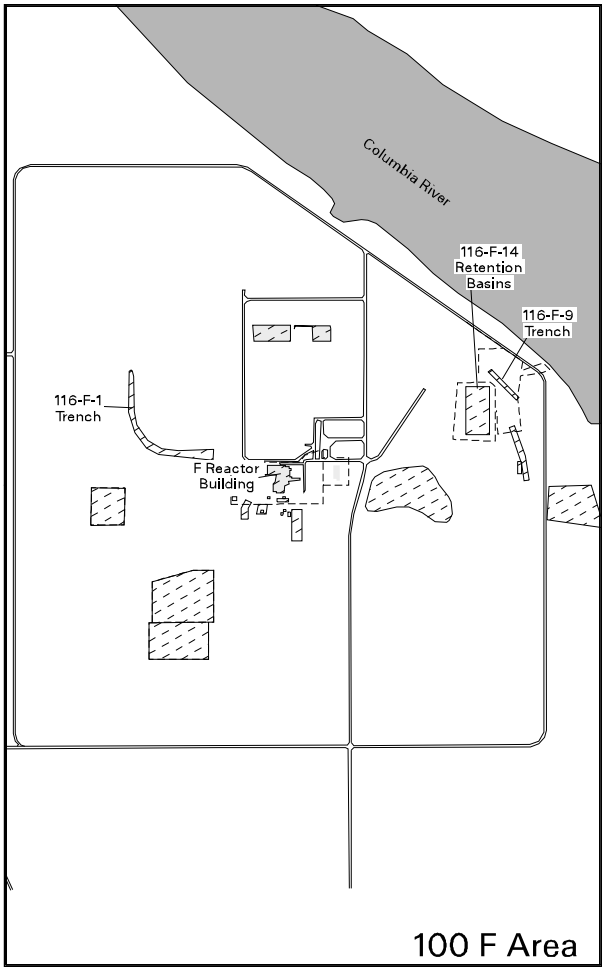
2.7 100 F Area

M. D. Sweeney, R. F. Raidl

The 100 F Area is located the farthest east and downstream of the reactor areas on the Hanford Site. F Reactor operated from 1945 to 1965. Like all of the other Hanford Site reactors, except N Reactor, F Reactor was cooled by a single-pass system (i.e., cooling water passed through the reactor and was discharged directly to the Columbia River). Waste sites in the 100 F Area included leaking retention basins for reactor coolant, liquid waste disposal trenches, and French drains. Waste sites are described in DOE/RL-95-54 and DOE/RL-95-92. Groundwater contaminants include nitrate, strontium-90, and tritium. Local contamination with chromium, trichloroethylene, and uranium is also detected.



can_hart_99036 January 28, 2000 10:14 AM

2.7.1 Groundwater Flow

Groundwater flows toward the east-northeast in the northern 100 F Area and toward the southeast in the southern 100 F Area (see Plate 2). In March 1999, the gradient between wells 199-F5-4 and 199-F8-4 was 0.0016. Hydraulic conductivity of the Hanford formation in the 100 F Area ranges from 9.1 to 69 meters per day (BHI-00917). Using these values and an effective porosity of 0.1 to 0.3, the flow rate ranges from 0.05 to 1.1 meters per day toward the southeast.

A plume of groundwater contaminated with nitrate and tritium, which originates from sources in the 100 F Area, extends to the southeast of the 100 F Area, confirming the southeastern direction of flow. This plume appears to discharge into the river in the vicinity of the 100 F Area slough and some additional but uncertain distance farther downstream (see Figures 2.1-3 and 2.1-4). The cause for this preferential pathway may be a buried former river channel that lies parallel to the current channel. Evidence for erosional features on the top of the Ringold Formation (which lies below the water table) was noted during earlier investigations of the hydrogeology of the 100 F Area (Figure 8 in WHC-SD-EN-TI-221, Rev. 0).

2.7.2 Tritium

Results from sampling at 100 F Area in fiscal year 1999 indicated a general decline in tritium concentration. Only one well, 199-F8-3, exceeded the 20,000 pCi/L drinking water standard, with a result of 32,700 pCi/L in October 1998 (see Plate 3). The tritium concentration had declined to 16,300 pCi/L in April 1999.

2.7.3 Uranium

Low levels of uranium are detected in the 100 F Area, but only one result exceeded the proposed 20 µg/L maximum contaminant level in fiscal year 1999. Well 199-F8-2 reported a result of 20.3 µg/L in October 1998. The well is located near the 118-F-3, -4, and -5 burial grounds and downgradient of the 116-F-1 trench. The result represents a slight increase in concentration in this well.

2.7.4 Strontium-90

A plume of strontium-90 exceeding the 8 pCi/L drinking water standard is centered on the 116-F-14 retention basins and the 116-F-2 and 116-F-9 trenches. The distribution in fiscal year 1999 was the same as in 1998 (see Figure 5.8-1 in PNNL-12086).

Most of the wells with detectable strontium-90 either exhibited a decline in concentration, or no significant change. The highest concentration continued to be in well 199-F5-3, with an annual average of 194 pCi/L (Figure 2.7-1). Concentrations in this well have been declining since 1997.

Monitoring Objectives in 100 F Area

Groundwater monitoring is conducted in the 100 F Area:

- triennially to annually to describe the nature and extent of contamination
- quarterly to monitor trends in variable constituents/wells.

2.7.5 Nitrate

Nitrate continues to have the widest distribution of any contaminant in the 100 F Area. The highest concentrations continued to be in the southwestern corner of the 100 F Area in well 199-F7-1 (Figure 2.7-2). This well had a peak in nitrate in fiscal year 1998 and decreased this year. Well 199-F5-45, located near the reactor building, showed a peak in nitrate concentrations early in fiscal year 1999, but declined later in the year.

2.7.6 Chromium

Most of the wells in the 100 F Area have low but detectable chromium concentrations. All results were below the 100 µg/L maximum contaminant level in fiscal year 1999. The highest concentrations were reported in wells 199-F5-46 (51 to 96 µg/L) and 199-F5-6 (66 µg/L). The chromium results from both of these wells show variable concentrations. Both wells are downgradient from the 100 F Reactor cooling water effluent lines (100-F-19), which may be the source of the elevated chromium.

2.7.7 Trichloroethylene

Trichloroethylene continued to be detected in the southwestern corner of the 100 F Area and in the adjacent 600 Area. Wells 199-F7-1 and 699-77-36 both exceeded the 5-µg/L maximum contaminant level in October 1998, at 16 and 18 µg/L, respectively. Both wells show declining trends.

Wells 199-F5-45 and 199-F5-46 consistently detect low levels of trichloroethylene. In October 1998, they both measured 5 µg/L.

2.7.8 Water Quality at Shoreline Monitoring Locations

Groundwater near the Columbia River is sampled annually in the late fall via aquifer sampling tubes and riverbank seeps. The sampling tubes are polyethylene tubes that were driven into the aquifer at locations near the low-water shoreline. Seeps are locations where groundwater discharges above the river level.

2.7.8.1 Aquifer Sampling Tube Results

Samples collected during the fall 1998 sampling were screened for hexavalent chromium, gross beta,

nitrate, and tritium. The highest contaminant concentrations were: 7.4 pCi/L gross beta, 29.4 µg/L hexavalent chromium, 49 mg/L nitrate, and 1,100 pCi/L tritium. All of the highest concentrations were detected in samples collected along the 100 F Area slough.

2.7.8.2 Riverbank Seepage Results

One seep site along the 100 F Area shoreline was sampled during October 1998. The specific conductance of the sample was 364 µS/cm, indicating that it was primarily groundwater. The maximum concentrations of the contaminants of concern are as follows: 39 mg/L nitrate, 898 pCi/L tritium, 17.6 µg/L chromium, and 5.87 pCi/L gross beta.

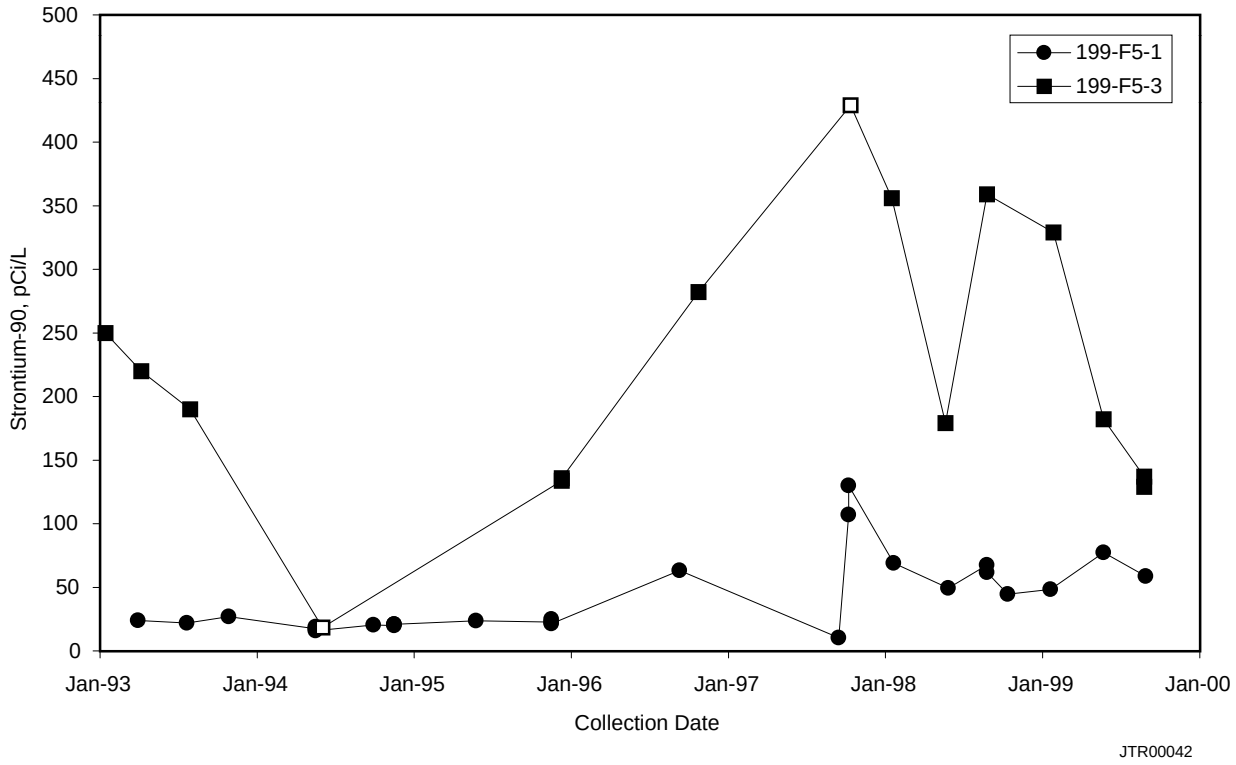
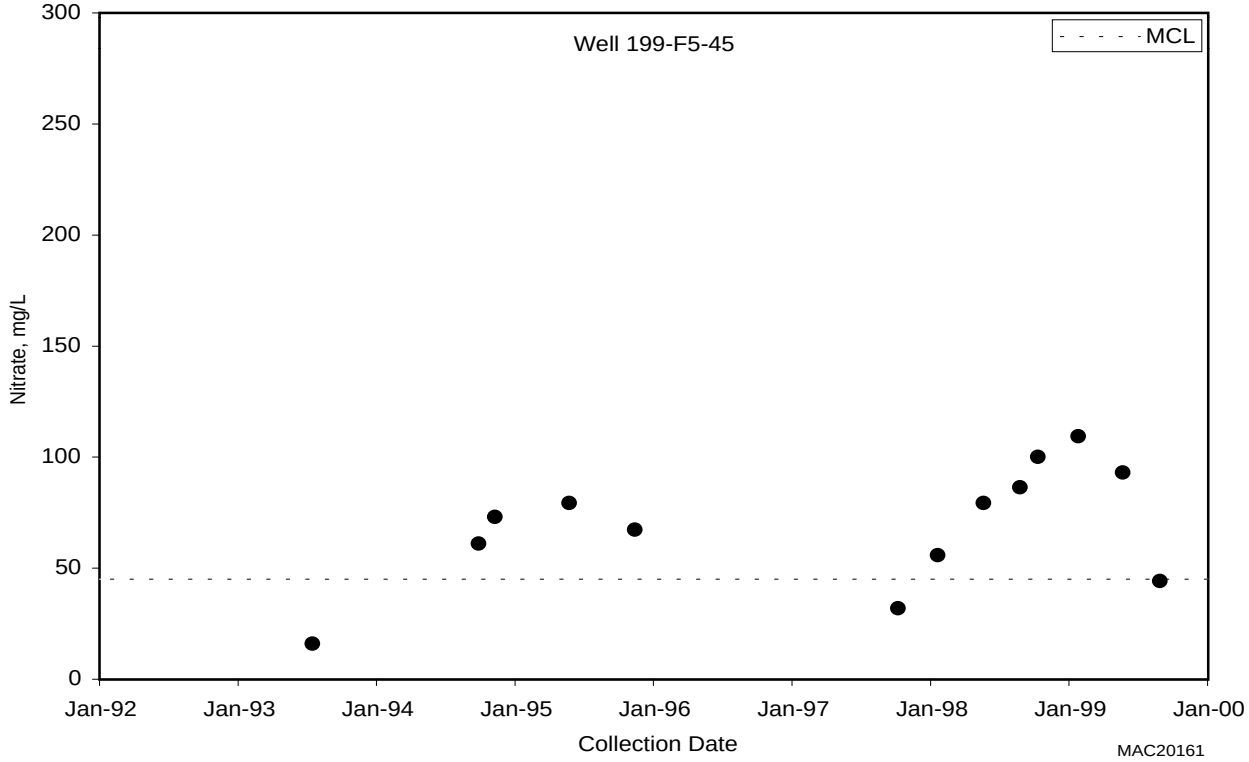


Figure 2.7-1. Strontium-90 in Wells 199-F5-1 and 199-F5-3 Near 116-F-2 Trench



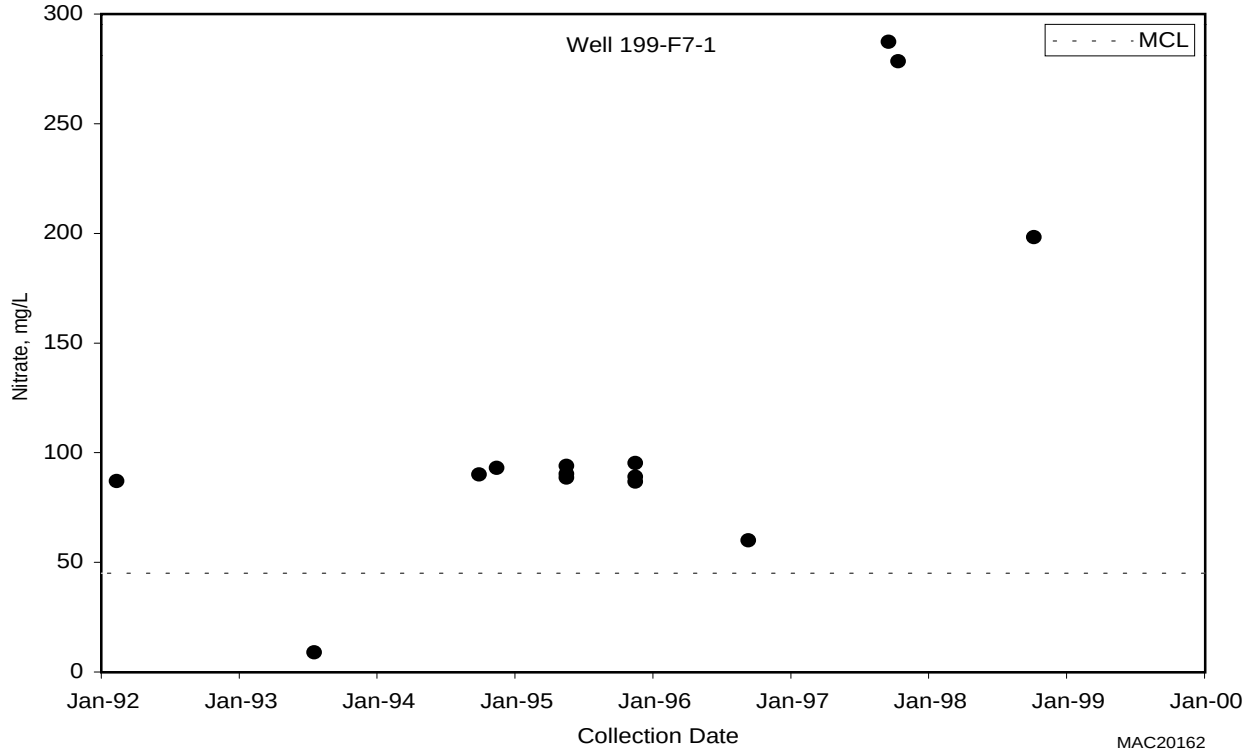


Figure 2.7-2. Nitrate in Well 199-F7-1, Southwestern 100 F Area, and Well 199-F5-45, Northeast of F Reactor