0059828

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Richland Operations Office
P.O. Box 550
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AUG 9 2000

00-GWVZ-062

Ms. Jane Hedges
Perimeter Areas Section Manager
Nuclear Waste Program
State of Washington
Department of Ecology
1315 W. Fourth Avenue
Kennewick, Washington 99336-6018

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JUL 14 2003
EDMC

Mr. Douglas R. Sherwood
Hanford Project Manager
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington 99352-0539

Dear Ms. Hedges and Mr. Sherwood:

QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) GROUNDWATER (GW) MONITORING DATA FOR THE PERIOD JANUARY 1, 2000, THROUGH MARCH 31, 2000

Please find enclosed the subject report. The RCRA groundwater chemistry and water level data for the subject period have been verified and evaluated. The data are publicly available in electronic form in the Hanford Environmental Information System database. The electronic availability of the data and the summary provided below fulfill the reporting requirements of WAC 173-303 (and by reference 40 CFR 265.94). Verification of data included a completion check (requested analyses were received), quality control checks (field blanks, field duplicates, and blind samples), and project scientist evaluation.

Nineteen RCRA sites were sampled during the reporting quarter (see enclosure, Attachment 1). Sampled sites include 11 monitored under indicator evaluation programs, 7 monitored under groundwater quality assessment programs, and 1 monitored under final-status corrective action. Detailed information on salient issues during this quarter are included in the enclosure.

If you have questions about this quarterly data transmittal, please contact Marvin J. Furman at (509) 373-9630.

Sincerely,

K. Michael Thompson, Acting Program Manager
Groundwater/Vadose Zone Program

GWVZ:MJF

Enclosure

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QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT GROUNDWATER MONITORING DATA FOR THE PERIOD JANUARY 1 THROUGH MARCH 31, 2000.

References:

(1) K. Michael Thompson, RL, to Jane Hedges, Ecology, "Results of Assessment at the 1325-N Facility," dtd. July 11, 2000 (00-GWVZ-054).

(2) K. Michael Thompson, RL, to Jane Hedges, Ecology, "Notification of Specific Conductance Exceedance at the 216-A-29 Ditch," dtd. April 26, 2000 (00-GWVZ-038).

(3) M. J. Furman, RL, to Jane Hedges, Ecology, "Notification of Exceedance of Critical Mean Value for Specific Conductance at Single-Shell Tank WMA U," dtd. February 11, 2000 (00-GWVZ-018).

(4) K. Michael Thompson, RL, to Jane Hedges, Ecology, "Transmittal of Groundwater Quality Assessment Plan for Single-Shell Tank Waste Management Area (WMA) U, PNNL-13185," dtd. April 3, 2000 (GWVZ-031).

(5) Antonio Valero, Ecology, to Michael Thompson, RL, "Groundwater Quality Assessment Plan for Single-Shell Tank Waste Management Area U at the Hanford Site, March 2000 (PNNL-13185)," dtd. May 30, 2000.

Comparison to Concentration Limits

Contamination indicator parameter data (pH, specific conductance, total organic halides [TOX], and total organic carbon [TOC]) from downgradient wells were compared to background values at sites monitored under interim-status, indicator evaluation requirements, as described in 40 CFR 265.93. There were several exceedances, but none indicated hazardous contamination from the RCRA units, as explained below.

1324-N/NA Facilities. Specific conductance at downgradient wells continued to exceed the critical mean. Groundwater quality assessment monitoring in 1992 indicated that the high conductivity 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.

1325-N Liquid Waste Disposal Facility. Specific conductance in downgradient well 199-N-41 averaged 569 µS/cm, which exceeded the critical mean value of 470.9 µS/cm. DOE notified Ecology of a September 1999 exceedance in wells 199-N-41 and 199-N-81 in January 2000, and recently transmitted the results of the groundwater quality assessment (Reference 1). The high specific conductance is believed to originate at an upgradient source, and passed the upgradient well several years ago.

216-A-29 Ditch. Specific conductance in downgradient wells 299-E25-35 and 299-E25-48 slightly exceeded the critical mean value during the October-December 1999 quarter. The recent values are part of an increasing trend in specific conductance, which is caused by increases in sulfate, nitrate, calcium, and sodium. A formal letter of notification and assessment plan/report, were submitted to Ecology in April (Reference 2).

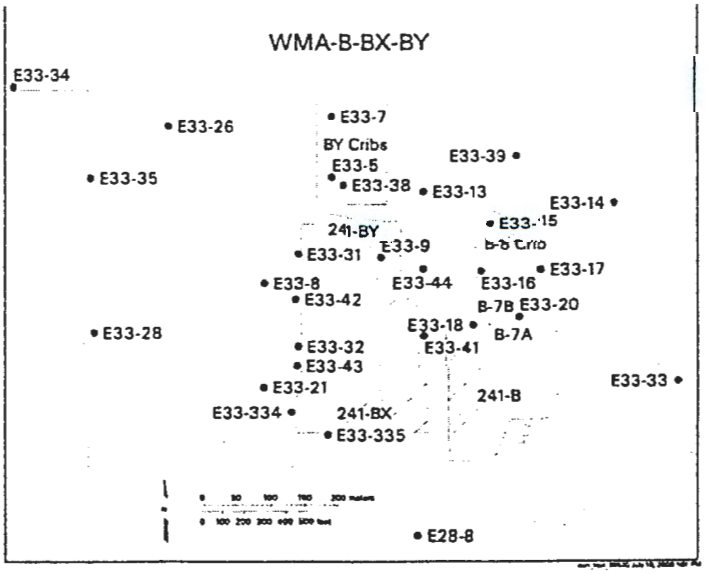
Low-Level Waste Management Area 1. This network was scheduled for sampling in October-December 1999, but was delayed until the first quarter of 2000. Specific conductance in one downgradient well (299-E33-34) continued to exceed the critical mean value. The elevated values are most likely the result of nitrate contamination from an upgradient source (the BY Crib). A letter of notification previously was submitted to Ecology. Because no wastes have been placed in the northern portion of this site and there is a known nitrate plume from an upgradient source, no further action is necessary.

Low-Level Waste Management Area 3. Specific conductance continued to exceed the critical mean value in an upgradient well (299-W10-13). The rise in specific conductance was reported previously and is caused by sulfate and nitrate.

Low-Level Waste Management Area 4. TOX continued to exceed the critical mean value in downgradient well 299-W15-16. This well used to be an upgradient well, and as reported earlier, the exceedance is believed to originate at an upgradient source.

Status of Assessment Programs

Single-Shell Tanks WMA B-BX-BY: Chemical ratios, chemical suites, plume locations, and trend analyses provide evidence of three distinct regions of contamination near this WMA. The bulk of the contamination, most likely associated with the BY cribs, is moving into the region from the north or northeast. Trend plots show this plume affects the west side of the WMA with concentrations decreasing to the south.



Groundwater flow direction, based on water levels and the apparent direction of plume migration, appears to be toward the west-southwest to southwest. There was no perceptible change in flow rate this quarter. However, without direct verification, flow direction and rate continue to be in question at this site.

Technetium-99. The prime area of contamination includes wells in the BY Cribs, the B-61 Crib, and on the west side of the WMA. Technetium-99 continued to increase in wells in this area (Attachment 2). Levels at well 299-E33-7 increased to 10,100 pCi/L in April 2000. West of the BY Cribs, technetium-99 concentrations continued to increase. Concentrations are highest in well 299-E33-26 and well 299-E33-34 and decrease to the south. With the exception of well 299-E33-35, cobalt-60 is elevated at these wells. It increased from 62.7 pCi/L in November 1999 to 75.3 pCi/L in February 2000 at well 299-E33-7 (drinking water standard of 100 pCi/L). Cyanide concentrations rose to over 380 μg/L in wells 299-E33-7 and 299-E33-38 (drinking water standard of 200 μg/L).

Technetium-99 concentrations also continued to increase along the west side of the WMA (see attachment 2). The level of technetium-99 generally decreases in the wells as one moves south. Technetium-99 contamination in well 299-E33-43 near the south end of the WMA has quadrupled since August 1999.

A second area of contamination is represented by well 299-E33-16, which is associated with the B-8 Crib and tile field. Technetium-99 concentration rose from 1,780 pCi/L in September 1999 to 2,030 pCi/L in February 2000. Other wells directly to the north and east have much lower technetium-99 concentrations that continued to rise slowly this quarter.

A third area of contamination is represented by wells 299-E33-44 and 299-E33-9. A pump has been installed in well 299-E33-9, which is located inside the 241-BY Tank Farm, and with a proper purge, the concentrations of iron and other metals has dropped to normal levels. Technetium-99 continued to rise from 5,640 pCi/L in December 1999 to 5,900 pCi/L in April 2000. These wells have a low nitrate:technetium-99 ratio and a unique chemical suite, consisting of high levels of uranium, technetium-99, nitrate and nitrite.

A special analysis of a sample from well 299-E33-9 detected about 5 pCi/g of cesium-137 in ionic form. Cobalt-60 and cyanide have previously been detected in wells 299-E33-34 and 299-E33-9. There are no February 2000 data for well 299-E33-9 for either constituent, and the data for well 299-E33-44 are presently under review.

Technetium-99 continued to rise in wells 299-E33-18 and 299-E33-41. Technetium-99 concentration doubled in well 299-E33-18 from 1,490 pCi/L in August 1999 to 3,030 pCi/L in February 2000. Technetium-99 more than doubled in well 299-E33-41 from 1,020 pCi/L in September 1999 to 2,500 in February 2000.

Nitrate. Nitrate levels continued to rise in wells in the BY Cribs, (e.g. 299-E33-7 in Attachment 2). West of the BY Cribs, nitrate rose in wells 299-E33-26 and 299-E33-34 and dropped slightly in well 299-E33-35. Farther south, nitrate continued to increase steadily at well 299-E33-28. Nitrate concentrations also continued to increase on the western boundary of the WMA, as shown in attachment 2. In well 299-E33-43, nitrate increased sharply along with technetium-99. If the flow direction of west-southwest is correct, this well may be reflecting the same increases in technetium-99 observed in well 299-E33-18, located to the northeast. Presently the nitrate:technetium-99 ratios agree quite well. Like technetium-99, nitrate levels decrease to the south down the WMA boundary. Higher values seen first in the north are observed at later times

farther south. Concentrations in well 299-E33-13, east of the BY Cribs, increased slightly, from 268 mg/L in December 1999 to 287 mg/L in February 2000.

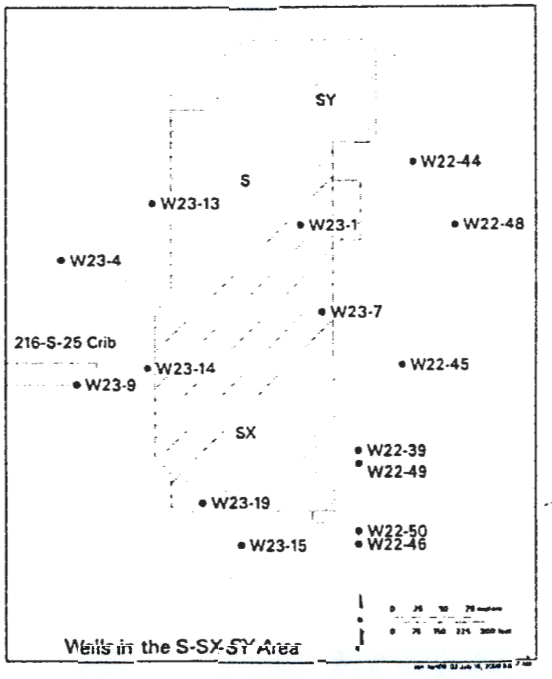
Uranium. This contaminant is found in the groundwater at WMA B-BX-BY east of 241-BY Tank Farm and in the southern part of the BY cribs. It also exceeds the 20- µg/L drinking water standard west of the BY Cribs in wells 299-E33-26 and -34 and on the west side of the WMA in well 299-E33-31. Some of the February 2000 data in this area are under review because of suspected problems.

Well 299-E33-44 continued to have the highest concentration of uranium this quarter, decreasing from 283 µg/L in December 1999 to 269 µg/L in February 2000. Inside the 241-BY Tank Farm, well 299-E33-9 had levels at 234 µg/L in December 1999. There are no data this quarter. The uranium source at these wells may be local, based on comparisons of nitrate:technetium-99 ratio, a unique and distinct contaminant suite, and the location of these well with respect to other wells displaying elevated uranium.

Well 299-E33-18, with the next highest uranium concentration, increased from 173 µg/L in December 1999 to 257 in February 2000, corresponding to an increase in technetium-99. The concentration in well 299-E33-13 last quarter was 52 µg/L. The value for this quarter is under review. The uranium concentration at well 299-E33-41 remained level at 24 µg/L in February 1999.

In the BY cribs, the uranium concentration was fairly stable in well 299-E33-38, at 121 µg/L in February 2000. Farther to the west, levels remained the same in well 299-E33-26 at 46 µg/L in March 2000. On the west side of the WMA, uranium increased sharply in well 299-E33-31 from 19 µg/L in December 1999 to 35 µg/L in February 2000. Wells farther south have uranium levels at or slightly above background.

Single-Shell Tanks WMA S-SX: Groundwater beneath this WMA is contaminated with technetium-99, nitrate, and hexavalent chromium, primarily from sources assumed to be within the WMA. High concentrations of tritium and carbon tetrachloride are also present from upgradient sources. The water table elevation has continued to decline but the gradient is relatively stable. The inferred flow direction has gradually shifted from southeastward to a more eastward direction with the decline in water table. The calculated groundwater flow rate remained unchanged for the quarter.



The technetium-99 drinking water standard of 900 pCi/L continued to be exceeded in new well 299-W23-19, which is located inside of the SX tank farm. This well has the highest concentration in

the WMA (52,300 pCi/L in March), and is located immediately adjacent to tank SX-115, where a leak occurred in the early 1960s. The proximity of this well to a known source, and the occurrence of high technetium-99 in the vadose zone at this well location, indicate that past leakage from tank SX-115 is the source. Technetium-99 concentrations also exceeded the standard in downgradient wells 299-W22-45, 299-W22-46, and 299-W22-50. The upward trend observed earlier in well 299-W22-45 appears to have reached a maximum concentration in January and declined slightly in March (Attachment 3). However, technetium concentrations in two upgradient wells (299-W23-9 and 299-W23-14) are increasing. These increases are attributed to residual contamination from an upgradient crib (216-S-25). In addition, one downgradient well (299-W22-44) at the S tank farm has increasing technetium-99, from non-detectable (<7 pCi/L) in May 1999 to 54 pCi/L in March 2000.

Nitrate exceeded the 45-mg/L maximum contaminant level in upgradient wells 299-W23-9 and 299-W23-14 and in new well 299-W23-19. However, concentrations dropped below 45 mg/L in downgradient wells 299-W22-45 and 299-W22-46. The concentration for upgradient well 299-W23-14 continued a sharp upward trend. Associated major cations and anions include sulfate, calcium, and sodium. High nitrate concentrations in well 299-W23-19 (491 mg/L in March) are consistent with the high technetium-99 in this well. The technetium-99/nitrate ratio is similar to the expected ratio for the contents of the single shell tank adjacent to the well (tank SX-115).

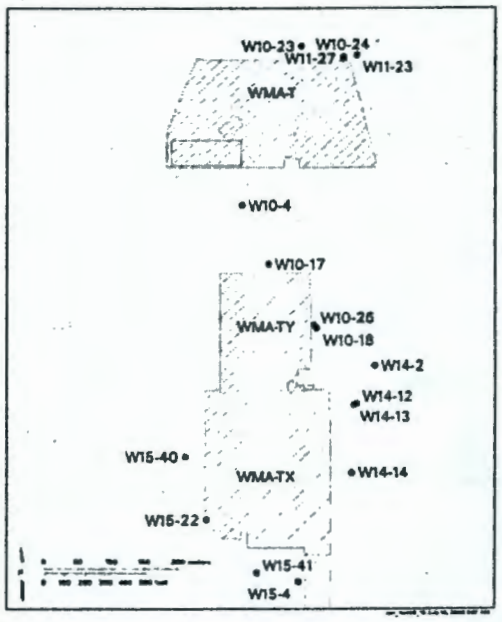
The tritium drinking water standard of 20,000 pCi/L continued to be exceeded in both upgradient and downgradient wells. The highest concentrations for this quarter occurred in wells closest to and directly downgradient from the 216-S-25 crib (wells 299-W23-9, 299-W23-14 and 299-W23-19, in order of decreasing concentration). Concentrations in downgradient wells 299-W22-45 and 299-W22-46 are declining, while increasing trends are observed in upgradient well 299-W23-9 and downgradient well 299-W22-39. The source of tritium in these four wells is attributed to residual contamination from past-practice discharges to the 216-S-25 crib as well as from tank leakage sources.

Neither strontium-90 nor cesium-137 was detected in any monitoring wells in the network during the quarter.

Carbon tetrachloride exceeded the 5-µg/L maximum contaminant level in two upgradient wells and six downgradient wells. The highest concentration, 140 µg/L, occurred in well 299-W23-15. This well has shown a gradual upward trend in TOX and carbon tetrachloride over the past two years. Carbon tetrachloride in groundwater beneath WMA S-SX is attributed to past-practice liquid waste disposal to various Plutonium Finishing Plant cribs, trenches and ponds. The specific location of the groundwater source area and pathway to WMA S-SX wells is unclear.

Uranium exceeded the proposed 20-µg/L maximum contaminant level in upgradient wells 299-W23-4 and 299-W23-9 and downgradient well 299-W22-50. The latter apparent exceedance was for a deep groundwater sample collected during extended drilling for this new monitoring well in January. Reanalysis of the sample for total uranium as well as isotopic uranium was requested and results are not yet available. The reported result for the April sampling event at this well (from the top of the aquifer) was slightly above natural background for the area (~2.5 µg/L).

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



WMA T. Technetium-99 concentrations in well 299-W10-24, the replacement well for 299-W11-27, decreased to 1,530 pCi/L in February. Technetium-99 in well 299-W11-23, a non-RCRA well located ~30 meters east of 299-W10-24, decreased to 1,120 pCi/L in January. The highest recorded technetium-99 value in this well was 8,540 pCi/L in November 1998.

The nitrate concentration in well 299-W10-4, a non-RCRA well located south of WMA T, decreased to 722 mg/L in February. Nitrate had been increasing in this well over the past several years and reached 1,049 mg/L in December 1999. Specific conductance has decreased to 1,854 µS/cm, from a high of 2,250 µS/cm in December 1999. Co-contaminants chromium and fluoride also decreased. Carbon tetrachloride, reported at 1,300 µg/L in December 1999, was not analyzed this quarter. The probable origin of these contaminants is waste disposal at facilities associated with the Plutonium Finishing Plant.

Nitrite concentrations in downgradient wells 299-W11-24 and 299-W11-28, on the west side of WMA T, continued to be high. In well 299-W11-24 nitrite was reported at 36 mg/L in January and 13 mg/L in February. In well 299-W11-28 nitrite was reported at 1.7 mg/L in March. These wells consistently have elevated concentrations of iron, manganese, and nickel. Chromium is relatively low.

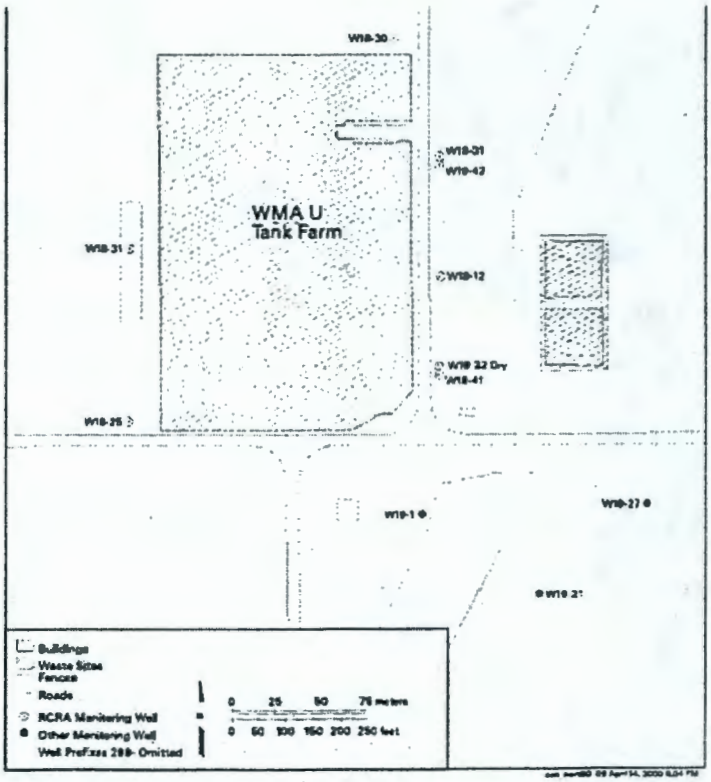
WMA TX-TY. Groundwater chemistry in well 299-W10-17 did not change significantly since the last sampling, i.e., nitrate continued to exceed the maximum contaminant level while chromium and technetium-99 were below applicable standards. This was one of the wells that initially placed WMA TX-TY in assessment but it is no longer downgradient of the WMA.

Technetium-99 concentration increased in well 299-W14-13 and decreased in well 299-W14-2 during the first quarter of 2000 (Attachment 4). Chromium was also elevated in well 299-W14-13 (538 µg/L), exceeding the maximum contaminant level. The technetium-99 and chromium are similar to the contaminant signature initially detected in well 299-W14-12; however, the chromium/technetium-99 ratio seems to have increased. Previous high values of technetium-99 and chromium were detected when groundwater flowed toward the northeast. Presently

groundwater flow in the area around well 299-W14-13 is toward the southeast. Thus, the recent increases in technetium-99 and chromium may represent a different source within the tank farms.

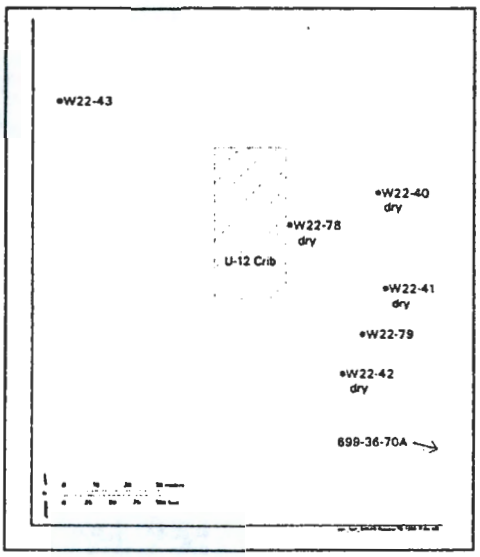
The high tritium groundwater plume first noted in well 299-W14-2 now includes well 299-W14-13. This quarter, tritium levels increased in wells 299-W14-2 and -13 to 1,900,000 and 2,940,000 pCi/L respectively (see Attachment 4). Iodine-129 concentrations also continued to be elevated in these wells during the quarter, up to 52 pCi/L in well 299-W14-2. The source of the high tritium/iodine-129 component is unclear, but the most likely source is operational leaks from the nearby 242-T Evaporator, which was closed in the early 1970s. The lack of elevated technetium-99 in well 299-W14-2 indicates the presence of at least two plumes in the area.

The first sampling of new well 299-W15-41, located along the southern margin of WMA TX-TY, indicated a technetium-99 concentration of 1,980 pCi/L. Nearby well 299-W15-4 reached 982 pCi/L in July, exceeding the 900-pCi/L drinking water standard, but decreased to 641 pCi/L in October 1999, the last sampling for this well.



Single-Shell Tanks Waste Management Area U. This WMA was placed into assessment after specific conductance in downgradient well 299-W19-41 (330.5 µS/cm in August 1999) exceeded the revised critical mean of 272.5 µS/cm. DOE transmitted a formal notification letter to Ecology on February 11, 2000 (Reference 3). DOE sent an assessment plan to Ecology in April (PNNL-13185), allowing for a first determination under 40 CFR 265.93(d)(5) (Reference 4). An assessment report was planned for completion by September 30, 2000. However, Ecology requested that the assessment report be completed by July 31, 2000 (Reference 5). An effort is underway to meet the new deadline.

216-U-12 Crib: The groundwater-monitoring network has been revised because of continued regional groundwater decline. Upgradient well 299-W22-43 now contains too little water to sample. A replacement well, originally planned for this year, has been deferred until at least next year. The current assessment monitoring network consists of only two downgradient wells (299-W22-79 and 699-36-70A). These wells were sampled at the end of March. Results are only available for downgradient well 299-W22-79; results for the other downgradient well will be reported next quarter. With the exception of technetium-99, contaminant concentrations have been declining and are expected to continue to decline.

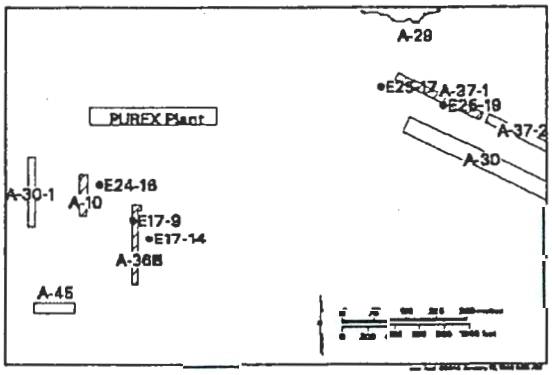


Due to regional changes in the water table the groundwater flow direction beneath the crib is slowly changing from an east-southeasterly direction to a more easterly direction. As this shift in flow direction progresses it is apparent that the regional contaminants, iodine-129 and tritium, are also shifting northward. This is reflected in increasing or unchanging (flat) concentration plots in the downgradient wells from south to north. The current flow direction is to the east-southeast. The rate of flow has not changed.

Specific conductance results in downgradient well 299-W22-79 averaged 403 µS/cm, remaining below the critical mean (457.8 µS/cm), similarly to previous values in dry well 299-W22-42, which it replaced. Nitrate values for well 299-W22-79 continues to exceed the 45-mg/L maximum contaminant level. Results from March 2000 were 62.6 mg/L, a slight decline from the previous quarter.

Technetium-99, tritium, and iodine-129 results for well 299-W22-79 were not reported last quarter because sampling was delayed until January 2000. The concentrations of these constituents were 73.9 pCi/L, 20,400 pCi/L, and 2.7 pCi/L, respectively. Results from the March sample were 61.8 pCi/L for technetium-99 and 20,300 pCi/L for tritium. Iodine-129 is only analyzed once a year. Tritium and iodine-129 are regional contaminants not associated with the crib.

PUREX Cribs (216-A-10, 216-A-36B, 216-A-37-1): One well near each of the three cribs was sampled during January 2000. The wells are 299-E17-14 near the 216-A-36B crib, 299-E24-16 near the 216-A-10 crib, and 299-E25-19 near the 216-A-37-1 crib. In addition, well 299-E17-9 (near the 216-A-36B crib), which was not sampled the previous quarter due to pumping problems, was sampled in January.



Near the PUREX Cribs, the difference in water table elevations from well to well is 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 contaminant plumes indicate that in the vicinity of the 216-A-10 and 216-A-36B cribs, the flow direction is probably southeast to east. Near the 216-A-37-1 crib, the flow direction is most likely south to southwest.

Concentrations of nitrate, iodine-129, strontium-90, and tritium continued to exceed drinking water standards. Details are discussed below.

- Nitrate concentrations remained above the maximum contaminant level (45 mg/L) near the 216-A-36B crib. The concentrations were 107 mg/L (average of two replicates) at well 299-E17-14 and 150 mg/L at well 299-E17-9. Trends have been relatively steady since at least 1993.

- Iodine-129 remained elevated above the interim drinking water standard (1 pCi/L) at all four wells sampled in January 2000. The sample collected at the 216-A-10 crib (well 299-E24-16) had a concentration of 6 pCi/L which is part of a trend slowly declining since 1997. At the 216-A-36B crib well 299-E17-14 had an iodine-129 concentration of 10 pCi/L and well 299-E17-9 measured 10 pCi/L. At well 299-E17-14 the trend is holding steady, but at well 299-E17-9 the trend is decreasing slightly. The well sampled at the 216-A-37-1 crib (299-E25-19) had an iodine-129 concentration of 2 pCi/L, which is part of a relatively steady trend.

- Strontium-90 remained above the 8-pCi/L drinking water standard at the 216-A-36B crib. Replicate samples from well 299-E17-14 in January 2000 both contained 18 pCi/L. These values are part of a gradual increase since 1997. Elevated strontium-90 results at the 216-A-36B crib were consistent with elevated gross beta. At well 299-E17-14 gross beta was reported at an average of 58 pCi/L (for two replicates) in January 2000 (drinking water standard is 50 pCi/L).

- Tritium concentrations remained above the interim drinking water standard (20,000 pCi/L) at all four wells sampled in January 2000. The highest level reported (2,510,000 pCi/L) was at well 299-E17-9 near the 216-A-36 crib. This value exceeds the Derived Concentration Guide of 2,000,000 pCi/L. The other well near this crib (299-E17-14) had an average value of 784,000 pCi/L for the two replicates collected, which is more than 10 times the interim standard. The value reported at the 216-A-10 crib (262,000 pCi/L at well 299-E24-16) is also more than 10 times the interim standard. The value reported at the 216-A-37-1 crib (well 299-E25-19) was 193,000 pCi/L. The concentrations of tritium at the PUREX Cribs are generally declining except for the 216-A-37-1 crib where the trends are fairly steady, but at lower levels.

Quality Control

Results of the RCRA quality control program for the January-March quarter are discussed in Attachment 5. Quality control data that are not available in HEIS are available in electronic form upon request. The quality control program indicated that the data were acceptable for use in the statistical comparisons discussed above.

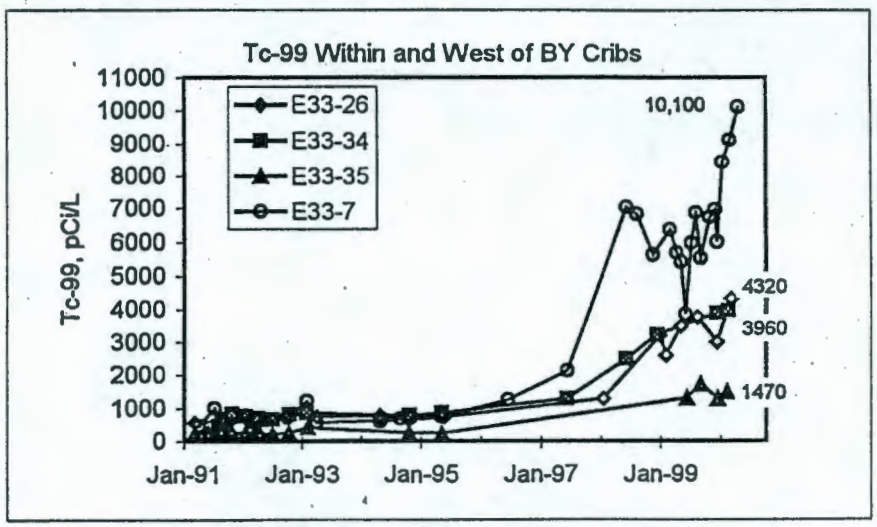
Attachment 1. Status of RCRA Sites, January-March 2000.

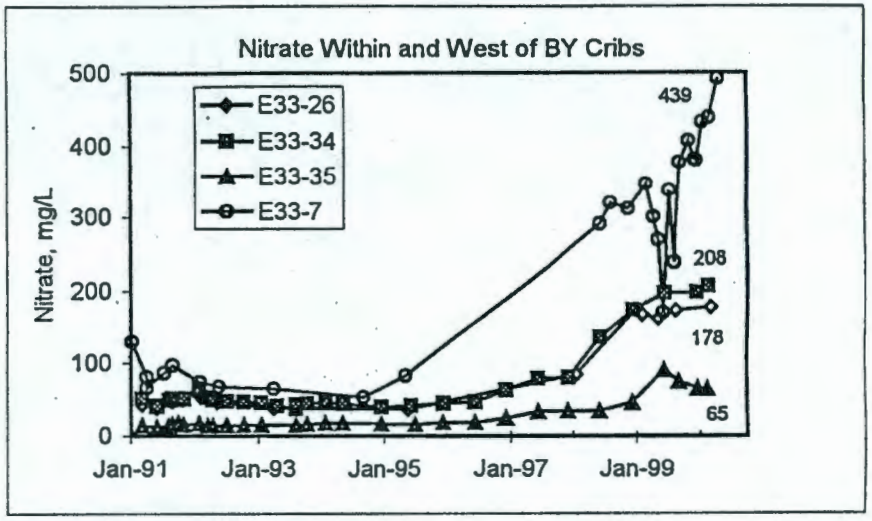
Site	Routine sampling Jan-Mar 2000	Statistical exceedance
Indicator Evaluation Sites [40 CFR 265.93(b)] (sampled semiannually)		
1301-N Facility	Yes	No
1325-N Facility	Yes	Yes[1]
1324-N/NA Site	Yes	Yes[1]
B-Pond	Yes	No
A-29 Ditch	No	Not applicable
B-63 Trench	Yes[2]	No
S-10 Pond and Crib	Yes[2]	No
LERF	No	Not applicable
LLBG WMA 1	Yes[2]	Yes[1]
LLBG WMA 2	No	Not applicable
LLBG WMA 3	Yes	Yes[1]
LLBG WMA 4	Yes	Yes[1]
SST WMA A-AX	Yes[2]	No
SST WMA C	No	Not applicable
NRDWL	Yes	No
Groundwater Quality Assessment Sites [40 CFR 265.93(d)] (sampled quarterly)		
Seven sites[3]	Yes	Not required
Final Status Sites (WAC 173-303-645)		
300 Area Process Trenches	Yes	Yes[4]
183-H Basins	No	Not applicable

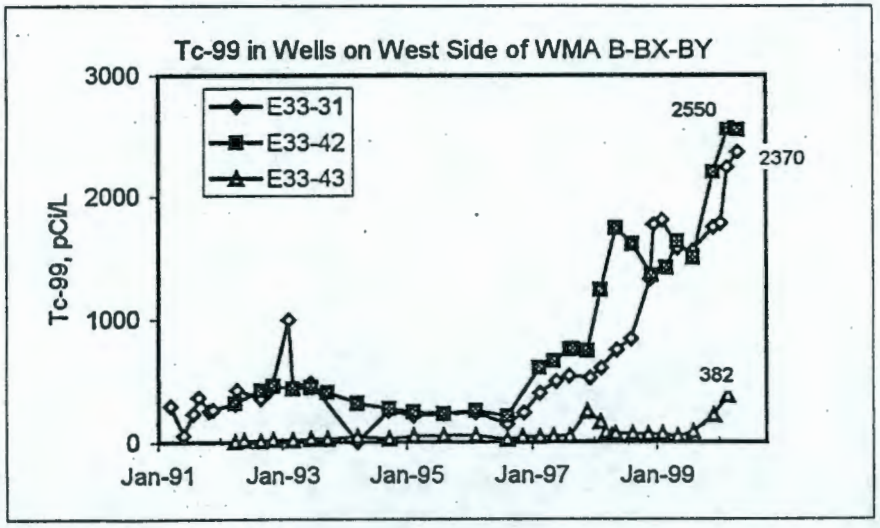
LERF = Liquid Effluent Retention Facility
LLBG = Low-Level Burial Grounds
NRDWL = Nonradioactive Dangerous Waste Landfill
SST = Single-Shell Tanks
WMA = Waste Management Area

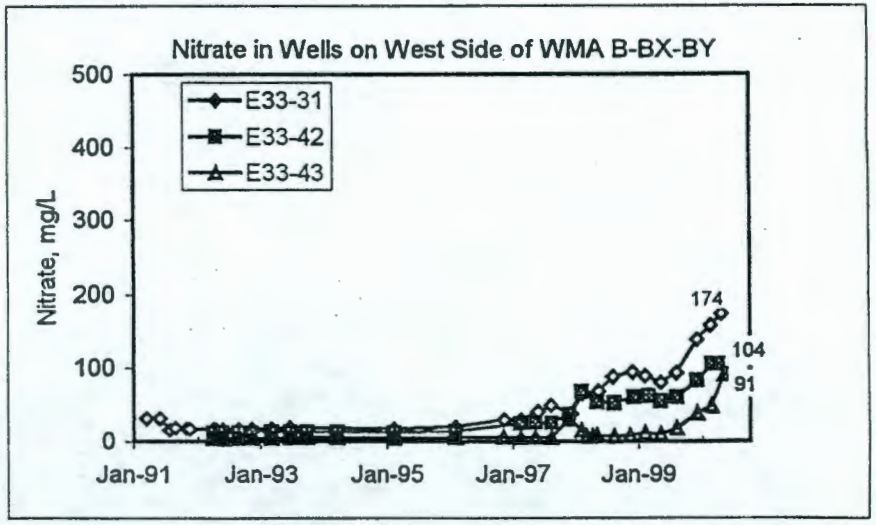
[1] No indication of hazardous waste contamination from facility; see text for explanation.
[2] Sampling scheduled for October-December 1999 but delayed until January-March 2000; data evaluated this quarter.
[3] U-12 Crib, PUREX Cribs, SST WMAs B-BX-BY, S-SX, T, TX-TY, and U.
[4] Site has entered corrective action because of previous exceedances.

Attachment 2

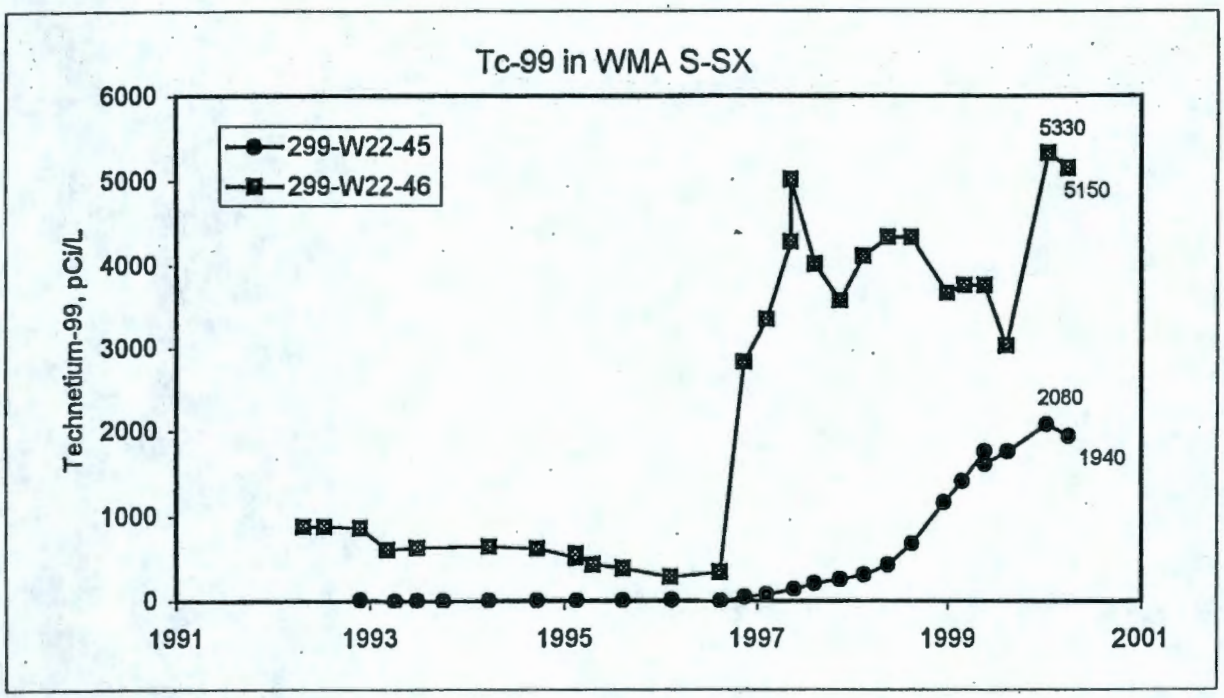




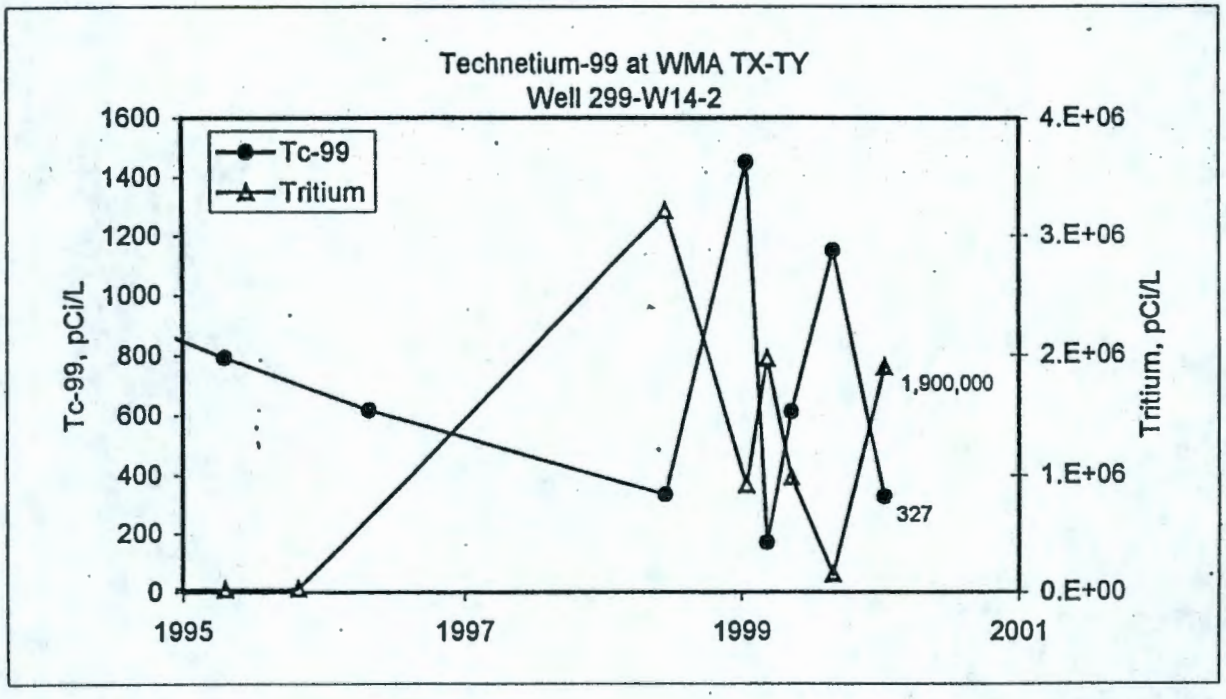


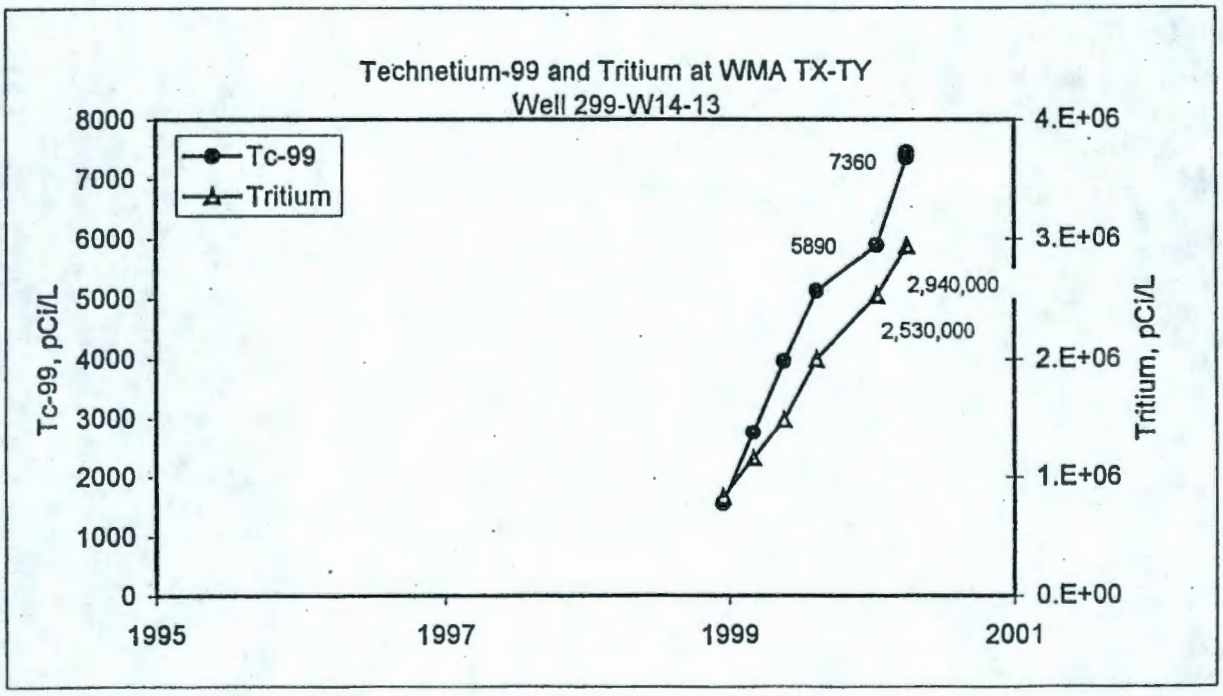


Attachment 3



Attachment 4





Attachment 5: Quality Control Results, January through March 2000.

This quality control (QC) report presents information on laboratory performance and field QC sample results for the first quarter of calendar year 2000.

Completeness. Completeness is determined by dividing the number of results judged to be valid by the total number of results evaluated and multiplying by 100. Data judged to be valid are data that have not been flagged with an Y, R, Q, or H, or qualified to indicate laboratory blank contamination. Out of a total of 22,496 results, 88% of the results were considered valid for the first quarter of 2000. This percentage is slightly higher than the value from the previous quarter (84%). Approximately 90% of the first quarter flags resulted from detection of anions, conductivity, metals, and total organic carbon (TOC) in field and method blanks. Most of these results were at levels near the method detection limits (MDL), so the overall impact of sample contamination or false-detection on data quality is believed to be minor.

The percentage of "suspect" (i.e., Y-flagged) data points was approximately twice as high in the first quarter than in the previous quarter. Thirty results were flagged with a Y. Over half of the suspect results were for ICP metals, and it appears that many of the anomalous values were caused by instrument and laboratory-contamination problems. The laboratory has taken steps to correct these problems. Another issue that caused some anomalous data points was a tritium interference problem with a new technetium-99 analysis method. The laboratory has corrected the interference problem, but for samples collected during the first quarter, technetium-99 results could be biased high in samples with greater than 40,000 pCi/L of tritium.

No first quarter results were flagged with an H to signify missed hold times. This is a significant improvement over the previous quarter, when 216 results were associated with exceeded hold times.

Field QC Data.

Field QC samples include field duplicates, split samples, and field blanks. Quadruplicate samples collected at many wells for TOC and total organic halides (TOX) analyses also provide useful QC data. Field blanks collected during the first quarter of 2000 included full trip blanks, field transfer blanks, and equipment blanks. In general, the desired collection frequency for field duplicates and full trip blanks is one sample per 20 well trips. The target collection frequency for field transfer blanks is one blank on each day in which routine well samples are collected for analysis of volatile organic compounds. Equipment blanks are normally collected once per 10 well trips for portable Grundfos pumps, or as needed for special projects. Split samples are also collected as needed.

Field duplicates. Field duplicates provide a measure of the overall sampling and analysis precision. Evaluation of field-duplicate data is based on the relative percent difference (RPD), which is calculated for each matching pair of results. Field duplicates with at least one result greater than 5 times the MDL or minimum detectable activity (MDA) must have RPDs less than 20% to be considered acceptable. Duplicates with RPDs outside this range are flagged with a Q in the database.

For the first quarter of 2000, 30 field duplicates were collected and analyzed to produce 1,213 pairs of results. Overall, the results indicate excellent sampling and analysis precision. Only 18 pairs of qualifying duplicate results had relative percent differences greater than 20%. Reanalyses resulted in acceptable precision for 6 pairs of results. The other discrepancies are probably related to differences in sample composition or poor precision at low sample concentrations.

Split samples. Split samples are replicate samples that are sequentially collected from the same location and analyzed by different laboratories. The results from split samples are useful for confirming out-of-trend results and assessing one laboratory's performance relative to another laboratory. Like field duplicates, split samples should have RPDs less than 20% to be considered acceptable. However, because the two laboratories can have different detection limits, concentrations that are quantifiable at one laboratory may go undetected at the other laboratory. Therefore, the 20% RPD criterion applies only to those results that are quantifiable at both laboratories.

During the first quarter of 2000, a single pair of split samples was collected. Results from the analyses indicated excellent agreement between the two laboratories.

TOC and TOX Quadruplicates. Samples for TOC and TOX analyses are normally collected in quadruplicate in accordance with RCRA requirements. While these samples are not intended as QC samples, quadruplicates may provide useful information about the overall sampling and analysis precision for organic indicator parameters. For the purposes of this discussion, TOC and TOX quadruplicate data were evaluated based on the relative standard deviation (RSD) for each set of quadruplicate results. Each quadruplicate set having an RSD greater than 20% and at least one result greater than 5 times the MDL was considered to have poor precision. Four out of 108 TOC quadruplicates and 2 out of 108 TOX quadruplicates failed to meet the evaluation criteria. However, most of the quadruplicate data sets did not include a result greater than 5 times the MDL. Most of the TOC results were relatively low, and some imprecision in the results is expected at these concentrations. However, several field blank results for TOC were also elevated, suggesting a possible analytical or sample-contamination problem. The laboratory has been asked to investigate possible causes for the elevated results.

Field Blanks. Full trip blanks, field transfer blanks, and equipment blanks are used to check for contamination resulting from field activities and/or bottle preparation. In general, the QC limit for blank results is 2 times the MDL or IDL for chemistry methods and 2 times the total propagated error for radiochemistry methods. For common laboratory contaminants such as acetone, methylene chloride, 2-butanone, toluene, and phthalate esters, the QC limit is 5 times the MDL. Blank results that exceed these limits may indicate a contamination or false-detection problem for regular groundwater samples. Results from groundwater samples that are associated with an out-of-limit field blank are flagged with a Q in the database.

A total of 3,052 results were produced from the first quarter field blank samples. Approximately 4% of the results (i.e., 133 results) exceeded the QC limits for field blanks. This percentage is similar to the values from the previous 2 quarters. Most of the flagged results were for TOC, anions, ICP metals, and volatile organic compounds; however, results were also flagged for total dissolved solids, TOX, and gross beta. The potential impacts on the data are minor in most cases. Several constituents (calcium, chloride, magnesium, sodium, sulfate, and total dissolved solids) had field blank results that were greater than the QC limits, but the values were much lower than the concentrations of these constituents in almost all first quarter groundwater samples. Some additional observations about the field blanks are noted below.

Twelve out of 25 field-blank results for TOC were greater than 2 times the MDL. Although none of the concentrations was greater than 1 mg/L, the number of out-of-limit results is of concern. Most of the elevated values were associated with samples collected near the end of February and analyzed during March. The source water for the deionized water system used by the samplers may have been contaminated during this time (the source water was changed during second quarter). A change in the analytical process could also be responsible. The laboratory has been asked to investigate whether any changes occurred during this period that might have affected the results. Groundwater Project staff will monitor the field blank results for TOC during the next quarter to determine if additional corrective actions are necessary.

Several metal results exceeded the QC limits. However, most of the results were within a factor of 3 of the QC limits. Calcium, iron, manganese, sodium, and zinc were the metals with the greatest number of out-of-limit results. Based on high results, it appears that the laboratory experienced some contamination problems with metals during the first quarter. Particulate matter in the laboratory hoods was probably the source of contamination. After the hoods were cleaned, the preparation-blank results were significantly lower. Due to this problem, it was necessary to reanalyze several groundwater samples. In most cases, the reanalysis results were much lower than the original values.

Forty-two volatile organic results exceeded the QC limits for blanks. Most of these results were within a factor of 2 of the QC limits, and the impacts on associated sample results should be minor. Chloroform had the greatest number of out-of-limit results. As noted in previous quarters, it is suspected that chloroform was present in the water used to prepare some of the field blanks due to incomplete removal by the water purification system. Laboratory contamination is the suspected source of the 1,4-dichlorobenzene, 2-butanone, and methylene chloride detected in some of the field transfer blanks, based on the lab's method blank results.

Due to the limited number of equipment blanks collected during the quarter (5), it is difficult to compare the equipment blank results to the full trip blank results. However, constituents detected in both types of blanks were generally found at lower levels in the equipment blanks. This suggests that the use of nondedicated sampling equipment at some wells did not introduce any significant contamination problems.

Laboratory QC Data.

Blind Standards. Double-blind standards containing known amounts of selected anions, organic compounds, and radionuclides were prepared and submitted to the primary laboratory in February and March. Splits of the TOX and gross beta standards were submitted to two other laboratories. All of the standards except those for cyanide were prepared using groundwater from background wells. Cyanide standards were prepared in deionized water.

The acceptance limits for blind standard recoveries are generally 75 – 125% except for chromium, which has limits of 80 – 120%, and specific radionuclides, which have a ± 30% acceptance range. The majority of the first quarter results were acceptable, indicating good analytical performance overall. Out-of-limit results are discussed in more detail below.

Two laboratories had low TOX-VOA recoveries. The first quarter standards were spiked at a high concentration (898 µg/L). Low recoveries have been observed for high-level TOX-VOA standards in the past. This phenomenon may be caused by the need to analyze such samples multiple times using successively smaller aliquot sizes (analogous to dilutions). The measured concentrations from successive analyses are expected to be lower since headspace is introduced into the sample bottle and volatilization may occur. Supplying the laboratory with an additional sample bottle may help avoid this problem in future high-level blinds.

One of the laboratories had TOX-phenol results that were biased high, and two results were out-of-limits. This is the second quarter in a row that the laboratory had unacceptable TOX-phenol results. These findings will be shared with the laboratory in an effort to identify the source of the problem. There are no impacts to project data since this laboratory did not analyze any groundwater samples for TOX during the first quarter.

Two sets of blind cyanide standards, prepared from cyanide from two different vendors, were analyzed to check whether the Groundwater Project's primary source of cyanide standard was reliable. With one exception, all of the results were biased low by approximately 20-30%. The similarity in the results for the 2 sets of samples suggests that the low recoveries observed in the past are not due to a problem with the cyanide standard. The laboratory has consistently obtained acceptable results on performance evaluation studies, so the low recoveries appear to be related to the procedure used to prepare the standards. This will be investigated by preparing blind standards using a different method.

All of the gross beta results were out-of-limits. The reason for the high bias is unknown, but based on the similarity in results from the 2 labs, it is suspected that the standards were spiked at higher concentrations than expected. These results have been shared with the project's blind-standard provider, and possible sources of errors are being investigated.

ERA Water Supply/Water Pollution Programs. The Environmental Resource Associates (ERA) Water Supply/Water Pollution (WS/WP) programs distribute standard water samples as blind samples to participating laboratories. These samples contain specific organic and inorganic analytes at concentrations unknown to the participating laboratories. After analysis, the labs submit their results to ERA. Regression equations are used to determine acceptance and warning limits. The results of these studies independently verify the level of laboratory performance and are expressed as a percentage of ERA-acceptable results.

Results were received for the WP samples reported in March 2000 (WP-60). Seven of the 130 results (5.4%) were unacceptable: conductivity, total suspended solids, COD, TOC, total kjeldahl nitrogen, cyanide, and total residual chloride. One result was outside the warning limits. The laboratory has responded to these unacceptable results. The high total suspended solids may have been caused by sample storage conditions, i.e., the sample was mistakenly stored in the refrigerator rather than at room temperature. The unacceptable COD, TOC, and residual chlorine results may have been caused by improper preparation of the samples. The laboratory had no explanation for the other unacceptable results and has requested new PE samples to repeat the analyses.

Mixed Analyte Performance Evaluation Program. The U.S. Department of Energy conducts the Mixed Analyte Performance Evaluation Program (MAPEP). In this program, samples containing metals, volatile and semivolatile organic compounds, and radionuclides are sent to participating laboratories in January and July. No new MAPEP results were available this quarter.

InterLaB RadCheM Proficiency Testing Program Studies. The InterLaB RadCheM Proficiency Testing Program, conducted by ERA, is a replacement for the EPA's National Exposure Research Laboratory PE studies. Control limits are based on the National Standards for Water Proficiency Testing Studies Criteria Document, December 1998.

The results from four RadCheM PE studies were reported in April and May 2000 (RAD-16, 17, 19, and 20. The following constituents were analyzed in these studies: gross alpha, gross beta, radium-226, radium-228, strontium-89, strontium-90, tritium, and uranium. All of the results were within the control limits.

Department of Energy Quality Assessment Program. The Environmental Measurements Laboratory conducts this program, which is designed to evaluate the performance of participating laboratories through the analysis of air filter, soil, vegetation, and water samples containing radionuclides. No new results were available this quarter.

QC Data from primary laboratory. Laboratory QC data includes the results from method blanks, laboratory control samples, matrix spikes, matrix spike duplicates, surrogates, and matrix duplicates. This information provides a means of assessing laboratory performance and the suitability of a method for a particular sample matrix. Laboratory QC data are not currently used for in-house validation of individual sample results unless the lab is experiencing unusual performance problems with an analytical method. Most of the first quarter laboratory QC results were within acceptance limits, suggesting that the analyses were in control and reliable data were generated. However, several parameters had unacceptable results, and some were significantly out of limits. Most of the results that were significantly out-of-limits were for anion and radiological matrix spikes. The only constituent in the laboratory control samples that was significantly out-of-limits was uranium-235.

Results for method blanks were evaluated based on the frequency of detection above the blank QC limits. In general, these limits are 2 times the MDL or IDL for chemical constituents and 2 times the total propagated error for radiochemistry components. For common laboratory contaminants such as acetone, methylene chloride, 2-butanone, toluene, and phthalate esters, the QC limit is 5 times the MDL. The general chemistry parameters and metals categories had the greatest percentage of method blank results exceeding the QC limits, with 6.9% and 7.5% exceeding twice the MDL or IDL, respectively. For metals, most of the out-of-limit results were for aluminum, iron, and zinc, although barium, copper, magnesium, and vanadium each had one or two out-of-limit values as well; these are not considered significant because of the very low detection limits. For general chemistry parameters, most of the high method blank results were for conductivity, with 83.3% above the QC limit. However, the out-of-limit method blank results for conductivity are not a significant problem because almost all first quarter groundwater samples had conductivity values that were at least 100 times higher than the highest blank value. For all other categories, the QC limits were exceeded by fewer than 4% of the method blanks. The only constituent in these categories with ten or more measurements that had greater than 10% of method blanks outside the QC limits was chloride (12.1%). The highest method blank result for chloride was 0.15 mg/L or 2.2 times the QC limit. Other parameters that had out-of-limit results are as follows: TOX, nitrogen in nitrate, sulfate, 1,4-dichlorobenzene, and tritium. Two chloride results were significantly out-of-limits.

Almost all laboratory control sample recoveries were acceptable. The percentages of out-of-limit results were as follows: 0% for general chemistry parameters, 0% for ammonia and anions, 0.2% for metals, 0% for volatile organic compounds, 0.3% for semivolatile organic compounds, and 1.6% for radiochemistry parameters. The only constituent with 10 or more measurements that had greater than 10% of laboratory control samples outside QC limits was uranium-235. Other parameters that had out-of-limit results were iron and oil and grease. Of these, uranium-235 was the only constituent with a significantly out-of-limit result.

For matrix spikes and matrix spike duplicates, the percentages of out-of-limit results were as follows: 3.1% for general chemistry parameters, 32.8% for ammonia and anions, 1.7% for metals, 0% for volatile organic compounds, 0% for semivolatile organic compounds, and 27.6% for radiochemistry parameters. Constituents with 10 or more

measurements that had greater than 10% of matrix spikes outside QC limits included chloride, fluoride, nitrate, nitrite, sulfate, cadmium, technetium-99, and uranium. Each of these constituents had one or more matrix spikes that were significantly outside the QC limits. Additional parameters that had out-of-limit results are as follows: TOC, TOX, phosphate, beryllium, calcium, chromium, iron, magnesium, potassium, silver, sodium, and strontium. Of these, TOC, phosphate, chromium, and silver had results that were significantly outside QC limits.

For matrix duplicates with values five times greater than the MDL or MDA, percentages of out-of-limit results were as follows: 1.9% for general chemistry parameters, 1.5% for ammonia and anions, 0% for metals, 0% for volatile organic compounds, 1.5% for semivolatile organic compounds, and 1.9% for radiochemistry parameters. Constituents with at least 10 measurements that had greater than 10% of matrix duplicates outside QC limits were uranium-234 and uranium-238. Other parameters that had out-of-limit results are as follows: TOC, total dissolved solids, bromide, chloride, 2-chlorophenol, 4-chloro-3-methylphenol, pentachlorophenol, carbon-14, iodine-129, technetium-99, uranium, and uranium-235. Of these, bromide, chloride, pentachlorophenol, carbon-14, iodine-129, uranium-234, and uranium-235 had results that were significantly outside QC limits.

Surrogate recoveries were also evaluated. The percentages of out-of-limit results were as follows: 0.2% for volatile organic compounds and 0.6% for semivolatile organic compounds. No constituents had greater than 10% of matrix duplicates outside QC limits. Constituents with out-of-limit results included 1,2-dichloroethane-d4, 4-bromofluorobenzene, 2,4,5,6-tetrachloro-m-xylene, 2,4,6-tribromophenol, and 2-fluorophenol. The latter three surrogates all had one result that was significantly outside the QC limits.