DRAFT QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT GROUNDWATER MONITORING DATA FOR THE PERIOD JANUARY THROUGH MARCH 2004.

Sixteen *Resource Conservation and Recovery Act of 1976* (RCRA) sites[1] were sampled during the reporting quarter, as listed in Table 1. Sampled sites include eight monitored under groundwater indicator evaluation ("detection") programs [40 CFR 265.93(b)], seven monitored under groundwater quality assessment programs [40 CFR 265.93(d)], and one monitored under a final-status groundwater corrective action program [WAC 173-303-645(11)].

DOE asserts that pursuant to the *Atomic Energy Act of 1954* (AEA), it has sole and exclusive responsibility and authority to regulate source, special nuclear and by-product materials at DOE-owned nuclear facilities. DOE further asserts that source, special nuclear and by-product materials as defined by AEA are not subject to regulation by the State of Washington and are not subject to State permit, license, order, or any other enforceable instrument thereof. DOE recognizes that radionuclide data are useful in the development and confirmation of geohydrologic conceptual models of the hydrologic flow system including, but not limited to, the rate and direction of groundwater flow, discrimination of the source of contaminant plumes in areas of multiple potential contamination sources, recharge mechanisms and rates to groundwater, and the performance of corrective measures. Radionuclide data contained herein are provided so that all information available may be used for such purposes.

Comparison to Concentration Limits

Contamination indicator parameter data (pH, specific conductance, total organic halides, and total organic carbon) from downgradient wells were compared to background values at sites monitored under detection requirements, as described in 40 CFR 265.93. Results of the comparisons are listed in Table 1. Additional explanation, if needed, is provided below.

1301-N Liquid Waste Disposal Facility: Average specific conductance in downgradient well 199-N-3 (1,291 μS/cm) exceeded the critical mean value (1,113 μS/cm) in March. Prior assessment results (Hartman 1992) indicated the elevated specific conductance is related to nonhazardous constituents from an upgradient facility. The site will remain in detection monitoring.

1324-N/NA Facilities. Specific conductance at downgradient wells 199-N-72 (717 μS/cm) and 199-N-73 (702 μS/cm) continued to exceed the critical mean value (489 μS/cm) in March. Groundwater quality assessment monitoring in 1992 (Hartman 1992) indicated that the high specific conductance is caused by the nonhazardous constituents sulfate and sodium. Because an assessment has already been completed and the high conductivity is caused by nonhazardous constituents, verification sampling and additional assessment monitoring will not be conducted. Downgradient well 199-N-59 could not be sampled in March 2004 because the well continued to be dry. The well can be sampled when the water table rises with increased river stage.

1325-N Liquid Waste Disposal Facility. Average specific conductance in downgradient well 199-N-41 (516 μS/cm) continued to exceed the critical mean value (451 μS/cm) in March. DOE notified Ecology of an earlier exceedance and transmitted the results of the groundwater quality assessment (Thompson, 2000). The high specific conductance is believed to originate at an upgradient source, and passed the location of the upgradient well several years ago, so the site will remain in a detection monitoring program.

---

[1] A site is a Treatment, Storage, and/or Disposal (TSD) unit or a waste management area associated with a TSD unit.

216-B-3 Pond. In January 2004, B-Pond reverted to interim-status monitoring requirements as prescribed in 40 CFR 265.92 (and by reference of WAC 173-303-400). For the previous two years, an alternative monitoring program, including alternative statistical methods, was under trial. None of the indicator parameters exceeded critical mean values in January 2004.

Low-Level Waste Management Area 3. Critical mean values were revised because upgradient well 299-W10-19 and downgradient wells 299-W7-1 and 299-W7-7 went dry and could not be sampled during the reporting quarter. Seven wells to be installed in 2005 have been proposed as part of the Tri-Party Agreement (TPA) milestone M-24 process. Indicator parameters did not exceed critical mean values. However, the results must be evaluated in the light of network limitations. The monitoring network at LLWMA-3 was designed in the late 1980s when the flow direction was toward the north-northeast. Under those flow conditions, contamination from upgradient sources (e.g., carbon tetrachloride) affected groundwater quality beneath much of the waste management area. Over the course of the past decade or more, flow directions have shifted toward the east, with the most recent direction determined to be toward the east-northeast (66 degrees east of north). Several of the designated upgradient wells are no longer hydraulically upgradient of the entire waste management area under current flow conditions. The Part B Permit Application Notice of Deficiency Process for the Low-Level Burial Grounds will address this shortcoming in the monitoring network. However, it is important to note that the preexisting flow direction and upgradient sources have resulted in variable contaminant levels across the waste management area. Thus no upgradient well locations can truly represent the preexisting contaminant levels for comparisons with downgradient wells. Under interim-status detection monitoring, statistical calculations will continue using the existing monitoring network, but the statistical results must be evaluated in the light of the complex contaminant history at the site.

Low-Level Waste Management Area 4. The network consists of three upgradient wells and only one downgradient well. Six downgradient wells to be installed in calendar year 2005 have been proposed as part of the TPA M-24 milestone process. Concentrations of total organic halides in the downgradient well, 299-W15-16 (237 μg/L in January 2004) continued to exceed the critical mean value of 123.3 μg/L. This well used to be an upgradient well and the exceedance is believed to originate from an upgradient source. DOE reported an earlier exceedance in this well to Ecology and EPA (Furman 1999), and detection monitoring will continue.

Single-Shell Tank WMA A-AX: Last quarter, data reported for the new downgradient well, 299-E25-93, showed high levels of contamination for the first sampling event in December 2003. Total organic carbon (TOC) data averaged over four duplicate samples was 3,600 μg/L, well over the critical mean of 2,360 μg/L for this site. Verification sampling was conducted in March 2004. Results from verification sampling for TOC averaged 1,700 μg/L, which is below the critical mean for this site. However, the verification result was above the limit of quantitation of 1,370 μg/L, and thus indicates that TOC is elevated in the groundwater. A split sample is required to be sent to a separate laboratory as part of verification sampling and analysis; scheduling problems associated with this well resulted in the split sample not being collected. The results of the next sampling will be reviewed to determine if the most recent TOC result is confirmed. The site will remain in a detection monitoring program. Because the groundwater is also elevated in nitrate (46.9 mg/L) and technetium-99 (13,100 pCi/L), this well has been placed on quarterly sampling for this year beginning with the June 2004 sampling event.

Wells Not Sampled as Scheduled

The wells listed in Table 2 were not sampled as scheduled. Wells that were delayed from their original sampling date are listed only if the successful sample date was beyond the end of the reporting quarter. The table does not include wells that were reported dry in previous quarterly or annual reports.

Table 1. Status of RCRA Sites January-March 2004.

Site	Routine sampling?	DG Statistical exceedance?	Comments
Indicator Evaluation Sites [40 CFR 265.93(b)] (sampled semiannually)			
1301-N Liquid Waste Disposal Facility	Yes	Yes[a]	See text.
1325-N Liquid Waste Disposal Facility	Yes	Yes[a]	See text.
1324-N/NA Facilities	Yes	Yes[a]	See text.
216-B-3 Pond	Yes	No	Reverted to interim-status statistical methods after 2-year trial period of alternative statistics.
216-A-29 Ditch	No	Not sampled	
216-B-63 Trench	No	Not sampled	
216-S-10 Pond and Ditch	No	Not sampled	Current network 2 shallow and 1 deep DG wells[(b)]
LERF	No	Not sampled	No statistical evaluation per Ecology.
LLWMA 1	No	Not sampled	
LLWMA 2	No	Not sampled	Wells monitoring the north part of the LLWMA are dry[(b)].
LLWMA 3	Yes	No	See text. Comparison value revised. 3 more dry wells; 12 of 20 wells in original network are dry[(b)]
LLWMA 4	Yes	Yes[a]	See text. Current network 3 UG, 1 DG well[(b)].
SST WMA A-AX	No	See comment	Verification sample. See text.
SST WMA C	Yes	See comment	Sampled quarterly. No statistical evaluation until 4 quarters stable data from UG well.
NRDWL	Yes	No	
Groundwater Quality Assessment Sites [40 CFR 265.93(d)] (sampled quarterly)			
Seven sites[c]	Yes	Not required	See updates in text.
Final Status Sites [WAC 173-303-645(11)]			
300 Area Process Trenches	Yes	Yes[d]	
183-H Solar Evaporation Basins	No	Not sampled	

CM = Critical mean value(s)
DG = Downgradient
LERF = Liquid Effluent Retention Facility
LLWMA = Low-Level WMA
NRDWL = Nonradioactive Dangerous Waste Landfill
SST = Single-Shell Tanks
UG = upgradient
WMA = Waste Management Area

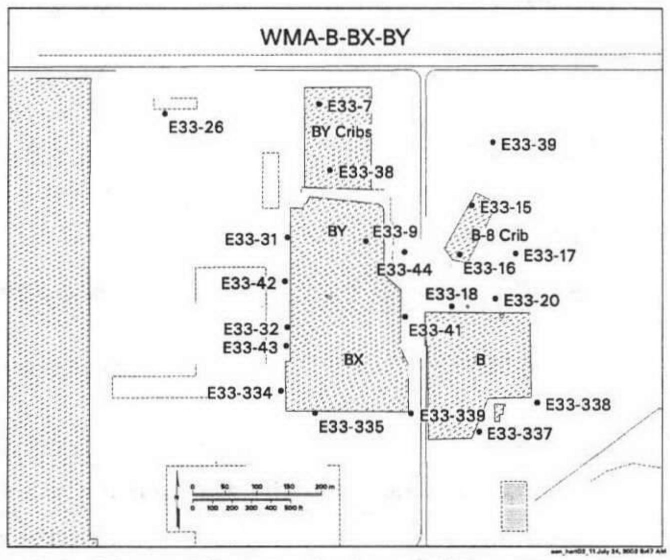
[a] No indication of dangerous waste contamination from facility; see text for explanation.
[b] Well installation needs are addressed each year as part of the M-24 milestone process.
[c] U-12 Crib, PUREX Cribs, SST WMAs B-BX-BY, S-SX, T, TX-TY, and U.
[d] Site has entered corrective action monitoring because of previous exceedances.

Table 2. Wells Not Sampled as Scheduled During the Reporting Period.

Well	RCRA Site	Date Scheduled	Date Sampled	Comment
199-N-59	1324-N/NA	3/03	--	Well dry; can be sampled only when water table rises. The current plan allows for this situation.
299-W10-19	LLWMA 3	3/22/04	--	Dry well.
299-W7-1	LLWMA 3	3/22/04	--	Dry well.
299-W7-12	LLWMA 3	3/24/04	4/05/05	Access problem; high wind and blowing dust.
299-W7-7	LLWMA 3	3/24/04	--	Dry well.

Status of Assessment Programs

This section describes the seven RCRA sites currently monitored under groundwater quality assessment.



Single-Shell Tanks Waste Management Area B-BX-BY: Based on in situ measurements, the groundwater is nearly stagnant in the north part of the waste management area, flowing slowly to the west southwest. In the southern half, it flows towards the south-southeast and southeast with a faster flow rate than in the north. From roughly November 2002 to September 2003, water levels ceased to decline and, for some areas, started to rise (see last quarterly report). This changing trend was not local to the WMA, but included a large portion of the 200 East Area. More recently the water level at the WMA is again decreasing and has dropped about a quarter of a foot in the last 6 to 7 months. One well under the BY Cribs, 299-E33-6, is dry down to the basalt indicating that the edge of the aquifer is impinging on this area.

In general, nitrate trends continued to display small fluctuations or remained steady. For example, the nitrate concentration changed from 107 mg/L to 100 mg/L from November 2003 to February 2004 in well 299-E33-32, located west of the BX Tank Farm. North of the B Tank Farm, the nitrate concentrations have remained relatively steady, changing from 128 to 124 mg/L over the same time period in well 299-E33-18. The highest nitrate concentration (611 mg/L) is now seen under the BY Cribs instead of the B-8 Crib (514 mg/L), which has shown a decreasing trend since late in 2000 when the maximum value reached 695 mg/L.

In the central part of the WMA, technetium-99 values are remaining steady or increasing slightly, ranging from 458 pCi/L just east of the BX Tank Farm to 3,360 pCi/L under the BY Tank Farm. However east of the BY Tank Farm and to the north under the BY Cribs, technetium-99 values appear to be rising with the maximum value found under the BY Cribs at 11,100 pCi/L.

As shown in Figures 1, 2 and 3, uranium levels under the BY Tank Farm, east of the farm and to the north in the southern part of the BY Cribs, are tracking with the rising technetium-99 contamination. However, the peak values from late 2000 to early 2001 indicate that the uranium's movement is retarded with respect to the mobile technetium-99, as expected. Although the technetium-99 peaks in well 299-E33-9 (Figure 1) and 299-E33-44 (Figure 2) are only offset from the corresponding uranium peaks by about 3 months, the two contaminant peaks are offset under the BY Cribs (well 299-E33-38; Figure 3) by over 18 months. The longer the travel path from the original processing source to the well where the mobile technetium-99 and retarded uranium are observed, the greater the amount of separation between the time the technetium-99 peak is seen and the corresponding uranium peak. Thus the wells 299-E33-9 and 299-E33-44 are closer to a source of uranium than well 299-E33-38. When uranium trends are compared for wells located south and north of well 299-E33-9 (Figure 4), it can be seen that the center of the uranium plume is located under the BY Tank Farm. The current maximum uranium value in the groundwater under the BY Tank Farm is 590 μg/L and rising.

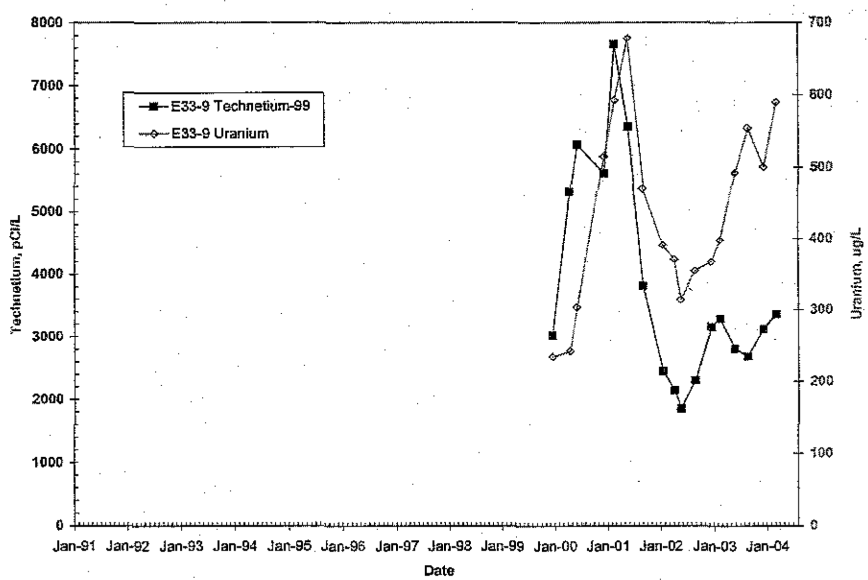


Figure 1. Technetium-99 and Uranium in Well 299-E33-9.

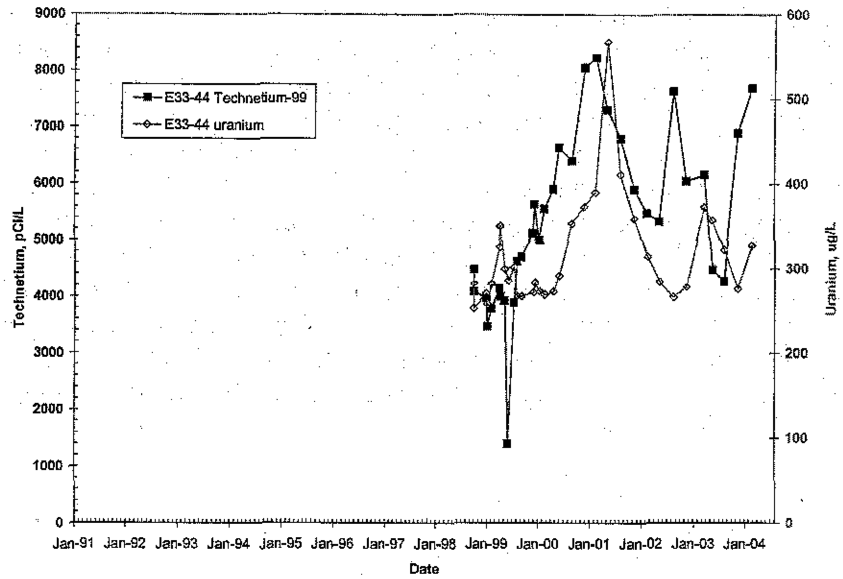


Figure 2. Technetium-99 and Uranium in Well 299-E33-44.

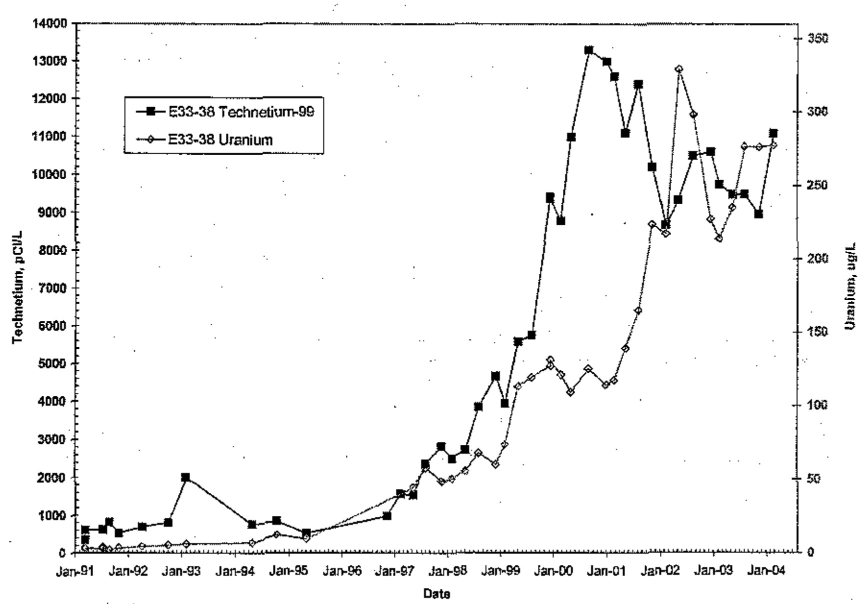


Figure 3. Technetium-99 and Uranium in Well 299-E33-38.

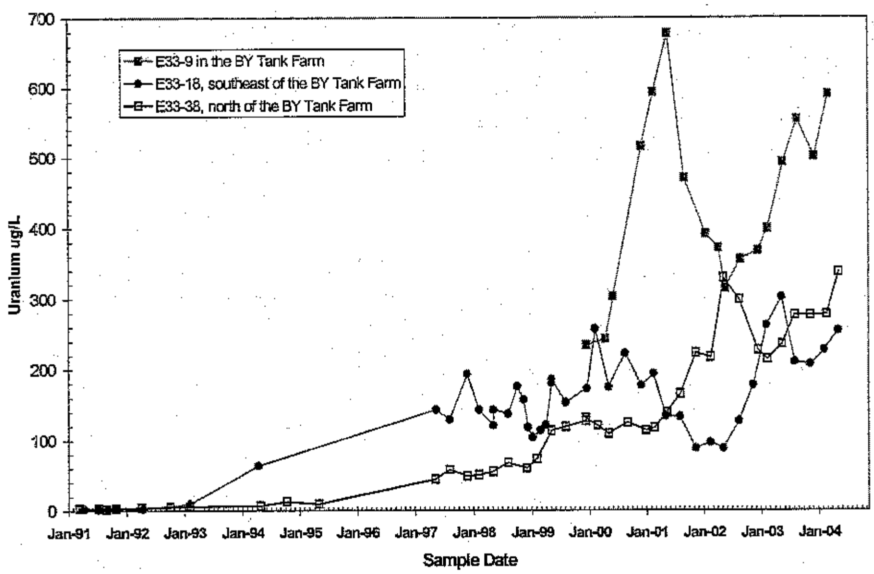
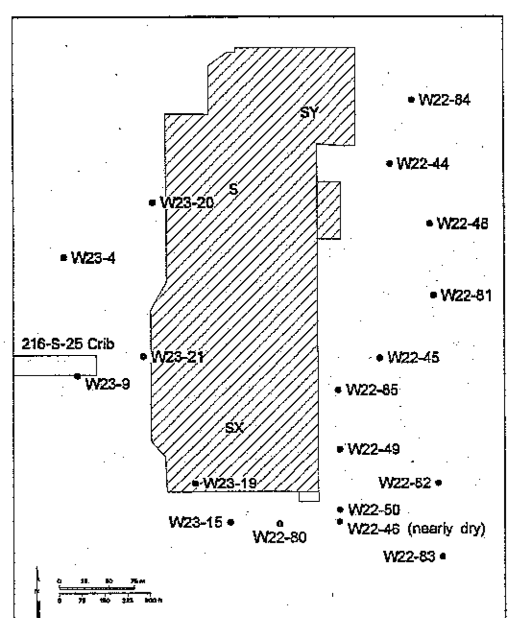


Figure 4. Uranium in Wells 299-E33-9, 299-E33-18, and 299-E33-38.

Evidence was shown and discussed in Hartman et al. (2003) that indicates the contamination seen in and around WMA B-BX-BY is entering the groundwater in multiple areas from the vadose zone and thus has its source in the contaminated soils under both the tank farms and the surrounding cribs. The correlation between the technetium-99 and uranium trends in the figures above shows that the uranium is traveling with the technetium-99 and is, most likely, from the same contaminated soils as the elevated technetium-99 and nitrate. Finally, low levels of uranium at less than 10 μg/L continue to rise along the south and southwest boundaries of the WMA.

Although cyanide is now seen only sporadically south of the BY Cribs, trends at well 299-E33-38 (106 μg/L, February 2004) and 299-E33-7 (357 μg/L, February 2004) appear to be increasing with the rising technetium-99. The drinking water standard is 200 μg/L. In the past, high levels of cyanide with a maximum value of 423 μg/L (February 2001) were observed under the BY cribs.

Single-Shell Tank Waste Management Area S-SX: Groundwater beneath this site is contaminated with hexavalent chromium, nitrate, and technetium-99 attributed to two general source areas within the WMA. In addition, tritium and carbon tetrachloride are present in groundwater beneath the WMA, but their sources are from adjacent facilities. All analytical results from groundwater samples collected during the quarter were on trend.



The water table has continued to decline at a steady rate of approximately 0.3 meter per year; the gradient and flow direction are stable with the interpreted flow direction to the east.

The northern contaminant plume, with an apparent source in S Tank Farm, passes through wells 299-W22-44, 299-W22-48, and 299-W22-81. Contaminant concentrations in this plume appear to be on a downward trend for chromium, nitrate, and technetium-99. Concentrations for all three contaminants have continued to drop in well 299-W22-48. At the same time, the plume appears to be spreading to the north because nitrate and especially technetium-99 have continued to increase in well 299-W22-44, located approximately 60 meters north of well 299-W22-48. Either the axis of the plume may be shifting slightly north or the plume is spreading laterally resulting in well 299-W22-48 intercepting a higher concentration part of the plume. These trends can be seen in technetium-99 trends shown in Figures 5.

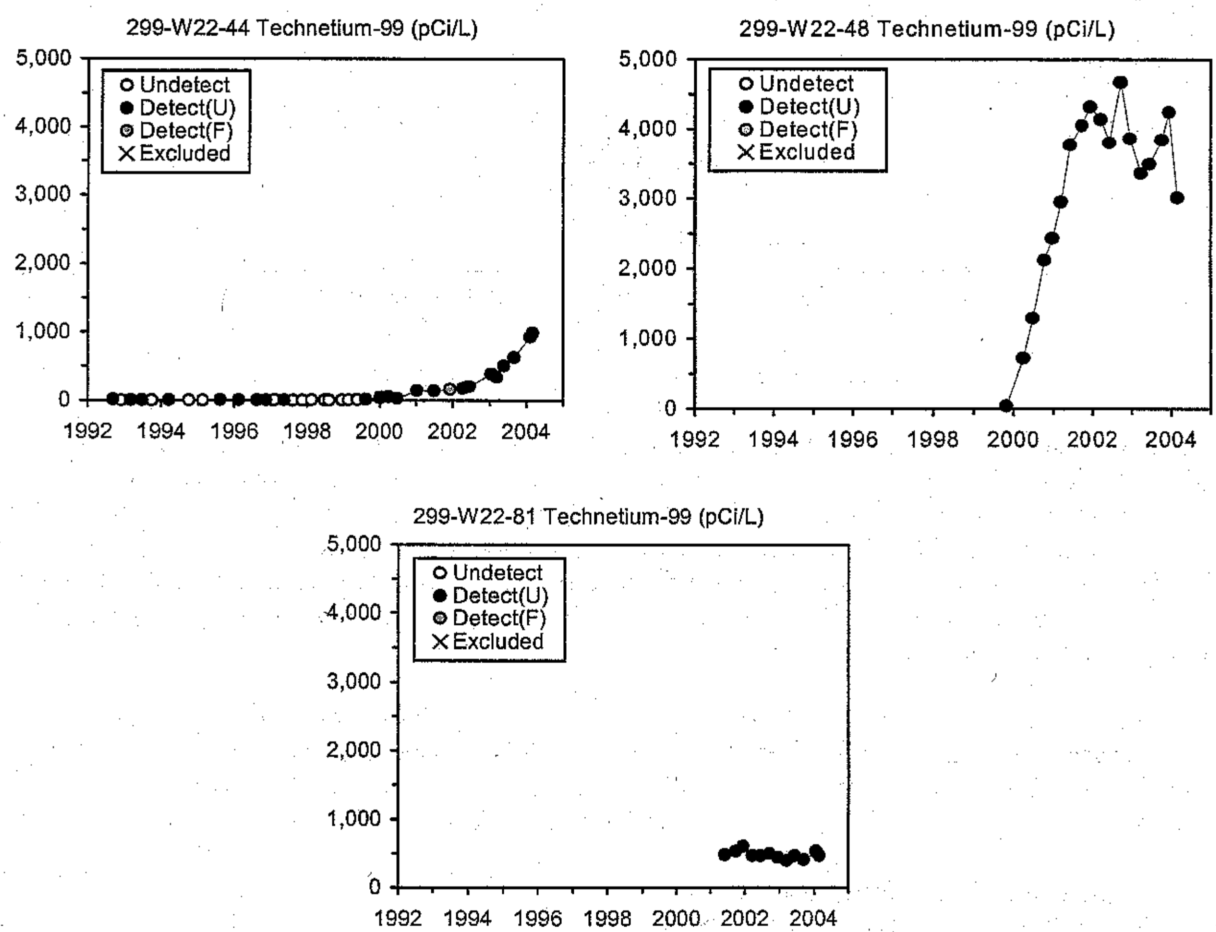


Figure 5. Technetium-99 in Wells Monitoring WMA S-SX.

The contaminant plume migrating from the SX Tank Farm in the southern portion of the WMA continues to spread slowly downgradient. This plume is comprised of chromium, nitrate, and technetium-99, just as the S Tank Farm plume to the north. Chromium concentrations in the source area (represented by well 299-W23-19; Figure 6) have continued to rise since the first half of 2002. At 143 μg/L in March 2004, the chromium concentration in the source area has again exceeded the 100 μg/L drinking water standard as in December 2000 and March 2001. As reported in previous reports, chromium concentrations have been increasing in the source area while nitrate and technetium-99 have been decreasing or remaining stable.

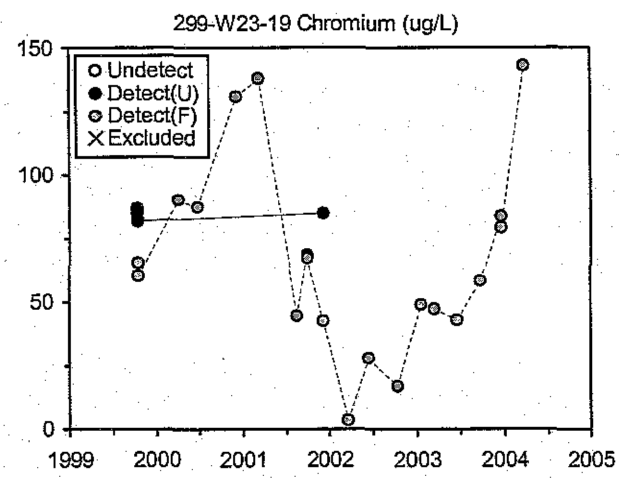
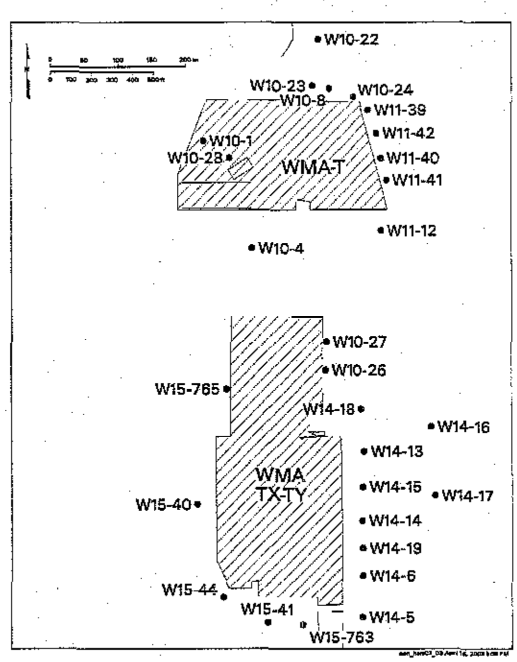


Figure 6. Chromium Concentrations in Well 299-W23-19, WMA S-SX.

Contaminant concentrations downgradient of the source area continued to increase or remained at elevated levels. Of the three plume contaminants, only chromium concentrations in well 299-W22-83 remained below the drinking water standard.

Data for well 299-W22-82 are used to provide an indication of the S-SX plume spreading on its northern margin. Nitrate and technetium-99 concentrations increased to their highest levels ever for the well during the quarter, but both were below their respective drinking water standards. These data indicate that the plume is slowing spreading to the north as well as to the east.



Single-Shell Tank Waste Management Areas T and TX-TY: Water levels in wells near WMA T continued to decline during the reporting period. The measured amount of decline during the past year was between 0.14 and 0.19 meter. Whereas the water table has continued to drop, the gradient remains unchanged; therefore, the rate and direction of groundwater flow has not changed appreciably during the quarter. Groundwater flow at WMA T is between about 5 degree north and 8 degrees south of east at a rate of about 0.022 meter per day.

Water level measurements in wells near WMA TX-TY showed between 0.09 and 0.2 meter decline in the water table during the reporting period. The groundwater flow direction at WMA TX-TY varies from the north to the south part of the WMA. In the north, groundwater flow is east to southeast at a rate of about 0.01 to 0.025 meter per day. In the south, where groundwater flow has been greatly altered by the 200-ZP-1 pump and treat system, flow direction is to the south or south-southwest at about 0.3 meter per day.

All wells in the monitoring networks at both WMA T and WMA TX-TY were successfully sampled during the first quarter of 2004.

WMA T

Chromium, carbon tetrachloride, and trichloroethene continued to be the only dangerous waste constituents found in the groundwater beneath WMA T. The source of the carbon tetrachloride and trichloroethene was liquid disposal associated with processes at the Plutonium Finishing Plant and not WMA T. Carbon tetrachloride and trichloroethene are monitored as part of the 200-ZP-1 Operable Unit. Nitrate and fluoride are also found in groundwater beneath the facility. In addition to the dangerous waste constituents, technetium-99, and tritium, non- RCRA-regulated constituents, are found in groundwater at the WMA.

Chromium concentrations continued to exceed the drinking water standard (100 µg/L) in four wells at WMA T in February 2004. The highest chromium concentration was in well 299-W10-4 located upgradient of the WMA. The concentration of chromium in this well was 386 µg/L, up from 350 µg/L during the previous quarter (Figure 7). Chromium concentrations have been increasing in this well since 1997. Well 299-W10-4 is located near the 216-T-36 crib, and that crib (or one of the cribs immediately west of the WMA) is the most likely source for the chromium.

Chromium in upgradient well 299-W10-28 exceeded the drinking water standard in February for the fifth straight quarter, with a concentration of 262 µg/L. The chromium concentration during the previous quarter was 202 µg/L.

Chromium continued to exceed the drinking water standard in two downgradient wells in February: 299-W11-41 and 299-W11-42. The chromium concentration was essentially unchanged from the previous quarter in well 299-W11-41 (144 µg/L) and well 299-W11-42 (143 µg/L). The source of the chromium in these wells is not known for certain but is not thought to be WMA T. Chromium in wells 299-W11-41 and 299-W11-42 could be from upgradient past practice disposal facilities such as the 216-T-36 crib and the 216-T-5 trench.

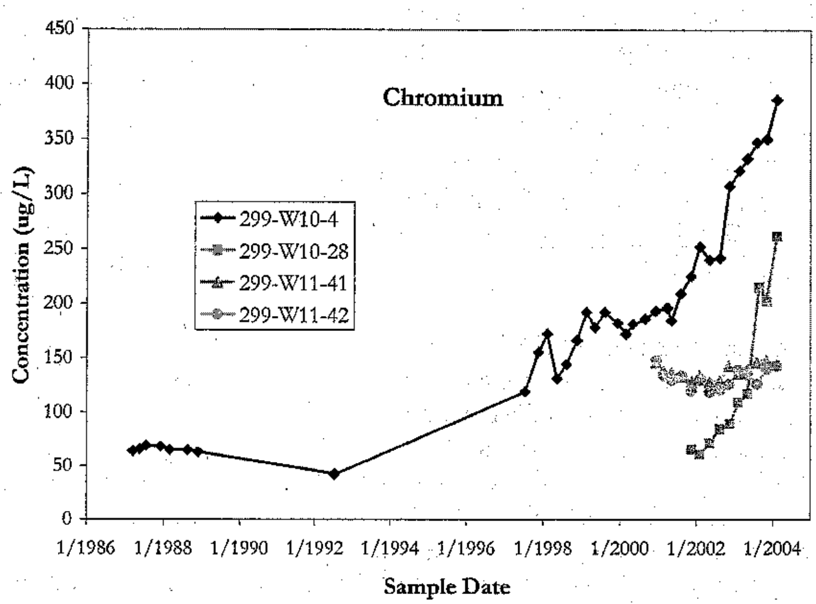


Figure 7. Chromium concentration in selected wells at WMA T. Wells 299-W10-4 and 299-W10-28 are upgradient wells; wells 299-W11-41 and 299-W11-42 are downgradient wells.

Nitrate concentrations remained above the drinking water standard in all wells in the WMA T network during the reporting period. The highest reported concentrations of nitrate were in upgradient wells 299-W10-4, where nitrate increased from 1,900 mg/L in November to 2,470 mg/L in February and in well 299-W10-28, where nitrate increased from 1,780 mg/L in November to 2,000 mg/L in February.

Nitrate concentrations in all downgradient monitoring wells at WMA T remained fairly level or increased slightly during the quarter. Concentrations in downgradient wells are between 239 mg/L (well 299-W11-40) and 952 mg/L (well 299-W11-42). Although a tank farm source for some of the nitrate in downgradient wells cannot be ruled out, most of the nitrate detected in wells at WMA T is believed to be from an upgradient source.

During the reporting period, the fluoride concentration in well 299-W10-23 fell below the Washington State drinking water standard for fluoride (4 mg/L) for the first time since November 2002. The concentration of fluoride in the well was 3.4 mg/L. Six other wells continued to exceed the secondary drinking water standard of 2 mg/L. These are 299-W10-4, located south of the WMA, 299-W10-8 and 299-W10-24, in the northeast corner of the WMA, and wells 299-W11-40, 299-W11-41, and 299-W11-42 east (downgradient) of the WMA.

Technetium-99 exceeded the 900 pCi/L drinking water standard in five downgradient wells at WMA T during February 2004 (Figure 8). The greatest concentration was 10,000 pCi/L in well 299-W11-39 which was down from 14,300 pCi/L during the previous quarter. The other wells exceeding the technetium-99 standard were 299-W10-24 (2,000 pCi/L), 299-W11-40 (1,160 pCi/L), 299-W11-41 (3,350 pCi/L), and 299-W11-42 (2,270 pCi/L). Technetium-99 concentration decreased slightly in the northern two wells (299-W10-24 and 299-W11-39) and increased slightly in the other three southern wells suggesting that technetium-99 contamination is spreading south along the eastern edge of the WMA.

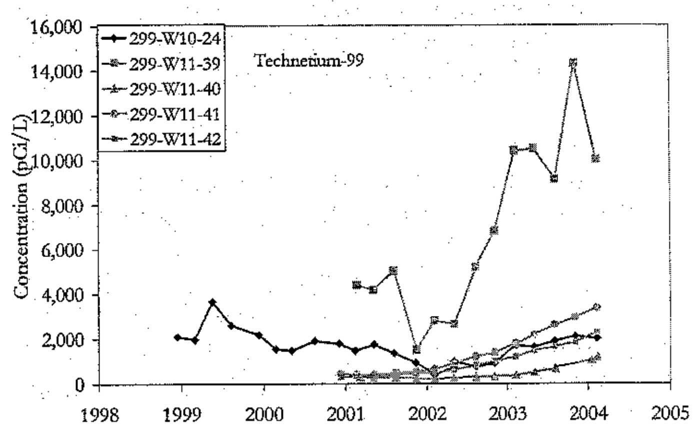


Figure 8. Technetium-99 in Wells Monitoring WMA T.

Tritium exceeded the drinking water standard of 20,000 pCi/L in well 299-W11-12 at WMA T during the reporting period. The tritium concentration was 48,500 pCi/L and has been decreasing slightly since the well was first regularly sampled for tritium in late 1998.

WMA TX-TY

Chromium, carbon tetrachloride, and trichloroethene continued to be the only dangerous waste constituents found in the groundwater beneath WMA TX-TY. The source of the carbon tetrachloride and trichloroethene was liquid disposal associated with processes at the Plutonium Finishing Plant and not WMA TX-TY. Carbon tetrachloride and trichloroethene are monitored as part of the 200-ZP-1 Operable Unit. In addition to the dangerous waste constituents, technetium-99, iodine-129, and tritium, all non-RCRA-regulated constituents, are found in groundwater at the WMA.

Chromium exceeded the 100 µg/L drinking water standard in one well at WMA TX-TY: 299-W14-13. The chromium concentration in that well was 663 µg/L during the reporting quarter, up from 573 µg/L during the previous quarter. The chromium concentration has been increasing in the well since May

2001. The most likely source for the chromium at WMA TX-TY is the WMA itself or the nearby TY cribs.

Nitrate continued to exceed the drinking water standard (45 mg/L) in all wells in the WMA TX-TY monitoring network during the reporting quarter. The highest nitrate concentration was found in well 299-W14-13 in the central part of the east side of the WMA. The nitrate concentration in this well was 440 mg/L in February. The nitrate concentration was 396 mg/L during the previous quarter. The regional nitrate plume at WMA TX-TY is attributed to past disposal practices throughout the 200 West Area. The relatively local high nitrate concentration at well 299-W14-13 may be due to one, or a combination of, nearby liquid disposal facilities and WMA TX-TY.

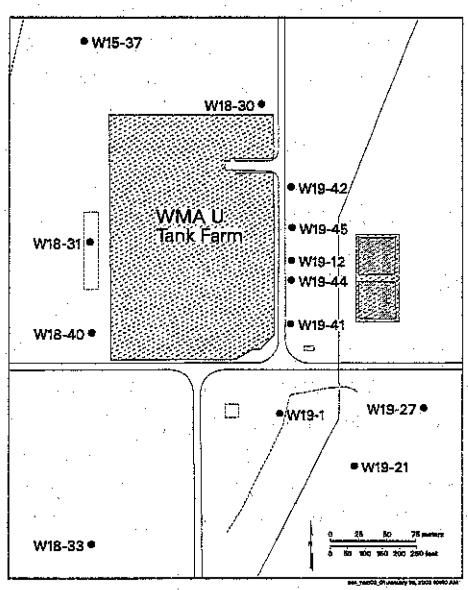
Manganese exceeded the secondary drinking water standard (50 μg/L) in well 299-W10-27 where the concentration was 221 μg/L in February 2004. This well has a history of high manganese concentration. The manganese concentration measured in August 2001, about 3 months after the well was drilled, was 862 μg/L. The manganese concentration subsequently decreased to its current level in about November 2002. The reason for the high manganese is not known.

Well 299-W14-13 is the only well at WMA TX-TY in which iodine-129 exceeds the 1 pCi/L drinking water standard; the February iodine-129 concentration in the well was 24.8 pCi/L, up from the November 2003 concentration of 18 pCi/L. The iodine-129 concentration in the well has fluctuated between 17 and 50 pCi/L since the well was drilled in late 1998.

The concentration of technetium-99 was 8,810 pCi/L in well 299-W14-13 during February 2004. This is an increase of 1,200 pCi/L over the previous quarter's concentration. Technetium-99 concentration has been greater than the 900 pCi/L drinking water standard since the well was drilled in 1998.

Tritium exceeded the 20,000 pCi/L drinking water standard in two downgradient wells at WMA TX-TY. The tritium concentration was 1,830,000 pCi/L in well 299-W14-13, up from 1,630,000 pCi/L during the previous quarter. Tritium in well 299-W14-15, located south of well 299-W14-13, was measured at 22,700 pCi/L, down from the previous quarter value of 27,300.

Single-Shell Tank Waste Management Area U: This WMA, which has been in assessment monitoring since 1999, has affected groundwater quality with elevated concentrations of chromium, nitrate, and technetium-99. The impact has been limited to the southern half of the downgradient (east) side of the WMA. Carbon tetrachloride is also present beneath the WMA at concentrations above the drinking water standard in all monitoring wells in the network. The source of carbon tetrachloride is upgradient of the WMA.



The water table has continued to decline at a steady rate of approximately 0.3 meter per year; the gradient and flow direction are stable with the interpreted flow direction to the east.

All analytical results from groundwater samples collected in February and March 2004 were generally on trend. The chromium concentration in well 299-W19-41 in February was the highest in the WMA at 13.7 μg/L. Chromium concentrations in other wells remained stable or dropped.

Nitrate concentrations (Figure 9) continue to increase in both upgradient wells (299-W18-31 and 299-W18-40) and in downgradient wells (299-W19-41 and 299-W19-44). The difference between upgradient wells and downgradient wells is that the rate of nitrate increase is greater in the downgradient wells than in the upgradient wells.

The only other trend of note is the increasing technetium-99 concentrations in wells located on the northeast side of the WMA as observed in wells 299-W18-30 and 299-W19-42 (Figure 10) as reported in the last quarterly report. This same trend continued during the reporting quarter, and the increasing trend for the past 3 or 4 quarters indicates a change. The increasing technetium-99 is not accompanied by a change in nitrate, which has remained at about 12 mg/l, in either well. Therefore, the source of technetium-99 on the northeast is not the same as found farther south, where it has been attributed to the WMA. This is further supported by the recent jump in technetium-99 in upgradient well 299-W18-31 (see Figure 10).

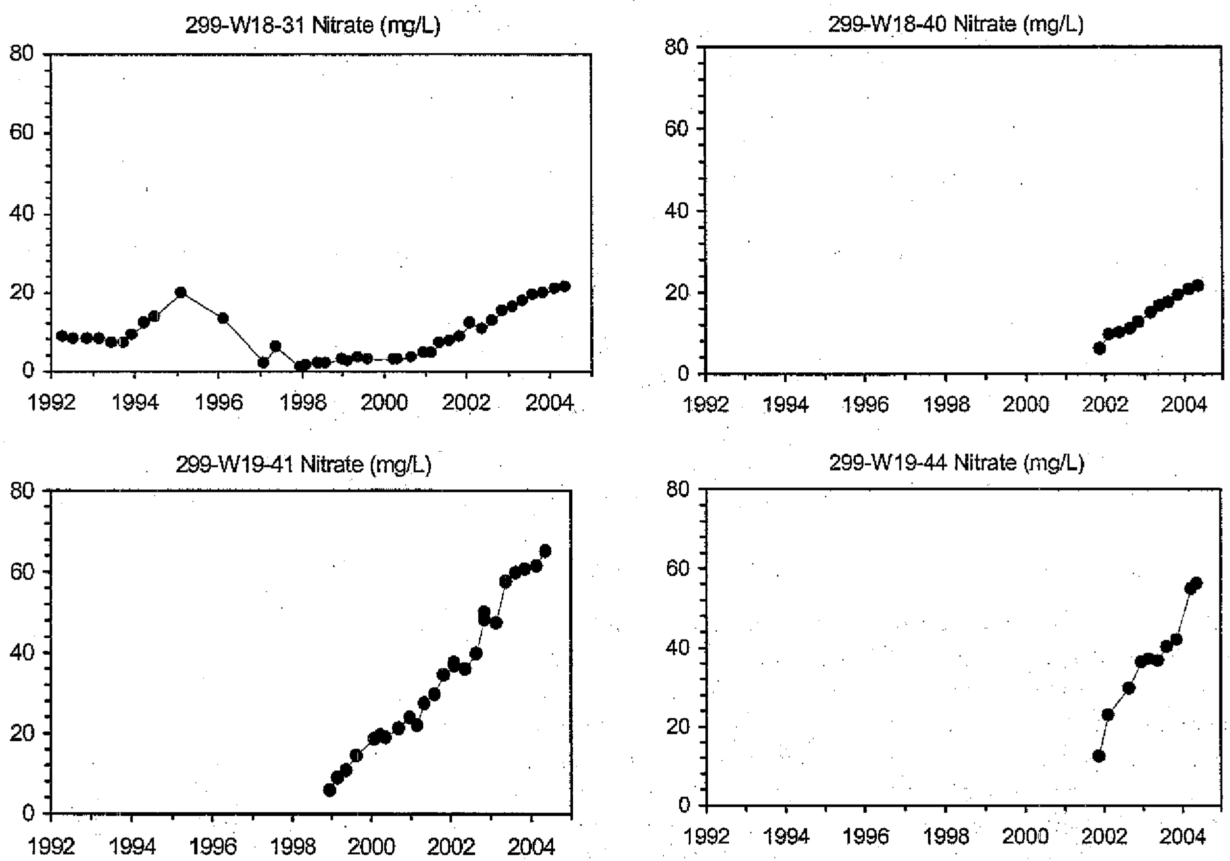


Figure 9. Nitrate Concentrations at WMA U.

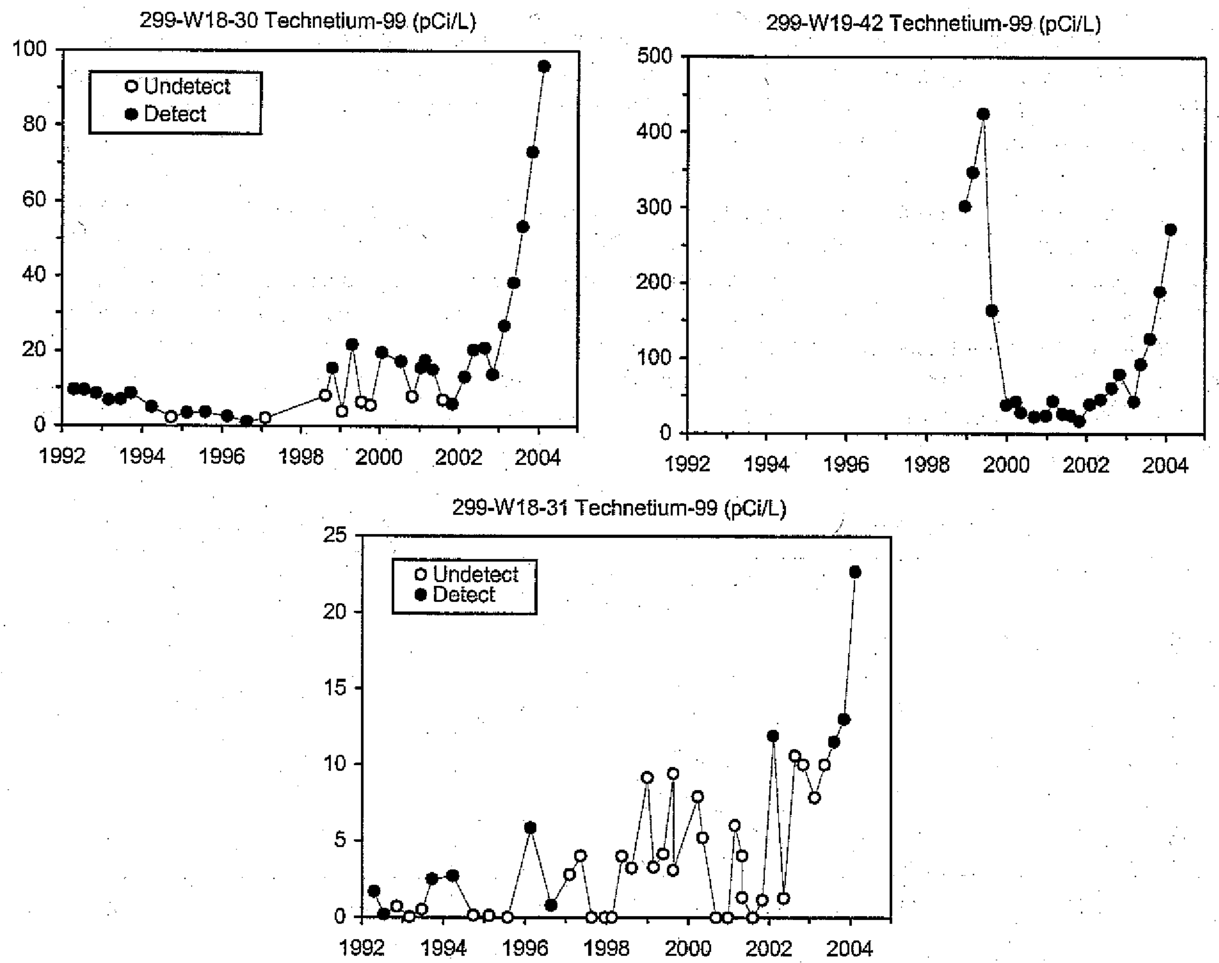
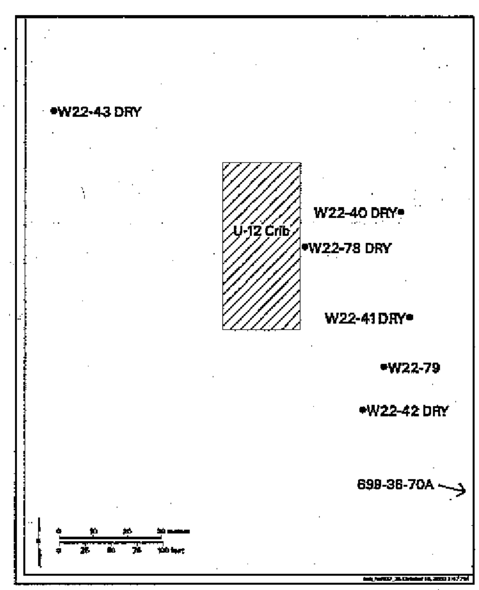


Figure 10. Technetium-99 in Wells Monitoring WMA U.

216-U-12 Crib: The current groundwater interim-status assessment monitoring network for the 216-U-12 Crib consists of only two downgradient wells (299-W22-79 and 699-36-70A). There is currently no upgradient well being monitored as part of this network. Well 299-W22-79 was sampled in January and March, 2004. Well 699-36-70A also was sampled in March. The groundwater flow direction beneath the crib has remained relatively unchanged, toward the east-southeast for years. It is believed that the two wells still effectively monitor releases from the 216-U-12 Crib. Water levels continue to decline as the regional water table drops.

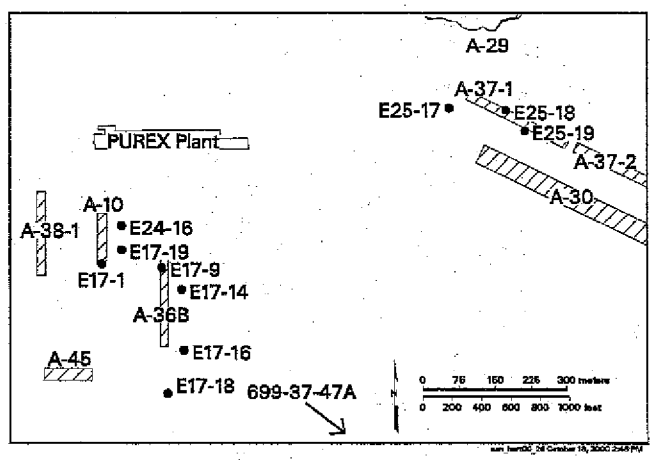


A proposed final status closure/post-closure groundwater monitoring plan, contained in PNNL-14301, is being reviewed and revised to address recent Notice of Deficiency comments from the regulators.

For downgradient well 299-W22-79, specific conductance and site specific contaminant nitrate stayed on trend or declined during the last two sampling events. Nitrate results were 43.4 mg/L in January and 43.2 mg/L in March, both below the 45 mg/L drinking water standard. All other data results are declining, on trend, and/or below the standard.

For well 699-36-70A, only the field parameters (pH, specific conductance, temperature, and turbidity) and arsenic were available in the HEIS database when this report was written; results will be discussed in the next quarterly report. Specific conductance declined during the reporting period, continuing a downward trend in this well. Specific conductance in well 699-36-70A was measured at 487 (versus 510 μS/cm last quarter).

PUREX Cribs (216-A-10, 216-A-36B, and 216-A-37-1): Three of the eleven near-field network wells were sampled as planned during the reporting quarter and water levels were measured on all 11 near-field wells. Nitrate was the only non-radioactive constituent that continued to exceed its drinking water standard in one or more of the wells sampled. Radioactive constituents (not regulated under RCRA) exceeding drinking water standards included iodine-129, strontium-90 and gross beta, and tritium. Some of the far-field wells also were sampled during the reporting quarter. Results were consistent with historical data and will be discussed in the annual report.



Beneath the PUREX Cribs, the differences in water table elevations from well to well are very small. Therefore, the water table gradient is too low to determine groundwater flow rate or flow direction reliably. However, groundwater flow directions determined from the movement of groundwater contamination plumes indicate that the regional flow is toward the southeast.

The drinking water standard for nitrate (45 mg/L) was exceeded at two of the three PUREX Cribs wells sampled. Well 299-E17-14 (at the 216-A-36B crib) had a result of 128 mg/L, which is part of a steady to slightly rising trend. Well 299-E24-16 (at the 216-A-10 crib) had a result of 56.7 mg/L. At this well the trend has been rising sharply since 2002 (Figure 11). The reason for the recent rise is not known, but it may be related to minor groundwater flow direction changes due to the dropping water table.

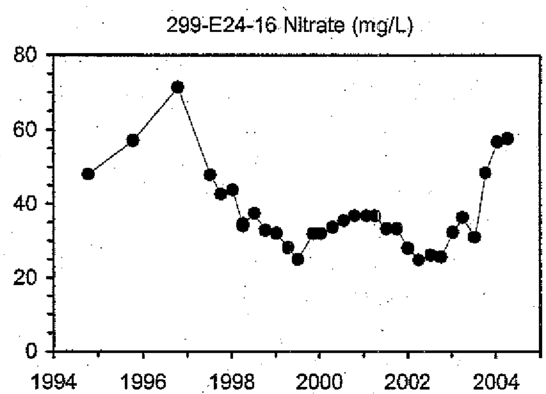


Figure 11. Nitrate in Well 299-E24-16, 216-A-10 Crib.

The drinking water standard for iodine-129 (1.0 pCi/L) continued to be exceeded at all three of the wells sampled during the reporting quarter. Iodine-129 trends at these wells are steady to decreasing. The highest iodine-129 concentration among the three wells was 9.9 pCi/L at well 299-E17-14.

The reported result for strontium-90, a beta-emitter, exceeded the drinking water standard (8 pCi/L) at well 299-E17-14. The result was 18.5 pCi/L for a sample collected in January 2004. The trend at this well is slightly increasing since 1997 (Figure 12), but has declined the last two sampling events. Gross beta at this well also exceeded its drinking water standard (50 pCi/L) during the reporting quarter with a result of 58.3 pCi/L. The strontium-90 plume is localized and moving very slowly downgradient from its source (presumably the 216-A-36B crib) due to the relatively high retardation factor for strontium-90.

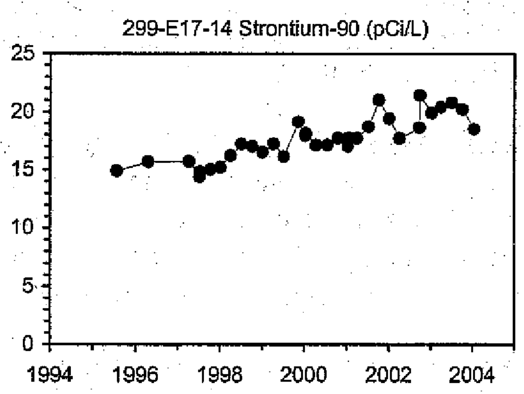


Figure 12. Strontium-90 in Well 299-E17-14, 216-A-36B Crib.

Tritium results during the reporting quarter also exceeded the tritium drinking water standard (20,000 pCi/L) at all three of the wells sampled. The historical trend at these wells is generally decreasing. The two wells at the 216-A-36B and 216-A-10 cribs exceeded the drinking water standard by more than a factor of 10. The highest result was 616,000 pCi/L at well 299-E17-14 (216-A-36B crib).

Quality Control

Highlights of the Groundwater Performance Assessment Project's quality control (QC) program for January-March 2004 are summarized below. We are transmitting a separate attachment with more specific QC information. The QC program indicated that most of the data were acceptable for use in the statistical comparisons discussed above. Data related to QC issues have been flagged in the database or are undergoing further review.

- Three hundred eight results were flagged with an H due to missed holding times. Of these, one hundred ninety results were for volatile organic compounds from eight samples. Nitrate and nitrite account for most of the rest of the flagged results. The data impacts should be minor.
- Most of the field duplicate results demonstrated good precision, although the relative percent differences for four pairs of results failed to meet the acceptance criteria. Cyanide, carbon tetrachloride, and tetrachloroethene were the constituents with out-of-limit results.
- Approximately 3% of the field blank results exceeded the QC limits. Most of the out-of-limit results were for chloride, copper, carbon tetrachloride, methylene chloride, and trichloroethene. In general, the field blank results should have little impact on the interpretation of 1st quarter groundwater data.
- Laboratory performance on the analysis of blind standards was good overall. Severn Trent St. Louis had out-of-limit results for cyanide and total organic halides, and Severn Trent Richland had low-biased results for plutonium-239 and uranium. Lionville Laboratory had out-of-limit results for total organic carbon. All of the results from Eberline Services were acceptable.
- Performance-evaluation study results were available from two Water Pollution studies, one investigative report for a Water Pollution study, a Mixed Analyte Performance Evaluation Program study, an InterLaB RadCheM study, and a Department of Energy Quality Assessment Program study (preliminary results) this quarter. The majority of the labs' results were within the acceptance limits, indicating good performance overall.
- Approximately 96.1% of the laboratory QC results for this quarter were within the acceptance limits, suggesting that the analyses were in control and reliable data were generated. Parameters with more than one result that was significantly out of limits include laboratory control samples for

acetone, vinyl chloride, and seventeen pesticides/herbicides; matrix spikes for nitrogen in nitrate, nitrogen in nitrite, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,2-dichloroethane, 2-butanone, 4-methyl-2-pentanone, TPH gasoline, vinyl chloride, seventeen phenols, 2,4-D, 4-(2,4-dichlorophenoxy)butyric acid, alpha-BHC, dieldrin, gamma-BHC, heptachlor epoxide, and TPH diesel; duplicates for acetone, sixteen phenols and sixteen pesticides/herbicides; and seven surrogates.

References

Furman, M. J., RL, to S. Leja, Ecology, and D.R. Sherwood, EPA, "Quarterly Resource Conservation and Recovery Act (RCRA) Groundwater (GW) Monitoring Data for the Period January 1, 1999, through March 31, 1999," August 4, 1999 (071519).

Hartman, M.J., 1992. *Results of Ground Water Quality Assessment Monitoring at the 1301-N Liquid Waste Disposal Facility and 1324-N/NA Facilities*, WHC-SD-EN-EV-003, rev. 1, Westinghouse Hanford Company, Richland, Washington.

Hartman, M.J., L.F. Morasch, and W.D. Webber, editors. 2003. Hanford Site Groundwater Monitoring for Fiscal Year 2002. PNNL-14187. Pacific Northwest National Laboratory, Richland, Washington.

Morse, John., RL, to Jane Hedges, Ecology, "Assessment Report for the at 1301-N Facility," July 17, 2002.

Thompson, K. Michael, RL, to Jane Hedges, Ecology, "Results of Assessment at the 1325-N Facility," July 22, 2000.

Williams, B.A. and C.J. Chou, 2003. *Monitoring Plan for RCRA Groundwater Assessment at the 216-U-12 Crib*. PNNL-14301. Pacific Northwest National Laboratory, Richland, Washington.