
**Pacific Northwest
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**Fiscal Year 2005
Integrated Monitoring Plan
for the Hanford Groundwater
Performance Assessment Project**

J. T. Rieger
M. J. Hartman

June 2005

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830



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Pacific Northwest National Laboratory
Richland, Washington 99352

Summary

Groundwater is monitored in hundreds of wells at the Hanford Site to fulfill a variety of requirements. Separate monitoring plans are prepared for various purposes, but sampling is coordinated and data are shared among users. The U.S. Department of Energy (DOE) manages these activities through the Hanford Groundwater Performance Assessment Project (groundwater project), which is the responsibility of Pacific Northwest National Laboratory. 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.

The report documents the purposes and objectives of groundwater monitoring, which 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.

The table of wells and constituents in Appendix A was constructed by querying the groundwater project's schedule database. This table was constructed mid-way through fiscal year 2005 and includes changes that were made to the baseline schedule, such as added sampling events (e.g., to confirm questionable results or critical mean exceedance) or cancelled sampling events (e.g., removing dry wells or reflecting plan revisions). A version of this schedule is available on the groundwater project's website (<http://groundwater.pnl.gov>) and is updated periodically to reflect schedule changes.

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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 Performance Assessment Project (groundwater project), which is the responsibility of Pacific Northwest National Laboratory. 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.

2.0 Objectives of Monitoring

The *Environmental Monitoring Plan* (DOE 2002) 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).

Table 1. Objectives of Groundwater Monitoring

<p style="text-align: center;">Plume and Trend Tracking</p> <ul style="list-style-type: none">• 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 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.
<p style="text-align: center;">Treatment/Storage/Disposal Unit Monitoring</p> <ul style="list-style-type: none">• Demonstrate compliance with applicable regulations and orders (RCRA, WAC).• Provide data to permit early detection of groundwater pollution or contamination.
<p style="text-align: center;">Groundwater Remediation Performance Monitoring</p> <ul style="list-style-type: none">• Provide continuing, independent assessment of groundwater remediation activities.

Plume and trend tracking are the primary objectives of long-term monitoring under the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) and the *Atomic Energy*

Act of 1954 (AEA). Treatment/storage/disposal unit monitoring includes units regulated under the *Resource Conservation and Recovery Act* (RCRA) or Washington Administrative Code (WAC) (recently active sites), CERCLA (past-practice sites), and the AEA. Monitoring associated with groundwater remediation activities is performed by Fluor Hanford, Inc. The groundwater project is responsible for “providing continuing, independent assessment of groundwater remediation activities” (DOE 2002).

For groundwater characterization and cleanup, groundwater beneath waste sites is grouped into operable units. The formal groundwater operable units do not include the entire Hanford Site. Therefore, to provide scheduling, data review, and interpretation for the entire Hanford Site, the groundwater project has informally defined “groundwater interest areas” that generally correspond to the groundwater operable units. Figure 1 illustrates these interest areas and the operable unit boundaries. Figures 2 through 16 are well location maps.

The groundwater project is responsible for groundwater monitoring for the following purposes:

- RCRA treatment/storage/disposal unit monitoring
- Performance assessment monitoring at low-level burial grounds under the AEA
- CERCLA monitoring at operable units without active groundwater remediation
- Monitoring of the Solid Waste Landfill under WAC 173-216
- Monitoring to supplement monitoring conducted under other programs for AEA objectives (e.g., monitoring of 100-K fuel storage basins, monitoring radionuclides at RCRA sites)
- Special sampling to support research projects or other special needs (not included in this monitoring plan)

In addition, DOE has instructed the groundwater project to integrate groundwater sample collection in the following cases:

- CERCLA monitoring at operable units with active groundwater remediation
- Monitoring of the Environmental Restoration Disposal Facility under CERCLA
- Monitoring by the Washington State Department of Health for independent assessment of Site conditions

Groundwater sampling is performed for a few purposes outside of the groundwater project. Those samples are scheduled independently by the responsible contractor. Where possible, sampling trips are coordinated between projects to avoid redundancy. Groundwater monitoring activities that are performed independently and are not captured in this integrated monitoring plan include:

- In-process monitoring of groundwater remediation systems for the evaluation of system performance
- Characterization monitoring performed during installation of new wells

- Groundwater monitoring of the State-Approved Land Disposal Site and the Treated Effluent Disposal Facility under WAC 173-216
- Near-facility monitoring near the Columbia River at the 100-N Springs
- In-system monitoring of the 400 Area drinking water supply

3.0 Wells and Constituents

The table of wells and constituents in Appendix A of this integrated monitoring plan was constructed by querying the groundwater project's schedule database. The table shows the number of times that a well is scheduled to be sampled in fiscal year 2005 for each constituent (or constituent group such as anions). Many wells are listed multiple times in this table because they are co-sampled for the objectives of more than one project or waste management area. Sampling is coordinated to avoid duplication. The table does not include quality control (QC) samples, samples collected during drilling of new wells, or shoreline seeps. Wells scheduled biennially or triennially are only listed in the table if they are scheduled for fiscal year 2005. The table does not include sampling conducted outside the groundwater project, such as operational sampling associated with pump-and-treat systems, monitoring of the 200 Area Treated Effluent Disposal Facility, or State-Approved Land Disposal Site.

This table was constructed mid-way through fiscal year 2005 and includes changes that were made to the baseline schedule, such as added sampling events (e.g., to confirm questionable results or critical mean exceedance) or cancelled sampling events (e.g., removing dry wells or reflecting plan revisions). A version of this schedule is available on the groundwater project's website (<http://groundwater.pnl.gov>) and is updated periodically to reflect schedule changes.

In addition to the constituents listed in the table in this plan, samples are analyzed in the field for temperature, turbidity, pH, and specific conductance. Water levels are measured before each well is sampled.

4.0 References

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

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

DOE – U.S. Department of Energy. 2002. *Environmental Monitoring Plan United States Department of Energy Richland Operations Office*. DOE/RL-91-50, Rev. 3, U.S. Department of Energy, Richland, Washington.

Hartman MJ, WD Webber, and LF Morasch (eds.). 2005. *Hanford Site Groundwater Monitoring for Fiscal Year 2004*. PNNL-15070, Pacific Northwest National Laboratory, Richland, Washington.

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

WAC 173-216. *Waste Discharge Permit Program.* Washington Administrative Code, Olympia, Washington.

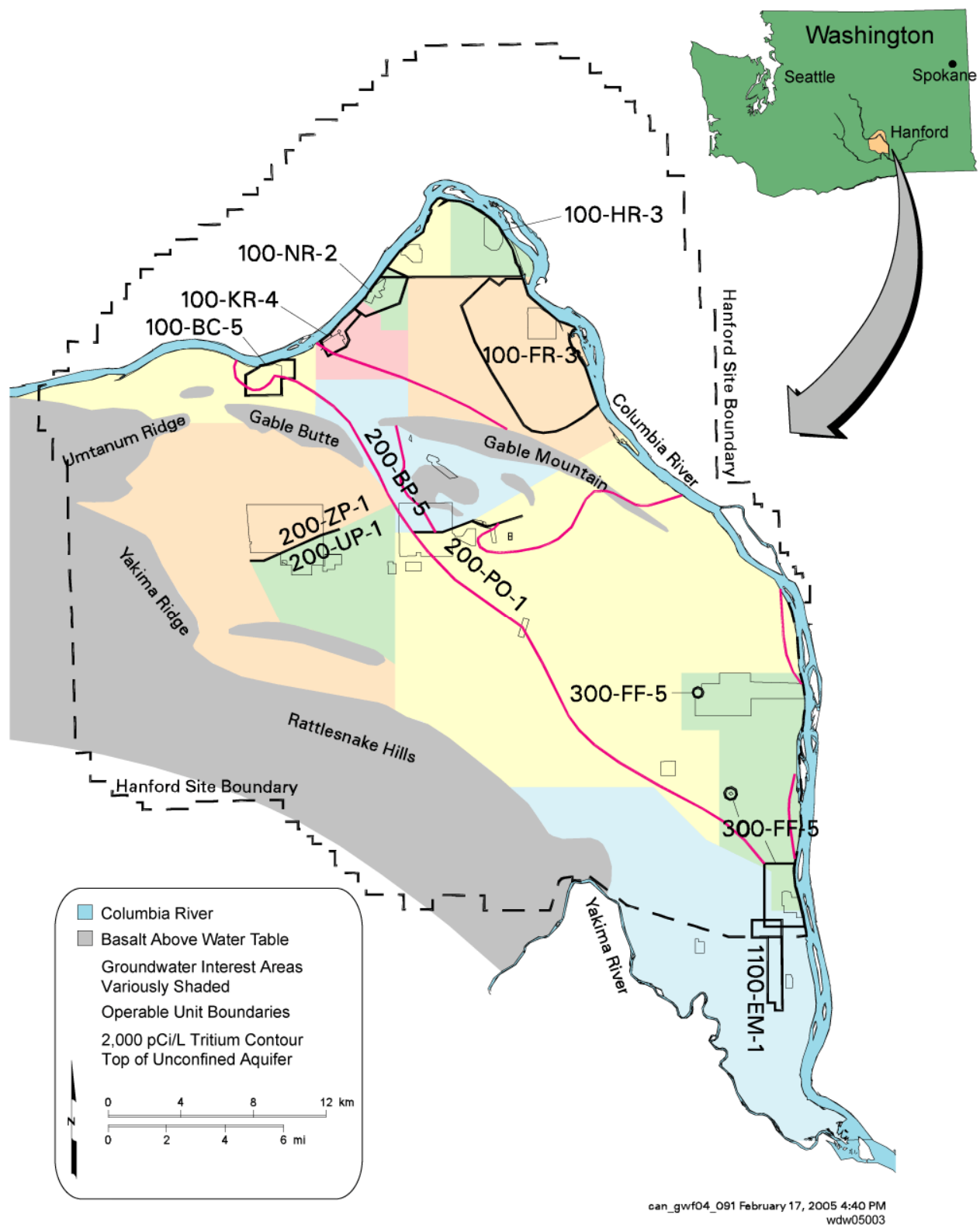


Figure 1. Hanford Site Groundwater Interest Areas

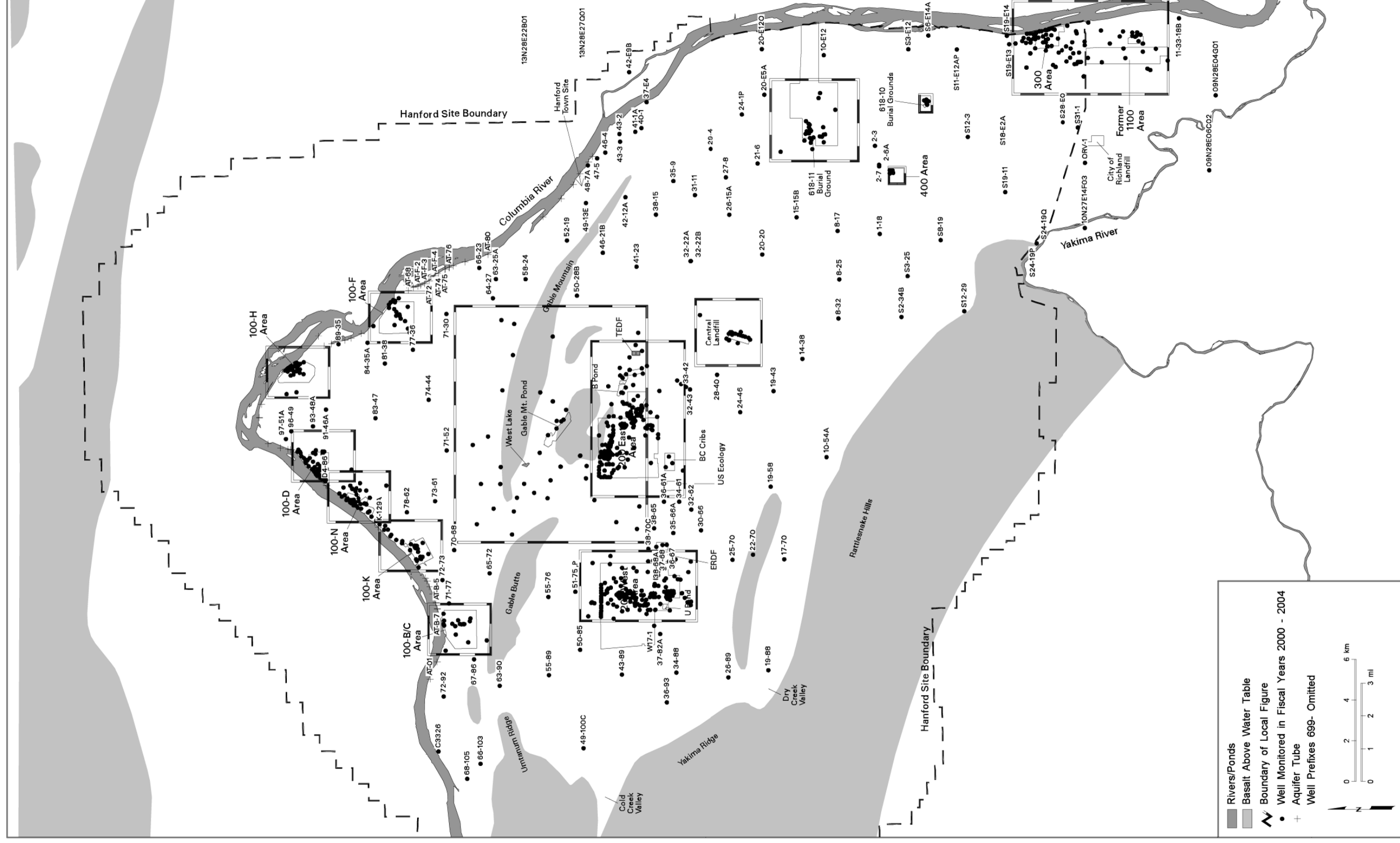


Figure 2. Groundwater Monitoring Wells in the 600 Area

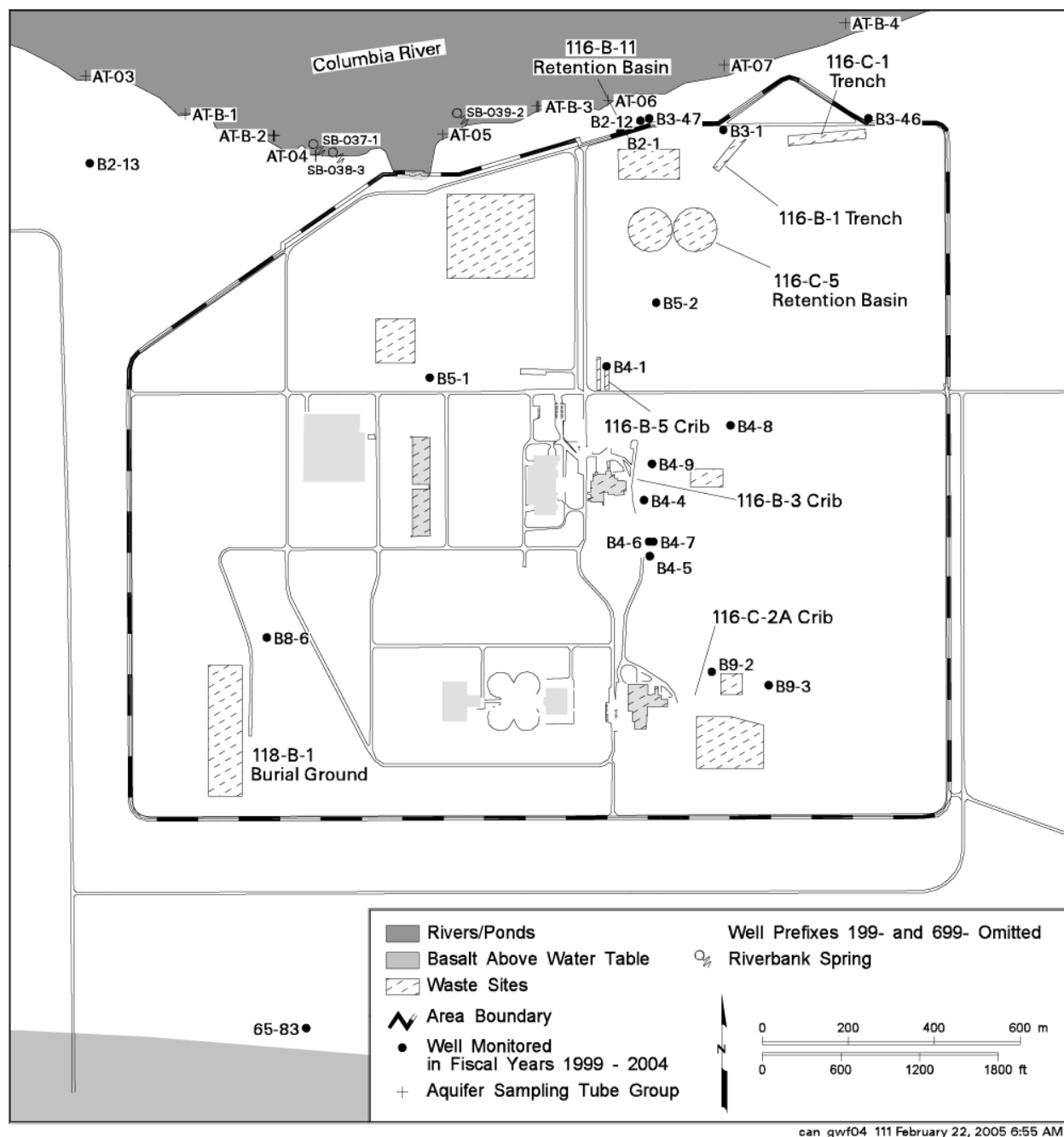


Figure 3. Groundwater Monitoring Wells in the 100-B/C Area

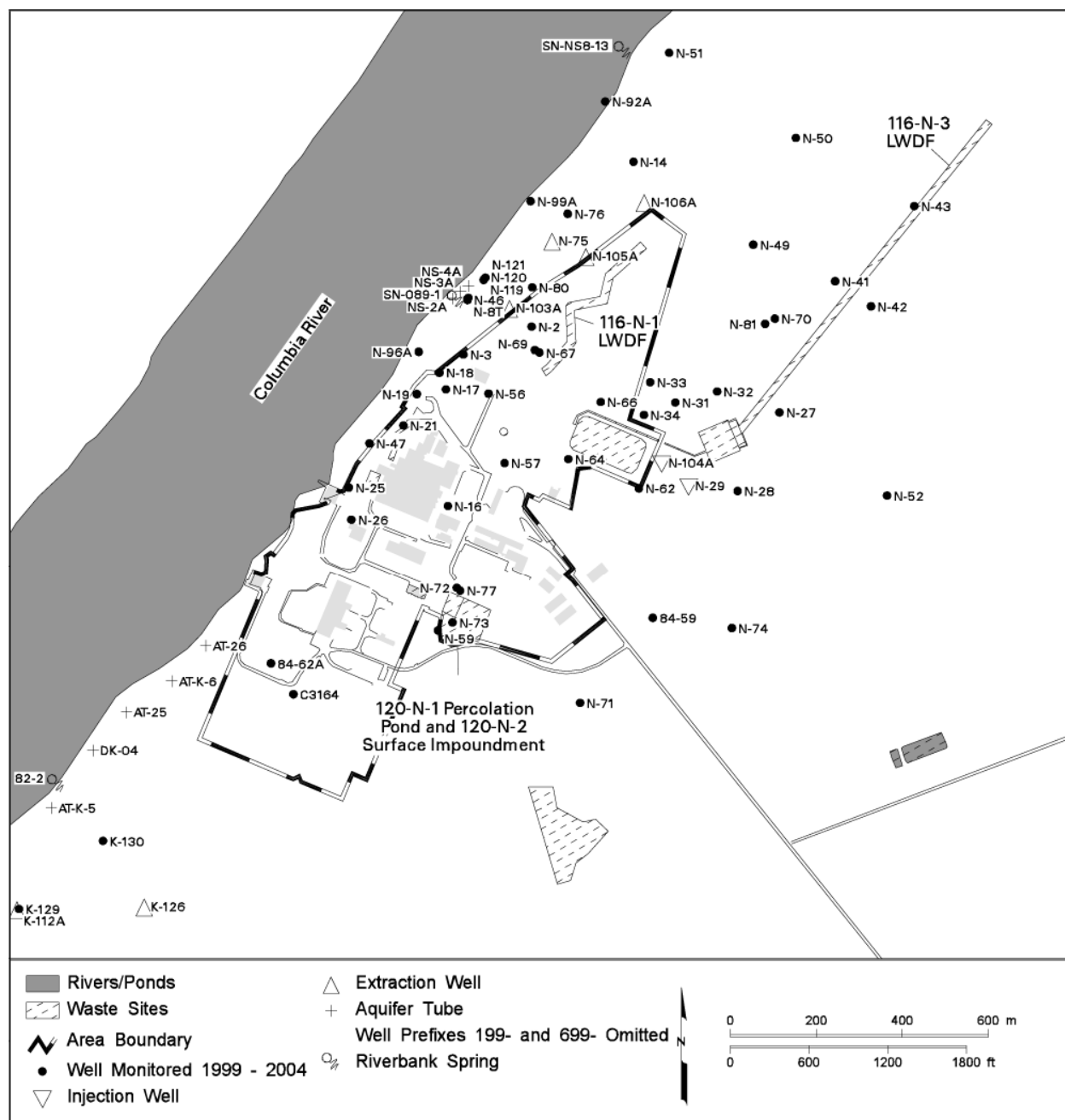
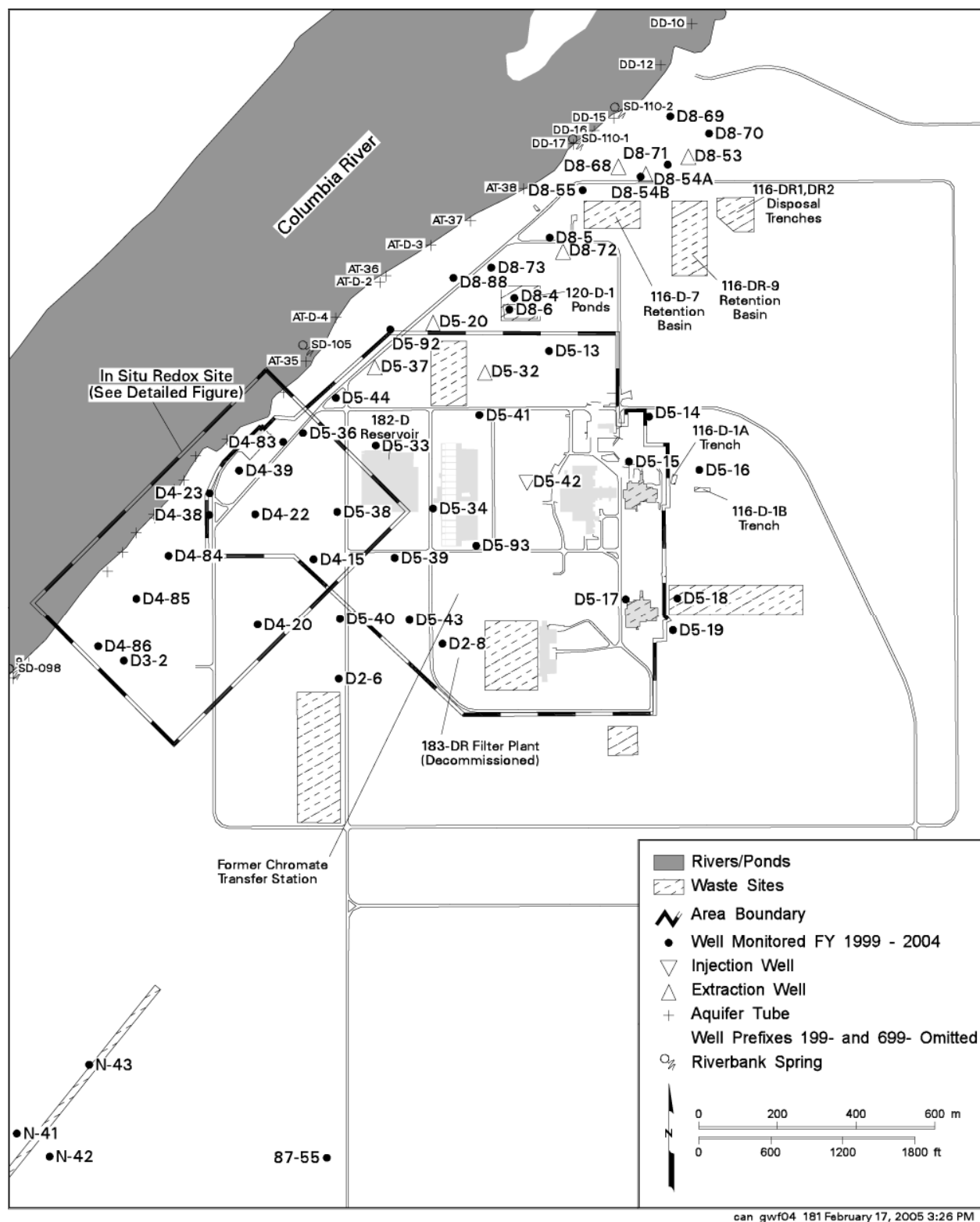
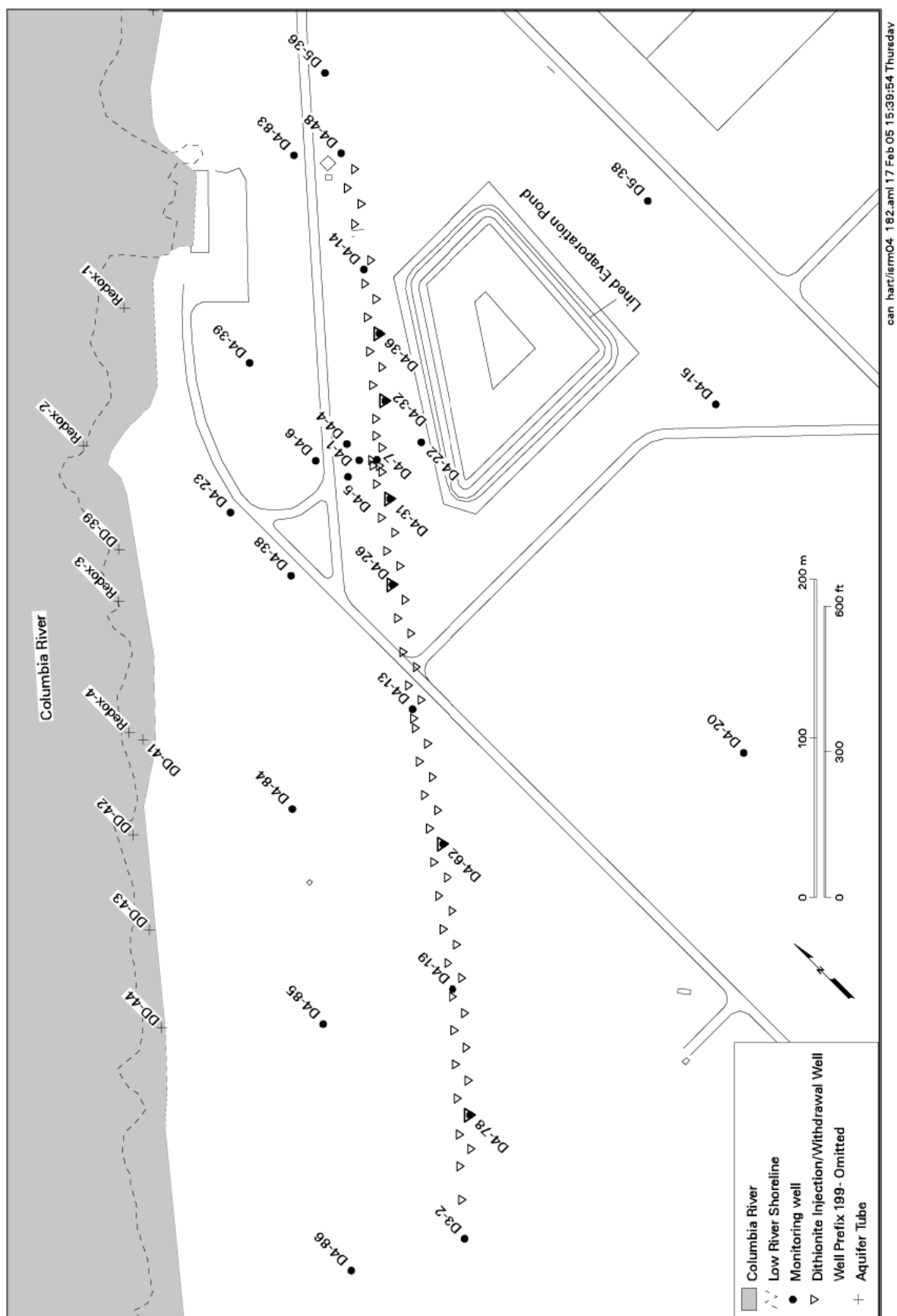
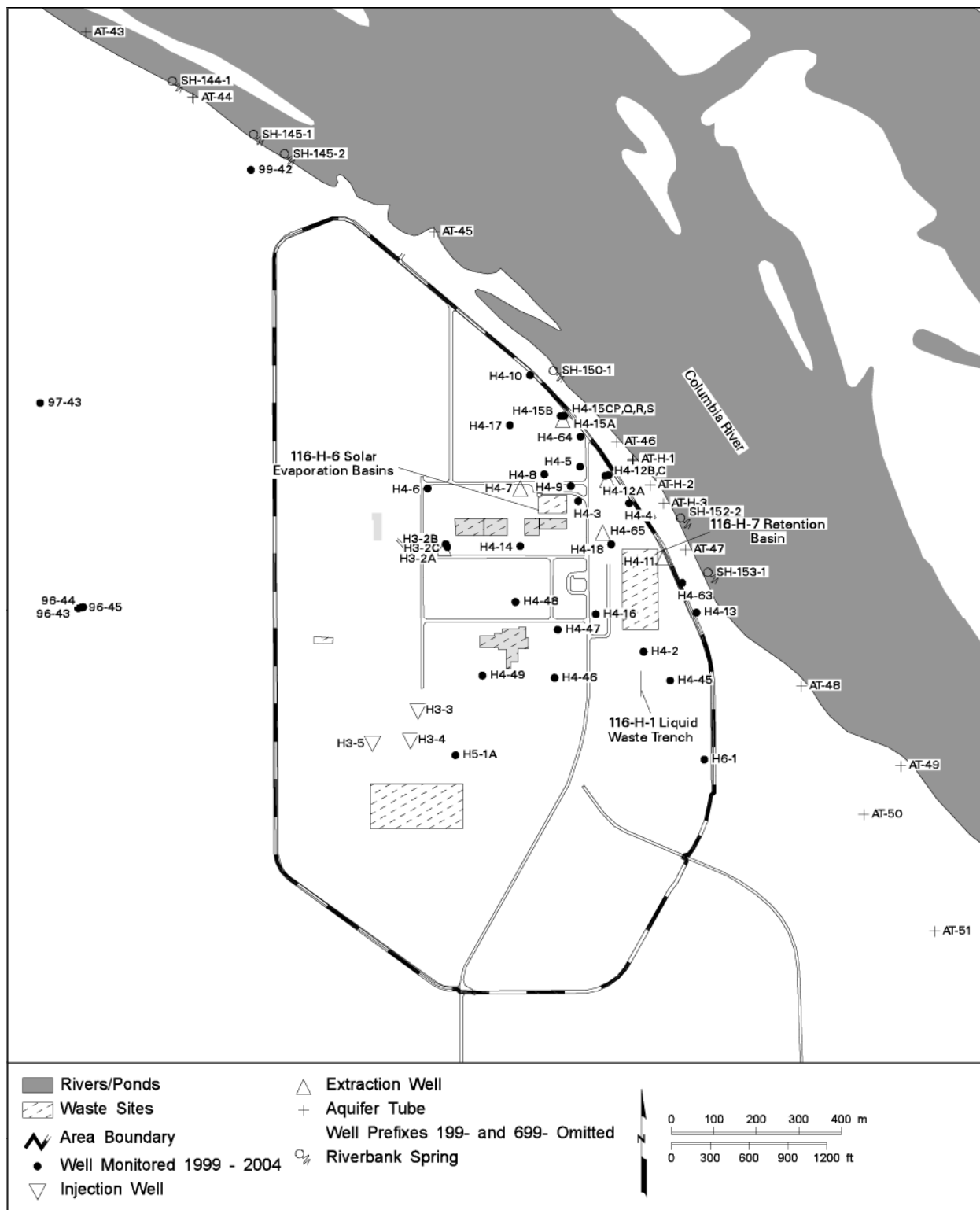


Figure 5. Groundwater Monitoring Wells in the 100-N Area







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Figure 8. Groundwater Monitoring Wells in the 100-H Area

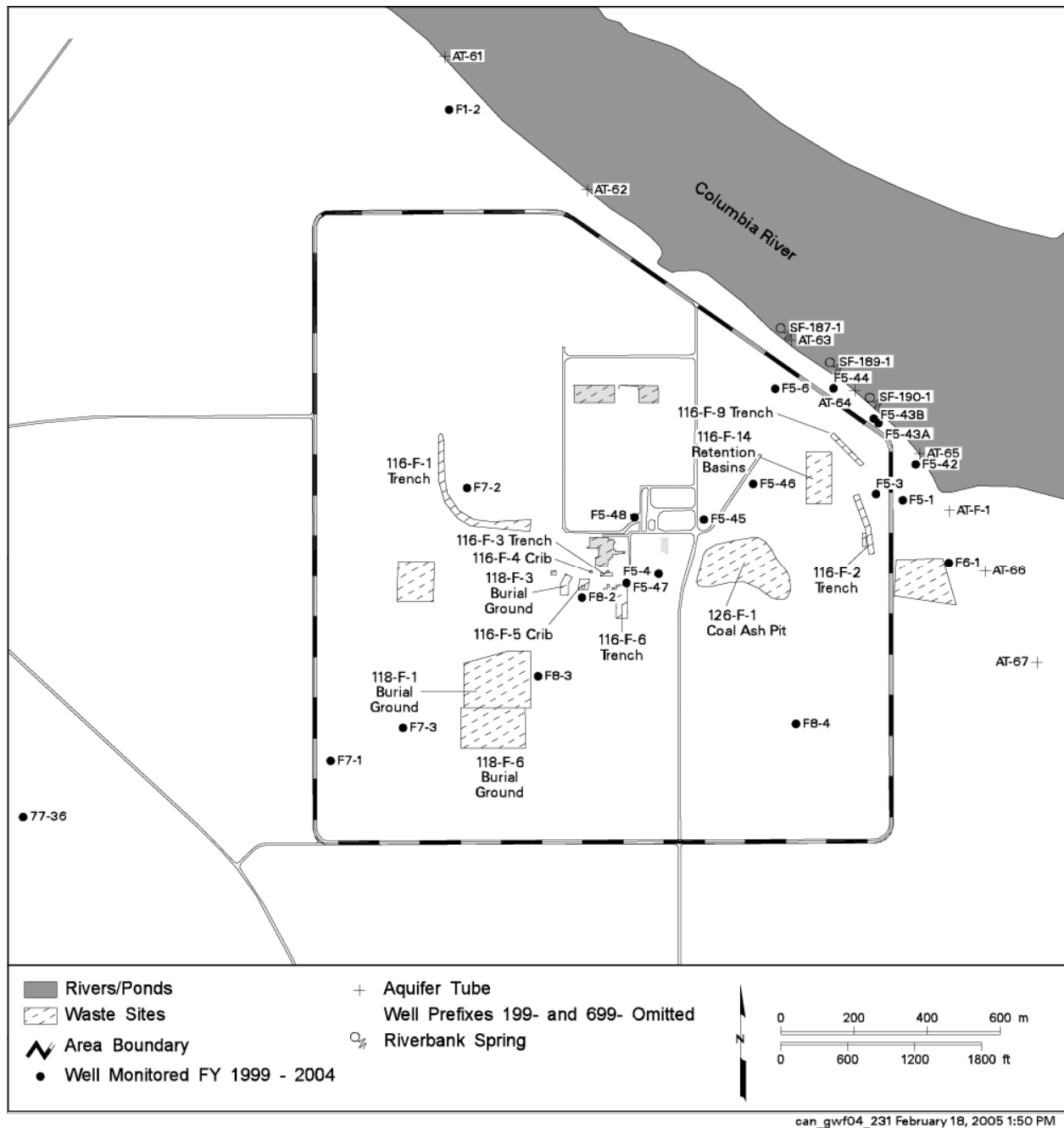
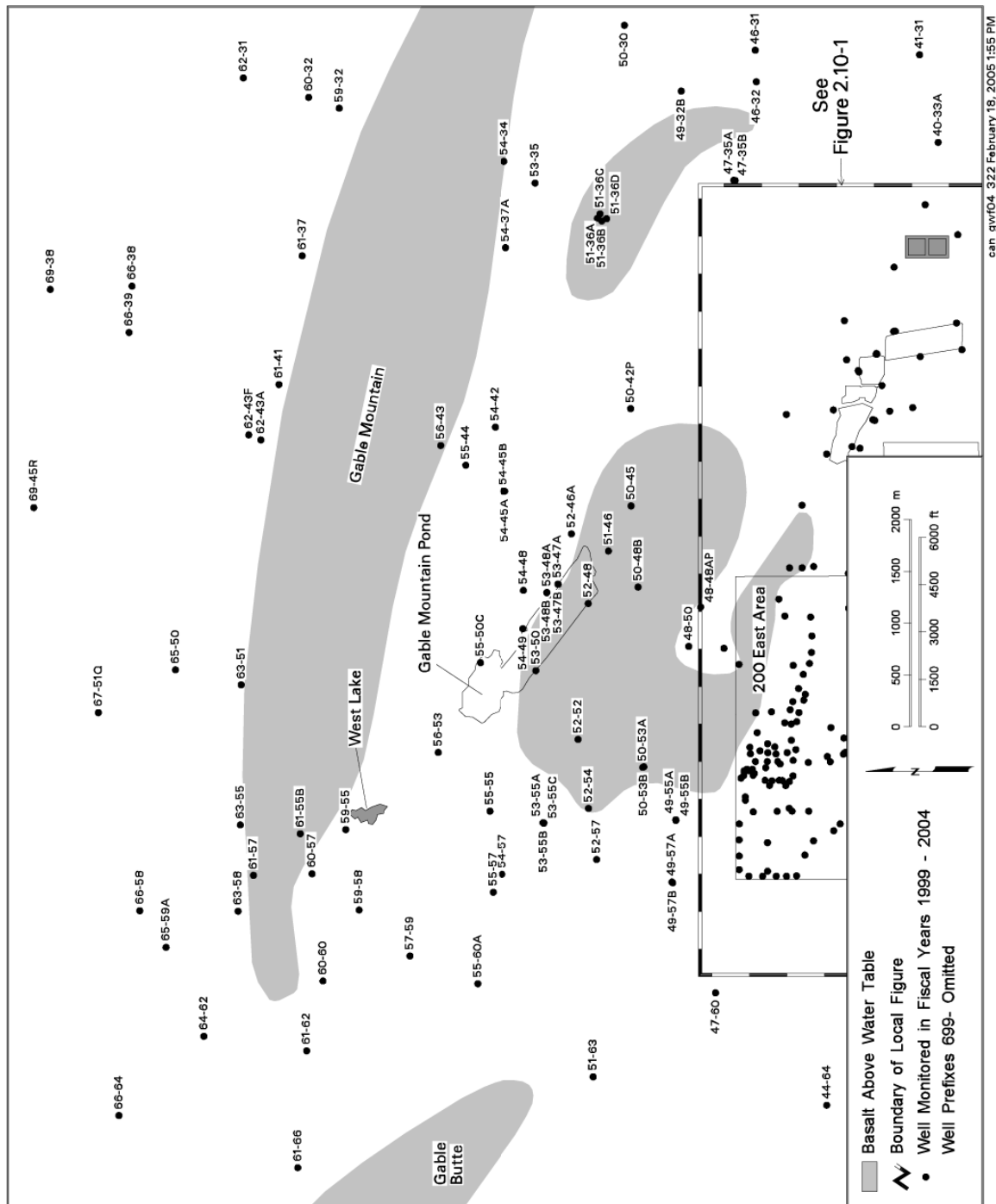


Figure 9. Groundwater Monitoring Wells in the 100-F Area



Figure 10. Groundwater Monitoring Wells in the 200 West Area



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Figure 12. Groundwater Monitoring Wells in the 600 Area Associated With the 200-BP-5 Operable Unit

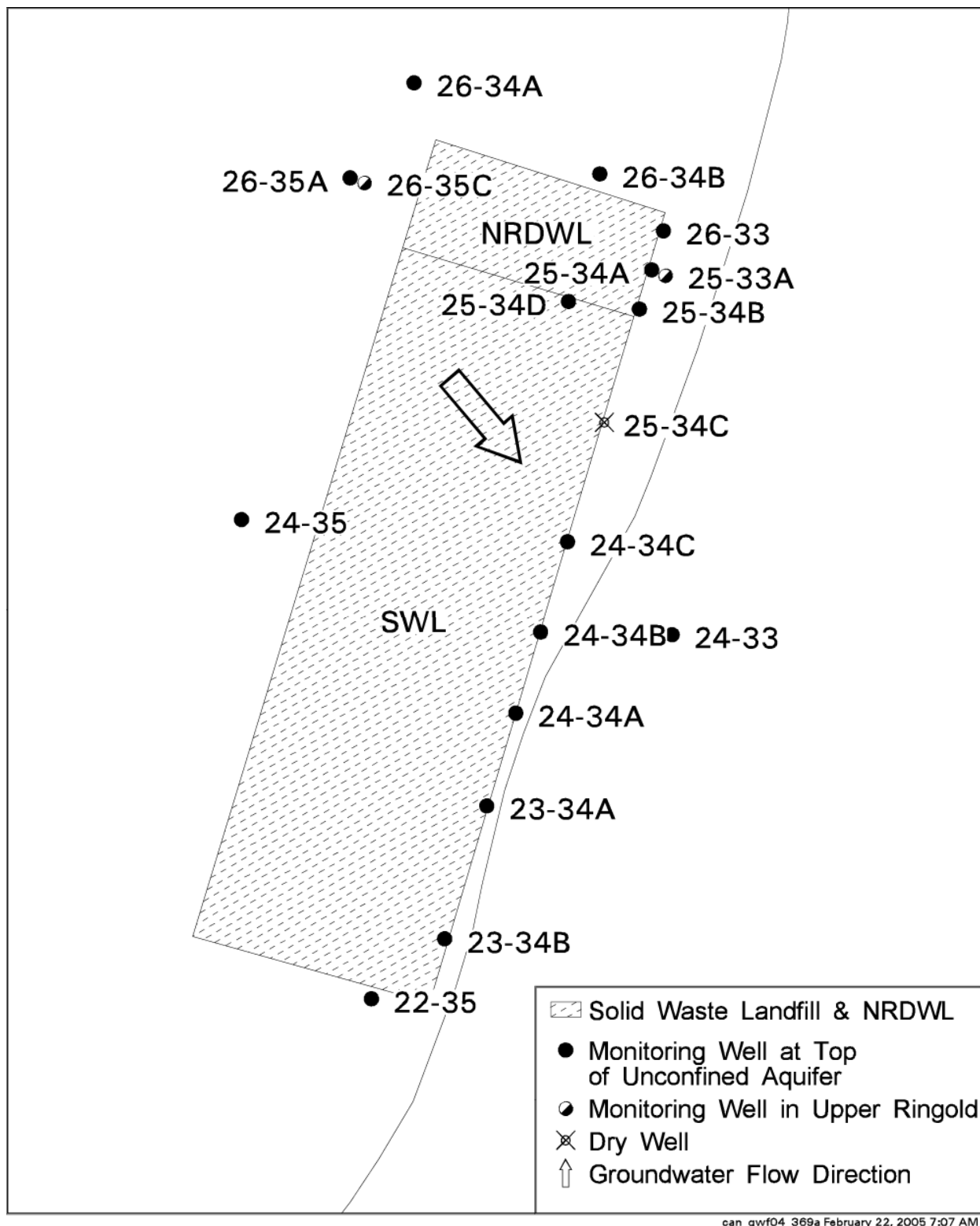


Figure 13. Groundwater Monitoring Wells at the Central Landfill

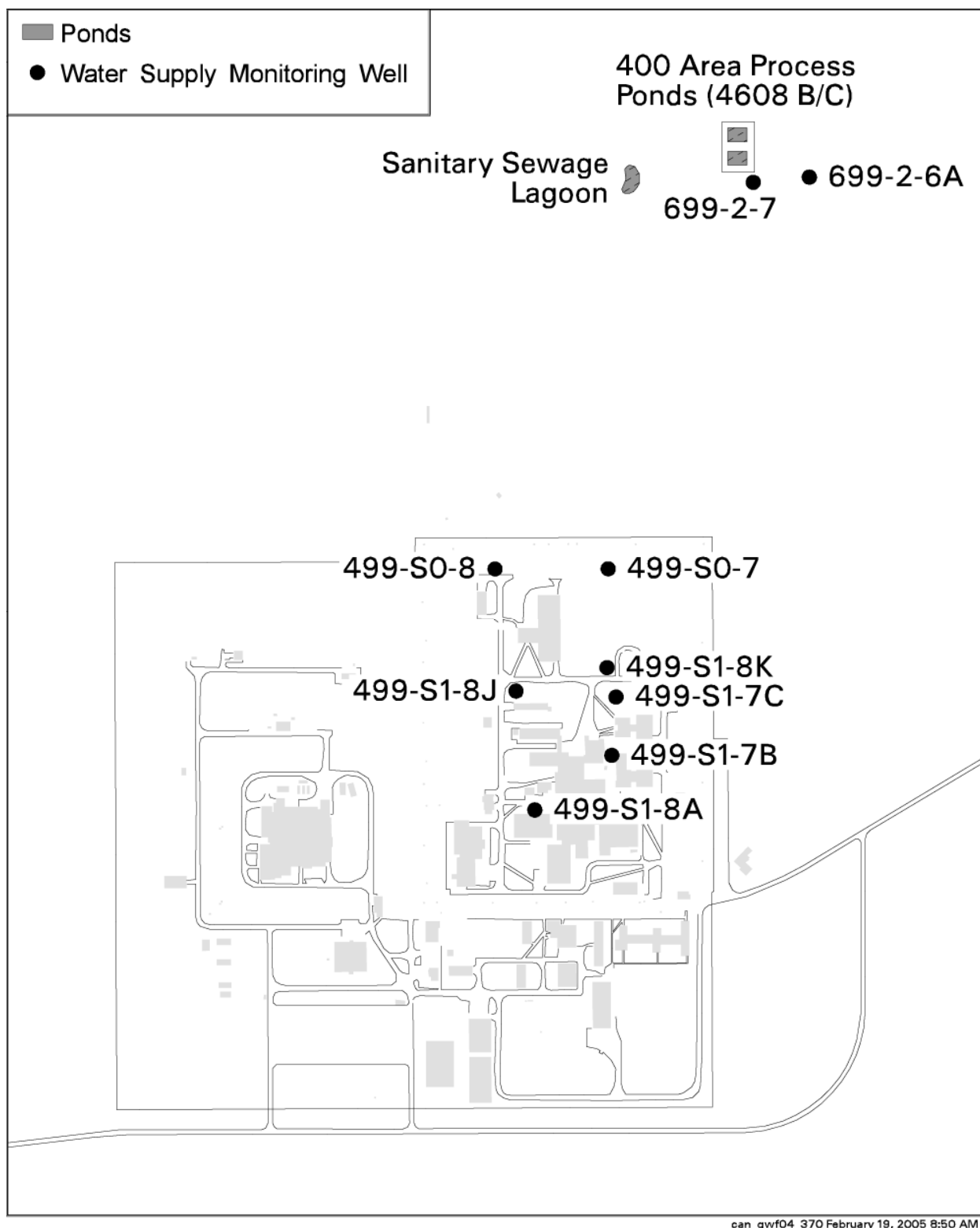


Figure 14. Groundwater Monitoring Wells in the 400 Area

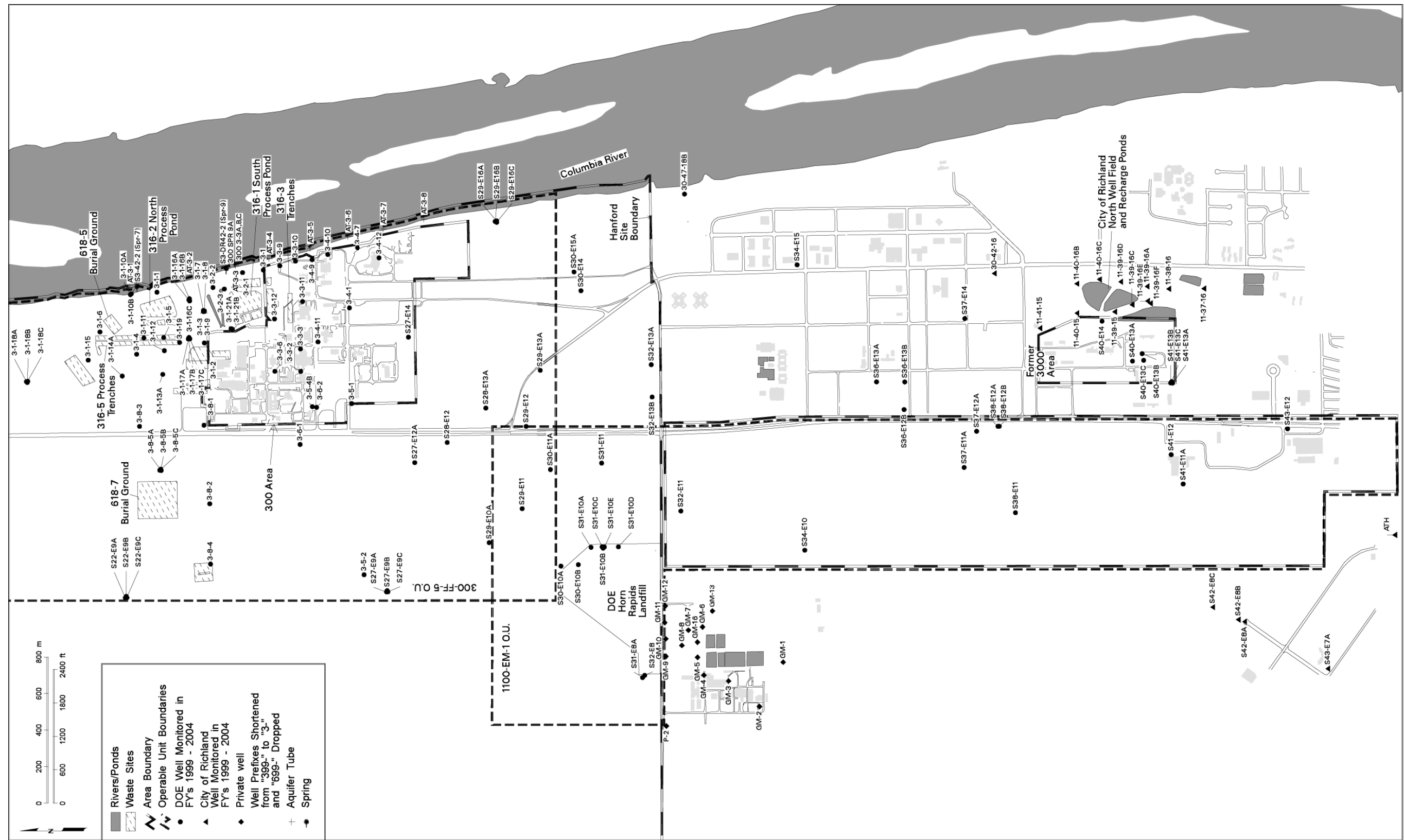


Figure 16. Groundwater Monitoring Wells in the 300 Area and 1100-EM-1 Interest Area

Appendix

Table of Wells and Constituents

Appendix A

Table of Wells and Constituents

This table of wells and constituents was constructed by querying the Hanford Groundwater Performance Assessment Project's (groundwater project) schedule database. This table was constructed mid-way through FY 2005 and includes changes that were made to the baseline schedule, such as added sampling events (e.g., to confirm questionable results or critical mean exceedance) or cancelled sampling events (e.g., removing dry wells or reflecting plan revisions). A version of this schedule is available on the groundwater project's website (<http://groundwater.pnl.gov>) and is updated periodically to reflect schedule changes.

A.1 Table Key

Program

CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i> (Monitoring associated with interim remedial actions.)
DOH	Washington State Department of Health (Samples collected for analysis by the Washington State Department of Health are for independent verification and are not part of the DOE programs. These samples are included in this table for information purposes only.)
LTMC	Long-term CERCLA monitoring and CERCLA remedial investigation/feasibility study investigations.
PA	Performance assessment under AEA
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
SURV	Site-wide surveillance (AEA)
TUBE	Aquifer sampling tubes

Proj_WMA (Project or Waste Management Area)

100HR3IAM(1) or (2)	Interim action monitoring for the 100-HR-3 Operable Unit (1) near pump-and-treat systems and (2) throughout the operable unit
100KR4IAM(1) or (2)	Interim action monitoring for the 100-KR-4 Operable Unit (1) near pump-and-treat systems and (2) throughout the operable unit
100NR2IAM	Interim action monitoring for the 100-NR-2 Operable Unit
11EM1-C	CERCLA monitoring for 1100-EM-1 Operable Unit
11EM1-City-S	Surveillance monitoring near the city of Richland for the 1100-EM-1 groundwater interest area
11EM1-S	Surveillance monitoring for the 1100-EM-1 groundwater interest area

1301N	1301-N Liquid Waste Disposal Facility
1324N	1324-N surface impoundment and 1324-NA percolation pond
1325N	1325-N Liquid Waste Disposal Facility
183H	183-H evaporation basins
1BC5-C	100-BC-5 Operable Unit and groundwater interest area
1FR3-C	100-FR-3 Operable Unit and groundwater interest area
1HR3-D-S	Surveillance monitoring for 100-HR-3-D groundwater interest area (west portion of 100-HR-3 Operable Unit)
1HR3-H-S	Surveillance monitoring for 100-HR-3-H groundwater interest area (east portion of 100-HR-3 Operable Unit)
1K-Basins	100-K storage basins
1KR4-S	Surveillance monitoring for 100-KR-4 groundwater interest area
1NR2-Rebound	Monitoring in support of proposed rebound study at 100-NR-2 Operable Unit
1NR2-S	Surveillance monitoring for 100-NR-2 groundwater interest area
2BP5-C	200-BP-5 Operable Unit and groundwater interest area
2PO1-C	200-PO-1 Operable Unit and groundwater interest area
2UP1-C	200-UP-1 Operable Unit, including interim action
2UP1-Rebound	Sampling to support rebound study at 200-UP-1 pump-and-treat
2UP1-S	Surveillance monitoring for 200-UP-1 groundwater interest area
2ZP1-C	200-ZP-1 Operable Unit, including interim action
2ZP1-S	Surveillance monitoring for 200-ZP-1 groundwater interest area
300-APT	300 Area process trenches (316-5)
3FF5-300-C	CERCLA monitoring for 300-FF-5 Operable Unit, 300 Area
3FF5-300-S	Surveillance monitoring for 300-FF-5 Operable Unit, 300 Area
3FF5-North-C	CERCLA monitoring for north portion of 300-FF-5 Operable Unit
400	400 Area
A-29	216-A-29 ditch
B-63	216-B-63 trench
BASTL-CONF	Basalt-confined aquifer
BPOND	216-B-3 pond
DOH	Washington State Department of Health (see Program key)

ERDF	Environmental Restoration Disposal Facility – sampling for facility performance for Bechtel Hanford, Inc. (expected to transition to Washington Closure Group)
ISRM	In situ redox manipulation system
LERF	Liquid Effluent Retention Facility
LLBG(1) through (4)	Low-level burial grounds, Waste Management Areas 1 through 4 (RCRA monitoring)
LLBG(1) through (4)-PA	Low-level burial grounds, Waste Management Areas 1 through 4 (AEA performance assessment monitoring)
NRDW	Nonradioactive Dangerous Waste Landfill
PUREX	Plutonium-Uranium Extraction Plant cribs
S-10	216-S-10 pond and ditch
SST(A), (B), (C), (SSX), (T), (TX/TY) or (U)	Single-shell tank waste management areas A-AX, B-BX-BY, C, S-SX, T, TX-TY, and U
SWL	Solid Waste Landfill
TUBE	Aquifer sampling tubes
U-12	216-U-12 crib

Constituent Abbreviations

As	arsenic
COD	chemical oxygen demand
DO	dissolved oxygen
filt	filtered samples
Hex Cr	hexavalent chromium
Hg	mercury
ICP	inductively couple plasma method
Pb	lead
PCB	polychlorinated biphenyls
REDOX	reduction-oxidation potential
TDS	total dissolved solids
TOC	total organic carbon
TOX	total organic halides
TPH	total petroleum hydrocarbons
U-iso	isotopic uranium
Uranium	total uranium
VOA	volatile organic analyses

A.2 References

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

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

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

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WELL	PROGRAM	PROJ_WMA	Alkalinity	Americium-241	Anions	Beta	COD	Coliform	Cyanide	Dioxins	DO	Gamma	Herbicides	Hex Cr	Hex Cr-filt	Iodine-129	Metals ICP	Metals ICP-filt	Metals-As-filt	Metals-Hg	Metals-Hg-filt	Metals-Pb	Metals-Pb-filt	Neptunium-237	Nickel-63	Nitrate	Oil/Grease	PCB	Pesticides	Phenols	Plutonium	Radium	REDOX	Selenium-79	Semi-VOA	Strontium-90	Sulfate	Sulfide	Technetium-99	TOC	TOX	TPH	Tritium	U-iso	Uranium	VOA																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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