2.2 100 B/C Area

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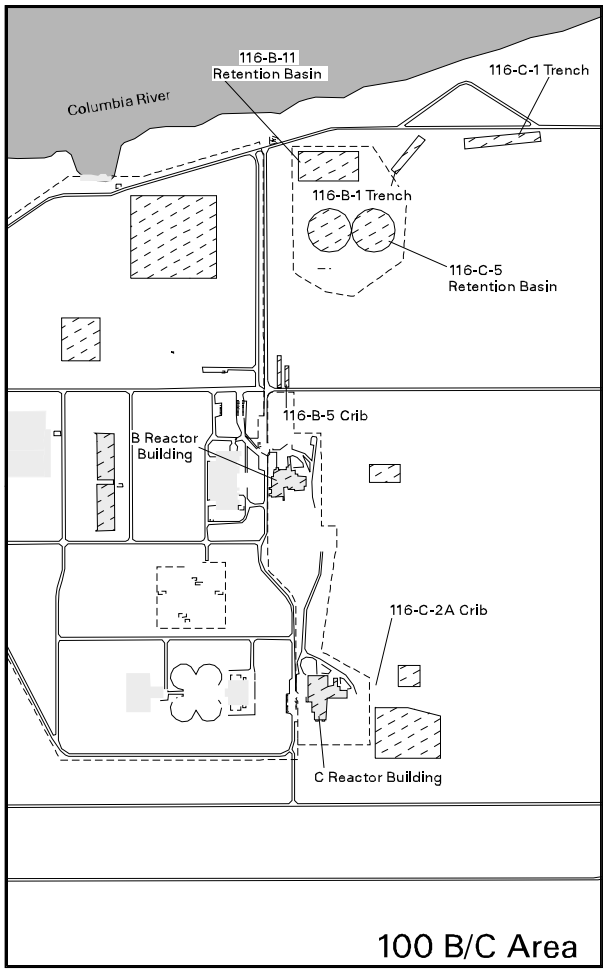
The 100 B/C Area is the reactor area farthest upstream along the Columbia River. B Reactor was placed into service in 1944 and operated until 1968. C Reactor operated from 1952 to 1969. The B and C Reactors used a single-pass system for cooling water (i.e., cooling water passed through the reactor and was discharged to the Columbia River). Groundwater contaminants include strontium-90 and tritium. Chromium and nitrate are elevated locally.

Extensive restoration of former waste sites continued in fiscal year 1999. Activities consisted of removing and stockpiling clean overburden soil and removing contaminated soil/debris for disposal at the Environmental Restoration Disposal Facility. Water was applied as necessary to control dust during remediation activities. Application of water was held to a minimum to reduce the potential for mobilizing contaminants from the vadose zone to the groundwater. Excavation of the 116-B-11 retention basin and 116-B-13 trench, located in the northern 100 B/C Area, was completed in November 1998 at a maximum depth of 4.6 meters. Twelve smaller sites, including cribs and French drains, were excavated near the 100 B and 100 C reactor buildings in spring 1999. The depths of these excavations ranged from 2.4 to 9.2 meters.



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2.2.1 Groundwater Flow

Groundwater flow within the unconfined aquifer was north toward the Columbia River in March 1999 (see Plate 2). The hydraulic gradient was ~0.002 near the Columbia River, and much lower farther inland near the reactors. The average gradient between C Reactor and the Columbia River was ~0.001. The hydraulic conductivity of the unconfined aquifer in the 100 B/C Area ranges from 4.3 to 17 meters per day (BHI-00917). Using these values and an effective porosity of 0.1 to 0.3, the flow rate ranges from 0.014 to 0.17 meters per day.

2.2.2 Tritium

Several wells in the northern 100 B/C Area and one well in the southwestern 100 B/C Area had tritium concentrations that exceeded the 20,000 pCi/L drinking water standard (see Plate 3). The distribution in fiscal year 1999 was similar to fiscal year 1998.

In fiscal year 1998, some wells in the 100 B/C Area had spikes in tritium concentration. Levels declined again in most of these wells in fiscal year 1999 (Figure 2.2-1), but remained higher than in the early 1990s. Some of the wells with recent tritium peaks are located near waste sites that were remediated in

fiscal years 1997 through 1999, leading to speculation that they were caused by infiltration of dust-control water through contaminated sediment (Section 5.3 of PNNL-12086). However, other wells (e.g., 199-B5-1 and 199-B8-6; see Figure 2.2-1) are not located near surface remediation sites, yet showed similar increases in tritium concentrations. Other wells that did not show spikes in concentrations show gradual declines in tritium.

Monitoring Objectives in 100 B/C Area

Groundwater monitoring is conducted in the 100 B/C Area:

- triennially to annually to describe the nature and extent of contamination
- quarterly to monitor trends near inactive waste sites.

2.2.3 Strontium-90

Strontium-90 continues to exceed the 8.0 pCi/L drinking water standard in wells near the 116-B-11 and 116-C-5 retention basins, nearby trenches, and waste disposal facilities near the B reactor building. The distribution is approximately the same as in fiscal year 1998. There are no obvious increasing or decreasing trends in strontium-90 concentration. The highest average concentration in fiscal year 1999 was 77 pCi/L in well 199-B3-46.

2.2.4 Chromium

As in the past, two wells, 199-B3-47 and 199-B5-1, had chromium results above the 100 µg/L maximum contaminant level in fiscal year 1999. These wells have shown a large variability in chromium in the past two years, with a general increase in concentrations. Well 199-B3-47 monitors the 116-B-11 retention basin. The source of chromium at well 199-B5-1 is believed to be sodium dichromate transfer facilities (BHI-00917).

2.2.5 Nitrate

One well, 199-B3-47, exceeded the 45 mg/L maximum contaminant level in fiscal year 1999 with a result of 50.4 mg/L. Concentrations are generally increasing in this well (Figure 2.2-2).

Some wells had high nitrate concentrations in fiscal years 1997 or 1998. Concentrations decreased in these wells in fiscal year 1999, but in some cases remain above earlier levels (Figure 2.2-3). Other wells show no obvious increasing or decreasing trends.

2.2.6 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.

2.2.6.1 Aquifer Sampling Tube Results

The highest concentrations of contaminants of concern from the fall 1998 sampling round were as follows: 52 pCi/L gross beta, 49.5 µg/L hexavalent chromium (filtered sample), 43 mg/L nitrate, and 66,000 pCi/L tritium. These values are consistent with groundwater contaminant concentrations in monitoring wells near the Columbia River shoreline.

2.2.6.2 Riverbank Seepage Results

The integrated *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* and Surface Environmental Surveillance projects collected samples from two seeps along the 100 B/C Area shoreline during October 1998. The highest contaminant concentrations were as follows: 21 µg/L chromium (filtered sample), 21.5 pCi/L gross beta, 15 mg/L nitrate, 5.73 pCi/L strontium-90, and 14,200 pCi/L tritium.

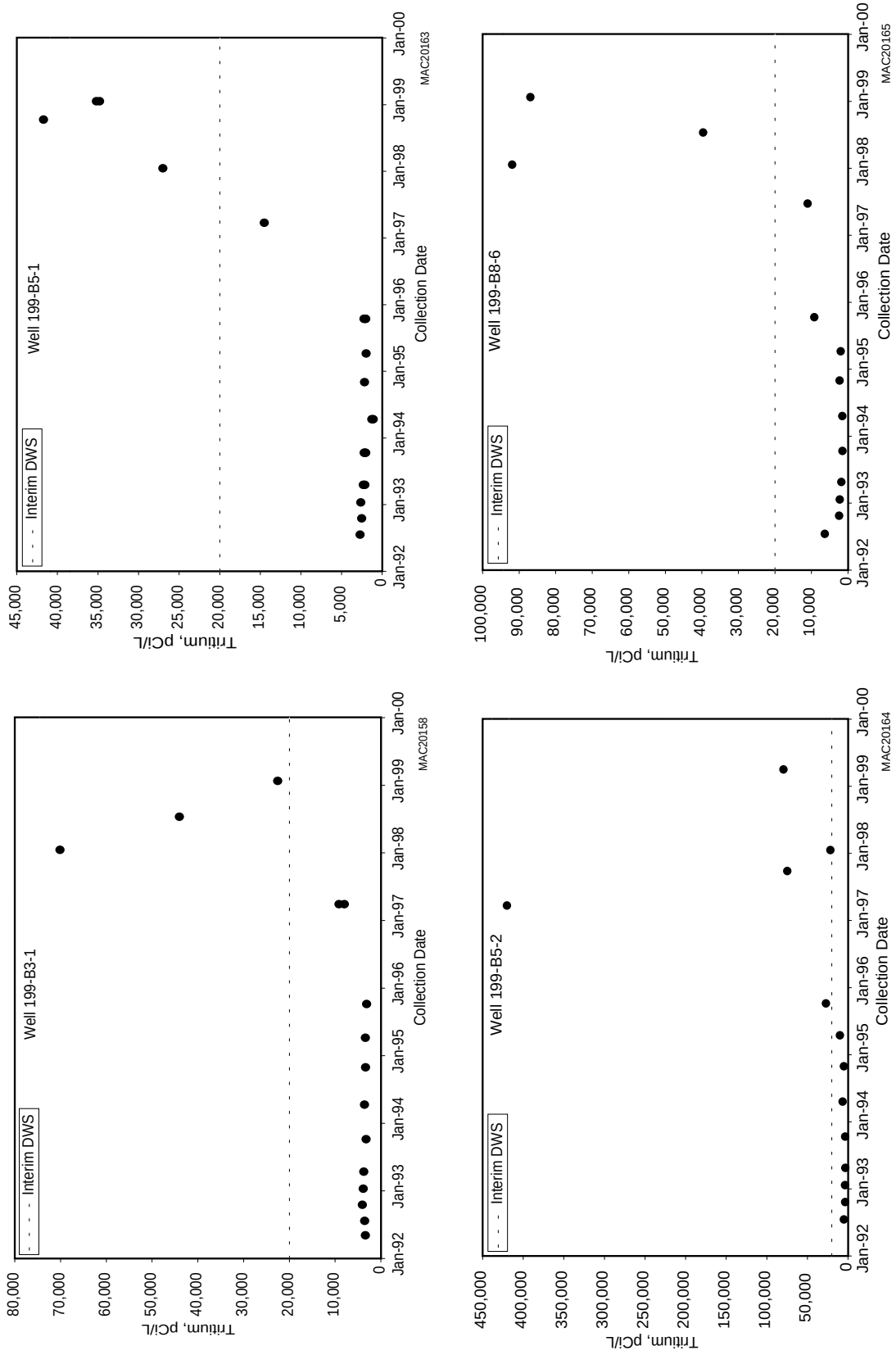

Figure 2.2-1. Tritium in Wells at 100 B/C Area

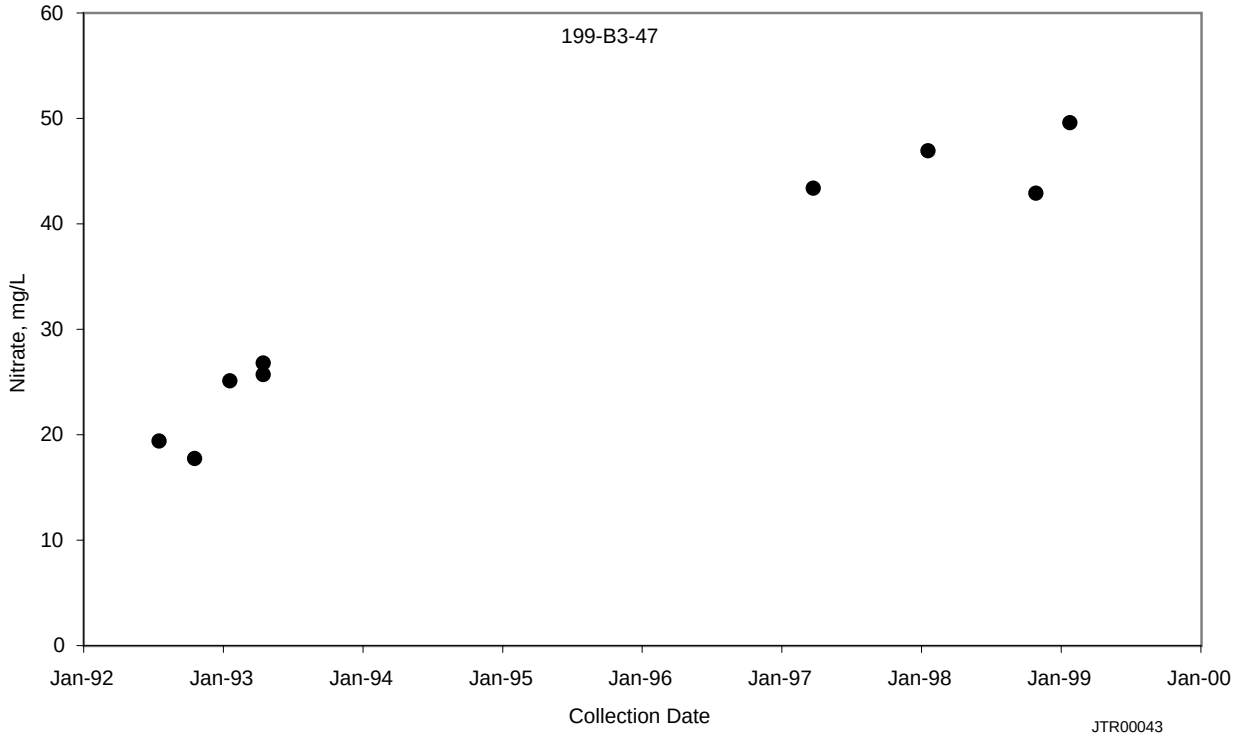

Figure 2.2-2. Nitrate in Well 199-B3-47 Near 116-B-11 Retention Basin

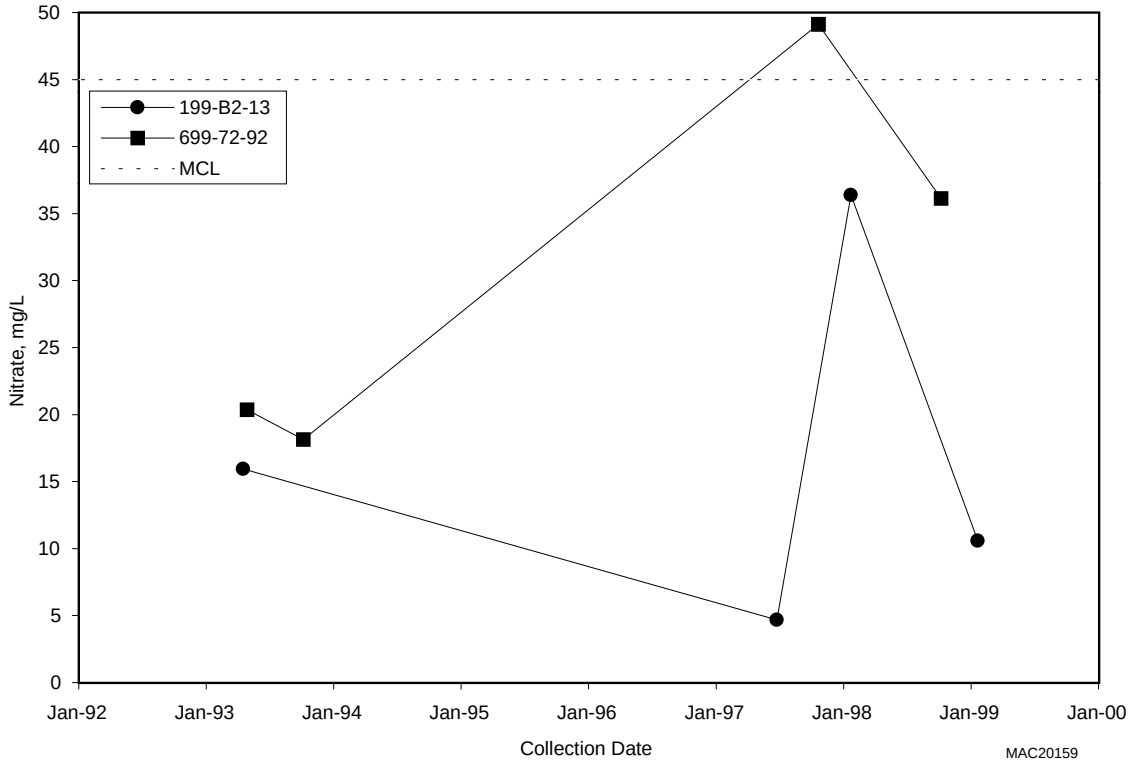

Figure 2.2-3. Nitrate in Wells 199-B2-13 and 699-72-92, West of 100 B/C Area