QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT GROUNDWATER MONITORING DATA FOR THE PERIOD JULY THROUGH SEPTEMBER, 2004.

Seventeen *Resource Conservation and Recovery Act of 1976* (RCRA) sites[1] were sampled during the reporting quarter, as listed in Table 1. Sampled sites include nine 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)].

Please note that source, special nuclear and by-product materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at DOE facilities exclusively by DOE acting pursuant to its AEA authority. These materials are not subject to regulation by the State of Washington. All information contained herein and related to, or describing AEA-regulated materials and processes in any manner, may not be used to create conditions or other restrictions set forth in any permit, license, order, or any other enforceable instrument. DOE asserts that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear and by-product materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

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 (1,311 μS/cm) exceeded the critical mean value (1,113 μS/cm) in September. Prior assessment results (Hartman 1992) indicated the elevated specific conductance is related to sulfate and sodium from an upgradient facility. The site will remain in detection monitoring.

1324-N/NA Facilities. Specific conductance at downgradient wells 199-N-72 (727 μS/cm) continued to exceed the critical mean value (489 μS/cm) in September. Groundwater quality assessment monitoring in 1992 (Hartman 1992) indicated that the high specific conductance is caused by the non-listed constituents sulfate and sodium. The site will remain in detection monitoring. Downgradient well 199-N-59 could not be sampled in September 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 (492 μS/cm) continued to exceed the critical mean value (451 μS/cm) in September. DOE notified Ecology of an earlier exceedance and transmitted the results of the groundwater

---

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

Table 1. Status of RCRA Sites July-September, 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	No[a]	See text.
1325-N Liquid Waste Disposal Facility	Yes	No[a]	See text.
1324-N/NA Facilities	Yes	No[a]	See text.
216-B-3 Pond	Yes	No	
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	See comment	No statistical comparisons (see text). 12 of 20 wells in original network are dry[(b)]
LLWMA 4	Yes	See comment	No statistical comparisons (see text). All shallow DG wells have gone dry[(b)].
SST WMA A-AX	No	See comment	Selected wells sampled quarterly but no statistical evaluation this quarter.
SST WMA C	Yes	See comment	Sampled quarterly. Statistical evaluation will resume next sampling event.
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.

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.

Low-Level Waste Management Area 3. Groundwater flow directions have shifted toward the east, with the most recent direction determined to be toward the east-northeast (70 degrees east of north). Wells 299-W10-20 and 299-W10-21 are no longer considered as upgradient wells. Statistical comparisons will resume after new upgradient wells are drilled and a new upgradient baseline is established.

Low-Level Waste Management Area 4. All of the shallow, downgradient wells in the network have gone dry, most recently well 299-W15-16. Ecology has approved well 299-W15-30 as a replacement well for 299-W15-16 and statistical evaluations will resume in the next sampling event for this site.

Single-Shell Tanks Waste Management Area C. Background values were established during the reporting quarter using 4 quarters of contamination indicator parameters collected during January to September 2004 from the newly drilled upgradient well 299-E27-22 and from an existing well 299-E27-7. Statistical evaluation will commence in the next sampling event.

Wells Not Sampled as Scheduled

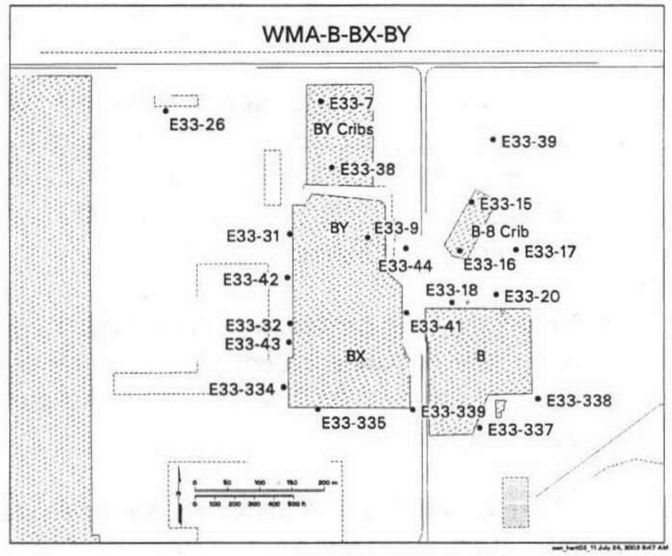
The wells listed in Table 2 were not sampled as scheduled. Wells that were delayed from their original sampling date are listed only if the successful sample date was beyond the end of the reporting quarter. The table does not include wells that were reported dry in previous quarterly or annual reports.

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

Well	RCRA Site	Date Scheduled	Date Sampled	Comment
199-N-59	1324-N/NA	09/2004	--	Well dry; can be sampled only when water table rises. The current plan allows for this situation.
299-E33-9	WMA B-BX-BY	08/2004	--	In tank farm; safety restrictions.
299-W15-16	LLWMA 4	07/2004	--	Dry.

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. At the southern boundary, it flows towards the south-southeast and southeast with a faster flow rate. This southward flow direction is supported by comparing local hydrographs (Figure 1). There has been no significant difference in flow direction or rate since the last quarterly report.

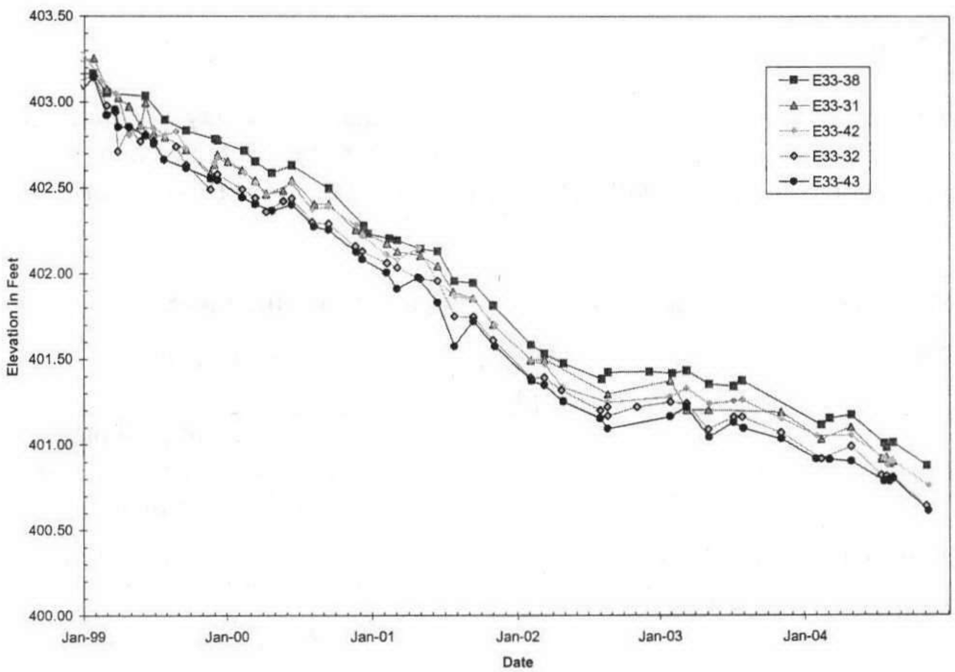


Figure 1. A Comparison of Hydrographs for Wells from the BY Cribs to the 241-BX Tank Farm. Data from Wells in the North are in Red and Orange; Data from Wells to the South are in Blue.

To date, assessment studies have identified two tank-related groups of contaminants based on chemical associations, spatial and temporal relationships, historic plume movement, knowledge of process chemistry, pattern matching and characteristic chemical ratios of constituent concentrations (PNNL-SA-39825, PNNL-14187, PNNL-13116, and PNNL-14548). The first group consists of uranium, technetium-99, nitrate, sulfate, and nitrite and is located under and east of the BY tank farm. Past leaks of processing waste from the tank farms have left contaminated soils under the farms, which are, most likely, the source of this contamination found in the groundwater. The second group consists of primarily tritium and is found along the southern border of the 241-BX Tank Farm. Movement through the vadose zone from a tritium-rich perching zone (PNNL-14083) located about 15 feet above the water table under the BX Tank Farm is, most likely, the source of this contamination. The tritium in this perching zone may be related to tank condensate collected from the tanks in the past. Other discrete groups of contamination found under and near the BY Cribs and the B-8 Crib appear to be related primarily with those facilities and not the tank farms (PNNL-SA-39825, PNNL-14187).

In general, trends for nitrate in downgradient wells have continued to remain steady or fluctuated with no defined trend during this quarter (Figure 2). One exception is well 299-E33-44, located in the center of the WMA, where nitrate levels increased sharply over the last quarter from 268 μg/L to 403 μg /l. Although well 299-E33-9 under the 241-BY Tank Farm has not been sampled since March 2004 due to tank farm safety issues, it also appeared to be increasing at that time. Other wells in the area displaying a distinct increase in nitrate concentration are located upgradient of the WMA. They include well 299-E33-7, (upgradient in the BY cribs to the north), 299-E33-15, (downgradient of the BY Cribs), and 299-E33-17 located downgradient from the B-8 crib, which is a local center for some of the highest nitrate in the area.

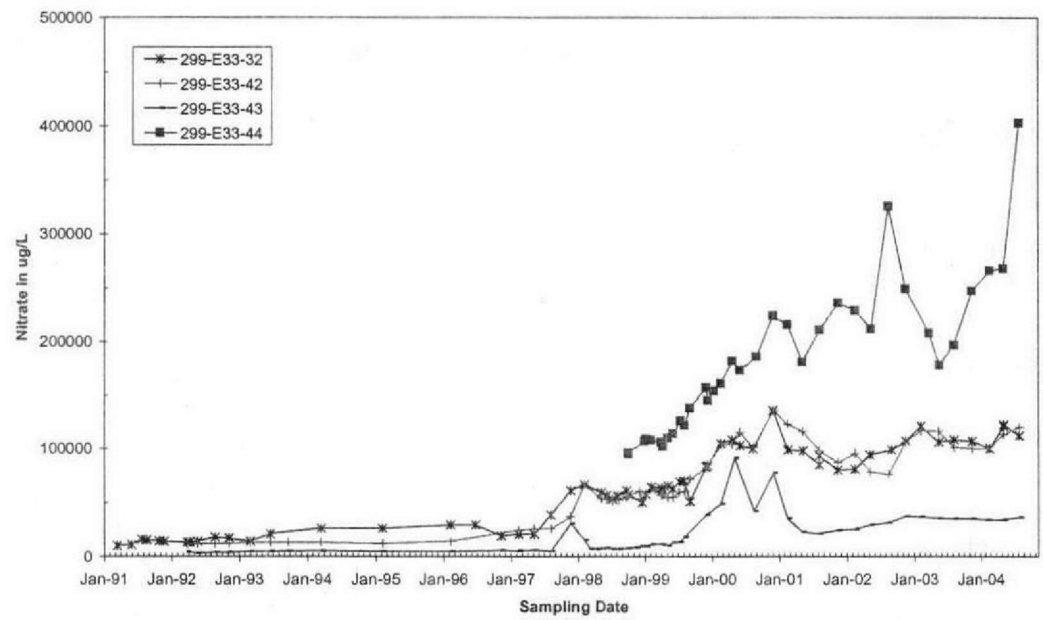


Figure 2. Nitrate Trends at WMA B-BX-BY.

Similar trends are seen for technetium-99 concentrations (Figure 3). Values have doubled over the last year in well 299-E33-44 from 4,270 pCi/L in August 2003 to 8,860 pCi/L in August 2004. This value is now above that seen in upgradient well 299-E33-7 under the BY Cribs where technetium-99 concentration decreased recently to 8,600 pCi/L (Figure 4). Although the temporal offset of peak technetium-99 levels between wells 299-E33-7 and 299-E33-44 versus 299-E33-16 may indicate that contamination is moving from the northwest or west to the vicinity of the B 8 Crib, it could be reflecting eastward migration in the vadose zone of the water source carrying contamination to the groundwater from contaminated soils.

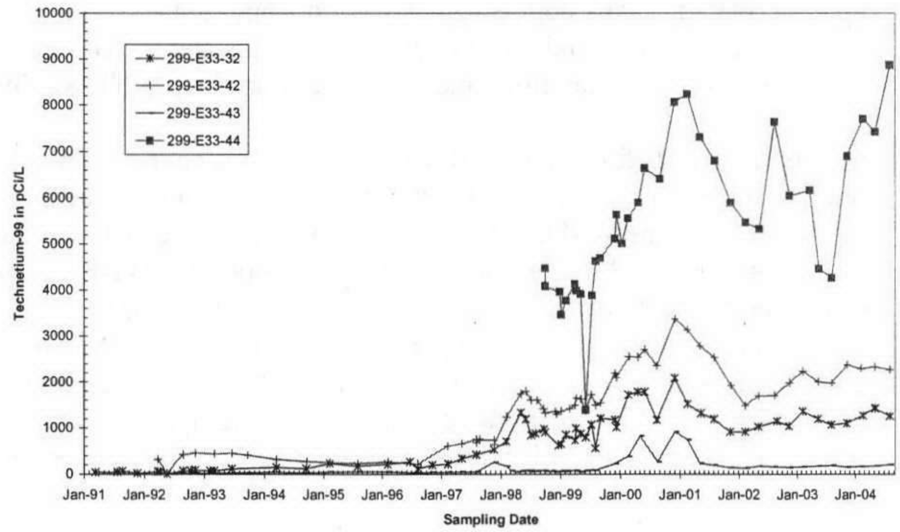


Figure 3. Technetium-99 Trends for WMA B-BX-BY.

Additional evidence to support a connection between these two areas is found in the nitrite data. Elevated nitrite has been observed in wells 299-E33-44 and 299-E33-9 (in the BY Tank Farm), since the wells were either installed (299-E33-44, 1998) or first sampled (299-E33-9, 1999). Currently the concentration is 657 ug/L in well 299-E33-44. The

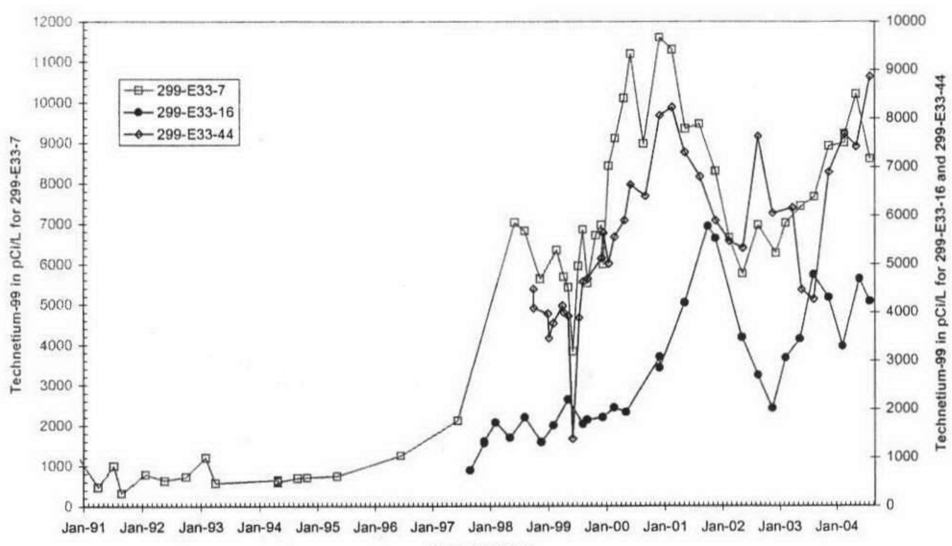


Figure 4. Comparison of Technetium-99 Trends at WMA B-BX-BY

maximum value observed in this well was over 2000 ug/L in 1999. Nitrite has been found in the groundwater recently to the east at the B-8 Crib in well 299-E33-16 at 138 ug/L in May 2004. This occurrence of nitrite may be related to movement into the B-8 crib area from the west.

The local high tritium plume, exceeding the drinking water standard of 20,000 pCi/L at times, found along the southern border of the waste management area, may be migrating in a southerly direction as seen by the offset and decreased concentrations in wells 299-E33-335 and 299-E33-339, located southeast of the BX tank farm with respect to well 299-E33-43 (Figure 5). Migration through the vadose zone from a tritium-rich perched water table located ~4.6 meters (15 feet) above the water table under the B and BX Tank Farm is probably the source of this contamination (RPP-10098). The tritium values above the DWS (20,000 pCi/L) seen in well 299-E33-339 when the well was first sampled in 2001 may have reflected an earlier tritium pulse from the perched water layer above. It is not possible to determine anything further since the complete history of this event was not observed. Recent, low increases in uranium (less than 10 μg /L) along this southern boundary may also indicate movement to the south.

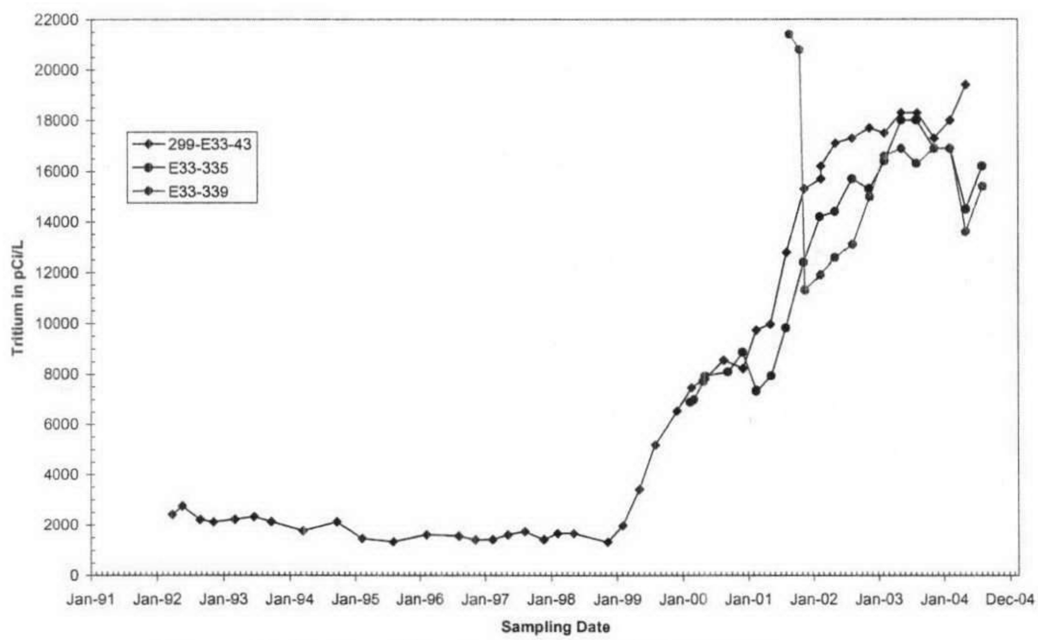


Figure 5. Tritium Trends for WMA B-BX-BY.

As shown in the April-June 2004 quarterly report, the peak uranium values from late 2000 to early 2001 indicated that uranium is associated the with mobile constituents such as technetium-99. However, that uranium's movement is retarded with respect to the mobile constituents. Thus an explanation for sources of uranium in the groundwater must also agree with source for the mobile constituents. When uranium trends are compared (Figure 6) for wells located south and north of well 299-E33-9, it can be seen that the center of the uranium contamination in the groundwater is located under the BY Tank Farm. The uranium value in the groundwater under the BY Tank Farm (well 299-E33-9) was 590 μg /L and was rising when last sampled in March

2004. Uranium levels at well 299-E33-44 dropped this quarter from 350 μg /L in May to 237 μg /L in August 2004.

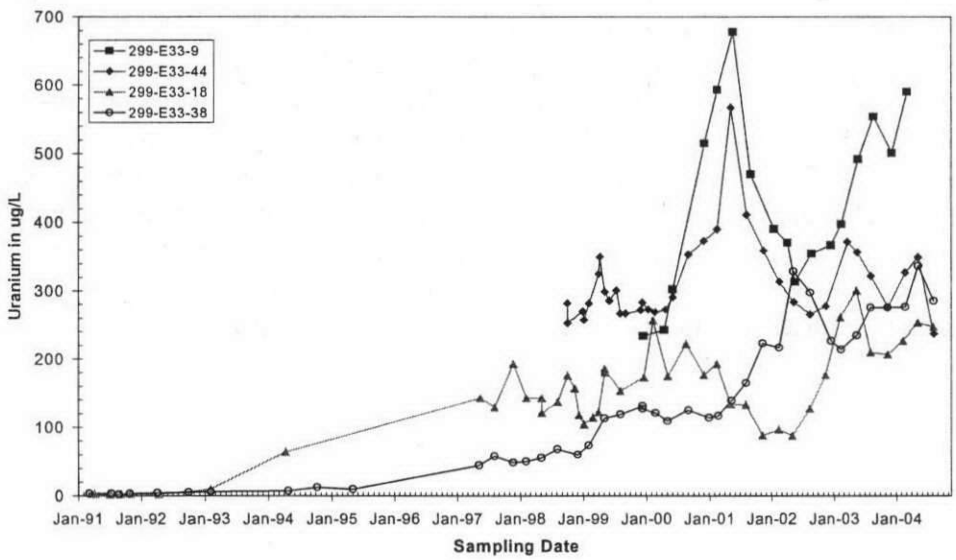
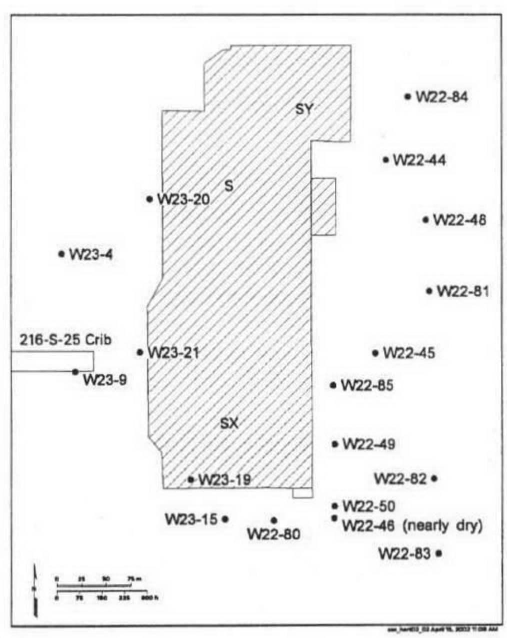


Figure 6. Uranium Trends at WMA B-BX-BY.



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 is stable and the flow direction is stable over the general area of the waste management area based on water level data, but there may be some slight shift to a more eastward direction (less southern component) based on the spreading of contaminant plumes to the north. All water levels measured during the quarter were consistent with the falling water table trend.

The axis of the northern contaminant plume, with an apparent source in S Tank Farm and passing through wells 299-W22-44 and 299-W22-48 appears to be shifting north as indicated by the downward trends for chromium, nitrate, and technetium-99 in well 299-W22-48 and corresponding increases in well 299-W22-44. Changes in nitrate and technetium concentrations for these two wells are shown in Figure 7. Both constituents exceed their respective drinking water standards in both wells.

The contaminant plume migrating from the SX Tank Farm in the southern portion of the WMA continues to spread slowly downgradient. This plume comprises 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) have continued to rise since the first half of 2002 (Figure 8). At 320 μg/L in September 2004, the chromium concentration in the source area jumped by more than 100 μg /L this quarter and is now more than three times the 100 μg/L drinking water standard. 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.

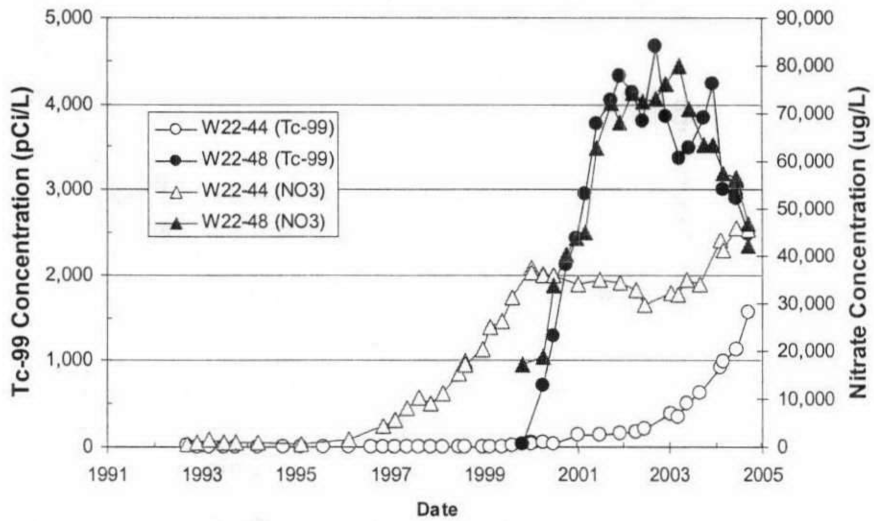


Figure 7. Technetium-99 and Nitrate in Wells Monitoring S Tank Farm.

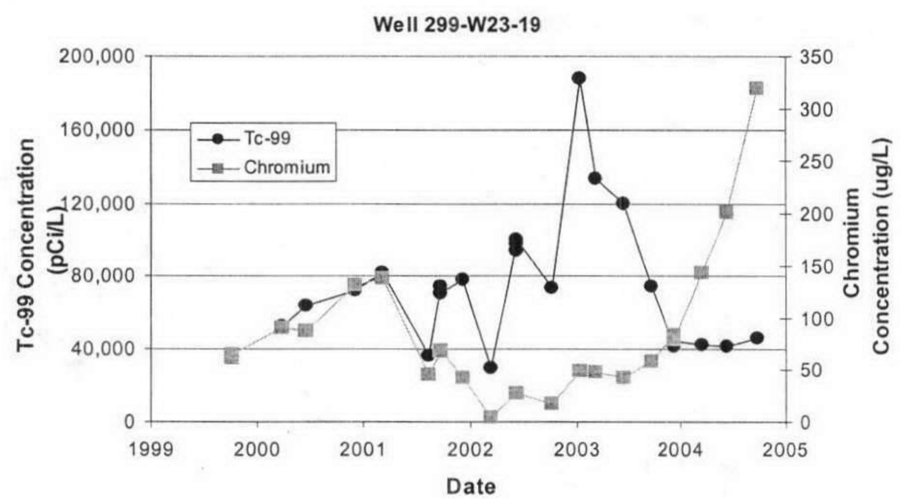


Figure 8. Technetium-99 and Chromium in Well 299-W23-19 at SX Tank Farm.

Concentrations of plume constituents in downgradient regions continue to increase or remain at elevated levels. On the distal margin of the plume (as indicated by well 299-W22-83) technetium-99 and chromium concentrations continued to increase during the quarter (Figure 9). It appears that the plume is encroaching into the area of well 299-W22-82 located on the northern margin of the plume as indicated by the slight indication of rising technetium-99 and chromium concentration.

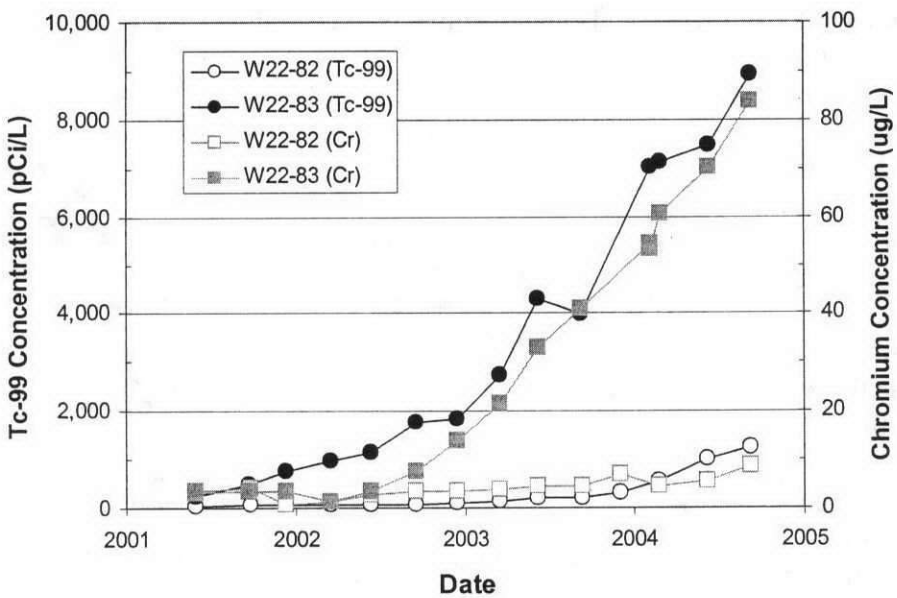


Figure 9. Technetium-99 and Chromium in Wells Downgradient of SX Tank Farm.

In comparison, concentrations in the mid portion of the plume as indicated by well 299-W22-50 have stabilized or decreased in concentration as shown in Figure 10. Data for well 299-W22-83 are provided for reference.

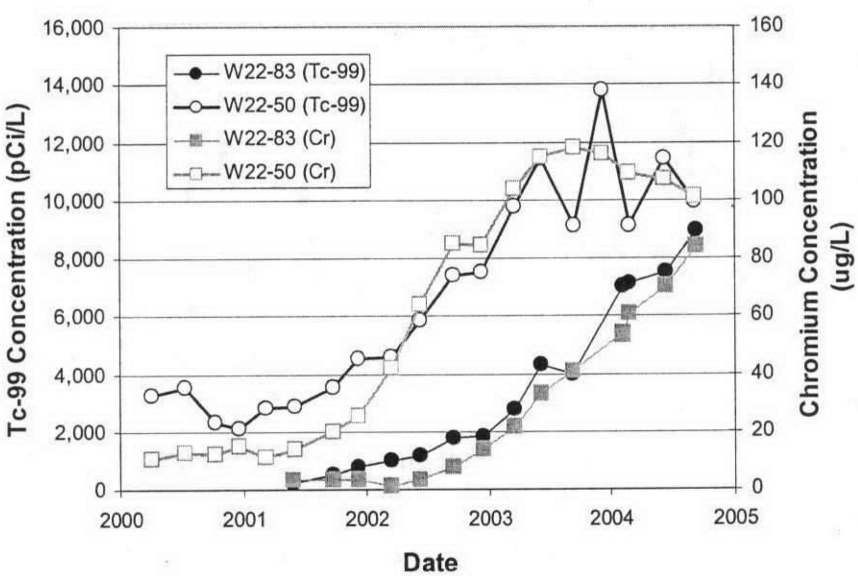
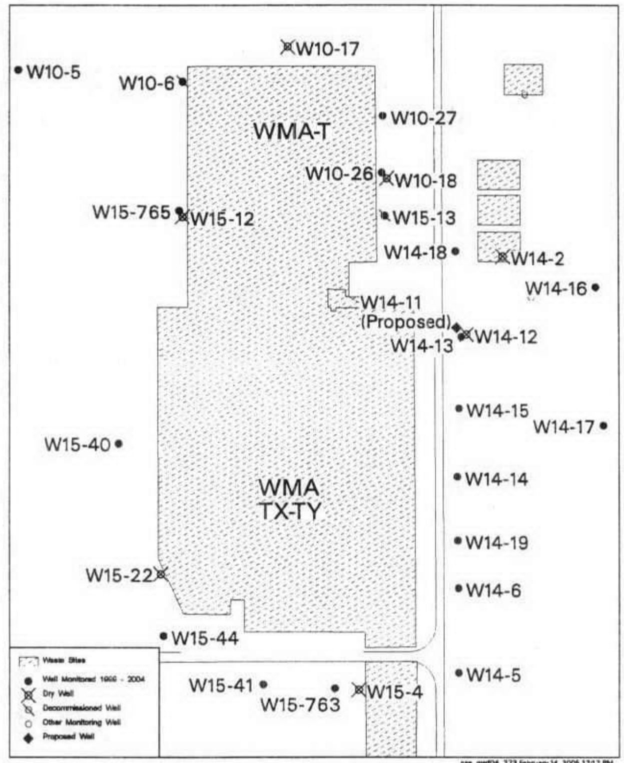


Figure 10. Technetium-99 and Chromium in Well 299-W22-50, Downgradient of SX Tank Farm.



Single-Shell Tank Waste Management Areas T and TX-TY: All wells in the monitoring networks at both WMA T and WMA TX-TY were successfully sampled during the third quarter of 2004.

WMA T

Water levels in wells near WMA T continued to decline during the reporting period. The measured amount of decline during the quarter was between 0.068 and 0.149 meter. Groundwater flow at WMA T is between east-northeast and east-southeast at a rate of about 0.02 meter per day.

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, based on regional plume information and historic waste disposal records. 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 five wells at WMA T in August 2004. The highest chromium concentration was in well 299-W10-4 located southwest of the WMA. The concentration of chromium in this well was 686 μg/L, up substantially from 436 μg/L during the previous quarter (Figure 11). 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.

The chromium concentration in well 299-W11-39 exceeded the drinking water standard for the first time in August 2004 with a concentration of 106 μg/L. Chromium in upgradient well 299-W10-28 (296 μg/L) and in downgradient wells 299-W11-41 (150 μg/L) and 299-W11-42 (161 μg/L) essentially remained unchanged from the previous quarter. Although a tank farm source for some of the chromium in downgradient wells cannot be ruled out, much of the chromium in downgradient wells 299-W11-41 and 299-W11-42 is believed to be from upgradient, past-practice units that received substantial chromium.

Nitrate concentrations remained above the 45 mg/L drinking water standard in all wells in the WMA T network during the reporting period. The highest reported concentrations of nitrate were in upgradient well 299-W10-4, where nitrate increased from 2,650 mg/L in May to 3,430 mg/L in August and in upgradient well 299-W10-28, where nitrate decreased slightly from 1,950 mg/L in May to 1,850 mg/L in August. These are the same wells that have the highest chromium concentrations.

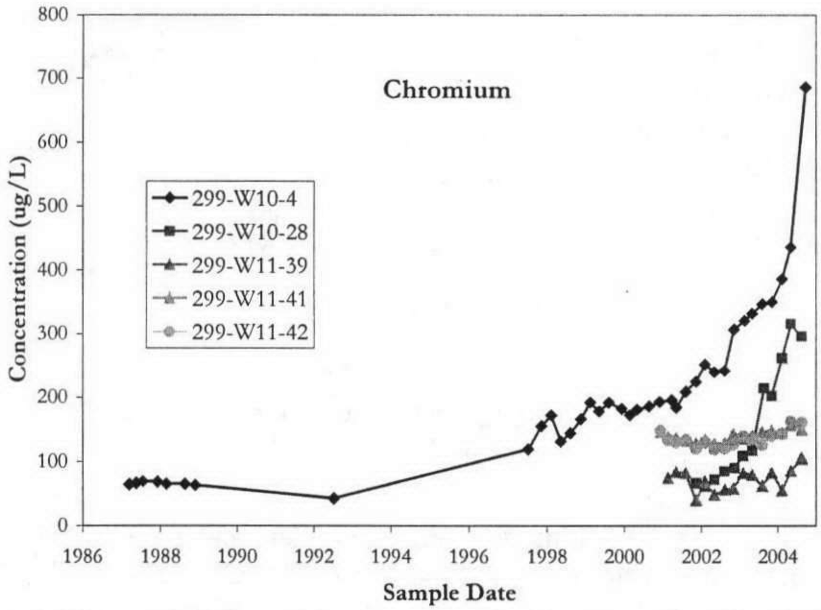


Figure 11. Chromium concentration in selected wells at WMA T. Wells 299-W10-4 and 299-W10-28 are upgradient wells; all other wells are downgradient wells.

Nitrate concentrations in downgradient monitoring wells at WMA T remained nearly unchanged during the quarter. Concentrations in downgradient wells are between 102 mg/L (well 299-W11-39) and 890 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 six 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, 299-W10-23 and 299-W10-24, located north and northeast of the WMA, and wells 299-W11-41 and 299-W11-42 east (downgradient) of the WMA. The highest fluoride concentration during the quarter was 3.3 mg/L in well 299-W10-28.

The AEA-regulated constituent technetium-99 exceeded the 900 pCi/L drinking water standard in five downgradient wells at WMA T during November 2004 (Figure 12). The greatest concentration was 21,400 pCi/L in well 299-W11-39 which was up significantly from 16,300 pCi/L during May 2003. Other wells exceeding the technetium-99 standard were 299-W10-24 (1,950 pCi/L), 299-W11-40 (1,670 pCi/L), 299-W11-41 (3,940 pCi/L), and 299-W11-42 (2,390 pCi/L). Technetium-99 concentration in the four latter wells either increased slightly or remained essentially unchanged from the previous quarter. The technetium-99 plume is well defined laterally but its downgradient extent is not known. A far-field well is planned to be installed about 50 meters downgradient of well 299-W11-39 to help define the eastern extent of the plume.

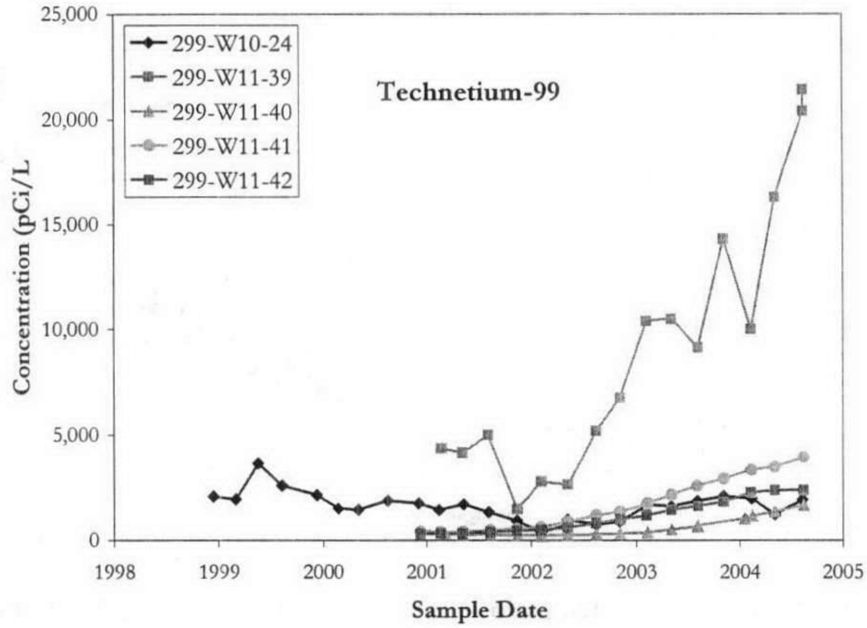


Figure 12. Technetium-99 Concentrations in Selected Wells Monitoring WMA T.

The technetium-99 concentration in upgradient well 299-W10-4 exceeded the drinking water standard for the first time since the well was first sampled for technetium-99 in 1987. The technetium-99 concentration was 972 pCi/L in September 2004. Concentrations of some of the major metals, anions, and alkalinity also increased over the concentrations in previous quarter (Figure 13). These increases appear to be confirmed in a subsequent sample collected in October, but, the charge balance and conductivity/metals ratios (using only the major cations and anions) for the September and October samples are out of generally acceptable charge balance thresholds. The cause of the increases is not known.

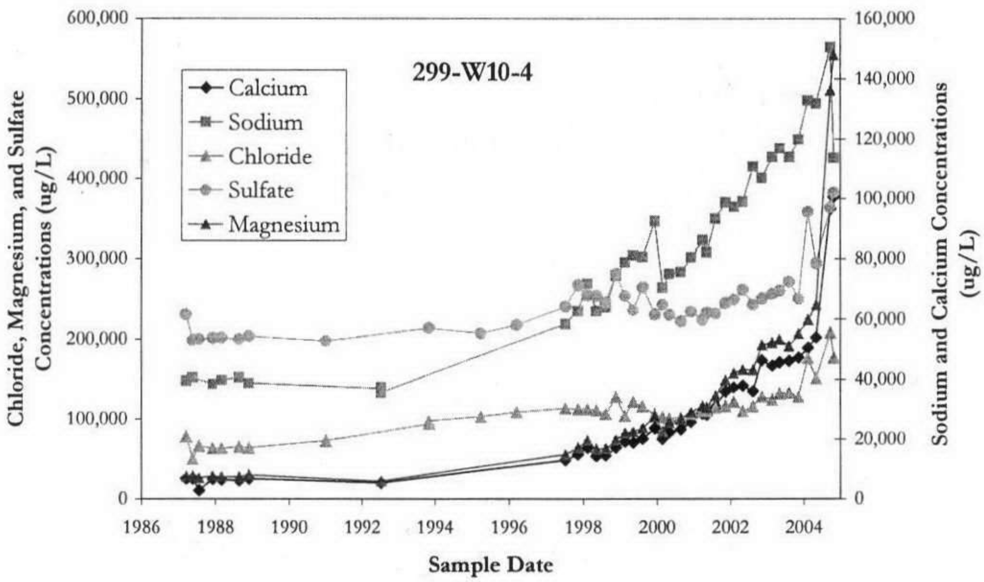


Figure 13. Concentrations of selected major cations and anions in well 299-W10-4 at WMA T.

Tritium exceeded the drinking water standard of 20,000 pCi/L in one well at WMA T during the reporting period. The tritium concentration was 47,100 pCi/L in well 299-W11-12 and has been decreasing slightly since the well was first regularly sampled for tritium in late 1998.

The pH of the sample from well 299-W10-24 exceeded the drinking water standard of 8.5 with a value of 8.61 during August 2004. Samples from this well have a history of pH values greater than the standard and the reason for the exceedance is not known.

Finally, aluminum concentrations exceeded the secondary drinking water standard of 50 μg/L in several wells at WMA T. Anomalously high aluminum concentrations have been found in many wells across the Hanford Site recently. The groundwater project's quality control team is working with the analytical laboratory to resolve the aluminum issue.

WMA TX-TY

Water level measurements in wells near WMA TX-TY showed between about 0.171 and 0.368 meter decline in the water table during the reporting period. Declines greater than about 0.2 meter, and two measurements that indicated increases in the water table, are not considered valid and are probably due to a combination of barometric effects, measurement error, and 200-ZP-1 pump-and-treat operations. 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.

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. Nitrate also is elevated in the groundwater beneath WMA TX-TY. 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 733 μg/L during the reporting quarter, up slightly from 669 μg/L during the previous quarter. The chromium concentration generally has been increasing in the well since May 2001. Well 299-W14-15, located just south of 299-W14-13, had a chromium concentration of 94.7 μg /L in August. Other wells near 299-W14-13 had no detectable chromium. 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 580 mg/L in August 2004. The nitrate concentration was 496 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 172 μg/L in August 2004. This well has a history of high manganese concentrations. The manganese concentration measured in August 2001, about 3 months after the well was drilled, was 862 μg/L. The manganese concentration has been decreasing since that time. The reason for the high manganese is not known. The well also has relatively high nitrite (1.25 mg/L) and low dissolved oxygen (2.2 mg/L).

The AEA constituent iodine-129 exceeded the 1 pCi/L drinking water standard in two wells at WMA TX-TY in August 2004. The concentration of iodine-129 in well 299-W14-13 was 9.7 pCi/L, down from 26.8 pCi/L the previous quarter. Previous to August 2004, the iodine-129 concentration in the well had fluctuated between 17 and 50 pCi/L since the well was drilled in late 1998.

Iodine-129 also exceeded the drinking water standard in well 299-W14-15 in August with a concentration of 2.67 pCi/L. With one exception, iodine-129 previously has been undetected in the well since late 2000 when it was drilled; the iodine-129 concentration was 2.59 pCi/L in February 2003.

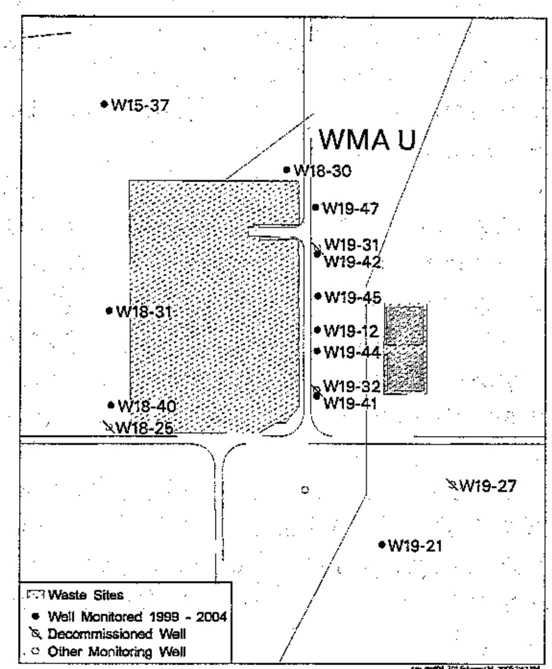
The concentration of technetium-99 was 9,080 pCi/L in well 299-W14-13 in August 2004. This was up from 8,630 pCi/L in May 2004. Technetium-99 concentration has been greater than the 900 pCi/L drinking water standard since the well was drilled in 1998 and has been increasing slightly since February 2001. The technetium-99 plume is small and exceeds the standard only in well 299-W14-13, although technetium-99 has been increasing in well 299-W14-18, north of 299-W14-13, since it was drilled in late 2001. Technetium-99 in well 299-W14-18 was 550 pCi/L in August 2004. The nearest downgradient well to 299-W14-13 had 432 pCi/L in August and the nearest well to the south had 562 pCi/L, slightly higher than, but similar to, most other wells on the east side of WMA TX-TY.

Tritium exceeded the 20,000 pCi/L drinking water standard in two downgradient wells at WMA TX-TY. The tritium concentration was 1,820,000 pCi/L in well 299-W14-13 in August 2004. This is somewhat higher than 1,770,000 pCi/L found in the well in May 2004. Tritium in well 299-W14-15, located south of well 299-W14-13, was measured at 59,800 pCi/L in August 2004. This is substantially higher than the 23,100 pCi/L found during the previous quarter and the well will be watched closely next quarter to determine whether the tritium contamination in well 299-W14-13, north of well 299-W14-15, is moving south.

Aluminum concentrations exceeded the secondary drinking water standard of 50 µg/L in several wells at WMA TX-TY. Anomalously high aluminum values have been found in many wells across the Hanford Site recently. The groundwater project's QC team is working with the analytical laboratory to resolve the aluminum issue.

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. 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 as determined from water levels are stable with the interpreted flow direction to the east. Chemistry data indicate that the flow direction may be shifting All water levels measured during the quarter were consistent with the trend of a falling water table.



All analytical results from groundwater samples collected in August were generally on trend.

A notable trend is the continued 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 as seen in Figure

14. These trends are the same as reported in the last quarterly report. These concentrations are not above the drinking water standard, but their increasing trend for the past 5 or 6 quarters indicates a change. The increasing technetium-99 is not accompanied by an equally large change in nitrate, which has remained at about 12 to 15 mg/L, in either well.

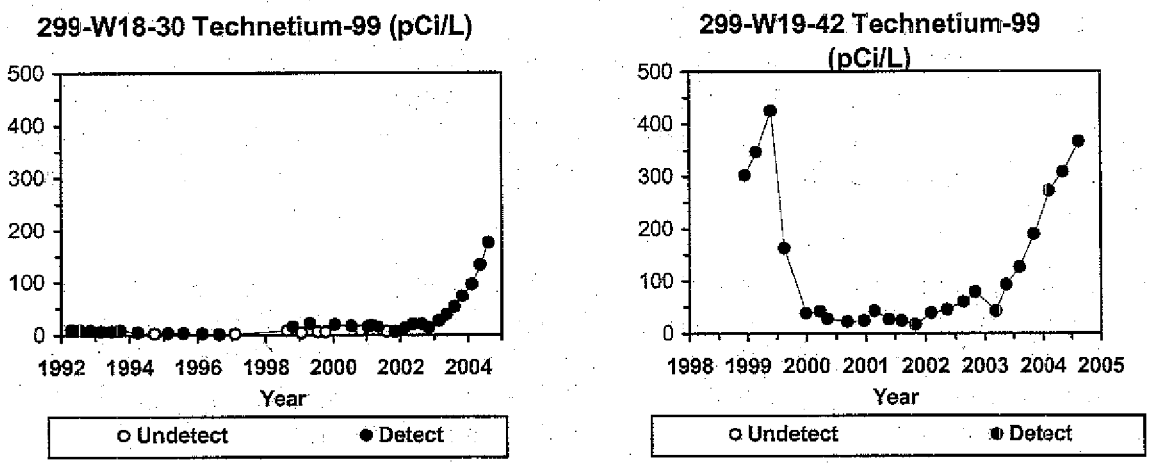
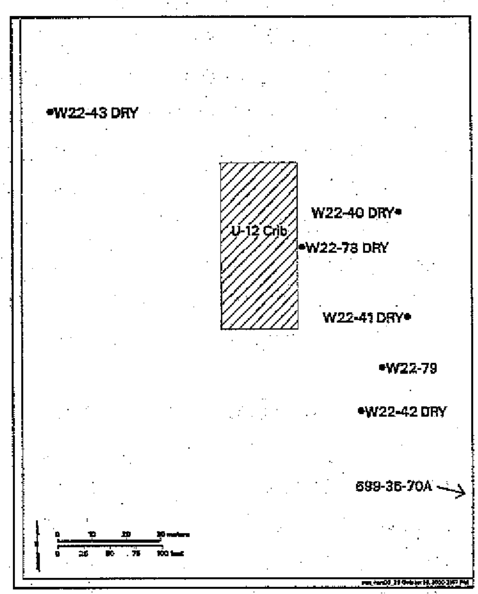


Figure 14. Technetium-99 in Wells Northeast of WMA U.

New well 299-W19-47 was completed during the quarter and it will be sampled for the first time at the next quarterly sampling event scheduled for November.

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). Both wells were sampled in September 2004. There is currently no upgradient well available at this network. The site is in assessment for elevated specific conductance and the site specific contaminant nitrate.

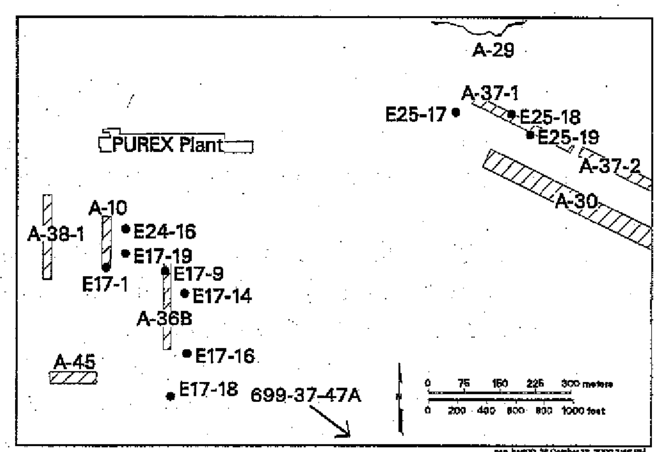


A proposed final status closure/post-closure groundwater monitoring plan, contained in Williams and Chou (2004), has been revised to address recent notice of deficiency comments received from Ecology. This proposed closure/post-closure groundwater monitoring plan provides an integrated semi-regional monitoring approach that would fulfill RCRA final status groundwater monitoring requirements. If approved, the groundwater monitoring described in this plan will be integrated into the CERCLA 200-UP-1 Operable Unit monitoring program after the closure of the 216-U-12 Crib which is scheduled to be closed under the CERCLA Accelerated U Area Waste Sites Closure.

For downgradient well 299-W22-79, specific conductance and nitrate decreased from last quarter's results and are back on a declining trend. Specific conductance was measured at 303 µS/cm in September. Nitrate decreased from 45.2 to 38.5 mg/L between June and September dropping below the 45mg/L drinking water standard at this well. All other data results are declining, on trend, and/or below drinking water standards.

For well 699-36-70A, specific conductance and nitrate decreased slightly from the June results. Specific conductance decreased from 511 µS/cm in June to 483 µS/cm in September. Nitrate decreased from 84.1 mg/L to 73.4 mg/L between June and September, remaining above the drinking water standard. All other data results, except sulfate (a co-contaminant released with nitrate), are declining, on trend, and/or below drinking water standards. Sulfate concentrations, which increased slightly for the second consecutive quarter, are being monitored but are not a concern at this time.

Based on the regional CERCLA 200-UP-1 Operable Unit network, the groundwater flow direction beneath the crib has remained relatively unchanged, toward the east-southeast for years. Without an upgradient well and additional downgradient wells it is difficult to assess flow direction but 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.



PUREX Cribs (216-A-10, 216-A-36B, and 216-A-37-1): Three of the 11 wells in the near-field network wells were sampled (as scheduled) during the reporting quarter. Water levels were measured at each well at the time of sampling. Nitrate and aluminum were the only non-radioactive (RCRA-regulated), groundwater constituents that continued to exceed their drinking water standards (45 mg/L and 50 μg /L, respectively) in one or more of the three near-field wells sampled. However, the aluminum exceedance is most likely an error. Radioactive constituents (not regulated under RCRA) exceeding drinking water standards included iodine-129, strontium-90, and tritium. Results of sampling the far-field wells are integrated with the 200-PO-1 Operable Unit and are described in the annual groundwater report for fiscal year 2004.

Beneath the PUREX Cribs, the differences in water table elevations from well to well are very small. Typically, the elevation difference between the lowest and highest levels is about 0.2 meter. During the reporting period the greatest water level difference was 0.23 meter (about 9 inches) over a distance of 850 meters for a maximum gradient of 0.0003. Therefore, the flow rate and direction based on hydraulic gradient has a high degree of uncertainty. However, groundwater flow directions determined from the movement of groundwater contamination plumes indicate that the regional flow is toward the southeast.

Nitrate was reported at levels greater than the drinking water standard (45 mg/L) at two of the near-field wells. The highest reported level of the three wells during the reporting period was 132 mg/L at well 299-E17-14 located near the 216-A-36B crib At this well the recent trend was upward until early 2004 (Figure 15).

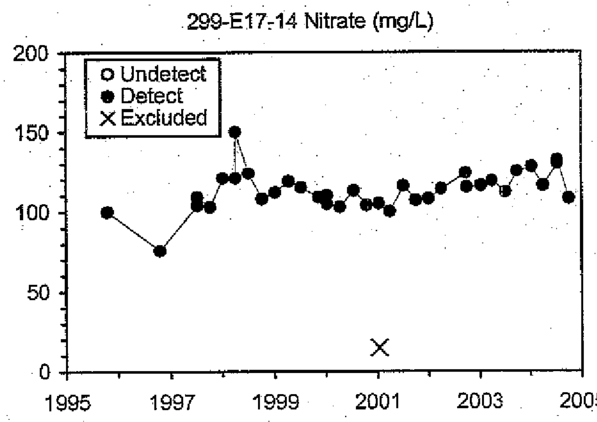


Figure 15. Nitrate at well 299-E17-14.

Iodine-129 exceeded the drinking water standard (1.0 pCi/L) at two of the three wells sampled. The highest reported level was 5.94 pCi/L at well 299-E17-14, which is located near the 216-A-36B crib. The trend for iodine-129 is variable but overall is either remaining steady or declining slightly.

Gross beta and strontium-90 (a beta-emitter) remained elevated at well 299-E17-14. Both exceeded their respective drinking water standards (50 and 8 pCi/L). The gross beta concentration during the reporting quarter was 67.8 pCi/L while strontium-90 was 21.1 pCi/L. Both show slightly upward trends since 2000. The reported level for gross beta is higher than would be accounted for by the strontium-90 (the ratio of gross beta to strontium-90 is about 2). The remainder of the gross beta is most likely technetium-99, another beta emitter. Strontium-90 also exceeded the drinking water standard at well 299-E24-16 where the reported result was 8.19 pCi/L.

Tritium exceeded its drinking water standard (20,000 pCi/L) at all three of the three wells sampled. Two of the three wells exceeded the drinking water standard by more than a factor of 10. The highest reported level was 562,000 pCi/L at well 299-E17-14. The trend in this well has been decreasing since 1997. The trends in the other two wells are mixed. In well 299-E24-16 (near 216-A-10 crib) tritium concentrations have been increasing since 2002. At well 299-E25-19 (near the 216-A-37-1 crib) the trend is decreasing since 2003.

Gross alpha has been generally rising but with some variability at well 299-E24-16. The drinking water standard for gross alpha is 15 pCi/L. The result for the reporting quarter was 16.9 pCi/L. Figure 16 shows the rising trend for gross alpha at well 299-E24-16. The most likely groundwater constituent

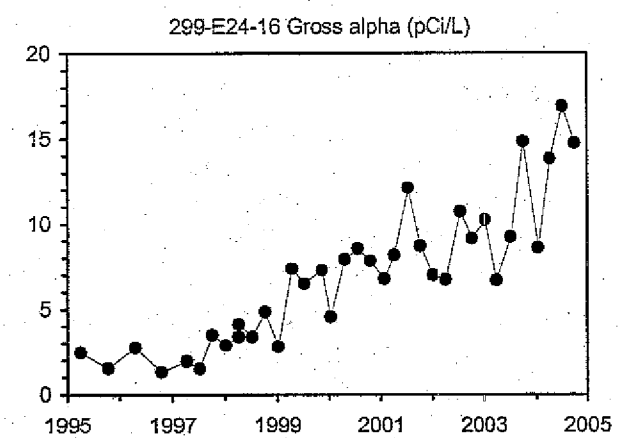


Figure 16. Gross alpha at well 299-E24-16.

responsible for the elevated gross alpha is uranium. Currently, groundwater samples collected from the near-field PUREX Cribs well network are not analyzed for uranium. Gross alpha was used to screen for uranium. If the ratio of uranium (in μg /L units) to gross alpha (in pCi/L units) is assumed to be about 1.6, then the concentration of uranium at well 299-E24-16 would be approximately 22 μg /L. The drinking water standard for uranium is 30 μg /L. In order to determine if the elevated levels of gross alpha at PUREX Cribs wells are caused by uranium, uranium will be analyzed in samples from two wells near these two cribs in future sampling events.

Quality Control

Highlights of the groundwater project's quality control (QC) program for July-September 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 evaluations and statistical comparisons discussed above. Data related to QC issues have been flagged in the database or are undergoing further review.

- A total of 112 results were flagged with an H due to missed holding times. Nitrate, nitrite, and volatile organic compounds account for most of the flagged results. In general, 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. Chloride, fluoride, carbon tetrachloride and tetrachloroethene were the constituents with out-of-limit results.
- Approximately 3% of the field blank results exceeded the QC limits. Acetone, methylene chloride, and zinc had the greatest number of out-of-limit results. Overall, the field blank results that were outside QC limits should have little impact on the interpretation of groundwater data.
- Laboratory performance on the analysis of blind standards was good overall. Severn Trent St. Louis had one out-of-limit result for total organic halides, and Severn Trent Richland had unacceptable results for gross alpha (3) and plutonium-239 (1). Lionville Laboratory had 4 out-of-limit results for total organic carbon. All of the results from Eberline Services were acceptable.
- Performance-evaluation study results were available from one Water Pollution study from STL St. Louis and six Water Pollution or Water Supply studies from Lionville Laboratory, a Mixed Analyte Performance Evaluation Program study, and two InterLaB RadCheM Proficiency Testing Program studies this quarter. The majority of the labs' results were within the acceptance limits, indicating good performance overall.
- Approximately 97% 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 method blanks for manganese and tritium; laboratory control samples for acetone; matrix spikes for nitrogen in nitrite, 1,1-dichloroethane, acetone, carbon tetrachloride, and methylene chloride; duplicates for acetone; and surrogates 1,2-dichloroethane-d4, 4-bromofluorobenzene, o-terphenyl, and toluene-d8.

References

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.

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, 2004. *Monitoring Plan for RCRA Groundwater Assessment at the 216-U-12 Crib.* PNNL-14301, Rev. 1. Pacific Northwest National Laboratory, Richland, Washington.