
699-26-34B	RCRA	NRDW			S								A	A				S	S			S	
699-26-35A	LTMC	2PO1-C			T							T								T			FY04
699-26-35A	RCRA	SWL			Q	Q							Q	A				Q	S			Q	Q:Amm, COD, Col
699-26-35C	RCRA	NRDW			S								A	A				S	S			S	Bottom unconfined
699-26-89	SURV	2ZP1-S			T															T			FY03
699-27-8	LTMC	2PO1-C			T							T								T			FY04
699-28-40	SURV	2PO1-S			T							T	T							T			FY04
699-29-4	LTMC	2PO1-C			T							T								T			FY04
699-31-11	LTMC	2PO1-C			T							T								T			FY04
699-31-31	DOH	600 DOH		A	A		A			A					A	A				A			

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
699-31-31	LTMC	2PO1-C			A															A			
699-31-31	SURV	Transects	A	A	A		A			A		A	A		A	A		A	A	A			
699-31-31P	SURV	2PO1-S			T							T								T			FY04. Confined Ringold.[a]
699-32-22A	SURV	Transects	A	A	A		A			A		A	A		A	A		A	A	A			
699-32-22B	SURV	Basalt	T	T	T		T					T	T							T			FY03; Rattle-snake Ridge interbed[a]
699-32-43	SURV	Transects	A	A	A		A			A		A	A		A	A		A	A	A			
699-32-62	LTMC	2UP1-C			B							B	B							B			FY03
699-32-72A	LTMC	2UP1-C			B							B								B		B	FY03
699-33-42	LTMC	2PO1-C			T							T	T							T			FY04
699-33-56	LTMC	2PO1-C			T								T							T			FY03
699-34-41B	LTMC	2PO1-C			A							A								A			
699-34-42	LTMC	2PO1-C			T							T								T			FY04
699-34-88	SURV	2ZP1-S			T		T													T		T	FY03
699-35-9	LTMC	2PO1-C			T							T								T			FY04
699-35-66A	CERCLA	ERDF	S	S	S		S					S				S	S		S		S	S	S:C14, Ra, trace metals
699-35-66A	LTMC	2UP1-C			B							B	B							B		B	FY03
699-35-70	DOH	600 DOH		S	S		S			S		S				S				S	S		S:Uiso
699-35-70	LTMC	2UP1-C			B							B								B		B	FY03
699-35-78A	LTMC	2UP1-C			A	A															A	A	
699-36-61A	LTMC	2UP1-C			A							A	A							A			
699-36-67	CERCLA	ERDF	S	S	S		S					S				S	S		S		S	S	S:C14, Ra, trace metals
699-36-70A	CERCLA	ERDF	S	S	S		S					S				S	S		S		S	S	S:C14, Ra, trace metals
699-36-70A	LTMC	2UP1-C			A							A				A				A	A	A	
699-36-70A	RCRA	U-12	A		Q							S	S			Q				Q			
699-36-93	SURV	2ZP1-S			T															T			FY03
699-37-43	LTMC	2PO1-C			T							T								T			FY04
699-37-47A	LTMC	2PO1-C			T	T						T								T			FY04
699-37-47A	RCRA	PUREX	S	S	S	S	S					S	S	S	S					S			S:Amm
699-37-68	CERCLA	ERDF	S	S	S		S					S				S	S		S		S	S	S:C14, Ra, trace metals
699-37-82A	SURV	2UP1-S			T															T		T	FY03
699-37-E4	LTMC	2PO1-C	T		T							T	T							T			FY04
699-38-15	LTMC	2PO1-C			T							T								T			FY04
699-38-65	LTMC	2UP1-C			A							A								A			
699-38-68A	LTMC	2UP1-C			B							B				B				B	B	B	FY03
699-38-70	LTMC	2UP1-C			A							A				A				A	A	A	
699-39-39	SURV	2PO1-S			T							T								T			FY04
699-39-79	LTMC	2ZP1-C			B																	B	B:Cd; FY03
699-40-1	LTMC	2PO1-C			T							T								T			FY04
699-40-33A	SURV	2PO1-S			T							T								T			FY04
699-40-36	FH	TEDF	Q	Q	Q	Q	Q	Q			Q		Q				Q			A			Q: Cd

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
699-40-62	LTMC	2UP1-C			B							B				B				B	B		FY03
699-41-1A	DOH	600 DOH		A	A		A			A		A			A	A				A			
699-41-1A	LTMC	2PO1-C			A															A			
699-41-1A	SURV	Transects	A	A	A		A			A		A	A		A	A		A	A	A			
699-41-23	LTMC	2PO1-C			A															A			
699-41-23	SURV	Transects	T	A	A		A			T		A	T		T	T		T	T	A			FY04
699-41-35	FH	TEDF	Q	Q	Q	Q	Q	Q			Q		Q				Q			A			Q: Cd
699-41-40	SURV	2PO1-S	T	T	T		T					T								T			FY04. Confined Ringold.[a]
699-42-12A	LTMC	2PO1-C			T							T								T			FY04
699-42-37	FH	TEDF	Q	Q	Q	Q	Q	Q			Q		Q				Q			A			Q: Cd
699-42-39A	SURV	2PO1-S			T							T								T			FY04
699-42-39B	SURV	2PO1-S	T		T							T								T			FY04. Confined Ringold.[a]
699-42-40C	SURV	Basalt	T	T	T		T					T	T							T			FY03; Rattle-snake Ridge interbed[a]
699-42-41	SURV	2PO1-S			T	T						T								T			FY04
699-42-42B	RCRA	BPOND	S	S	A		S				A		A	A						A			A: Cd; confined Ringold[a]
699-42-42B	SURV	2PO1-S	T		T							T								T			FY04. Confined Ringold.
699-42-E9B	DOH	600 DOH		A	A		A			A		A								A	A		A:Uiso; E. of river; Upper Saddle Mts. Basalt[a]
699-42-E9B	SURV	Basalt	A	A	A		A			A		A	A							A			A:Uiso; E. of river; Upper Saddle Mts. Basalt[a]
699-43-3	LTMC	2PO1-C			T							T								T			FY04
699-43-40	SURV	2BP5-S			T	T						T								T			FY04
699-43-41E	SURV	2BP5-S			T	T						T								T			FY04. Confined Ringold.[a]
699-43-43	SURV	2PO1-S			T	T						T								T			FY04
699-43-44	RCRA	BPOND	S	S	A		S				A		A	A						A			A:Cd
699-43-45	RCRA	A-29	S		S								A	A				S	S				
699-43-45	RCRA	BPOND	S	S	A		S				A		A	A						A			A:Cd
699-43-45	SURV	2PO1-S			T	T						T								T			FY04
699-43-89	LTMC	2ZP1-C			B	B						B	B		B	B				B	B	B	A:Cd; FY03
699-44-39B	RCRA	BPOND	S	S	A		S				A		A	A						A			A:Cd
699-44-39B	SURV	2BP5-S			T							T								T			FY04
699-44-64	LTMC	2ZP1-C			B							B				B				B	B		FY03
699-45-42	SURV	2BP5-S			T							T								T			FY04
699-45-69A	LTMC	2ZP1-C			B							B										B	FY03
699-46-4	LTMC	2PO1-C			A															A			
699-46-4	SURV	Transects	A	A	A		A			A		A	A		A	A		A	A	A			
699-46-21B	LTMC	2PO1-C			A															A			
699-46-21B	SURV	Transects	T	A	A		A			T		T	T		T	T		T	T	A			FY04

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
699-47-5	LTMC	2PO1-C			T							T								T			FY04
699-47-60	LTMC	2ZP1-C			B							B	B			B				B	B	B	FY03
699-48-7A	SURV	2PO1-S																		T			FY04
699-48-71	FH	SALDS																		A			
699-48-71	LTMC	2ZP1-C			S							S								S	S	S	
699-48-77A	FH	SALDS	Q	Q			Q				Q		Q		Q		Q			Q			Q: Cd, SO4
699-48-77A	LTMC	2ZP1-C			B															B		B	FY03
699-48-77C	FH	SALDS	Q	Q			Q				Q		Q		Q		Q			Q			Q: Cd, SO4
699-48-77C	SURV	2ZP1-S			A										A					A		A	
699-48-77D	FH	SALDS	Q	Q			Q				Q		Q		Q		Q			Q			Q: Cd, SO4
699-48-77D	SURV	2ZP1-S			A										A					A		A	
699-49-13E	SURV	2PO1-S		T	T		T			T		T								T			FY04
699-49-55A[b]	LTMC	2BP5-C							A			A				A							
699-49-55A[b]	SURV	2BP5-S		A	A	A	A		T	A					A	T				A	A		A:Am, Np, Puis, Uiso; FY05
699-49-57A	LTMC	2BP5-C							A	A						A							
699-49-57A	SURV	2BP5-S			A	A			A	A		A				A				A			
699-49-57B	LTMC	2BP5-C								A						A							Rattlesnake Ridge interbed[a]
699-49-57B	SURV	2BP5-S			A	A			A	A		A				A				A			Rattlesnake Ridge interbed[a]
699-49-57B	SURV	Basalt	T	T	T		T					T	T			T				T			FY04. Rattle-snake Ridge Interbed.[a]
699-49-79	FH	SALDS																		A			
699-49-79	SURV	2ZP1-S			T															T		T	FY03
699-49-100C	DOH	600 DOH		A	A		A			A										A			
699-49-100C	SURV	2ZP1-S		Q	A		Q			Q		Q	A		Q	Q		Q	Q	A	Q	Q	Q:Puis, A:Uiso
699-50-28B	SURV	2PO1-S			T							T								T			FY04
699-50-53A	LTMC	2BP5-C			A				A	A						A							
699-50-53A	SURV	2BP5-S			A	A	T		A	A		A				A				A			FY05
699-50-53B	SURV	Basalt	T		T							T	T			T				T			FY03; T:Uiso; Rattlesnake Ridge interbed[a]
699-50-85	SURV	2ZP1-S			T															T		T	FY03
699-51-63	SURV	2ZP1-S			A							A	A			A				A		A	
699-51-75	FH	SALDS																		S			
699-51-75	SURV	2ZP1-S			T															T		T	FY03
699-51-75P	FH	SALDS																		A			
699-52-19	SURV	2PO1-S			T															T			FY04
699-52-46A	SURV	Basalt	T	T	T		T						T		T					T			FY04. Rattlesnake Ridge Interbed.[a]
699-52-54	LTMC	2BP5-C			A				A	A						A							
699-52-57	LTMC	2BP5-C			A											A							
699-53-47A[b]	LTMC	2BP5-C			A										A								
699-53-47A[b]	SURV	2BP5-S		A	A		A								A					A			

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
699-53-47B[b]	LTMC	2BP5-C			A										A								
699-53-47B	LTMC	2BP5-C	T	T	T		T		T	T		T	T		T	T				T			T:Uiso; FY05
699-53-48A[b]	LTMC	2BP5-C			A										A								
699-53-48A	SURV	2BP5-S			T		T					T	T		T					T			FY05
699-53-48B[b]	LTMC	2BP5-C			A										A								
699-53-48B	SURV	2BP5-S			T		T								T					T			FY05
699-53-55A	LTMC	2BP5-C														A							
699-53-55A	SURV	2BP5-S			T				T	T						T				T			FY05
699-53-55B	LTMC	2BP5-C														A							
699-53-55B	SURV	2BP5-S			T				T	T						T				T			FY05
699-53-55C	LTMC	2BP5-C														A							
699-53-55C	SURV	2BP5-S			T				T	T						T				T			FY05
699-54-34	SURV	Basalt	T	T	T		T						T							T			FY04. Upper Saddle Mt. Basalt.[a]
699-54-45A[b]	LTMC	2BP5-C			A																		
699-54-45B[b]	LTMC	2BP5-C			A																		
699-54-48[b]	LTMC	2BP5-C													A								
699-54-49[b]	LTMC	2BP5-C													A								
699-54-49	SURV	2BP5-S			T		T								T					T			FY05
699-55-50C[b]	LTMC	2BP5-C													A								
699-55-57	LTMC	2BP5-C			A				A	A						A							
699-55-57	SURV	2BP5-S			T				T	T		T				T				T			FY05
699-55-60A[b]	LTMC	2BP5-C			T				T	T						T				T			FY03
699-55-60A	LTMC	2ZP1-C			B							B	B			B				B	B	B	FY03
699-55-60A	SURV	2BP5-S		T	T		T		T	T		T				T				T			FY05
699-55-76	SURV	2ZP1-S			T		T													T			FY03
699-55-89	SURV	2ZP1-S			T															T		T	FY03
699-56-43	SURV	Basalt	T	T	T		T						T							T			FY03; Upper Saddle Mts. Basalt[a]
699-56-53	SURV	Basalt	T	T	T		T						T							T			FY03; Rattle-snake Ridge interbed[a]
699-57-59	LTMC	2BP5-C			A					A						A							
699-57-59	SURV	2BP5-S	A	A	A		A			A		A	A		A	A		A	A	A			
699-59-58[b]	LTMC	2BP5-C			A					A						A							
699-59-58[b]	SURV	Transects	A	A	A		A			A		A	A		A	A		A	A	A			
699-60-60	DOH	600 DOH		A	A		A			A					A	A				A			
699-60-60	SURV	Transects	A	A	A		A			A		A	A		A	A		A	A	A			
699-61-62	SURV	Transects	A	A	A		A			A		A	A		A	A		A	A	A			
699-61-66	SURV	Transects	A	A	A		A			A		A	A		A	A		A	A	A			
699-62-43F	SURV	1FR3-S	T		T								T							T			FY05
699-63-58	LTMC	1BC5-C	A		A								A							A			
699-63-58	SURV	1BC5-S	T		T							T	T							T			FY05
699-63-90	SURV	1BC5-S	A	T	A		T			T		T	A							A		T	FY05
699-64-27	SURV	1FR3-S	T		T							T	T							T		T	FY05

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
699-64-62	SURV	Transects	A	A	A		A			A			A		A	A		A	A	A			
699-65-50	SURV	1FR3-S	T		T							T	T			T				T			FY05
699-65-72	LTMC	1BC5-C		A	A		A						A		A					A			
699-65-72	SURV	1BC5-S	T		T								T							T			FY05
699-65-83	LTMC	1BC5-C		B	B		B						B		B					B			FY04
699-66-23	SURV	1FR3-S	T		T							T	T							T		T	FY05
699-66-58	SURV	1BC5-S			T							T				T				T			FY05
699-66-64	LTMC	1BC5-C		A	A		A						A		A					A			
699-66-64	SURV	1BC5-S			T							T				T				T			FY05
699-67-86	LTMC	1BC5-C	T		T								T							T			FY05
699-67-86	SURV	1BC5-S		B	B		B						B		B					B			FY04
699-70-68	CERCLA	100KR4IAM(2)		B	B		B			B			B							B			FY04
699-70-68	SURV	1KR4-S			A		A							A		A				A			
699-71-30	LTMC	1FR3-C		B	B		B						B		B					B		B	FY03
699-71-30	SURV	1FR3-S	T		T								T							T		T	FY05
699-72-73	LTMC	1BC5-C		A	A		A						A		A					A			
699-72-73	SURV	1KR4-S			A		A									A				A			
699-72-92	LTMC	1BC5-C		B	B		B						B		B					B			FY04
699-72-92	SURV	1BC5-S	T		T								T							T			FY05
699-73-61	CERCLA	100KR4IAM(2)		B	B		B			B			B							B			FY04
699-77-36	LTMC	1FR3-C	B	B	B		B						B		B					B		B	B:C14; FY04
699-77-36	SURV	1FR3-S	T		T								T							T		T	FY05
699-78-62	CERCLA	100KR4IAM(2)		B	B		B			B			B							B			FY04
699-81-38	LTMC	1FR3-C		B	B		B						B		B					B		B	FY03
699-81-58	SURV	1NR2-S	T		T								T							T			FY05
699-83-47	LTMC	1FR3-C		B	B		B						B		B					B		B	FY04
699-83-47	SURV	1FR3-S	B		B								B							B			FY04
699-84-35A	LTMC	1FR3-C		B	B		B						B		B					B		B	FY03
699-87-55	SURV	1HR3-H-S	T		T								T							T			FY05
699-89-35	SURV	1HR3-H-S	T		T								T							T			FY05
699-91-46A	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY04
699-91-46A	SURV	1HR3-H-S	B		B								B							B			FY04
699-93-48A	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY04
699-96-43	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY03
699-96-43	SURV	1HR3-H-S											T										FY05
699-96-49	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY03
699-96-49	SURV	1HR3-D-S	B		B								B							B			FY03
699-97-43	CERCLA	100HR3IAM(2)		B	B		B						B							B			FY04
699-97-43	SURV	1HR3-H-S	A		A								A							A			
699-97-51A	CERCLA	100HR3IAM(2)		A	A		A						A							A			
699-S2-34B	SURV	Basalt	A		A							A	A				A			A			
699-S3-25	SURV	2PO1-S			T															T			FY04
699-S3-E12	LTMC	2PO1-C			A															A			
699-S3-E12	SURV	Transects	A	A	A		A			A			A		A	A		A	A	A			

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
699-S6-E4A	LTMC	3FF5-North-C	S	S	S		S			S			S							S	S	S	S:SVOA
699-S6-E4A	SURV	3FF5-North-S	A		A					A					A						S	A	S:0&G, TPH, SVOA; A:Puis, Uiso
699-S6-E4B	LTMC	3FF5-North-C	S	A			A			A										S	A		
699-S6-E4B	SURV	3FF5-North-S		T	T		T			T										T			FY04
699-S6-E4D	LTMC	3FF5-North-C	S	A			A			A										S	A		
699-S6-E4E	LTMC	3FF5-North-C	A																				
699-S6-E14A	LTMC	2PO1-C		T	T		T			T										T			FY04
699-S6-E14A	LTMC	2PO1-C		T	T		T			T										T			FY04
699-S6-E14A	SURV	3FF5-North-S		T	T		T			T										T			FY04
699-S8-19	SURV	11EM1-S			T															T			FY04
699-S11-E12AP	LTMC	2PO1-C			A															A			Levey Interbed (Spane and Webber 1995)
699-S11-E12AP	SURV	3FF5-North-S																		A			Levey Interbed (Spane and Webber 1995)
699-S12-3	SURV	2PO1-S			T															T			FY04
699-S12-29	SURV	11EM1-S			T															T			FY04
699-S19-11	SURV	11EM1-S			T															T			FY04
699-S19-E13	LTMC	2PO1-C			A															A			
699-S19-E13	SURV	Transects	S	A	S		A			A			A		A	A		A	A	S			
699-S19-E14	LTMC	2PO1-C			T															T			FY04
699-S19-E14	SURV	3FF5-North-S			T															T			FY04
699-S22-E9A	SURV	11EM1-S			A															A			
699-S22-E9C	SURV	11EM1-S																		T			FY04
699-S24-19P	SURV	Basalt	T		T								T							T			FY04. Levey Interbed.[a]
699-S24-19Q	SURV	11EM1-S	T		T								T							T			FY04
699-S27-E9A	SURV	11EM1-S			A															A		A	
699-S27-E9B	SURV	11EM1-S																		A		A	Deep unconfined[a]
699-S27-E9C	SURV	11EM1-S																		T			FY04
699-S27-E12A	LTMC	11EM1-C			A																	A	
699-S27-E12A	SURV	11EM1-S		A	A																	A	
699-S27-E14	SURV	11EM1-S			S															S	A	S	
699-S28-E0	SURV	11EM1-S		A	A		A													A		A	
699-S28-E12	LTMC	11EM1-C			A																	A	
699-S28-E12	SURV	11EM1-S																			A	A	
699-S28-E13A	LTMC	11EM1-C			A																	A	
699-S28-E13A	SURV	11EM1-S			A																	A	
699-S29-E10A	LTMC	11EM1-C			A																	A	
699-S29-E10A	SURV	11EM1-S			A																	A	

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
699-S29-E11	LTMC	11EM1-C			A																	A	
699-S29-E11	SURV	11EM1-S																			A	A	
699-S29-E12	LTMC	11EM1-C			A																	A	
699-S29-E13A	LTMC	11EM1-C			A																	A	
699-S29-E13A	SURV	11EM1-S			A																	A	
699-S29-E16A	SURV	11EM1-S			A															Q	A	A	
699-S29-E16B	SURV	11EM1-S																		A			Deep unconfined[(a)]
699-S29-E16C	SURV	11EM1-S																		A			Confined Ringold[(a)]
699-S30-E10A	LTMC	11EM1-C			A																	A	
699-S30-E10A	SURV	11EM1-S			A																A	A	
699-S30-E10B	LTMC	11EM1-C			A																	A	
699-S30-E10B	SURV	11EM1-S											A										A:Amm
699-S30-E11A	LTMC	11EM1-C			A																	A	
699-S30-E11A	SURV	11EM1-S			A																	A	
699-S30-E15A	DOH	600 DOH		A	A		A			A										A			
699-S30-E15A	SURV	11EM1-S		A	A		A													A	A		
699-S31-1	SURV	11EM1-S		A	A		A					A								A		A	
699-S31-E8A	DOH	600 DOH		A	A		A			A		A				A				A			
699-S31-E8A	SURV	11EM1-S		A	A		A					A				A				A	A	A	
699-S31-E10A	LTMC	11EM1-C			A																	A	
699-S31-E10A	SURV	11EM1-S																				A	
699-S31-E10B	SURV	11EM1-S											A			A					A	A	A:Amm
699-S31-E10C	LTMC	11EM1-C			A																	A	
699-S31-E10C	SURV	11EM1-S																		T		A	FY04
699-S31-E10D	LTMC	11EM1-C			A																	A	
699-S31-E10D	SURV	11EM1-S																				A	
699-S31-E10E	SURV	11EM1-S																		T		A	FY04. Deep unconfined.[(a)]
699-S31-E11	LTMC	11EM1-C			A																	A	
699-S31-E11	SURV	11EM1-S			A																	A	
699-S32-E11	SURV	11EM1-S		A	A																A		
699-S32-E13A	SURV	11EM1-S	A		A								A							Q	A		

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
699-S32-E13B	SURV	11EM1-S		A																	A	A	
699-S32-E8	LTMC	11EM1-C																		T			FY04
699-S32-E8	SURV	11EM1-S																				A	
699-S34-E10	DOH	600 DOH		A	A		A			A										A			
699-S34-E10	SURV	11EM1-S			A															A	A	A	
699-S34-E15	SURV	11EM1-S			A															A			
699-S36-E13A	SURV	11EM1-S			A															A		A	
699-S37-E14	DOH	600 DOH		S	S		S			S										S			A:C14
699-S37-E14	SURV	11EM1-S	A	A	A		A						A							Q		A	
699-S38-E11	SURV	11EM1-S			A															A			
699-S38-E12A	SURV	11EM1-S			A															A		A	
699-S38-E12B	SURV	11EM1-S																		T			FY04
699-S40-E13A	DOH	600 DOH		A	A		A			A										A			
699-S40-E13A	SURV	11EM1-S																		Q			
699-S40-E14	SURV	11EM1-S																		S			
699-S41-E12	LTMC	11EM1-C																					A:Cr
699-S41-E12	SURV	11EM1-S			S															S			
699-S41-E13A	SURV	11EM1-S			A															A			
699-S41-E13B	SURV	11EM1-S																		T			FY04
699-S41-E13C	SURV	11EM1-S																		T			FY04
699-S43-E12	DOH	600 DOH		A	A		A			A										A			
699-S43-E12	SURV	11EM1-S			A															A		A	
1199-39-16D	SURV	11EM1-City-S	A	A	A		A						A							Q		A	
1199-40-15	SURV	11EM1-City-S																		A			
3099-42-16	SURV	11EM1-City-S			A															A			
3099-47-18B	SURV	11EM1-City-S			A															A			
C3164	SURV	1NR2-S	A	A	A		A		A	A			A			A		A		A		A	A:PCB, SVOA, C14; Hanford Generating Plant
New Wells (to be drilled)																							
2UP1-C-NEW-J	LTMC	2UP1-C			Q							Q				Q				Q	Q	Q	
2ZP1-C-NEW-A	LTMC	2ZP1-C			Q								Q			Q						Q	
W19-44	RCRA	SST(TX/TY)	Q	A	Q		A					A	Q			Q				Q			
W19-45	RCRA	SST(TX/TY)	Q	A	Q		A					A	Q			Q				Q			
Aquifer Sampling Tubes[c]																							
14S/M/D	SURV	Aquifer														A				A			
15M	SURV	Aquifer		A	A		A						A		A	A				A			
17M/D	SURV	Aquifer		A	A		A													A			A:C14

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
18S	SURV	Aquifer		A	A		A						A							A			A:C14
19M/D	SURV	Aquifer														A				A			
21S/M	SURV	Aquifer					A																
22M/D	SURV	Aquifer					A																
23M/D	SURV	Aquifer					A																
25D	SURV	Aquifer																		A			
26S/M/D	SURV	Aquifer																		A			
47M/D	SURV	Aquifer						A															
48S/M	SURV	Aquifer						A															
DD-12-2	SURV	Aquifer						A															
DD-17-3	SURV	Aquifer						A															
DD-39-3	SURV	Aquifer						A															
DD-41-2	SURV	Aquifer						A															
DD-42-4	SURV	Aquifer						A															
DD-43-3	SURV	Aquifer						A															
Springs and Seeps																							
100-N Seep wells and seeps	FH	NFEM								A					A					A			
HANSPR-28-2	SESP	Spring/Seep				A																	
HANSPRDR-28-2	SESP	Spring/Seep				A																	
HANSPRUR-28-2	SESP	Spring/Seep				A																	
SB-037-1	LTMC	1BC5-C		A	A		A						A		A					A			
SB-038-3	LTMC	1BC5-C		A	A		A						A		A					A			
SB-038-3	SESP	Spring/Seep			A																	A	
SB-039-2	SESP	Spring/Seep			A																	A	
SD-102-1	CERCLA	100HR3IAM(2)		A	A		A						A							A			
SD-102-1	SESP	Spring/Seep			A																		
SD-110-1	CERCLA	100HR3IAM(2)		A	A		A						A							A			
SD-110-1	SESP	Spring/Seep			A																		
SD-110-2	CERCLA	100HR3IAM(2)		A	A		A						A							A			
SD-98-1	CERCLA	100HR3IAM(2)		A	A		A						A							A			
SF-187-1	LTMC	1FR3-C		A	A		A						A		A					A		A	
SF-190-4	LTMC	1FR3-C		A	A		A						A		A					A		A	
SF-207-1	LTMC	1FR3-C		A	A		A						A		A					A		A	
SF-207-1	SESP	Spring/Seep			A																	A	
SF-211-1	SURV	1FR3-S		A	A		A						A		A					A		A	
SH-144-1	CERCLA	100HR3IAM(2)		A	A		A						A							A			
SH-145-1	CERCLA	100HR3IAM(2)		A	A		A						A							A			
SH-145-1	SESP	Spring/Seep			A																		
SH-150-1	CERCLA	100HR3IAM(2)		A	A		A						A							A			
SH-152-2	CERCLA	100HR3IAM(2)		A	A		A						A							A			
SH-152-2	SESP	Spring/Seep			A																		

Well	Program	Project	Alkalinity	Alpha	Anions	Arsenic	Beta	Cr6+	Cyanide	Gamma	Hg &Pb	I-129	ICP	Phenols	Sr-90	Tc-99	TDS	TOC	TOX	Tritium	Uranium	VOA	Other/ comments
SH-153-1	CERCLA	100HR3IAM(2)		A	A		A						A							A			
SK-057-3	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			
SK-063-1	SESP	Spring/Seep																				A	
SK-063-1	SURV	1K-Basins		A	A		A						A							A			A:C14
SK-068-1	SURV	1K-Basins		A	A		A						A		A	A				A			A:C14
SK-077-1	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			
SK-077-1	SESP	Spring/Seep			A																	A	
SK-082-2	CERCLA	100KR4IAM(2)		A	A		A			A			A							A			
SN-008-13	SESP	Spring/Seep			A																		
SN-199N-46	SESP	Spring/Seep			A																		
River Samples																							
RPMPHS-10HRM46.4	SESP	Transect river			Q																		
RPMPHS-1HRM46.4	SESP	Transect river			Q																		
RPMPHS-2HRM46.4	SESP	Transect river			Q																		
RPMPHS-3HRM46.4	SESP	Transect river			Q																		
RPMPHS-5HRM46.4	SESP	Transect river			Q																		
RPMPHS-7HRM46.4	SESP	Transect river			Q																		
RPMPHS-HRM43.5	SESP	Transect river			Q																		
RPMPHS-HRM43.9	SESP	Transect river			Q																		
RPMPHS-HRM45.0	SESP	Transect river			Q																		
RPMPHS-HRM45.8	SESP	Transect river			Q																		
VERNITA-1HRM 0.3	SESP	Transect river			Q																		
VERNITA-2HRM 0.3	SESP	Transect river			Q																		
VERNITA-3HRM 0.3	SESP	Transect river			Q																		
VERNITA-4HRM 0.3	SESP	Transect river			Q																		

(a) McDonald, J. P., M. A. Chamness, and D. R. Newcomer. 1999. *Water-Level Monitoring Plan for the Hanford Groundwater Monitoring Project*. PNNL-13021, Pacific Northwest National Laboratory, Richland, Washington.
(b) Will not be sampled until waste control plan is approved.
(c) Locations of aquifer sampling tubes shown in figures of main text. Suffixes S, M, and D indicate tube's relative depth (shallow, mid-depth, deep). For tubes with "DD" prefix, suffix 1 indicates shallowest tube and 4 represents deepest.

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