QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT GROUNDWATER MONITORING DATA FOR THE PERIOD OCTOBER THROUGH DECEMBER, 2001.

Sixteen RCRA sites were sampled during the reporting quarter, as listed in Table 1. Sampled sites include seven monitored under indicator evaluation programs, seven monitored under groundwater quality assessment programs, and two monitored under final-status corrective action.

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 interim-status, indicator evaluation requirements, as described in 40 CFR 265.93. One of the sites had an exceedance during the October-December 2001 quarter (see Table 1), but it was not due to an impact of the facility.

Discussions on non-dangerous waste constituents not regulated under RCRA (i.e. radionuclides) are provided because the information may provide further insight regarding the source and migration of dangerous waste constituents in groundwater.

Low-Level Waste Management Area 1: Average specific conductance in two downgradient wells continued to exceed the critical mean value in December 2001. The exceedance is caused by elevated nitrate concentrations from upgradient sources and is a continuation of an exceedance reported previously.

Single-Shell Tanks Waste Management Area A-AX: The critical mean values were revised based on the most recent interpretation of groundwater flow. Well 299-E24-20 is now an upgradient well and 299-E25-46, 299-E25-41, and 299-E24-19 are downgradient wells. There were no exceedances during the October-December 2001 quarter The new critical mean values are included in an interim change notice to the groundwater monitoring plan and is being submitted to Ecology separately.

Single-Shell Tanks Waste Management Area C: Although no indicator parameters exceeded critical mean values during October-December 2001, specific conductance continued to rise across the site due to increasing non-dangerous waste constituents sulfate, calcium, nitrate, chloride and to a lesser extent, sodium. The highest values are in upgradient wells 299-E27-14 (577 uS/cm) and 299-E27-7 (502 uS/cm). Specific conductance began rising in both wells in the mid 1990s. Due to problems with the pump, well 299-E27-7 was not sampled in the 4th quarter, of 2001 but in early January 2002. These January data were used for the October-December 2001 comparisons.

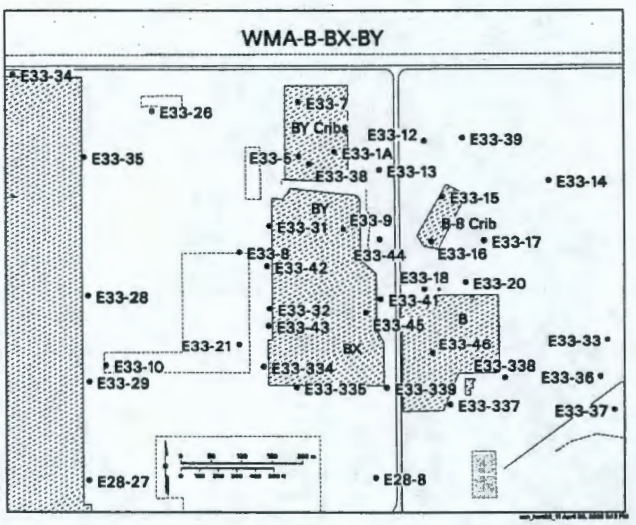
The following discussion on non-RCRA constituents is provided because it allows further insight regarding the source and migration of dangerous waste constituents in groundwater. Most notably, technetium-99 concentrations are increasing in all wells at Waste Management Area C. Until recently the highest technetium-99 values were in well 299-E27-14 (1,740 pCi/L in December 2001), which began increasing in the mid-1990s along with the anions. Recently the highest technetium-99 values have been detected in well 299-E27-7 (maximum value of 2,760 pCi/L in January 2002). Unlike well 299-E27-14, the technetium-99 began increasing in this well in early 1998.

These increases are part of a contaminant plume that may be moving into the area from upgradient areas in recent years (1995 to the present). It may be related to the upgradient 216-B-3-1 Ditch. This ditch was decommissioned in 1964 after an accidental release of mixed fission products from the PUREX Plant was discharged directly to the ditch. It should be noted, however, that the technetium-99 level in well 299-

E27-7 has risen sharply since 1998 indicating a short travel time and thus a short travel distance in the groundwater from the point of entry into the groundwater to the well.

Status of Assessment Programs

Single-Shell Tanks Waste Management Area B-BX-BY: There was no apparent change in the direction or rate of groundwater flow this quarter. Flow is to the southwest in the north half of the WMA and is slow. Groundwater flows toward the south-southeast to southeast in the southern WMA, where the flow rate is faster.

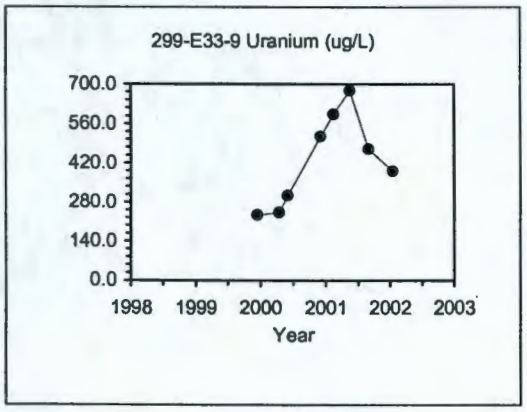


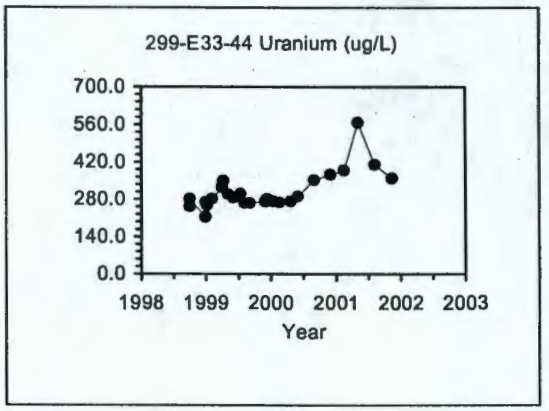
Nitrate is still migrating across the WMA, with the highest values in the north to the lowest along the southern boundary. The source of this nitrate contamination is the original BY Cribs plume migrating back into the area from the north. This plume, characterized in the early 1990s north of the BY Cribs, contains high levels of the dangerous waste constituent cyanide, as well as nitrate. In general, contaminant levels for these constituents have decreased across the area from the BY Cribs to the central part of WMA B-BX-BY.

Nitrite is still found in well 299-E33-44 in the central part of the WMA (1,050 μg/L, August 2001). Nitrite is not usually found in the groundwater, probably because it is oxidizes to nitrate before it can be detected in the groundwater. The presence of nitrite might suggest a recent release from the WMA.

The following discussion on non-RCRA constituents is provided because it allows further insight regarding the source and migration of dangerous waste constituents in groundwater. Technetium-99 and cobalt-60, associated with BY Cribs, have also exhibited high levels in some wells in the north part of the WMA B-BX-BY. The BY Cribs are part of the 200-BP-5 Groundwater Operable Unit and are monitored under separate CERCLA requirements.

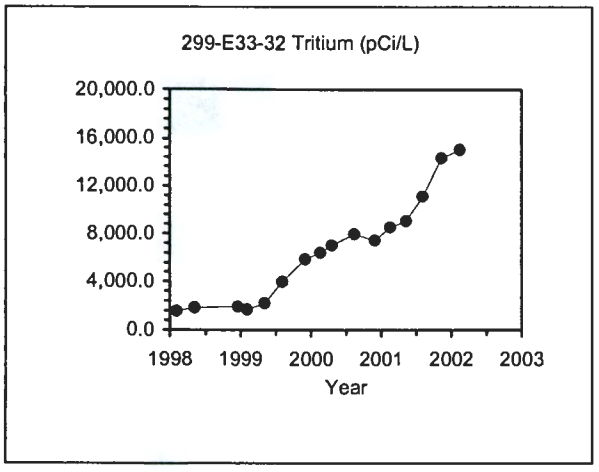
Uranium levels rose sharply in the central part of the WMA (wells 299-E33-9, 299-E33-44) in 2000 and declined in 2001 (see graphs). These decreases in uranium are similar to decreasing trends seen in other

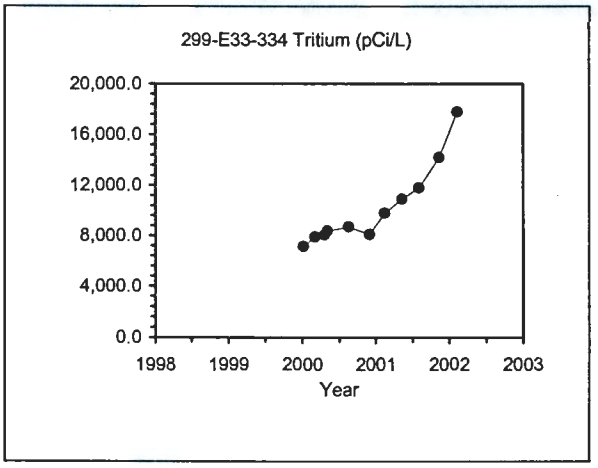




contaminants across the site. Upgradient, under the BY Cribs, uranium was found at 223 μg/L in November 2001 in well 299-E33-38. Downgradient, in wells 299-E33-41 and 299-E33-18, values ranged from 23 μg/L to 88.3 μg/L. To the west and southwest of the BY Tank Farm, uranium remained steady with values ranging from 76.6 μg/L in well 299-E33-31 to 26 μg/L in well 299-E33-42. Because uranium levels upgradient and downgradient of the BY Tank Farm are either significantly lower or at background levels, the source of the uranium could be associated with WMA B-BX-BY. The uranium trend seen in well 299-E33-44 also indicates the uranium source is close to the BY Tank Farm. The shape of the trend plot for well 299-E33-44 indicates that a relatively steady source was operative in the groundwater at this site until concentrations rose sharply after April 2000. The abrupt breakthrough curve indicates that the uranium had not traveled far in the groundwater before impacting the well.

Tritium, another non-RCRA constituent, was observed recently in new wells installed south of WMA B-BX-BY. Tritium began rising abruptly in wells 299-E33-43 and –32 on the west side of the BX Tank Farm (see graph of 299-E33-32). This trend is similar in wells 299-E33-334 (see graph) and –335 located in the southwest corner of the site. The highest value of 21,400 pCi/L found last quarter at the southeast corner of the BX Tank Farm in the recently installed well 299-E33-339 has decreased to 11,300 pCi/L. Farther to the east, a value of 8,620 pCi/L was detected in well 299-E33-337, decreasing from 14,500 pCi/L in August 2001. Tritium values continued to be low in the southeast corner of the WMA in new well 299-E33-338. Upgradient, tritium remained at local background levels, decreasing to 1,870 pCi/L and 2,230 pCi/L in wells 299-E33-41 and –42, respectively, indicating that tritium is not migrating into the local area from the north. During the drilling of borehole 299-E33-45, located in the BX Tank Farm, a significant perched water zone was found on a local silt layer about 15 feet above the water table. Analyses of the perched water showed tritium levels over 75,000 pCi/L. Breakthrough of this contamination to the groundwater may be the source of the tritium in this area.

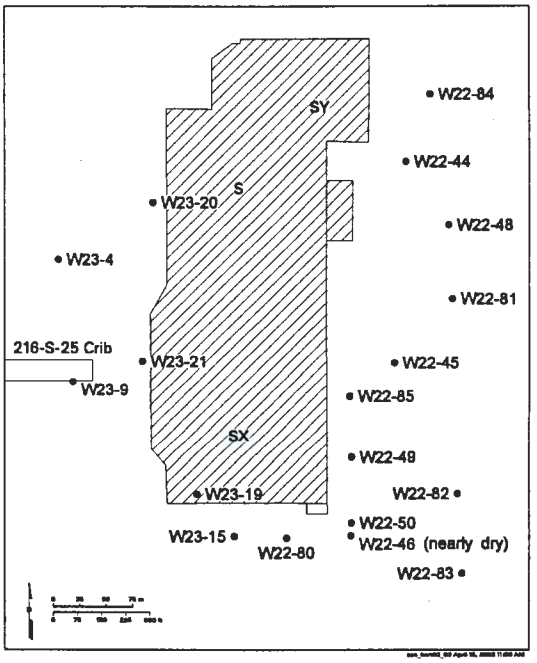




Single-Shell Tanks Waste Management Area S-SX: Groundwater beneath this WMA is contaminated with the dangerous waste constituent hexavalent chromium, as well as nitrate, and is attributed to sources primarily within the WMA. High concentrations of tritium and carbon tetrachloride are present from upgradient sources. The water table elevation has continued to decline but the gradient is relatively stable and the interpreted flow direction remains eastward. Chromium and nitrate were low in December, but the nitrate concentration was determined to be in error low by a factor of at least 2 based on the cation-anion balance and comparison with the specific conductance. These trends will continue to be watched.

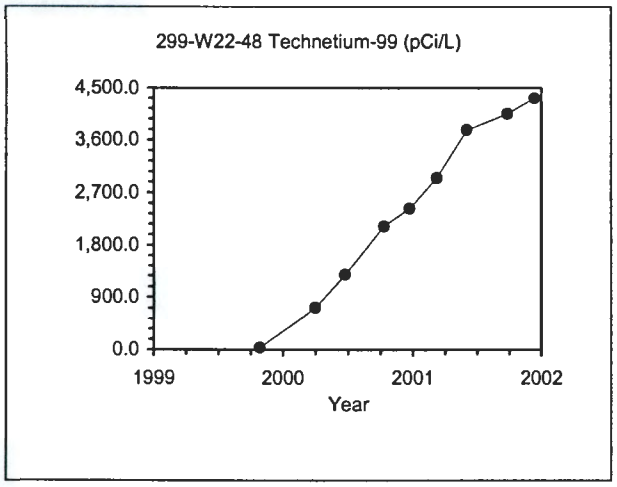
The following discussion on the non-RCRA constituent technetium-99 is provided because it allows further insight regarding the source and migration of dangerous waste constituents in groundwater. Technetium-99 concentrations continued to increase in downgradient well 299-W22-48, located east of the southern end of S tank farm. Concentrations have steadily increased since the well was installed in

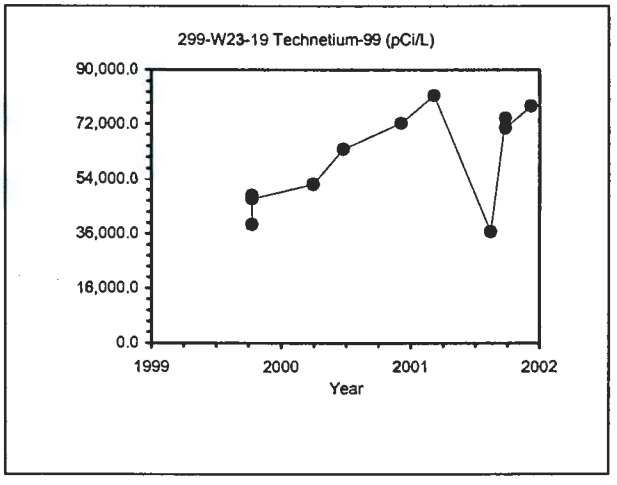
1999 (see graph). The upward trend in technetium-99 is accompanied by similar upward trends in nitrate and chromium, which is consistent with a tank waste source. The lateral extent of the contaminant plume responsible for these observations is limited to an area between well 299-W22-44 on the north and 299-W22-81 on the south, where the December 2001 technetium-99 concentrations were 159 pCi/L and 596 pCi/L, respectively.



The technetium-99 plume located across the southern portion of the WMA continues to slowly spread downgradient. Well 299-W22-83 has been used to delineate the downgradient margin of the technetium-99, but the concentration in this well increased to 756 pCi/L in December 2001. Therefore, the leading edge of the plume, as delineated by the 450 pCi/L contour, has migrated beyond the well farthest downgradient of the WMA. The northern margin of the plume has been bounded by well 299-W22-49. The technetium-99 concentration in the well had increased to 381 pCi/L in September, but this result is considered suspect because duplicate samples returned to the previous trend at 130 pCi/L. Therefore, the plume has not migrated to the north, as earlier suspected.

Technetium-99 concentrations in well 299-W23-19, located near tank SX-115 in the southwestern corner of SX tank farm, experienced a 50% drop in August 2001. This trend was duplicated for nitrate, chromium, and specific conductance. It was postulated that cutting and capping a nearby-pressurized water line in April 2001 eliminated a leaking water line, and stopped the driving force that leached contaminants to the water table, thus leading to the drop in concentrations in August. However, data from September and December do not support that conclusion: technetium-99 concentrations have returned to high levels in this well (see graph).

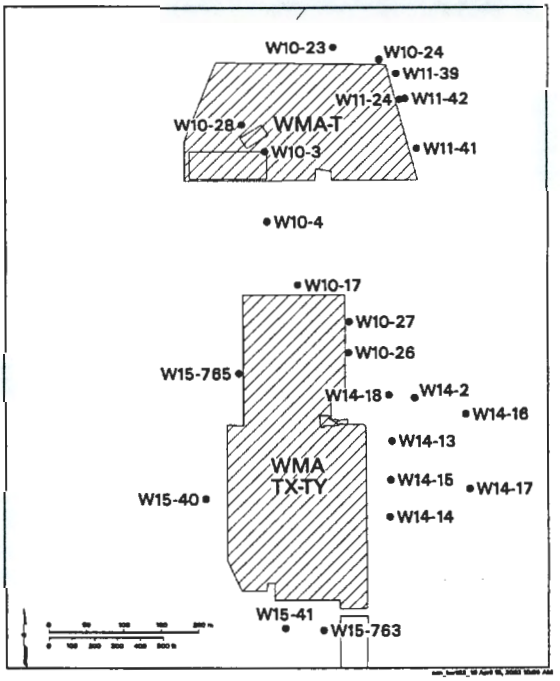




Two new wells, 299-W22-84 and 299-W22-85, were completed and sampled for the first time in December 2001. All reported results were within expected ranges and consistent with neighboring wells and the location of know contaminant plumes. Data from well 299-W22-84 indicate that groundwater downgradient from the northern end of the WMA is not contaminated with dangerous waste constituents.

Single-Shell Tanks Waste Management Areas T and TX-TY: Water levels near these waste management areas continued to decline during the reporting quarter. While the water table has continued to drop, the gradient has changed little; therefore the rate and direction of groundwater flow has not changed appreciably during the quarter. As previously reported groundwater flow directions have been affected by the 200-ZP-1 groundwater remediation in the southern part of WMA TX-TY. Groundwater flow is to the east or slightly north of east beneath T tank farm, to the east or east-southeast beneath TY tank farm, and toward the south beneath the TX tank farm.

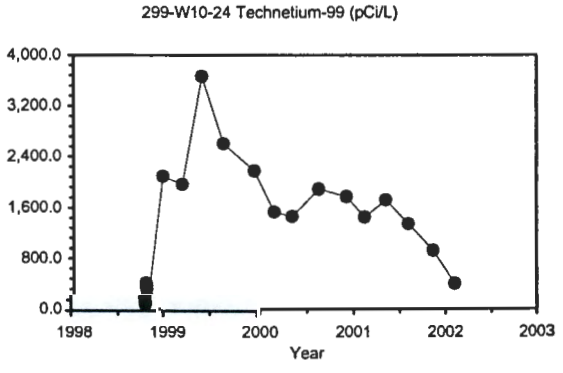
WMA T



Contaminants, including the dangerous waste constituent chromium, and fluoride, continued to be above maximum contaminant levels in some wells. The highest chromium concentrations were in well 299-W10-4, south of WMA T, where chromium continued to increase to 225 µg/L, and in wells along the east side of the WMA where concentrations are 120 to 130 µg/L. Fluoride is highest in wells in the north and northeast parts of the WMA. Fluoride concentration remained fairly steady at 4,300 µg/L in wells 299-W10-24 and 299-W11-42.

Nitrate concentrations remained above the maximum contaminant level in all wells in the WMA T network. Nitrate concentrations, which were increasing in well 299-W10-4, located south of WMA T, leveled off at 1,290 mg/L in November 2001. The next highest nitrate levels are found in wells along the east side of the WMA, where nitrate has reached 409 mg/L in 299-W11-41 and 536 mg/L in 299-W11-42. However, these values are very near those of the previous quarter. New, upgradient well 299-W10-28 was sampled for the first time in November 2001. Nitrate concentration in that well was 1,120 mg/L. Several other constituents from this well showed elevated concentrations and the data are similar to the first samples collected from other, newly constructed wells.

The following discussion on non-RCRA constituents is provided because it allows further insight regarding the source and migration of dangerous waste constituents in groundwater. Technetium-99 continued to be elevated in wells near the northeastern corner of WMA T. Technetium-99 levels in well 299-W10-24, at the northeast corner of the WMA, decreased slightly during the quarter from 1,340 pCi/L in August 2001 to 922 pCi/L in November 2001, still slightly above the drinking water standard of 900 pCi/L (see graph). A sample collected in February 2002 continued the downward trend, at 390 pCi/L.



The highest levels of technetium-99 continued to be in well 299-W11-39, on the northern part of the east boundary of the WMA. However, the November technetium-99 concentration was 1,490 pCi/L which is

substantially lower than the previous value of 5,010 pCi/L in August 2001. The November value may be a bad analytical result and has been flagged in the database.

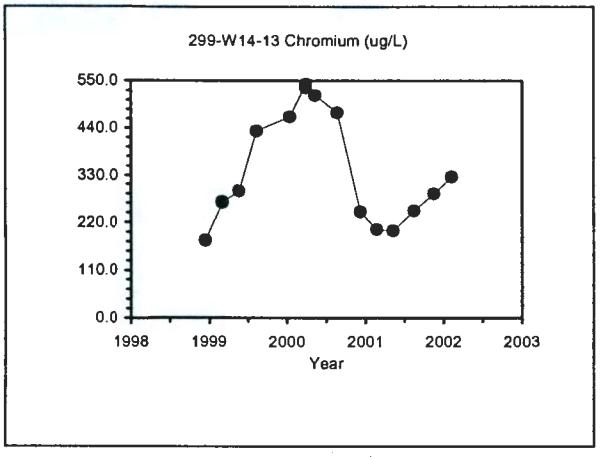
Technetium-99 concentrations in two of the three wells along the central and southern parts of the east boundary of the WMA (299-W11-41 and 299-W11-42), have been increasing slightly since May 2001 and are in the 450 to 540 pCi/L range. The latest technetium-99 results are consistent with an eastward migrating plume and the fairly recent changes in groundwater flow direction.

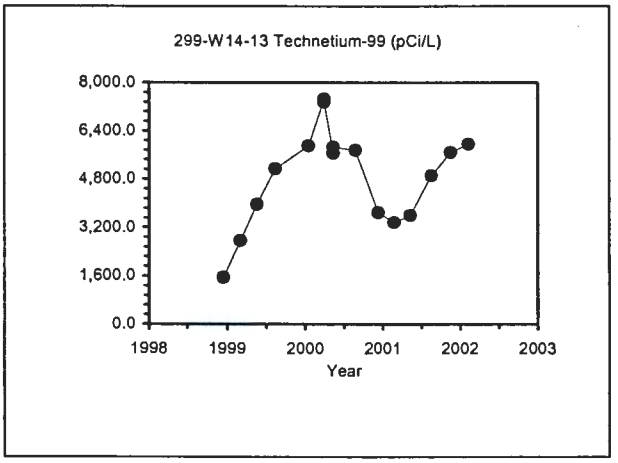
WMA TX-TY

Nitrate exceeded the maximum contaminant level (45 mg/L) in all wells in the WMA TX-TY monitoring network except 299-W15-763, located south of the WMA. The highest nitrate concentration was found in well 299-W14-13 in the central part of the east side of the WMA (315 mg/L in November 2001, up from 239 mg/L in August 2001). Nitrate in well 299-W14-17 increased slightly from 173 mg/L in August 2001 to 182 mg/L in November. Well 299-W14-17 is a mid-field well downgradient from 299-W14-13 and nitrate from the latter well may be reaching 299-W14-17. Nitrate in well 299-W10-17, north of the WMA decreased from 247 mg/L in August to 230 mg/L in November.

The dangerous waste constituent chromium increased downgradient in well 299-W14-13 in December(see graph). Nitrate follows this trend as well.

The following discussion on non-RCRA constituents is provided because it allows further insight regarding the source and migration of dangerous waste constituents in groundwater. Technetium-99 increased in downgradient well 299-W14-13 in December (see graph), following the same general trend as chromium. Iodine-129 and tritium also follow this same general trend.



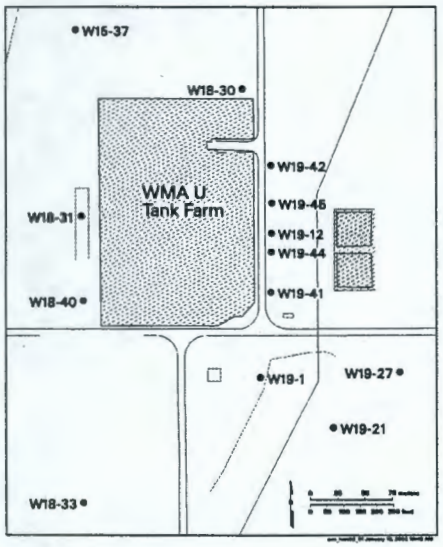


The only other well in the monitoring network at WMA TX-TY with technetium-99 above the 900 pCi/L drinking water standard is well 299-W15-41, south of the WMA where technetium-99 remained fairly steady at 1,180 pCi/L in November 2001.

Tritium exceeded the drinking water standard in one well at WMA TX-TY. Tritium increased to 1,690,000 pCi/L in well 299-W14-13 in November 2001. This was up from 1,390,000 in August 2001. Mid-field, downgradient well 299-W14-17, where tritium continued to remain very low at 547 pCi/L, does not intercept the tritium plume passing through 299-W14-13, as it appears to do for nitrate.

Iodine-129, which had been above the 1 pCi/L drinking water standard since March 2000 in well 299-W14-13, was not detected in November 2001. However, the reported non-detect value is 24.4 pCi/L. The previous value from August 2001 was 22.4 pCi/L. Probably, iodine-129 remains elevated in the groundwater at well 299-W14-13 but was reported as non-detect due to matrix effects.

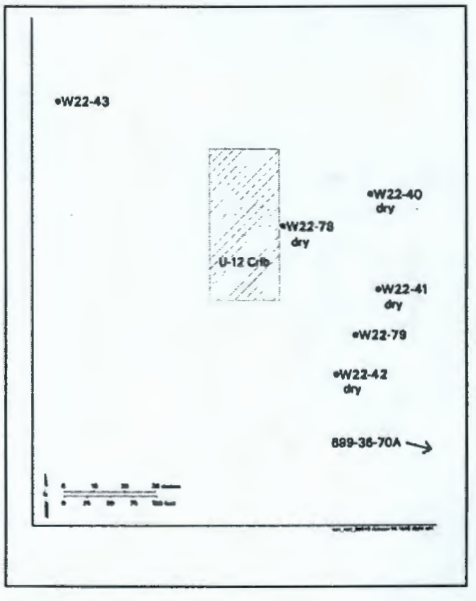
Single-Shell Tanks Waste Management Area U. The WMA, which has been in assessment monitoring since 1999, has affected groundwater quality with elevated concentrations of the non-dangerous waste constituent nitrate. Concentrations of dangerous-waste constituent chromium in downgradient well 299-W19-41 have exceeded background levels, but concentrations have been decreasing since 2000. These contaminants are accompanied by elevated concentrations of the non-dangerous waste constituents calcium, magnesium, chloride, and sulfate. Nitrate and technetium-99 levels have increased over the past several years, though concentrations are below their respective drinking water standards. The water table elevation has continued to decline but the gradient is relatively stable and the interpreted flow direction is eastward.



All analytical results from groundwater samples collected in November 2001 were on trend with the exception of technetium-99 in well 299-W19-12 where the concentration dropped from 397 pCi/L to 239 pCi/L. This drop in concentration is surprising because the technetium-99 had been increasing from about 150 pCi/L since 1998. Downgradient wells still show elevated concentrations of non-dangerous waste constituents technetium-99, nitrate, calcium, magnesium, sulfate, and chloride. Concentration trends for these constituents have been increasing since 1998, most obviously in well 299-W19-12.

Three new groundwater-monitoring wells that were completed in September, downgradient wells 299-W19-44 and 299-W19-45 and upgradient well 299-W18-40, were sampled for the first time in November. Results for the new wells are consistent with trends in neighboring wells.

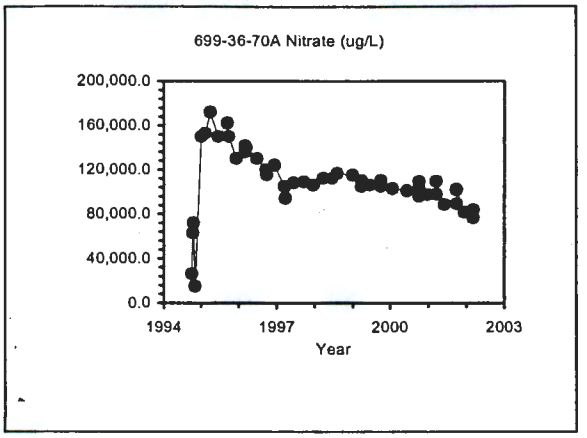
216-U-12 Crib: The current groundwater assessment monitoring network for the 216-U-12 Crib consists of only two downgradient wells (299-W22-79 and 699-36-70A). Both wells were sampled in December 2001. Concentrations for the site specific contaminants were varied: most declined and some increased slightly during the past quarter. Concentrations are expected to continue to decline overall.



The groundwater flow direction beneath the crib is relatively unchanged, toward the east-southeast, and the two wells still effectively monitor releases from the 216-U-12 Crib. The water level in well 299-W22-79 only declined about 0.1 meter since September's sampling event.

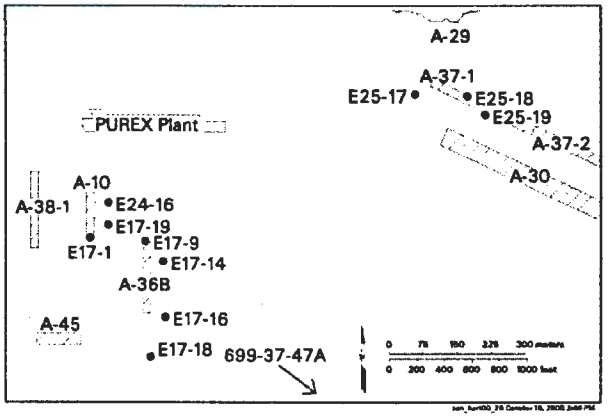
Specific conductance in downgradient well 299-W22-79 increased again slightly during the December sampling event. There have now been three consecutive quarters of increase in specific conductance, beginning with the June, 2001

sample event. The new value was 346 µS/cm. Specific conductance in downgradient well 699-36-70A continued to decline and was 530 µS/cm during December. The nitrate concentration in well 299-W22-79 increased to 45.2 mg/L, slightly above the 45 mg/L maximum contaminant level. The nitrate concentration in 699-36-70A continued to decline but remained above the maximum contaminant level (see graph).



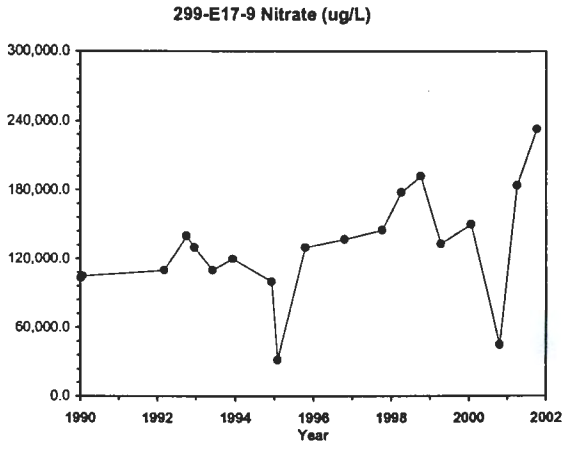
PUREX Cribs (216-A-10, 216-A-36B, and 216-A-37-1): The 11 wells of the near-field network were sampled in October 2001.

Beneath the PUREX Cribs, the differences in water table elevations from well to well are very small. Typically, the elevation differences between the lowest and highest water levels are about 0.2 meter. Therefore, the water table gradient is too low to determine groundwater flow rate or flow direction reliability. Groundwater flow directions determined from the movement of groundwater contaminant plumes indicate that the regional flow is toward the southeast.



Several non-dangerous waste constituents continued to be elevated above drinking water standards at some of the near-field wells. These include aluminum, manganese, nitrate, nitrite, pH; and the radionuclides gross beta, strontium-90, iodine-129, and tritium. Far-field wells are sampled annually to once every three years.

The maximum contaminant level for nitrate (45 mg/L) was exceeded at four PUREX Cribs wells during the reporting period (two at the 216-A-10 crib and two at the 216-A-36B crib). The trends in these four wells are generally steady to downward, with the exception of well 299-E17-9 near the 216-A-36B crib (see graph), which has an upward trend since 2000.



Manganese concentrations in well 299-E25-9 near the 216-A-36B crib continued to exceed the drinking water standard, but are declining. The latest reported value was 51 ug/L. The trend at this well has been variable since 1999.

Well 299-E25-31, an upgradient well, had a pH of 8.5 during the reporting period. The maximum contaminant level for pH is 8.5. This pH is typical for the historical trend at this well, which has been rising slightly since 1997.

The following discussions on non-RCRA radionuclide constituents is provided because it allows further insight regarding the source and migration of dangerous waste constituents in groundwater. Results for samples collected during the reporting period were 57.4 pCi/L for gross beta and 21 pCi/L for strontium-90. Strontium-90 has been generally rising in well 299-E17-14 since 1997. Iodine-129 concentrations at all 11 near-field wells exceeded the drinking water standard for iodine-129 (1 pCi/L). The general trend is steady to downward. The highest reported result was 9.78 pCi/L at well 299-E17-14 near the 216-A-36B crib.

Nine of the 11 near-field wells in the PUREX Cribs well network had tritium results that exceeded the drinking water standard (20,000 pCi/L). Six exceeded the drinking water standard by factor of 10. Most wells show steady to declining concentrations. However, three wells show more variable historical trends. Well 299-E17-9 had the highest level of tritium during the reporting period (4,170,000 pCi/L) and is an example of a well where the historical trend has been variable (see graph). The result also exceeds the derived concentration guide for tritium (2,000,000 pCi/L).

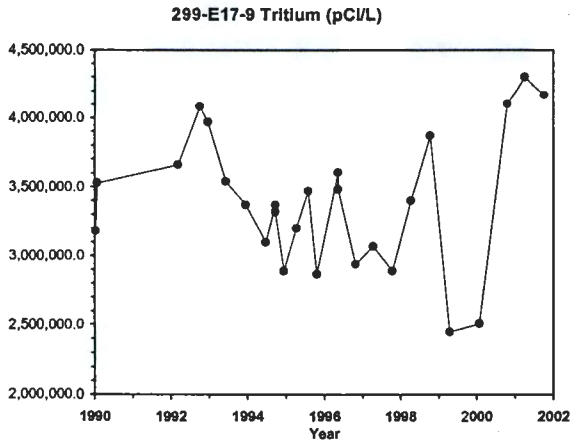


Table 1. Status of RCRA Sites, October-December, 2001.

Site	Routine sampling Oct-Dec 2001	Statistical exceedance
Indicator Evaluation Sites [40 CFR 265.93(b)] (sampled semiannually)		
1301-N Facility	No	Not applicable
1325-N Facility	No	Not applicable
1324-N/NA Site	No	Not applicable
B-Pond	No	Not applicable
A-29 Ditch	No[a]	Not applicable
B-63 Trench	Yes	No
S-10 Pond and Ditch	Yes	No
LERF	Yes	Not applicable (no statistical evaluations)
LLBG WMA 1	Yes	Yes[b]
LLBG WMA 2	Yes	No
LLBG WMA 3	No	Not applicable
LLBG WMA 4	No	Not applicable
SST WMA A-AX	Yes	No
SST WMA C	Yes	No
NRDWL	No	Not applicable
Groundwater Quality Assessment Sites [40 CFR 265.93(d)] (sampled quarterly)		
Seven sites[c]	Yes	Not required
Final Status Sites (WAC 173-303-645)		
300 Area Process Trenches	Yes	Yes[d]
183-H Basins	Yes	Yes[d]

LERF = Liquid Effluent Retention Facility
LLBG = Low-Level Burial Grounds
NRDWL = Nonradioactive Dangerous Waste Landfill
SST = Single-Shell Tanks
WMA = Waste Management Area

[a] Sampled in October; delayed from September. Results included in July-September 2001 report.
[b] No indication of dangerous waste contamination from facility; see text for explanation.
[c] U-12 Crib, PUREX Cribs, SST WMAs B-BX-BY, S-SX, T, TX-TY, and U.
[d] Site has entered corrective action because of previous exceedances.

Quality Control

Highlights of the RCRA quality control program for the October-December 2001 quarter are listed in Table 2. Details and data that are not available in HEIS are available upon request. The quality control program indicated that the data were acceptable for use in the statistical comparisons discussed above.

Table 2: Quality Control Highlights, October-December, 2001.

- One hundred forty-one results were flagged with an H due to missed holding times. Anions and phenols account for most of the flagged results, and the data impacts should be minor.
- Most of the field duplicate results demonstrated good precision, although the relative percent differences for ten pairs of results failed to meet the acceptance criteria. Bromide, chromium, fluoride, gross beta, iron, nitrate, technetium-99, tritium, and zinc were the constituents with out-of-limit results.
- Severn Trent Richland and St. Louis, Lionville Laboratory, and Eberline Services demonstrated excellent agreement in the analysis of anions, metals, strontium-90, and uranium in three split samples from 100 Area wells.
- Most total organic carbon and total organic halide quadruplicates exhibited acceptable precision. Four total organic carbon quadruplicates were out of limits, but most of the associated results were below the quantitation limit (i.e., less than 5 times the method detection limit).
- Approximately 4% of the field-blank results exceeded the QC limits. Most of the out-of-limit results were for acetone, copper, methylene chloride, sodium, total organic carbon, uranium, and zinc. In general, the field blank results should have little impact on the interpretation of 4th quarter groundwater data.
- Overall, Severn Trent, Lionville Laboratory, and Eberline Services performed well on the analysis of blind standards. Three out of 7 of Severn Trent's total organic halide results were outside the acceptance limits.
- Performance-evaluation study results were available from two InterLaB RadCheM studies and eight Water Supply/Water Pollution studies this quarter. The majority of the labs' results were within the acceptance limits, indicating good performance overall.
- Most of the laboratory QC results for this quarter were within 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 conductivity, total organic carbon, chloride, fluoride, sulfate, aluminum, and sodium; matrix spikes for cyanide and silver; duplicates for nitrogen in nitrate; and three surrogates. Overall, laboratory QC results were similar to last quarter.