



8.6 Radiological Monitoring of Hanford Site Drinking Water

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The quality of drinking water at the Hanford Site is routinely checked to assure site compliance with the *Safe Drinking Water Act* (see Section 5.4.2). During 2004, Pacific Northwest National Laboratory conducted radiological monitoring of drinking water supplied to Hanford Site facilities by DOE-owned pumps and water treatment facilities. Fluor Hanford, Inc. conducted routine chemical and microbiological monitoring of onsite drinking water. WAC 246-290, *Public Water Supplies*, requires that all drinking water analytical results be reported routinely to the Washington State Department of Health. Radiological results for Hanford Site drinking water samples are reported to the state through this annual environmental report and through an annual supplemental data compilation (e.g., PNNL-15222, APP. 1). Chemical and microbiological data are reported to the state directly by the state-accredited laboratory performing the analyses and to Fluor Hanford, Inc. but are not otherwise published.

All DOE-owned drinking water systems on the Hanford Site were in compliance with drinking water standards for radiological, chemical, and microbiological contaminant levels during 2004. Contaminant concentrations measured during the year were similar to those observed in recent years (see Section 4.3 in PNNL-14295 for 2002; PNNL-14687 for 2003).

8.6.1 Hanford Site Drinking Water Systems

During 2004, drinking water was supplied to DOE facilities on the site by nine DOE-owned, contractor-operated, water systems and one DOE-owned, contractor-operated, distribution system in the 300 Area that obtained treated water from the city of Richland. Eight of these systems, including Richland's system, used water from the

Columbia River. One system used groundwater from the unconfined aquifer beneath the site. Fluor Hanford, Inc. operated most of the DOE systems. Bechtel Hanford, Inc. operated one system in the 100-N Area that was supplied with water from a pumping station operated by Fluor Hanford, Inc. The city of Richland provided drinking water to the 300 Area, Richland North Area, and Hazardous Materials Management and Emergency Response Training and Education Center (HAMMER) facility.

8.6.2 Hanford Site Drinking Water Supply Facilities

Radionuclide concentrations in onsite drinking water during 2004 were monitored at four DOE-owned water treatment facilities (Figure 8.6.1). Three of these facilities supplied treated Columbia River water to four DOE drinking water systems on the site. The fourth treatment facility furnished groundwater to the 400 Area drinking water system. The 400 Area continued to use well 499-S1-8J (P-16) as the primary drinking water supply well and wells 499-S0-8 (P-14) and 499-S0-7 (P-15) as backup sources. The backup well with the lowest tritium level, as demonstrated by sampling and analysis, is considered the primary backup water supply. The three wells supply water to a common header that supplies three above-ground storage tanks prior to dissemination through the distribution system. Well 499-S0-7 was not used as a drinking water source during 2004. Well 499-S0-8 supplied 250,000 liters (66,000 gallons) to the distribution system on November 23 and 2.83 million liters (747,600 gallons) from December 7 through December 15. Water for the system in the 300 Area was supplied by the city of Richland.



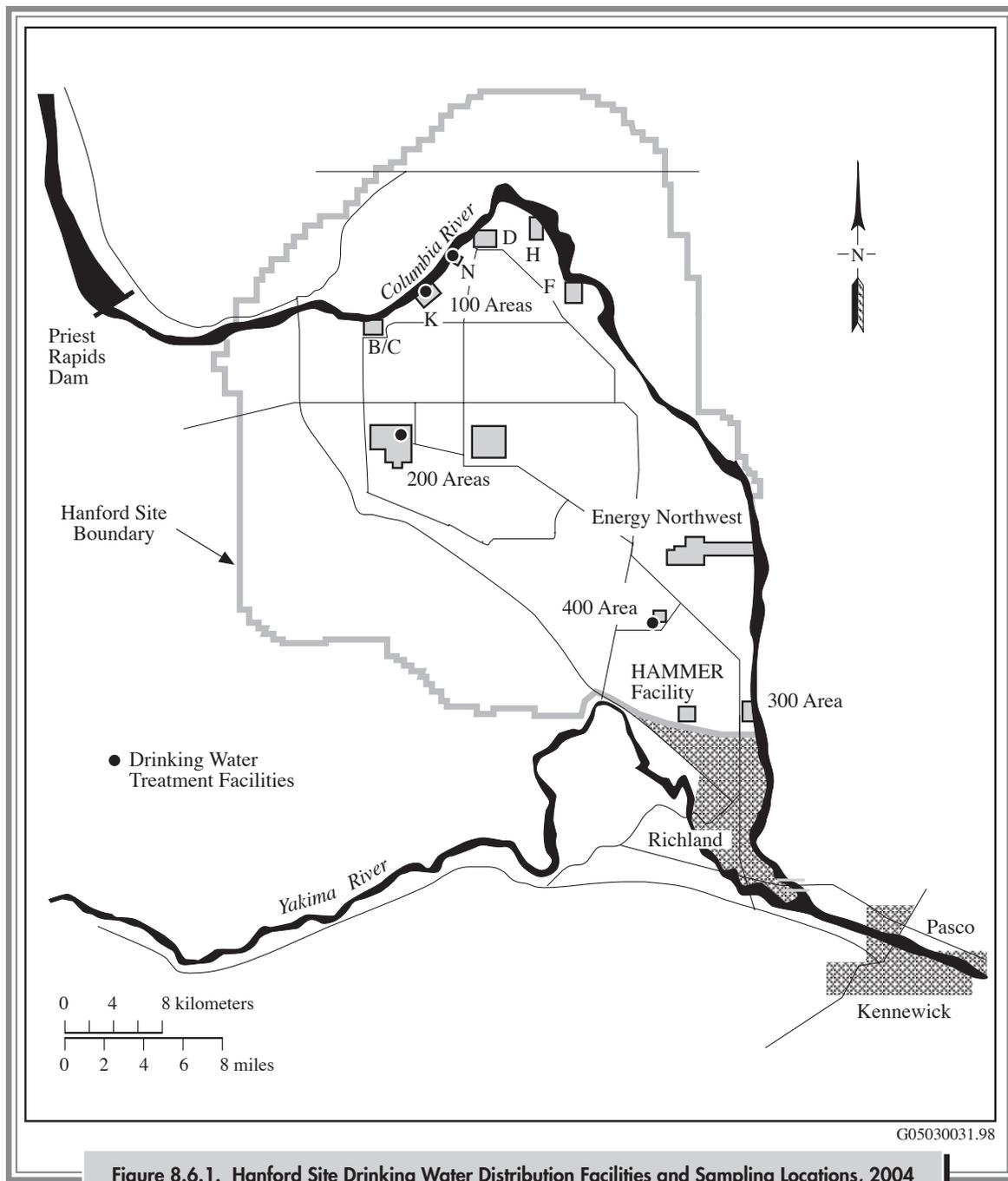


Figure 8.6.1. Hanford Site Drinking Water Distribution Facilities and Sampling Locations, 2004

8.6.3 Collection of Drinking Water Samples and Analytes of Interest

Samples at all four drinking water treatment facilities were collected and analyzed quarterly. All were samples of treated water collected before the water was distributed

for general use. Drinking water in the 300 and Richland North Areas and at the HAMMER facility was not routinely monitored for radiological contaminants by DOE contractor personnel. However, personnel from Pacific Northwest National Laboratory’s Surface Environmental Surveillance Project routinely collected water samples from the Columbia River at the city’s river water intake. The Columbia River is the primary source of the city of

Richland's drinking water. The radiological analytical results for these river water samples are summarized in Section 8.4 and tabulated in Appendix C (Table C.2). The city of Richland also monitors its water for radiological and chemical contaminants, and for general water quality. As a community water system, the city is required to annually report monitoring results and characterize the risks (if any) from exposure to contaminants in the water, in what is known as a Consumer Confidence Report. The reports are mailed to all consumers as an insert with a monthly utility bill. Results are also made available on the city of Richland's web page (<http://www.ci.richland.wa.us/RICHLAND/Utilities/index.cfm?PageNum=15>).

8.6.4 Radiological Results for Hanford Site Drinking Water Samples

Drinking water samples collected for radiological analysis were analyzed for gross alpha, gross beta, tritium, strontium-90, iodine-131, radium-226, and radium-228.

Results for radiological monitoring of Hanford Site drinking water during 2004 are summarized in Table 8.6.1. Individual analytical results are reported in PNNL-15222, APP. 1. The maximum amount of beta-gamma radiation from manmade radionuclides allowed in drinking water by Washington State and EPA is an annual average concentration that will not produce an annual dose equivalent to the whole body or any internal organ greater than 4 mrem (0.04 mSv). Maximum contaminant levels for gross alpha (excluding uranium and radon) and radium-226 and radium-228 (a combined total) are 15 pCi/L (0.56 Bq/L) and 5 pCi/L (0.18 Bq/L), respectively. The maximum allowable limit for tritium is 20,000 pCi/L (740 Bq/L) (40 CFR 141; WAC 246-290). These concentrations are assumed to produce a total body or organ dose of 4 mrem/yr (0.04 mSv/yr). If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any internal organ must not exceed 4 mrem (0.04 mSv).

During 2004, annual average concentrations of all monitored radionuclides in Hanford Site drinking water were below state and federal maximum contaminant levels. All

Table 8.6.1. Concentrations (pCi/L)^(a) of Selected Radiological Constituents in Hanford Site Drinking Water, 2004

Constituent	No. of Samples Analyzed	Systems				Standards
		100-K Area	100-N Area	200-West Area	400 Area	
Gross alpha ^(b)	4 ^(c)	-0.19 ± 0.57 ^(d)	0.40 ± 0.44 ^(d)	0.23 ± 0.77 ^(d)	0.04 ± 0.50 ^(d)	15 ^(e,f)
Gross beta ^(b)	4 ^(g)	1.25 ± 2.56 ^(d)	1.58 ± 1.95 ^(d)	0.21 ± 0.83 ^(d)	5.99 ± 4.00	50 ^(f)
Tritium ^(h)	1 ⁽ⁱ⁾	-21 ± 87 ^(d)	-7.7 ± 88 ^(d)	50 ± 94 ^(d)	3,225 ± 296 ⁽ⁱ⁾	20,000 ^(f)
Strontium-90 ^(h)	1 ⁽ⁱ⁾	0.07 ± 0.02	0.92 ± 0.15	0.10 ± 0.03	0.01 ± 0.06 ^(d)	8 ^(e,f)
Iodine-131 ^(h)	4 ^(c)	-0.01 ± 0.54 ^(d)	0.05 ± 0.47 ^(d)	-0.24 ± 0.21 ^(d,k)	-0.00 ± 0.29 ^(d)	3 ^(l)
Radium-226 ^(b)	4 ^(c)	0.06 ± 0.07	0.07 ± 0.06	0.07 ± 0.07	0.08 ± 0.09	combined 5 ^(f)
Radium-228 ^(b)	4 ^(c)	1.32 ± 3.33	0.84 ± 1.88	0.51 ± 0.47	0.50 ± 0.25	

- (a) Multiply pCi/L by 0.037 to convert to Bq/L.
 (b) Annual average ±2 times the standard deviation.
 (c) Samples are collected and analyzed quarterly.
 (d) Analytical results for all samples were below the detection limit.
 (e) WAC 246-290.
 (f) 40 CFR 141.
 (g) Samples are collected monthly, composited, and analyzed quarterly.
 (h) Single result ±2 times the total propagated analytical error.
 (i) Samples are collected quarterly, composited, and analyzed annually.
 (j) Samples are collected and analyzed quarterly.
 (k) Only three samples.
 (l) EPA-570/9-76/003.



iodine-131 and gross alpha results were below their respective minimum detectable concentrations (i.e., concentrations were too low to measure). All gross beta results for river water samples were also below the minimum detectable concentration, as were all three river water tritium results and five of twelve river water radium-228 results. Radium-226 and strontium-90 were detected in every river water sample analyzed. Gross beta was found in three of four 400 Area well water samples, radium-226 was found in one of the four samples analyzed, and tritium was measured in all 400 Area samples. Strontium-90 was not detected in 400 Area well water (Table 8.6.1).

The Groundwater Performance Assessment Project collected and analyzed raw water samples from all three 400 Area drinking water wells. A tritium plume that originates in the 200-East Area extends under the 400 Area and has historically affected tritium concentrations in all 400 Area drinking water wells. During 2004, annual average tritium concentrations in all three wells were below the 20,000 pCi/L (740 Bq/L) state and federal annual average drinking water standard (Table 8.6.2; Figure 8.6.2).

Table 8.6.2. Tritium Concentrations (pCi/L)^(a) in Hanford Site 400 Area Drinking Water Wells, 2004^(b)

<u>Sampling Date</u>	<u>Primary Drinking Water Well 499-S1-8J (P-16)</u>	<u>Backup Drinking Water Well 499-S0-8 (P-14)</u>	<u>Backup Drinking Water Well 499-S0-7 (P-15)</u>
January 22, 2004	2,830 ± 270	2,910 ± 270	11,600 ± 610
April 15, 2004	2,680 ± 240	2,750 ± 240	11,000 ± 550 12,400 ± 610
July 20, 2004	2,780 ± 290	3,050 ± 300	12,600 ± 690
October 13, 2004	2,120 ± 190	2,290 ± 200	10,700 ± 530
Annual Average	2,602	2,750	11,660

(a) Multiply pCi/L by 0.037 to convert to Bq/L.
(b) Reported concentration ±2 total propagated analytical error.

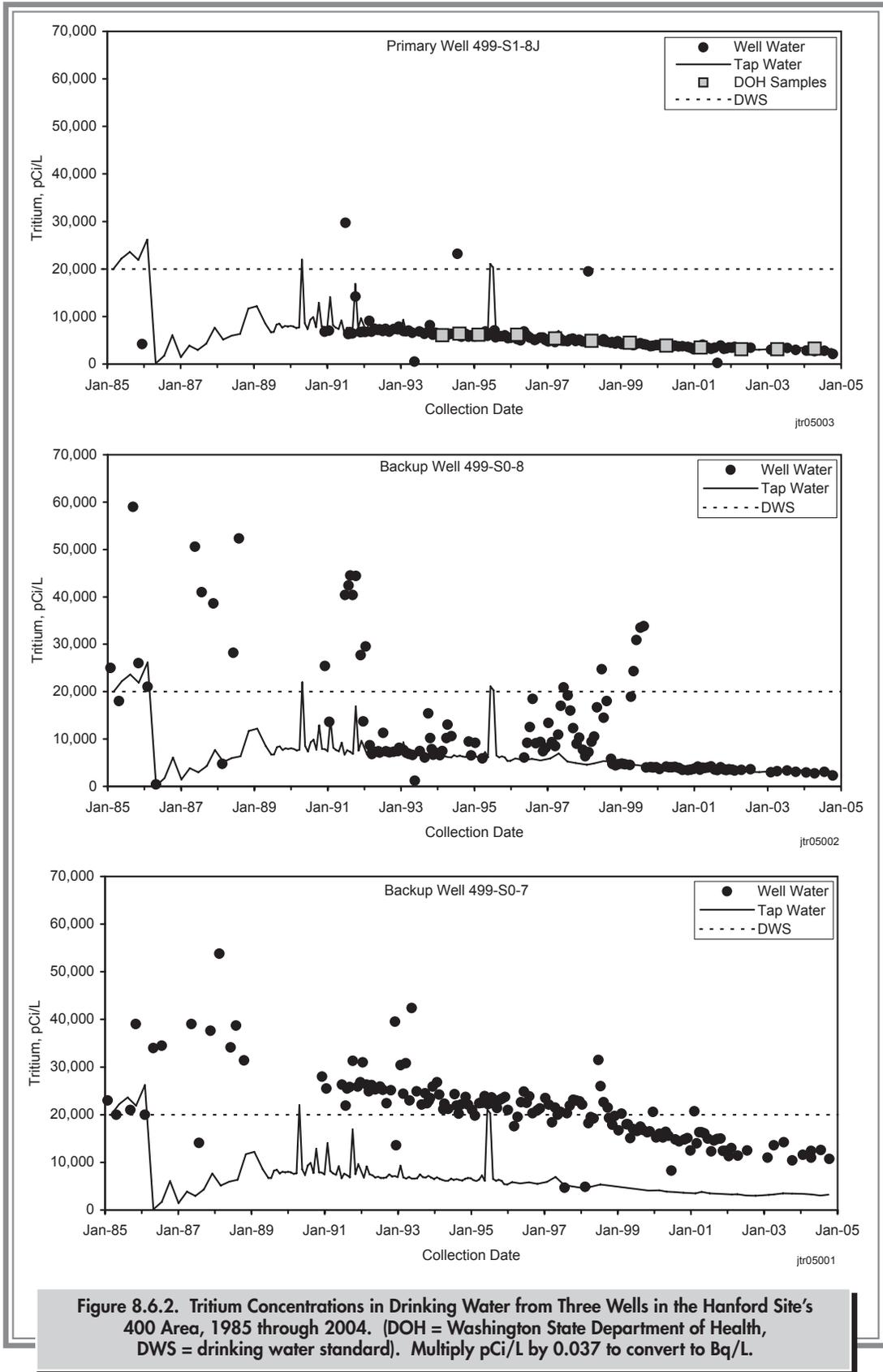


Figure 8.6.2. Tritium Concentrations in Drinking Water from Three Wells in the Hanford Site's 400 Area, 1985 through 2004. (DOH = Washington State Department of Health, DWS = drinking water standard). Multiply pCi/L by 0.037 to convert to Bq/L.

