

2.2 100-BC-5 Operable Unit

M. J. Hartman

The scope of this section is the 100-BC-5 groundwater interest area, which includes the 100-BC-5 Operable Unit (Figure 2.1-1). Figure 2.2-1 shows facilities, wells, and shore-line monitoring sites in this region. Groundwater contaminants of concern include strontium-90, tritium, nitrate, and chromium.

Groundwater flows primarily to the north toward the Columbia River beneath the 100-B/C Area (Figure 2.2-2). The hydraulic gradient is very flat in the south 100-B/C Area and in the west part of the interest area (Figure 2.1-3). At times the river elevation is higher than the water table, and the river recharges the aquifer west of 100-B/C Area.

The remainder of this section describes contaminant plumes and concentration trends for the contaminants of concern under the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) or *Atomic Energy Act of 1954* (AEA) monitoring. There are no active waste disposal facilities or *Resource Conservation and Recovery Act* (RCRA) sites in the 100-B/C Area.

2.2.1 Groundwater Contaminants

This section describes distributions and trends for strontium-90, tritium, nitrate, and chromium beneath the 100-BC-5 groundwater interest area.

2.2.1.1 Strontium-90

The strontium-90 plume beneath 100-B/C Area is wedge-shaped, with an apex in the central 100-B/C Area, extending and spreading north toward the Columbia River (Figure 2.2-3). The plume has not changed significantly in at least 10 years.

Strontium-90 concentrations continued to exceed the 8 pCi/L drinking water standard in several wells and in two aquifer tubes. In most wells, the concentrations are variable but are not increasing or decreasing overall. The maximum strontium-90 concentration in fiscal year 2003 was 99 pCi/L in well 199-B3-46, near the 116-C-1 trench (Figure 2.2-4). Concentrations are variable in this well, but there is no clear relationship between concentrations and water levels. Concentrations vary directly with water level in some wells (e.g., well 199-B3-1; Figure 2.2-5).

Strontium-90 is limited to the top of the aquifer. None is detected in deeper well 199-B2-12.

Strontium-90 and tritium exceeded drinking water standards in groundwater at the 100-BC-5 Operable Unit during fiscal year 2003. Both contaminants are limited to the upper aquifer and are not detected in deep wells.

Groundwater monitoring in the 100-BC-5 groundwater interest area includes CERCLA and AEA monitoring:

CERCLA Monitoring

- Thirteen wells and one seep were sampled as scheduled; one seep was not flowing; samples from one well were not analyzed for three constituents (see Appendix A).*
- A new sampling and analysis plan was developed and approved in fiscal year 2003 for implementation in fiscal year 2004.*

AEA Monitoring

- Monitoring is integrated with CERCLA to avoid duplication.*
- Two wells that were not in the CERCLA plan were sampled to improve coverage.*

Tritium, nitrate, and chromium concentrations in groundwater are below drinking water standards beneath the 100-BC-5 Operable Unit.

2.2.1.2 Tritium

A tritium plume with concentrations above 2,000 pCi/L underlies the north 100-B/C Area and extends west and east of the area boundaries (Figure 2.1-5). In most wells, tritium concentrations showed a peak in about 1997 to 1998 and have declined since then. Thus, the area of the plume has decreased.

In fiscal year 2003, concentrations exceeded the 20,000 pCi/L drinking water standard in one well near the Columbia River and in a nearby aquifer tube (Figure 2.2-6). Concentrations also typically exceed the standard in one well near the 118-B-1 burial ground, but that well was not scheduled for sampling in fiscal year 2003.

Data from well 699-72-73 and aquifer tube 14-D, east of the 100-B/C Area (see Figure 2.1-2 for well location), indicate that tritium and technetium-99 from the 200 Areas have migrated north toward the Columbia River. The tritium concentration in well 699-72-73 peaked at over 20,000 pCi/L in 2001 but declined to 13,000 pCi/L in fiscal year 2003 (Figure 2.2-7). Aquifer tube 14-D detected 7,800 pCi/L of tritium in November 2002.

Tritium is limited to the upper aquifer. No tritium was detected in deeper well 199-B2-12, which is completed beneath the shallow tritium plume near the former retention basin and disposal trenches.

2.2.1.3 Nitrate

Nitrate is not a major groundwater contaminant in the 100-BC-5 groundwater interest area. Concentrations continued to be below the 45 mg/L drinking water standard. Concentrations in several wells (199-B2-13, 199-B3-47, and 199-B3-1) in the north 100-B/C Area exceeded 20 mg/L in fiscal year 2003. Nitrate concentrations in those wells are variable. Some of the variability appears to relate to river stage, as a higher water table mobilizes contaminated water from the lower vadose zone.

Like tritium, nitrate concentrations are very low in deep well 199-B2-12.

2.2.1.4 Chromium

Chromium concentrations have remained below the 100 µg/L drinking water standard in the 100-B/C Area in recent years. Dissolved chromium concentrations exceed 20 µg/L in an area approximately coincident with the strontium-90 plume.

The highest chromium concentration in fiscal year 2003 was detected in well 199-B3-47 (46 µg/L). Concentrations have been steady or decreasing in recent years. Chromium concentrations in nearby aquifer tubes 5 and 6 were comparable to those in groundwater (~38 µg/L).

2.2.2 CERCLA Groundwater Monitoring

No groundwater remediation decisions have been made for the 100-BC-5 Operable Unit. Until such decisions are made, the Groundwater Performance Assessment Project monitors plume extent and contaminant trends, as discussed in the preceding sections.

The sampling and analysis plan that was in effect during fiscal year 2003 (PNNL-13326) specified annual sampling of 9 wells and 2 seeps and biennial sampling of 12 wells (Appendix A). Of these, 13 wells and 2 seeps were scheduled for sampling in fiscal year 2003. All 13 wells were sampled, but gross alpha, gross beta, and strontium-90 were not analyzed in one of the wells (699-63-90) south of the 100-B/C Area. The impact of this omission is minimal, since the well is upgradient from contaminant sources in the operable unit. One seep was not sampled for the 100-BC-5 Operable Unit because it was not flowing at the time of

Plume areas (square kilometers) above the drinking water standard at the 100-BC-5 Operable Unit:

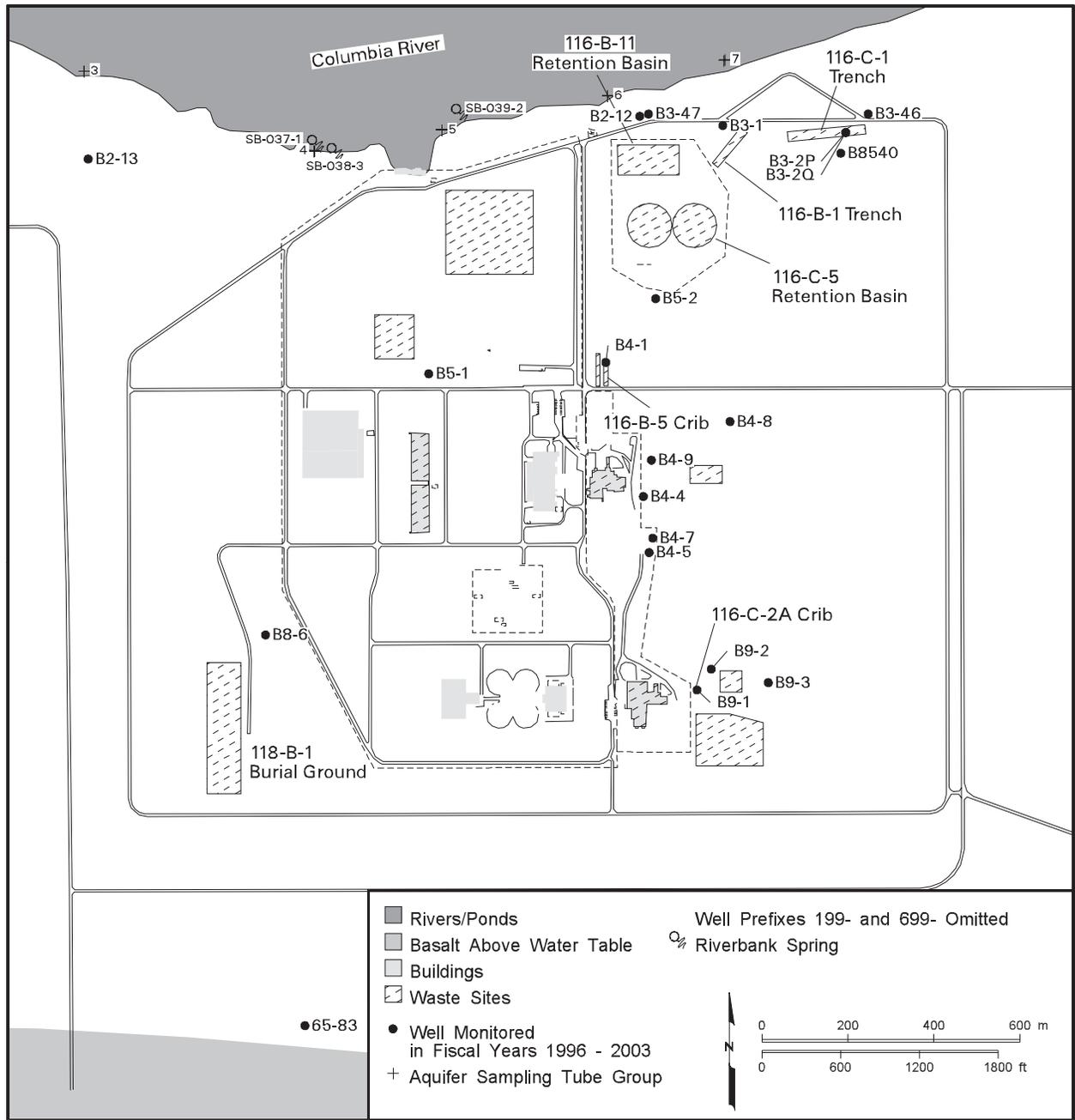
Strontium-90 — 0.86

**Tritium — 0.07*

**Excludes plume from 200-BP-5 Operable Unit.*

sampling in fall 2002. It was sampled in September 2003 for another project. Those data will be included in the Hanford Site Environmental Report for 2003.

The U.S. Environmental Protection Agency approved a new sampling and analysis plan at the end of September 2003 (DOE/RL-2003-38). The new plan, which is being implemented in fiscal year 2004, revises the monitoring program slightly and calls for the addition of more aquifer sampling tubes to monitor contaminants near the Columbia River.



can_gwf03_31 January 29, 2004 3:54 PM

Figure 2.2-1. Groundwater Monitoring Wells in the 100-B/C Area

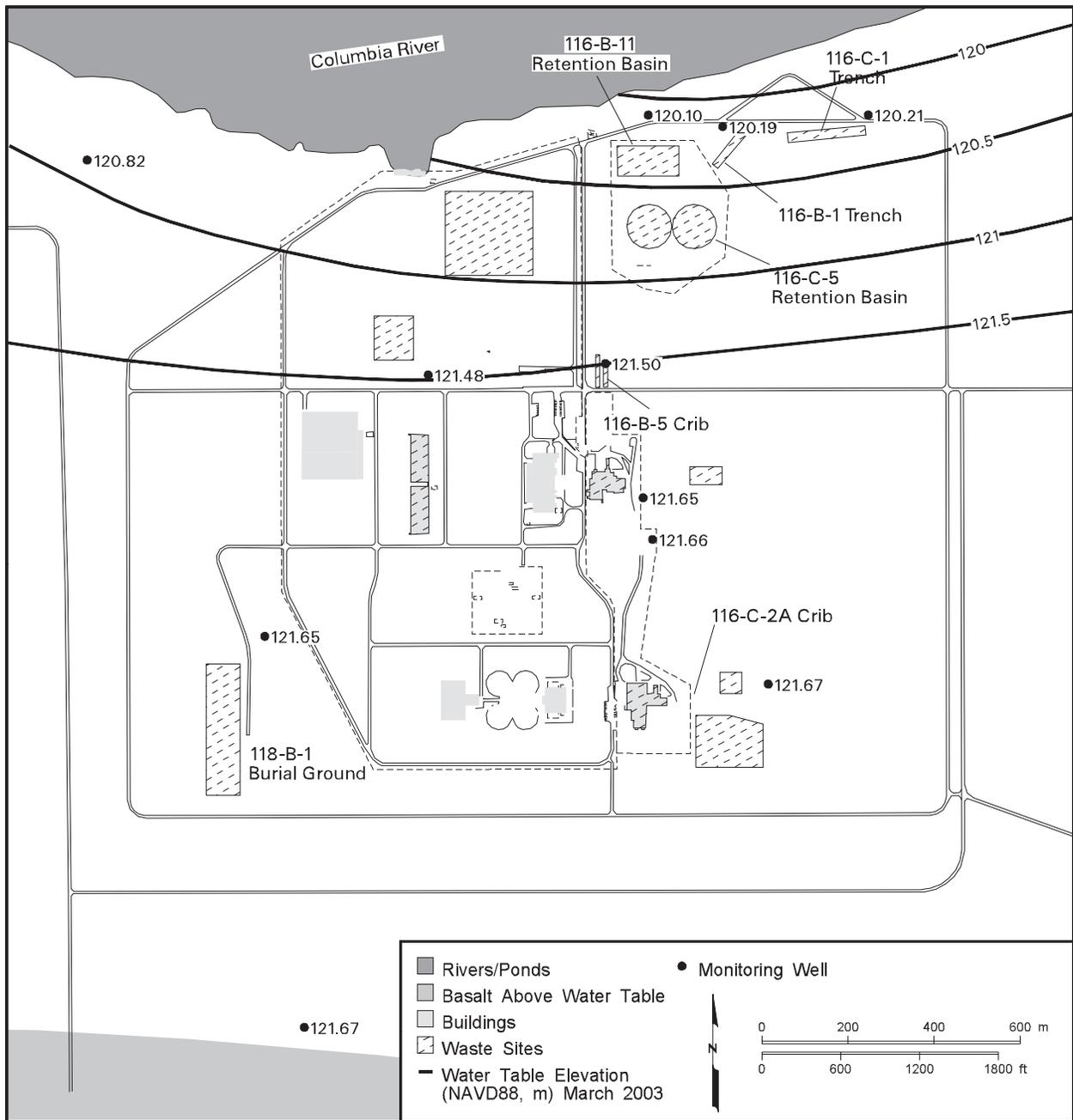


Figure 2.2-2. 100-B/C Area Water-Table Map, March 2003

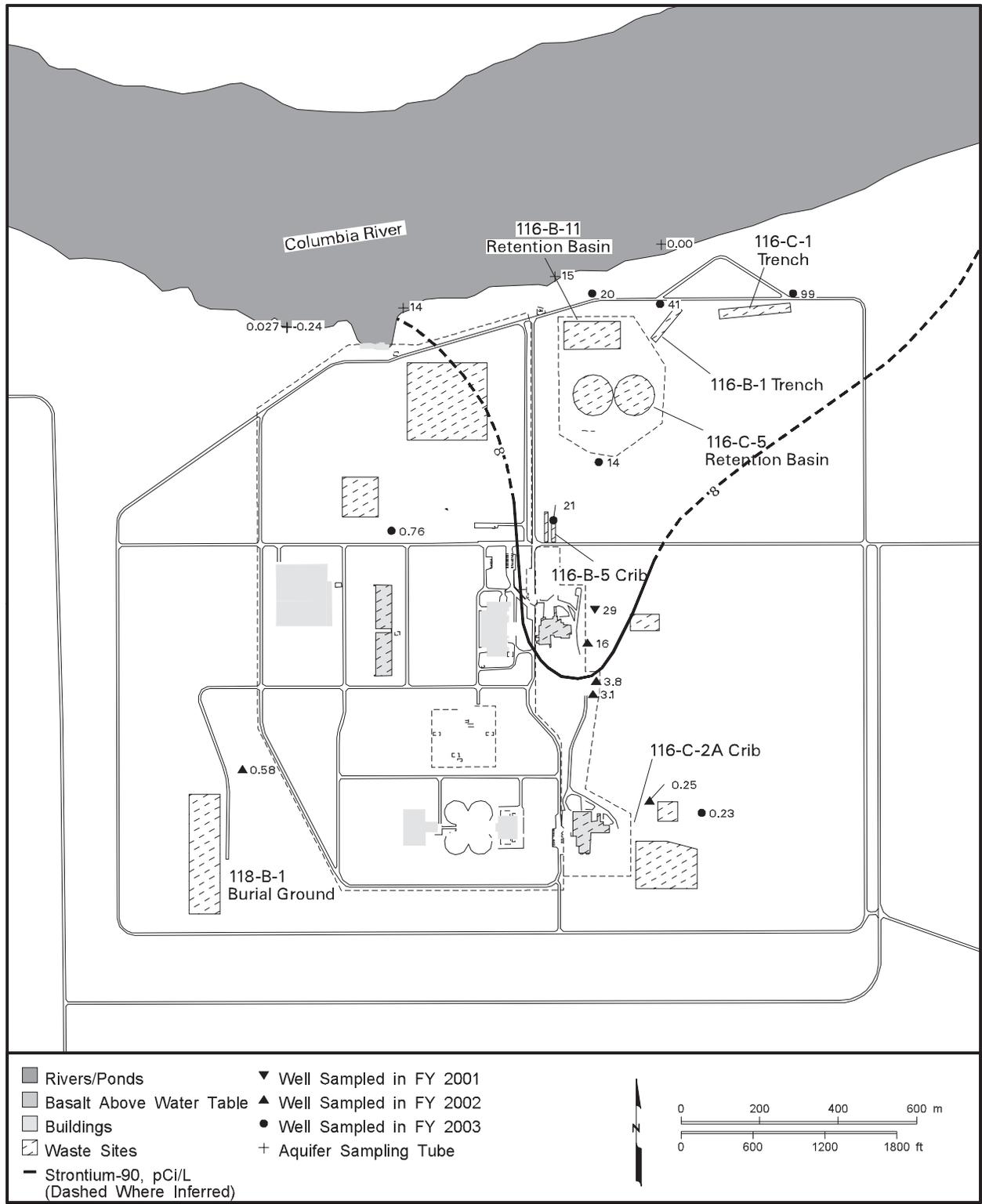
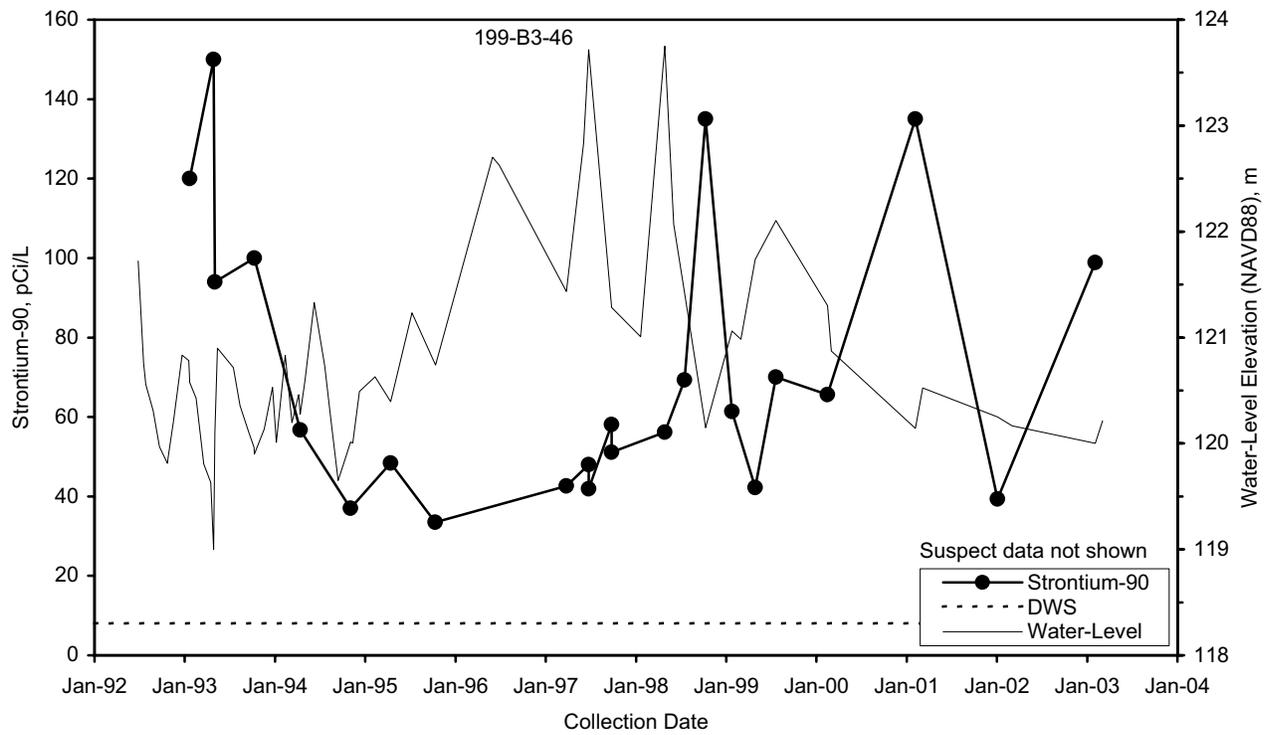
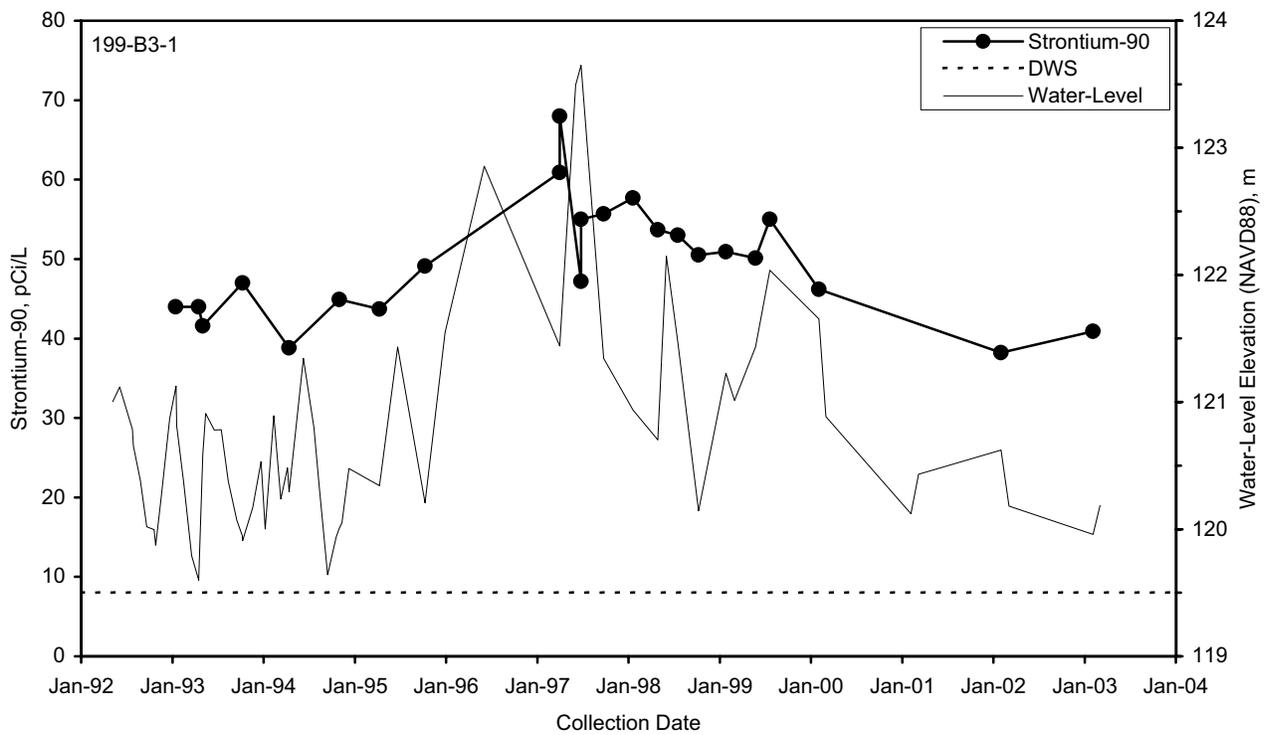


Figure 2.2-3. Average Strontium-90 Concentrations in the 100-B/C Area, Top of Unconfined Aquifer



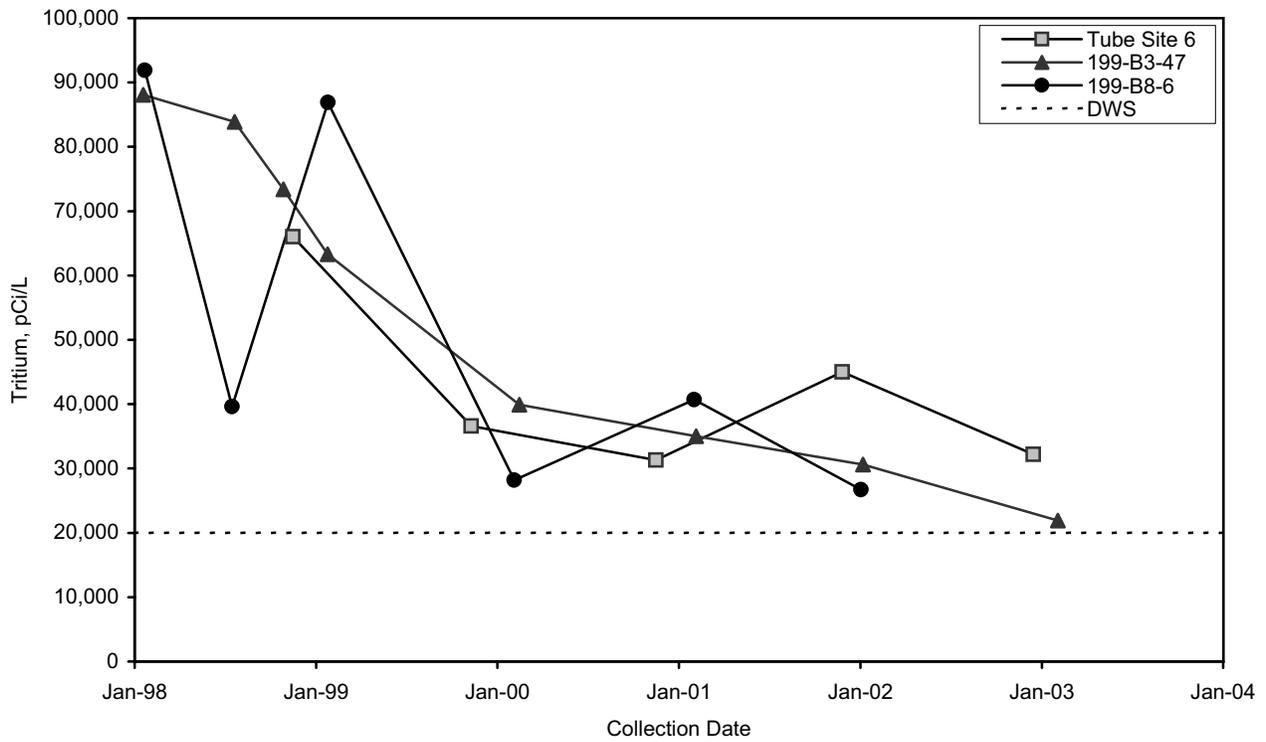
mac03031

Figure 2.2-4. Strontium-90 Concentrations and Water Levels Near 116-C-1 Trench



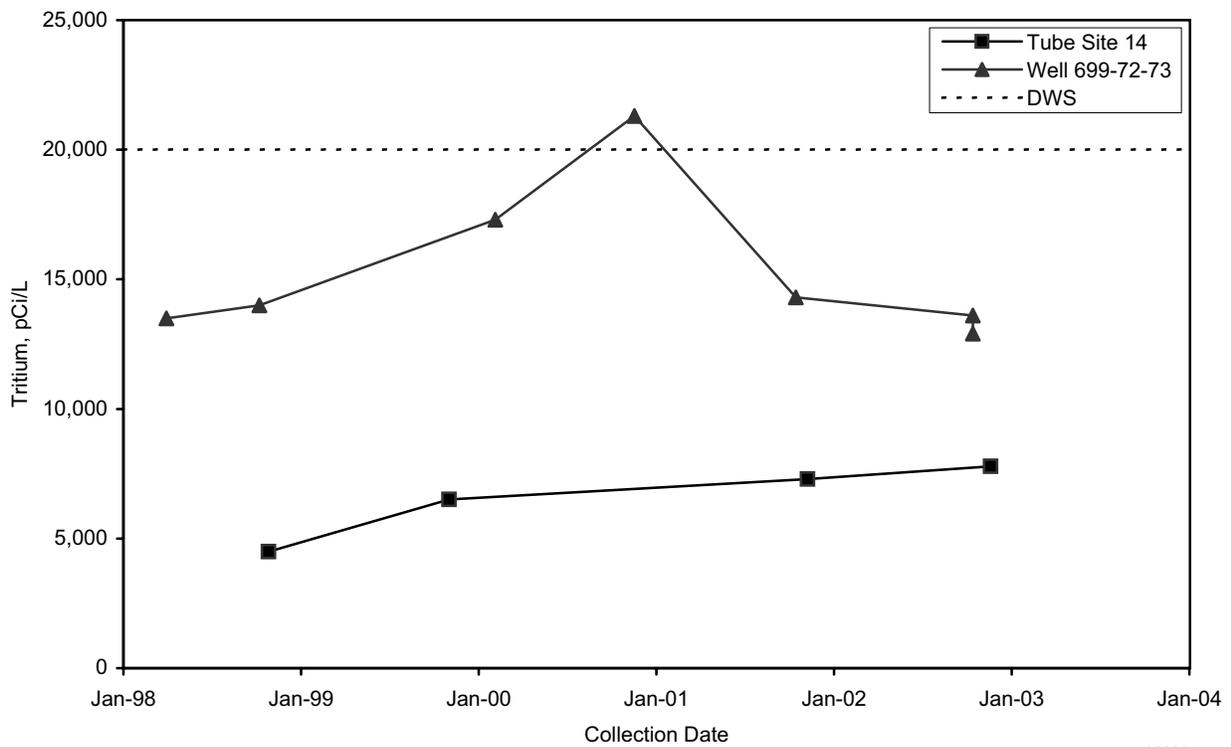
mac03030

Figure 2.2-5. Strontium-90 Concentrations and Water Levels Near 116-B-1 Trench



mac03004

Figure 2.2-6. Tritium Concentrations Near 116-B-11 Retention Basin (well 199-B3-47 and tube site 6), and Near 118-B-1 Burial Ground (well 199-B8-6)



mac03005

Figure 2.2-7. Tritium Concentrations East of 100-B/C Area