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Pacific Northwest National Laboratory
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April 3, 2000

Dec 1996 – Dec 1999

Mr. Marvin J. Furman
U.S. Department of Energy
Richland Operations Office
Richland, WA 99352

Dear Mr. Furman:

RE: RCRA FINAL STATUS CORRECTIVE ACTION SEMIANNUAL REPORTS

Semiannual reports for RCRA sites in Final Status/Corrective Action programs are attached. At the present time there are two sites under this status: the 183-H Solar Evaporation Basins and the 300 Area Process Trenches. The reports will be prepared semiannually each year as required by WAC 173-303-645(11)(g). Because these reports are the first of these reports on corrective action monitoring, they cover the total period of final status (up to 3 years). Subsequent reports will likely cover only the semiannual period being reported.

You may want to make editorial or technical changes to these reports before sending them to Ecology. Please indicate the changes you want and we will make the corrections. If you have any questions contact me or Jon Lindberg (376-5005).

Sincerely,

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Results of Groundwater Monitoring for RCRA Corrective Action
At The 300 Area Process Trenches
December 1996 Through December 1999

J.W. Lindberg
March 2000

INTRODUCTION

The 300 Area Process Trenches (also known as the 300 Area Process Trenches) were operated to receive effluent discharges of dangerous mixed waste from fuel fabrication laboratories in the 300 Area. This is the first of a series of semiannual groundwater-monitoring reports on the corrective action program at the 300 Area Process Trenches. It fulfills requirements of WAC 173-303-645(11)(g) to report on the effectiveness of the corrective action program. Results of monitoring have been reported previously in groundwater annual reports (e.g., Hartman 1999). This report covers the period from December 1996, when the groundwater-monitoring plan was modified for final status compliance monitoring, through December 1999. Future reports will be issued semiannually.

A RCRA interim-status groundwater quality assessment well network monitored the groundwater near the 300 Area Process Trenches from June 1985 until December 1996. In December 1996, the interim-status network was changed to a final-status compliance-monitoring program. The schedule for modifying the Hanford Site RCRA Permit (Ecology 1994) required that a modified closure plan and accompanying revised groundwater-monitoring plan be submitted. The documents were prepared, and the closure plan (DOE/RL-93-73) included the revised groundwater-monitoring plan (Lindberg et al. 1996). This documentation is referenced in the revised Hanford Site RCRA Permit (Ecology 1994) and became effective December 26, 1996.

As expected, groundwater samples from well 399-1-16B, a downgradient well sampling the base of the uppermost aquifer, showed that cis-1,2-dichloroethene (cis-DCE) and trichloroethene (TCE) were in concentrations higher than the required limits (70- and 5-μg/L MCLs, respectively). Similarly, the three downgradient wells monitoring the aquifer at the water table (399-1-10, -1-16A, and –1-17A) had concentrations of uranium that exceeded the 20-μg/L interim DWS. After the first four independent samples were collected in December 1996, and January, February, and March 1997, the exceedances of MCLs for cis-DCE, TCE, and uranium were confirmed and the regulator was notified. As required by WAC 173-303-645(2)(a)(ii), the monitoring plan was modified to move from a compliance-monitoring plan to a corrective action plan.

The objective of groundwater monitoring during the corrective action period is to demonstrate the effectiveness of the corrective action program by examining the trend of the constituents of interest to confirm that they are attenuating naturally, as expected by the CERCLA record of decision for the 300-FF-5 Operable Unit (ROD 1996). The proposed groundwater-monitoring plan for corrective action calls for samples from the same wells that were being sampled in the previous compliance period but uses the combined Shewart-Cusum

approach for statistical evaluations. This approach, when implemented, needs a single observation (sample) at any monitoring event. Also, each well showing an exceedance of one of the constituents of interest (currently, four of eight wells) will be on a quarterly sampling schedule to better follow the trends of contaminant concentration. The other wells in the network will continue to be sampled on a semiannual basis. The proposed plan is still being reviewed by the regulator.

RCRA GROUNDWATER-MONITORING PROGRAM

Until the proposed corrective action plan is approved by the regulator, the current final-status compliance-monitoring program (Lindberg et al. 1996) will remain in effect. This current compliance-monitoring plan calls for four independent (time independent) groundwater samples from each network well (eight) during each semiannual sampling period (2/yr) (i.e., 64 well trips/yr). The groundwater-monitoring well network is sampled in the following months: December, January, February, March, June, July, August, and September. Time independence is accomplished by sampling at one-month intervals during each semiannual sampling period. An alternate final-status/corrective action-monitoring plan has been proposed that will accomplish the goals of the original final-status/compliance-monitoring program but with one independent sample collected during each semiannual sampling event.

The groundwater-monitoring well network for the 300 Area Process Trenches includes four well pairs (Figure 1). One pair is upgradient and three pairs are downgradient. Each well pair is composed of one well that monitors the upper portion of the uppermost aquifer near the water table, and another well that monitors the base of the uppermost aquifer.

Wells in the network are monitored for constituents of interest including uranium and volatile organics. The concentration limits are as follows:

- Uranium: 20 μg/L. Based on interim proposed DWS.
- Cis-1,2-dichloroethene: 70 μg/L. Based on MCL.
- Trichloroethene: 5 μg/L. Based on MCL.
- Tetrachloroethene: 5 μg/L. Based on MCL.
- Any other volatile organic detected: MCL.

Originally, network wells were also monitored for chrysene, benzo(a)pyrene, thallium, and PCBs, but these constituents were eliminated after two years (December 1996 – December 1998) because they were not detected. Manganese, iron, dissolved oxygen, and Eh were also monitored because manganese and iron were detected (in concentrations exceeding the MCLs, 50 and 300 μg/L, respectively) in wells monitoring the base of the uppermost aquifer. However, it was concluded that the exceedances of manganese and iron were due to well construction effects under reducing conditions at the lower levels in the aquifer. Therefore, sampling for manganese, iron, dissolved oxygen and Eh was discontinued after two years also.

CONTAMINANT TRENDS

This section discusses concentrations of uranium, cis-DCE, TCE, and tetrachloroethene in groundwater near the 300 Area Process Trenches. Data for the reporting period (December 26, 1996, through December 1999) are included in the attachment. Trends are compared to the concentration limits defined above. For more information on groundwater contamination near the 300 Area Process Trenches, as well as the whole 300 Area since December 1996, see Hartman and Dresel (1998), Hartman (1999), and Hartman et al. (2000).

Uranium

Uranium-contaminated groundwater in the 300 Area occurs mostly near the top of the uppermost aquifer. The spatial distribution is illustrated in Figure 2. Although uranium is disseminated throughout all of the 300 Area, wells downgradient (southeast) of the southern end (the discharge end) of the 300 Area Process Trenches are associated with some of the highest concentrations of uranium in the 300 Area. The soil beneath the 300 Area Process Trenches continues to be one of the sources of uranium contamination in groundwater.

In December 1994 all discharges to the 300 Area Process Trenches ceased. Shortly thereafter the concentration of uranium increased in wells downgradient and remained elevated through 1997 (Figure 3). The concentration increased in the groundwater after discharges ceased because the large volumes of water formerly discharged to the trenches were no longer diluting the uranium in the aquifer downgradient of the trenches. After 1997, the concentration began to decline. Although uranium concentration continued to decline throughout 1998 and 1999, the concentration remains above the concentration limit (20 μg/L) in the three downgradient wells of the well network (399-1-10A, -1-16A, and –1-17A) that are screened in the upper portion of the uppermost aquifer. In the three downgradient wells in the lower portion of the uppermost aquifer, uranium is usually not detected except for well 399-1-16B. In this well uranium is detected but concentrations remain lower than the concentration limit.

Figure 3 also shows a yearly cycle for uranium concentration. The uranium concentration peak each year for well 399-1-17A is in the spring or early summer while the lowest concentration each year in the fall or early winter. However, the concentration of uranium in well 399-1-16A appears to be nearly a mirror image. As the concentration rises in well 399-1-17A, the concentration appears to decrease in well 399-1-16A. This yearly cycle or yearly fluctuation is caused by high Columbia River stages, which either mobilize or dilute uranium from the soil column depending on well location. Well 399-1-16A is closer to the river, and the high river stages tend to dilute and move lower concentrations of uranium past the well. Conversely, higher river stages tend to increase levels of uranium in well 399-1-17A by mobilizing uranium from the portion of the soil column that is above the water table at normal and low river stages.

Chlorinated Hydrocarbons

Only one well (399-1-16B – installed in the lower portion of the uppermost aquifer) of the 300 Area Process Trenches well network had reported concentrations of TCE above the

drinking water standard (5.0 μg/L) during the reporting period. The highest reported concentration during that time was 10 μg/L in March of 1997 (Figure 4). Other wells of the network occasionally have detectable concentrations of TCE, but none higher than 2.0 μg/L. Since March 1997 the reported concentrations of TCE have been slowly declining. In fiscal year 1998, the high concentration at well 399-1-16B was 8.0 μg/L. During fiscal year 1999, the concentration of TCE at well 399-1-16B decreased from 6.0 μg/L in January and February to 4.0 μg/L later in July through September.

Like TCE, cis-DCE is detected in several wells near the 300 Area Process Trenches, but only one well (399-1-16B) has reported concentrations above the MCL (70 μg/L) during the reporting period. The highest reported concentration during that time was 190 μg/L in February 1997. During 1997 and 1998 the concentration of cis-DCE in well 399-1-16B remained fairly constant in the range of 140 to 180 μg/L (Figure 5). During 1999, the concentration began to decline with one value as low as 120 μg/L.

Tetrachloroethene (MCL 5.0 μg/L) contamination in the groundwater near the 300 Area Process Trenches is different than TCE and cis-DCE in that it is detected in the network wells screened in the upper portion of the uppermost aquifer. Furthermore, the source of tetrachloroethene at the 300 Area Process Trenches appears to be short-lived compared to the longer-lived (albeit decreasing) sources for the other two chlorinated hydrocarbons (Figure 6). A plume was discovered in May of 1998 with a concentration of 10 μg/L at well 399-1-17A. At the same time well 399-1-16A (further downgradient) had a reported tetrachloroethene concentration of 2.0 μg/L. The tetrachloroethene plume peaked in concentration at well 399-1-17A with a concentration of 38 μg/L during August 1998, and well 399-1-16A peaked in September 1998 with concentration of 17 μg/L. By mid-1999 tetrachloroethene in 300 Area Process Trenches network wells was no longer detectable.

CONCLUSIONS

Concentrations of uranium, cis-DCE, TCE, tetrachloroethene, manganese and iron exceeded applicable concentration limits during the reporting period of December 1996 through December 1999. Sampling for manganese and iron has been discontinued because the exceedances are due to well effects under reducing conditions in the lower portion of the uppermost aquifer. Uranium concentrations exceeded the concentration limit at all three downgradient wells that are completed in the upper portion of the uppermost aquifer. However, concentrations continue to decline with time and vary with Columbia River stage. Cis-DCE and TCE exceeded applicable concentration limits in only one well (399-1-16B – screened in the lower portion of the uppermost aquifer). Tetrachloroethene exceeded the concentration limit at downgradient wells (screened in the upper portion of the uppermost aquifer) for a brief period during the reporting period, but is no longer detected in downgradient wells.

Until the proposed corrective action groundwater-monitoring plan is approved by the regulator, the current final-status compliance-monitoring program (Lindberg et al. 1996) will remain in effect.

REFERENCES

DOE/RL-93-73, 1994, *300 Area Process Trenches Closure Plan.* U.S. Department of Energy, Richland, Operations Office, Richland, Washington.

Ecology, 1994, *Dangerous Waste Portion of the Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste*, Permit No. WA7890008967, effective September 28, 1994, Washington State Department of Ecology, Olympia, Washington.

Hartman, M.J., ed., 1999, *Hanford Site Groundwater Monitoring for Fiscal Year 1998*. PNNL-12086., Pacific Northwest National Laboratory, Richland, Washington.

Hartman, M.J, and P.E. Dresel, eds., (1998), *Hanford Site Groundwater Monitoring for Fiscal Year 1997*. PNNL-11793, Pacific Northwest National Laboratory, Richland, Washington.

Hartman, M.J., L.F. Morasch, and W.D. Webber, eds., 2000, *Hanford Site Groundwater Monitoring for Fiscal Year 1999.* PNNL-13116, Pacific Northwest National Laboratory, Richland, Washington.

Lindberg, J.W., C.J. Chou, and V.G. Johnson, 1996, *Groundwater Monitoring Plan for the 300 Area Process Trenches*. WHC-SD-EN-AP-185, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

Record of Decision (ROD), 1996, *Declaration of the Record of Decision for the 300-FF-1 and 300-FF-5 Operable Units.* State of Washington Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Richland, Operations Office, Richland, Washington.

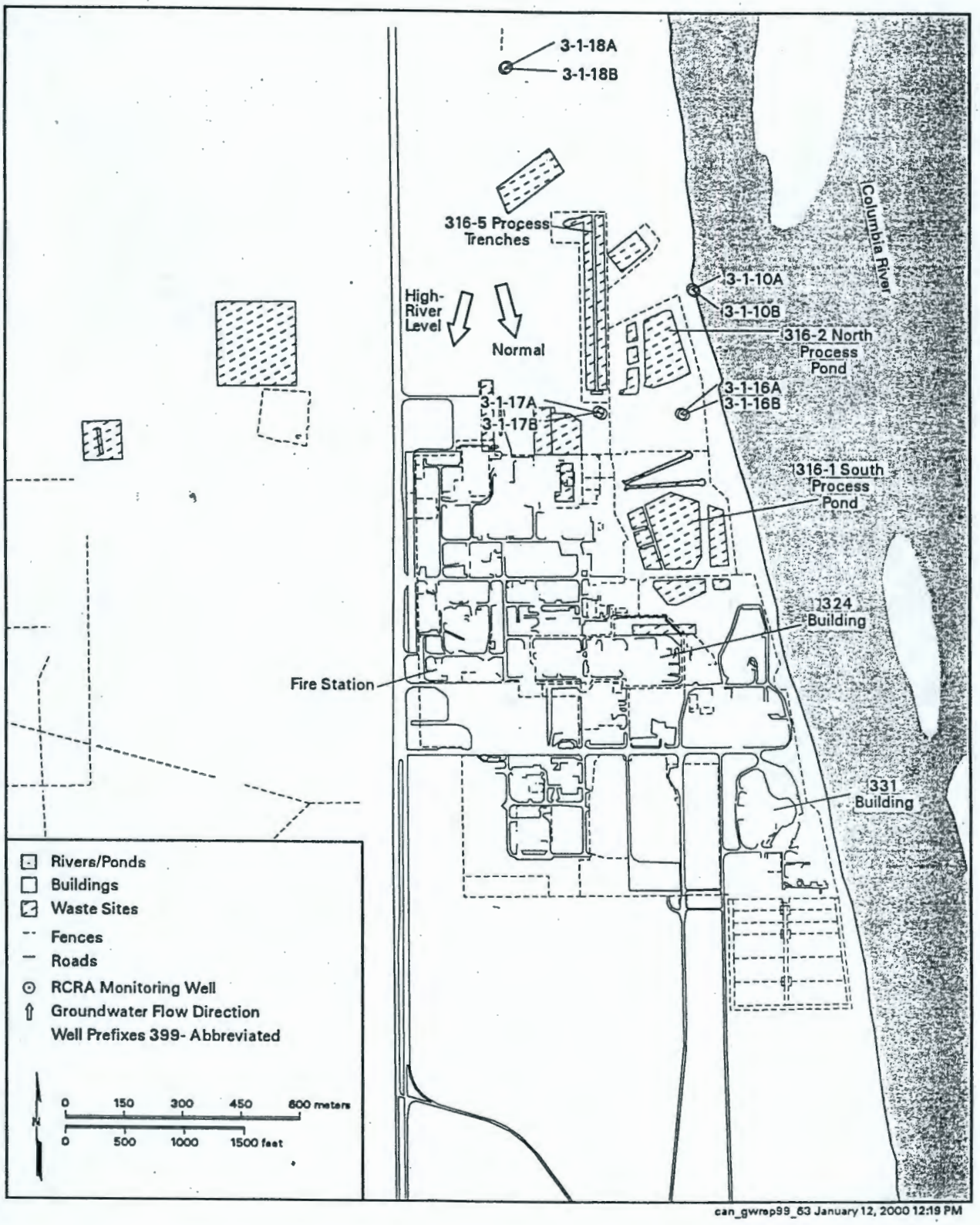

Figure 1. Monitoring Well Locations for the 300 Area Process Trenches.

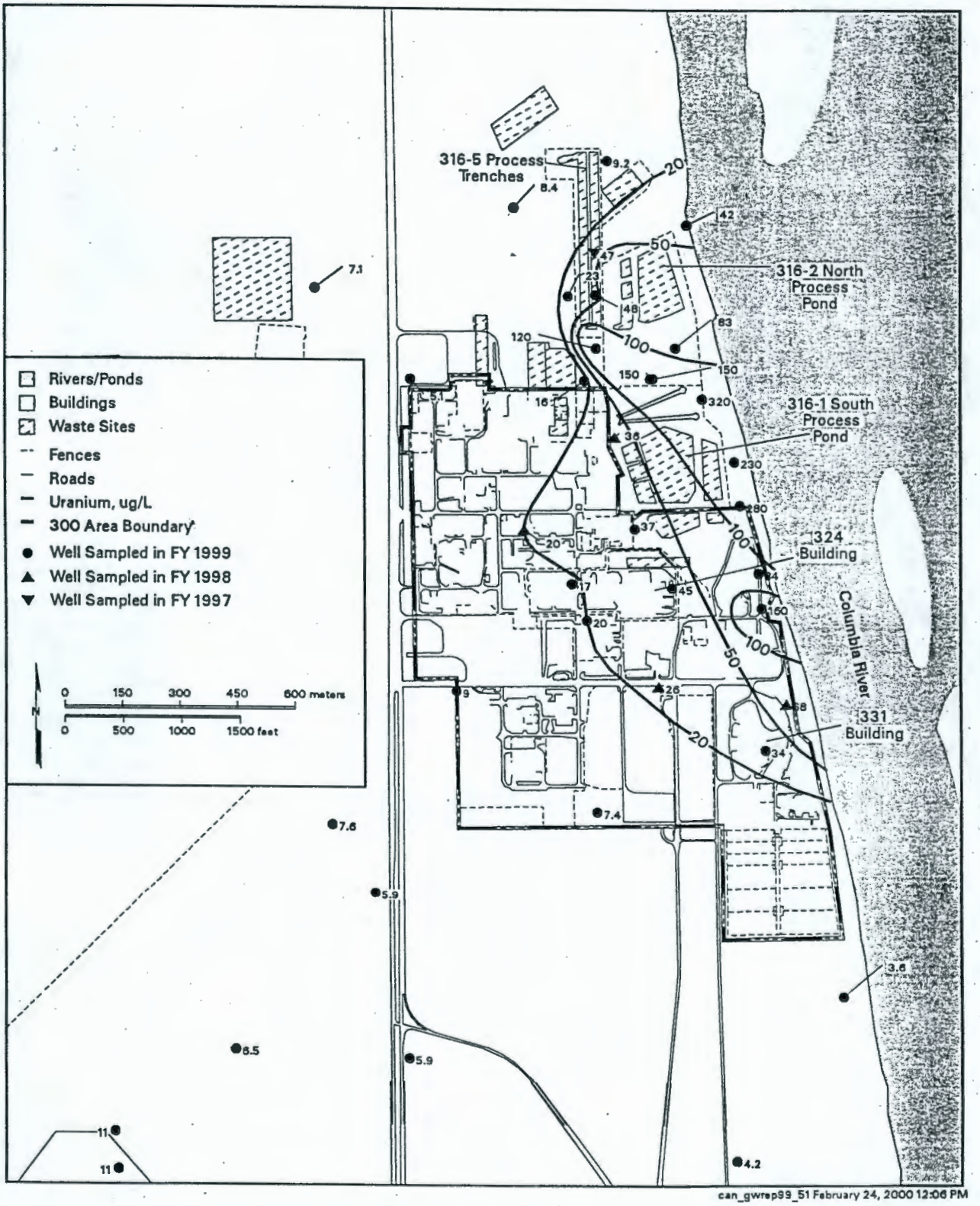

Figure 2. Average Uranium Concentrations at the 300 Area, Uppermost Portion of the Uppermost Aquifer, during FY 1999.

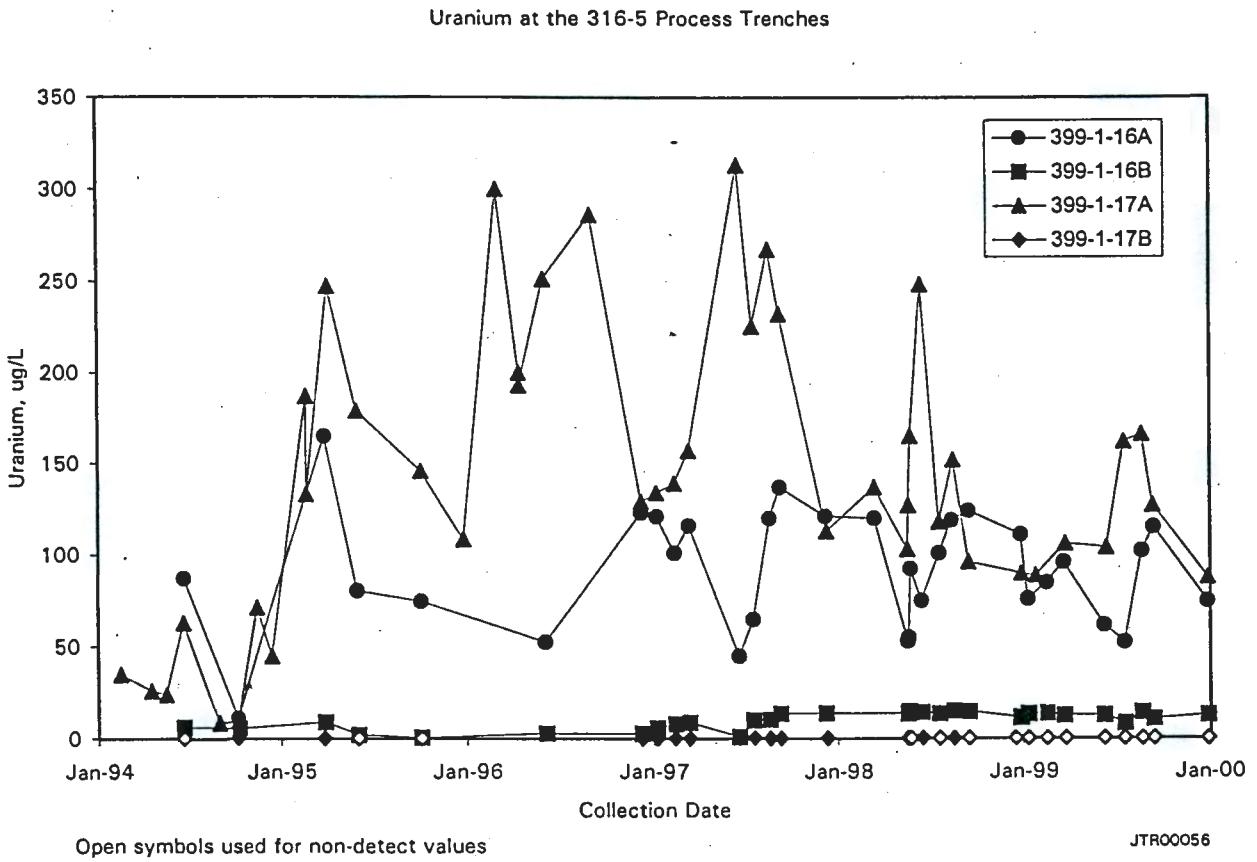

Figure 3. Uranium in Wells Downgradient of the 316-5 Process Trenches.

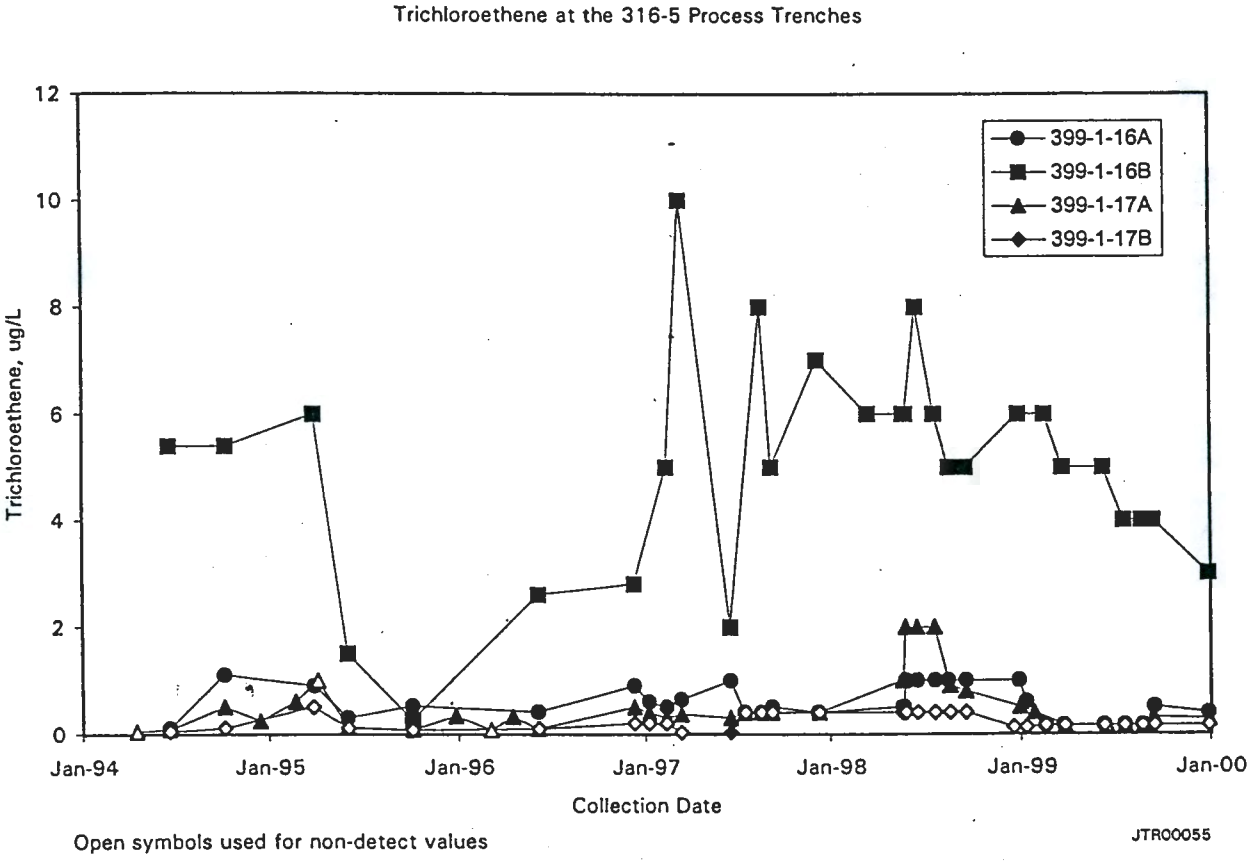

Figure 4. Trichloroethene in Wells Downgradient of the 316-5 Process Trenches.

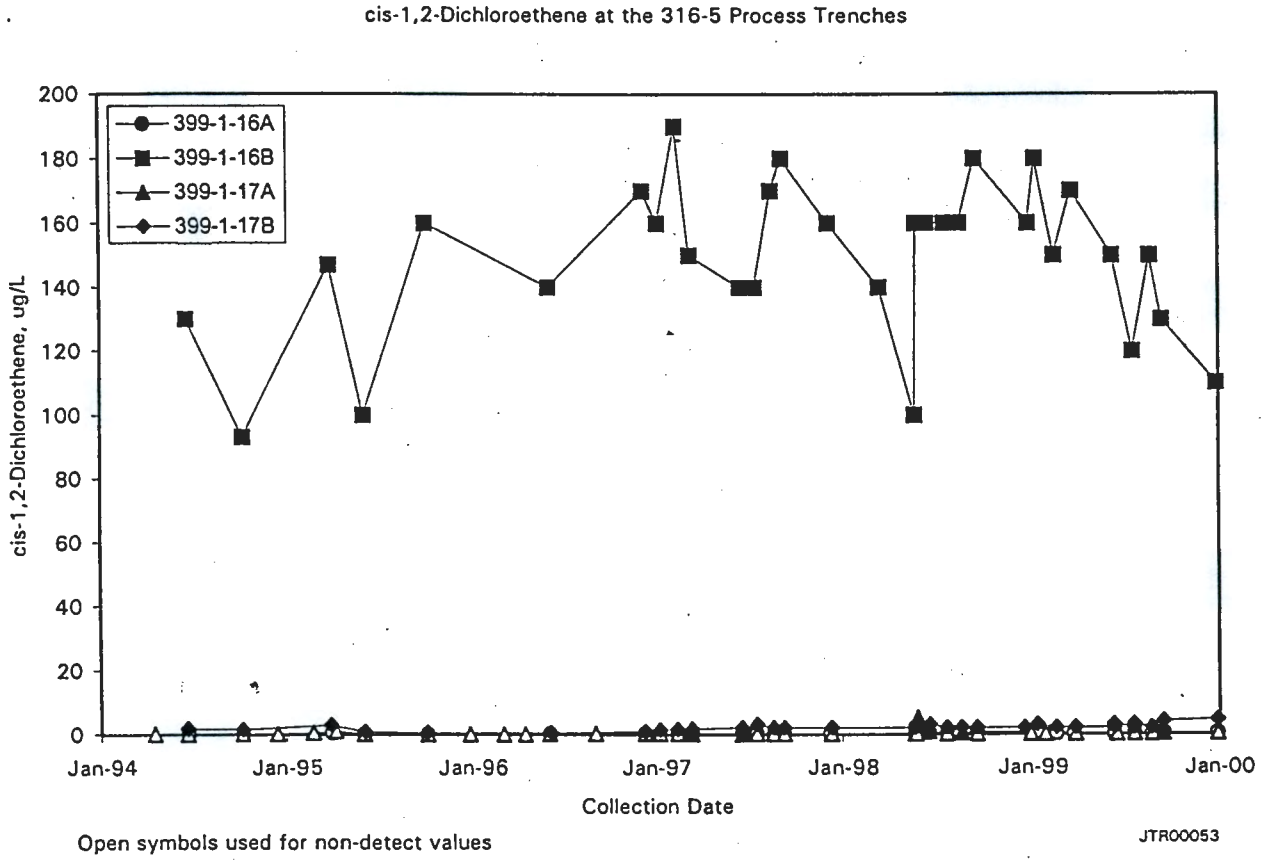

Figure 5. Cis-1,2-Dichloroethene in Wells Downgradient of the 316-5 Process Trenches.

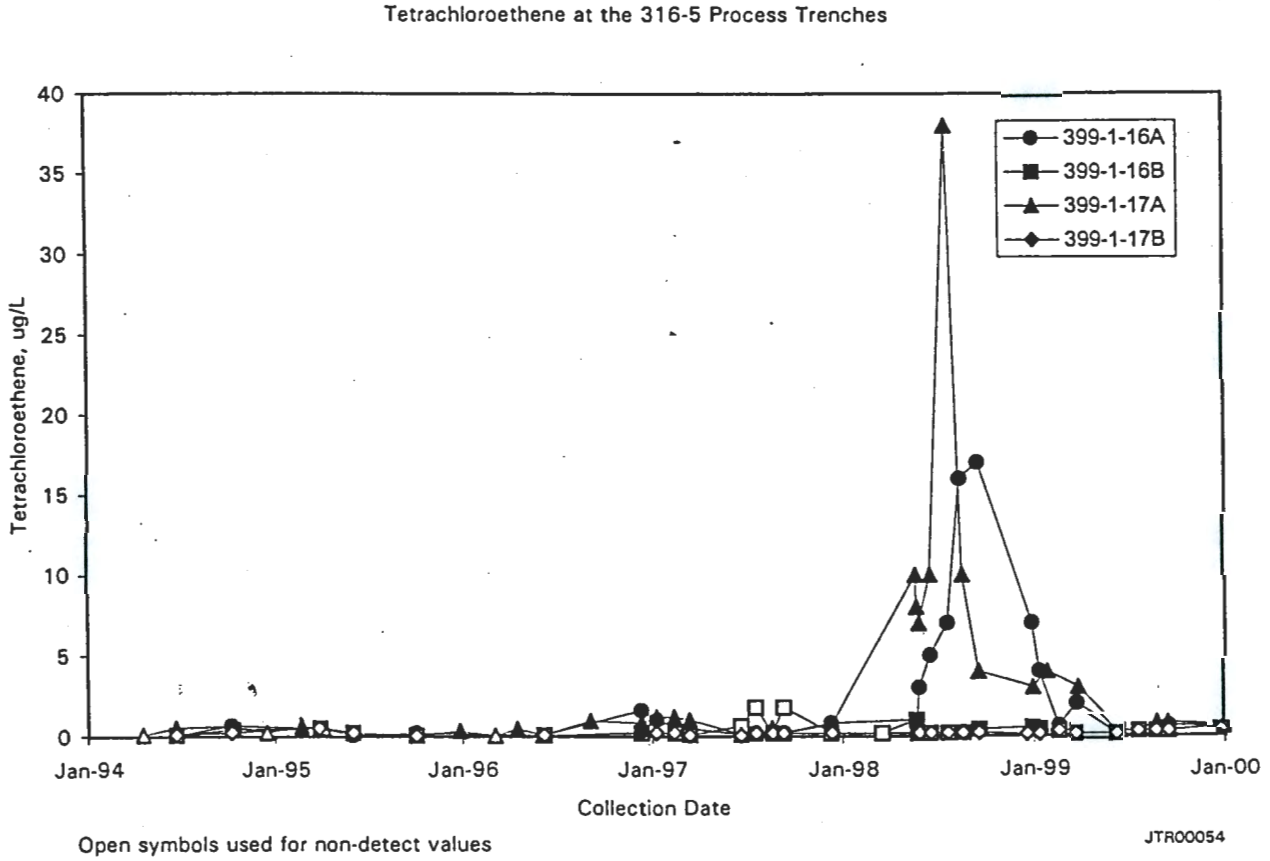

Figure 6. Tetrachloroethene in Wells Downgradient of the 316-5 Process Trenches.

Appendix A. Constituents of Interest for RCRA Groundwater Monitoring at the 300 Area Process Trenches, December 1996 through December 1999

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
cis-1,2-Dichloroethylene						
399-1-10A	10-Dec-96	0.2	ug/L	N	U	
399-1-10A	08-Jan-97	0.2	ug/L	N	U	
399-1-10A	11-Feb-97	0.2	ug/L	N	U	
399-1-10A	13-Mar-97	0.03	ug/L	N	J	
399-1-10A	19-Jun-97	0.025	ug/L	N	U	
399-1-10A	17-Jul-97	0.1	ug/L	N	U	
399-1-10A	19-Aug-97	0.1	ug/L	N	U	
399-1-10A	09-Sep-97	0.1	ug/L	N	U	
399-1-10A	11-Dec-97	0.1	ug/L	N	U	
399-1-10A	11-Dec-97	0.1	ug/L	N	U	
399-1-10A	20-May-98	0.1	ug/L	N	U	H
399-1-10A	22-May-98	0.1	ug/L	N	U	
399-1-10A	26-May-98	0.1	ug/L	N	U	
399-1-10A	16-Jun-98	0.1	ug/L	N	U	
399-1-10A	20-Jul-98	0.1	ug/L	N	U	
399-1-10A	17-Aug-98	0.1	ug/L	N	U	
399-1-10A	16-Sep-98	0.1	ug/L	N	U	
399-1-10A	29-Dec-98	0.13	ug/L	N	U	
399-1-10A	12-Jan-99	0.13	ug/L	N	U	
399-1-10A	17-Feb-99	0.15	ug/L	N	U	
399-1-10A	24-Mar-99	0.15	ug/L	N	U	
399-1-10A	10-Jun-99	0.15	ug/L	N	U	
399-1-10A	20-Jul-99	0.15	ug/L	N	U	
399-1-10A	19-Aug-99	0.15	ug/L	N	U	
399-1-10A	14-Sep-99	0.15	ug/L	N	U	
399-1-10A	29-Dec-99	0.18	ug/L	N	U	
399-1-10B	10-Dec-96	0.2	ug/L	N	U	
399-1-10B	08-Jan-97	0.2	ug/L	N	U	
399-1-10B	12-Feb-97	0.2	ug/L	N	U	
399-1-10B	13-Mar-97	0.025	ug/L	N	U	
399-1-10B	19-Jun-97	0.025	ug/L	N	U	
399-1-10B	22-Jul-97	0.1	ug/L	N	U	
399-1-10B	18-Aug-97	0.1	ug/L	N	U	
399-1-10B	09-Sep-97	0.1	ug/L	N	U	
399-1-10B	09-Dec-97	0.1	ug/L	N	U	
399-1-10B	20-May-98	0.2	ug/L	N	UD	H
399-1-10B	22-May-98	0.1	ug/L	N	U	
399-1-10B	26-May-98	0.1	ug/L	N	U	
399-1-10B	16-Jun-98	0.1	ug/L	N	U	
399-1-10B	16-Jun-98	0.1	ug/L	N	U	
399-1-10B	20-Jul-98	0.1	ug/L	N	U	
399-1-10B	17-Aug-98	0.1	ug/L	N	U	
399-1-10B	16-Sep-98	0.1	ug/L	N	U	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-10B	18-Dec-98	0.13	ug/L	N	U	
399-1-10B	12-Jan-99	0.13	ug/L	N	U	
399-1-10B	16-Feb-99	0.15	ug/L	N	U	
399-1-10B	24-Mar-99	0.15	ug/L	N	U	
399-1-10B	10-Jun-99	0.15	ug/L	N	U	
399-1-10B	20-Jul-99	0.15	ug/L	N	U	
399-1-10B	19-Aug-99	0.15	ug/L	N	U	
399-1-10B	14-Sep-99	0.15	ug/L	N	U	
399-1-10B	29-Dec-99	0.18	ug/L	N	U	
399-1-16A	10-Dec-96	0.2	ug/L	N		
399-1-16A	08-Jan-97	0.2	ug/L	N	U	
399-1-16A	12-Feb-97	0.2	ug/L	N	U	
399-1-16A	13-Mar-97	0.24	ug/L	N		
399-1-16A	19-Jun-97	0.3	ug/L	N		
399-1-16A	17-Jul-97	0.1	ug/L	N	U	
399-1-16A	19-Aug-97	0.1	ug/L	N	U	
399-1-16A	09-Sep-97	0.2	ug/L	N	J	
399-1-16A	09-Dec-97	0.1	ug/L	N	U	
399-1-16A	20-May-98	0.1	ug/L	N	U	H
399-1-16A	22-May-98	0.1	ug/L	N	U	H
399-1-16A	26-May-98	0.6	ug/L	N	J	
399-1-16A	16-Jun-98	0.4	ug/L	N	J	
399-1-16A	20-Jul-98	0.3	ug/L	N	J	
399-1-16A	13-Aug-98	0.1	ug/L	N	U	
399-1-16A	16-Sep-98	0.7	ug/L	N	J	
399-1-16A	29-Dec-98	0.6	ug/L	N	J	
399-1-16A	12-Jan-99	0.13	ug/L	N	U	
399-1-16A	17-Feb-99	0.15	ug/L	N	U	
399-1-16A	23-Mar-99	0.15	ug/L	N	U	
399-1-16A	10-Jun-99	0.15	ug/L	N	U	
399-1-16A	20-Jul-99	0.15	ug/L	N	U	
399-1-16A	23-Aug-99	0.15	ug/L	N	U	
399-1-16A	15-Sep-99	0.3	ug/L	N	J	
399-1-16A	29-Dec-99	0.18	ug/L	N	U	
399-1-16B	10-Dec-96	170	ug/L	N	D	
399-1-16B	10-Dec-96	170	ug/L	N	D	
399-1-16B	08-Jan-97	160	ug/L	N	D	
399-1-16B	08-Jan-97	160	ug/L	N	D	
399-1-16B	13-Feb-97	190	ug/L	N	D	
399-1-16B	13-Mar-97	150	ug/L	N		
399-1-16B	19-Jun-97	140	ug/L	N	D	
399-1-16B	17-Jul-97	140	ug/L	N	D	
399-1-16B	19-Aug-97	170	ug/L	N	D	
399-1-16B	09-Sep-97	180	ug/L	N	D	
399-1-16B	09-Dec-97	160	ug/L	N	D	
399-1-16B	16-Mar-98	140	ug/L	N	D	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-16B	20-May-98	0.1	ug/L	N	U	H
399-1-16B	22-May-98	100	ug/L	N	D	
399-1-16B	26-May-98	160	ug/L	N	D	
399-1-16B	16-Jun-98	160	ug/L	N	D	
399-1-16B	20-Jul-98	160	ug/L	N	D	
399-1-16B	17-Aug-98	160	ug/L	N	D	
399-1-16B	16-Sep-98	180	ug/L	N	D	
399-1-16B	29-Dec-98	160	ug/L	N	D	
399-1-16B	12-Jan-99	180	ug/L	N	D	
399-1-16B	17-Feb-99	150	ug/L	N	D	
399-1-16B	23-Mar-99	170	ug/L	N	D	
399-1-16B	10-Jun-99	150	ug/L	N	D	
399-1-16B	20-Jul-99	120	ug/L	N	D	
399-1-16B	23-Aug-99	150	ug/L	N	D	
399-1-16B	14-Sep-99	130	ug/L	N	E	
399-1-16B	30-Dec-99	110	ug/L	N	D	
399-1-17A	10-Dec-96	0.2	ug/L	N	U	
399-1-17A	08-Jan-97	0.2	ug/L	N	U	
399-1-17A	12-Feb-97	0.2	ug/L	N	U	
399-1-17A	13-Mar-97	0.07	ug/L	N	J	
399-1-17A	19-Jun-97	0.03	ug/L	N	J	
399-1-17A	17-Jul-97	0.1	ug/L	N	U	
399-1-17A	18-Aug-97	0.1	ug/L	N	U	
399-1-17A	09-Sep-97	0.1	ug/L	N	U	
399-1-17A	09-Sep-97	0.1	ug/L	N	U	H
399-1-17A	11-Dec-97	0.1	ug/L	N	U	
399-1-17A	20-May-98	0.1	ug/L	N	U	H
399-1-17A	22-May-98	0.1	ug/L	N	U	
399-1-17A	26-May-98	5	ug/L	N		
399-1-17A	16-Jun-98	0.8	ug/L	N	J	
399-1-17A	20-Jul-98	0.1	ug/L	N	U	
399-1-17A	17-Aug-98	0.4	ug/L	N	J	
399-1-17A	16-Sep-98	0.1	ug/L	N	U	
399-1-17A	30-Dec-98	0.13	ug/L	N	U	
399-1-17A	27-Jan-99	0.15	ug/L	N	U	
399-1-17A	26-Mar-99	0.15	ug/L	N	U	
399-1-17A	15-Jun-99	0.15	ug/L	N	U	
399-1-17A	20-Jul-99	0.15	ug/L	N	U	
399-1-17A	24-Aug-99	0.15	ug/L	N	U	
399-1-17A	14-Sep-99	0.2	ug/L	N	J	
399-1-17A	30-Dec-99	0.18	ug/L	N	U	
399-1-17B	10-Dec-96	0.8	ug/L	N		
399-1-17B	08-Jan-97	1.3	ug/L	N		
399-1-17B	12-Feb-97	1.5	ug/L	N		
399-1-17B	13-Mar-97	1.6	ug/L	N		
399-1-17B	19-Jun-97	2	ug/L	N		

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-17B	18-Jul-97	3	ug/L	N	J	
399-1-17B	19-Aug-97	2	ug/L	N	J	
399-1-17B	09-Sep-97	2	ug/L	N	J	
399-1-17B	11-Dec-97	2	ug/L	N	J	
399-1-17B	20-May-98	2	ug/L	N	J	H
399-1-17B	22-May-98	3	ug/L	N	J	H
399-1-17B	26-May-98	3	ug/L	N	J	
399-1-17B	17-Jun-98	3	ug/L	N	J	
399-1-17B	20-Jul-98	2	ug/L	N	J	
399-1-17B	17-Aug-98	2	ug/L	N	J	
399-1-17B	16-Sep-98	2	ug/L	N	J	
399-1-17B	18-Dec-98	2	ug/L	N	J	
399-1-17B	12-Jan-99	3	ug/L	N	J	
399-1-17B	17-Feb-99	2	ug/L	N	J	
399-1-17B	26-Mar-99	2	ug/L	N	J	
399-1-17B	10-Jun-99	2	ug/L	N	J	Q
399-1-17B	10-Jun-99	3	ug/L	N	J	Q
399-1-17B	19-Jul-99	3	ug/L	N	J	Q
399-1-17B	19-Jul-99	2	ug/L	N	J	Q
399-1-17B	23-Aug-99	2	ug/L	N	J	
399-1-17B	15-Sep-99	4	ug/L	N	J	
399-1-17B	30-Dec-99	4.4	ug/L	N	J	
399-1-18A	10-Dec-96	0.2	ug/L	N	U	
399-1-18A	08-Jan-97	0.2	ug/L	N	U	
399-1-18A	10-Feb-97	0.2	ug/L	N	U	
399-1-18A	13-Mar-97	0.025	ug/L	N	U	
399-1-18A	19-Jun-97	0.025	ug/L	N	U	
399-1-18A	17-Jul-97	0.1	ug/L	N	U	
399-1-18A	18-Aug-97	0.1	ug/L	N	U	
399-1-18A	09-Sep-97	0.1	ug/L	N	U	
399-1-18A	11-Dec-97	0.1	ug/L	N	U	
399-1-18A	20-May-98	0.1	ug/L	N	U	H
399-1-18A	22-May-98	0.1	ug/L	N	U	
399-1-18A	26-May-98	0.1	ug/L	N	U	
399-1-18A	16-Jun-98	0.1	ug/L	N	U	
399-1-18A	20-Jul-98	0.1	ug/L	N	U	
399-1-18A	13-Aug-98	0.1	ug/L	N	U	
399-1-18A	16-Sep-98	0.1	ug/L	N	U	
399-1-18A	29-Dec-98	0.13	ug/L	N	U	
399-1-18A	12-Jan-99	0.13	ug/L	N	U	
399-1-18A	16-Feb-99	0.15	ug/L	N	U	
399-1-18A	23-Mar-99	0.15	ug/L	N	U	
399-1-18A	10-Jun-99	0.15	ug/L	N	U	
399-1-18A	19-Jul-99	0.15	ug/L	N	U	
399-1-18A	19-Aug-99	0.15	ug/L	N	U	
399-1-18A	14-Sep-99	0.15	ug/L	N	U	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-18A	29-Dec-99	0.18	ug/L	N	U	
399-1-18B	10-Dec-96	0.2	ug/L	N	U	
399-1-18B	08-Jan-97	0.2	ug/L	N	U	
399-1-18B	12-Feb-97	0.2	ug/L	N	U	
399-1-18B	13-Mar-97	0.025	ug/L	N	U	
399-1-18B	19-Jun-97	0.025	ug/L	N	U	
399-1-18B	17-Jul-97	0.1	ug/L	N	U	
399-1-18B	18-Aug-97	0.1	ug/L	N	U	
399-1-18B	09-Sep-97	5	ug/L	N	UD	
399-1-18B	09-Dec-97	0.1	ug/L	N	U	
399-1-18B	20-May-98	0.1	ug/L	N	U	H
399-1-18B	20-May-98	0.1	ug/L	N	U	H
399-1-18B	22-May-98	0.1	ug/L	N	U	
399-1-18B	26-May-98	0.1	ug/L	N	U	
399-1-18B	16-Jun-98	0.1	ug/L	N	U	H
399-1-18B	20-Jul-98	0.1	ug/L	N	U	
399-1-18B	13-Aug-98	0.1	ug/L	N	U	
399-1-18B	16-Sep-98	0.1	ug/L	N	U	
399-1-18B	18-Dec-98	0.13	ug/L	N	U	
399-1-18B	12-Jan-99	0.13	ug/L	N	U	
399-1-18B	16-Feb-99	0.15	ug/L	N	U	
399-1-18B	23-Mar-99	0.15	ug/L	N	U	
399-1-18B	10-Jun-99	0.15	ug/L	N	U	
399-1-18B	19-Jul-99	0.15	ug/L	N	U	
399-1-18B	19-Aug-99	0.15	ug/L	N	U	
399-1-18B	14-Sep-99	0.15	ug/L	N	U	
399-1-18B	29-Dec-99	0.18	ug/L	N	U	
Tetrachloroethene						
399-1-10A	10-Dec-96	0.2	ug/L	N		
399-1-10A	08-Jan-97	0.2	ug/L	N		
399-1-10A	11-Feb-97	0.2	ug/L	N	U	
399-1-10A	13-Mar-97	0.13	ug/L	N	J	
399-1-10A	19-Jun-97	0.04	ug/L	N	J	
399-1-10A	17-Jul-97	0.18	ug/L	N	U	
399-1-10A	19-Aug-97	0.18	ug/L	N	U	
399-1-10A	09-Sep-97	0.18	ug/L	N	U	
399-1-10A	11-Dec-97	0.18	ug/L	N	U	
399-1-10A	11-Dec-97	0.18	ug/L	N	U	
399-1-10A	20-May-98	0.6	ug/L	N	J	H
399-1-10A	22-May-98	0.6	ug/L	N	J	
399-1-10A	26-May-98	2	ug/L	N	J	
399-1-10A	16-Jun-98	2	ug/L	N	J	
399-1-10A	20-Jul-98	2	ug/L	N	J	
399-1-10A	17-Aug-98	3	ug/L	N	J	
399-1-10A	16-Sep-98	8	ug/L	N		
399-1-10A	29-Dec-98	3	ug/L	N	J	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-10A	12-Jan-99	1	ug/L	N	J	
399-1-10A	17-Feb-99	0.29	ug/L	N	U	
399-1-10A	24-Mar-99	0.7	ug/L	N	J	
399-1-10A	10-Jun-99	0.29	ug/L	N	U	
399-1-10A	20-Jul-99	0.29	ug/L	N	U	
399-1-10A	19-Aug-99	0.29	ug/L	N	U	
399-1-10A	14-Sep-99	0.3	ug/L	N	J	
399-1-10A	29-Dec-99	0.57	ug/L	N	U	
399-1-10B	10-Dec-96	0.2	ug/L	N	U	
399-1-10B	08-Jan-97	0.2	ug/L	N	U	
399-1-10B	12-Feb-97	0.2	ug/L	N	U	
399-1-10B	13-Mar-97	0.031	ug/L	N	U	
399-1-10B	19-Jun-97	0.031	ug/L	N	U	
399-1-10B	22-Jul-97	0.18	ug/L	N	U	
399-1-10B	18-Aug-97	0.18	ug/L	N	U	
399-1-10B	09-Sep-97	0.18	ug/L	N	U	
399-1-10B	09-Dec-97	0.18	ug/L	N	U	
399-1-10B	20-May-98	0.36	ug/L	N	UD	H
399-1-10B	22-May-98	0.18	ug/L	N	U	
399-1-10B	26-May-98	0.18	ug/L	N	U	
399-1-10B	16-Jun-98	0.18	ug/L	N	U	
399-1-10B	16-Jun-98	0.18	ug/L	N	U	
399-1-10B	20-Jul-98	0.18	ug/L	N	U	
399-1-10B	17-Aug-98	0.18	ug/L	N	U	
399-1-10B	16-Sep-98	0.18	ug/L	N	U	
399-1-10B	18-Dec-98	0.11	ug/L	N	U	
399-1-10B	12-Jan-99	0.11	ug/L	N	U	
399-1-10B	16-Feb-99	0.29	ug/L	N	U	
399-1-10B	24-Mar-99	0.29	ug/L	N	U	
399-1-10B	10-Jun-99	0.29	ug/L	N	U	
399-1-10B	20-Jul-99	0.29	ug/L	N	U	
399-1-10B	19-Aug-99	0.29	ug/L	N	U	
399-1-10B	14-Sep-99	0.29	ug/L	N	U	
399-1-10B	29-Dec-99	0.57	ug/L	N	U	
399-1-16A	10-Dec-96	1.6	ug/L	N		
399-1-16A	08-Jan-97	1	ug/L	N		
399-1-16A	12-Feb-97	0.6	ug/L	N		
399-1-16A	13-Mar-97	0.47	ug/L	N		
399-1-16A	19-Jun-97	0.1	ug/L	N	J	
399-1-16A	17-Jul-97	0.18	ug/L	N	U	
399-1-16A	19-Aug-97	0.2	ug/L	N	J	
399-1-16A	09-Sep-97	0.2	ug/L	N	J	
399-1-16A	09-Dec-97	0.8	ug/L	N	J	
399-1-16A	20-May-98	1	ug/L	N	J	H
399-1-16A	22-May-98	1	ug/L	N	J	H
399-1-16A	26-May-98	3	ug/L	N	J	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-16A	16-Jun-98	5	ug/L	N	J	
399-1-16A	20-Jul-98	7	ug/L	N		
399-1-16A	13-Aug-98	16	ug/L	N		
399-1-16A	16-Sep-98	17	ug/L	N		
399-1-16A	29-Dec-98	7	ug/L	N	J	
399-1-16A	12-Jan-99	4	ug/L	N	J	
399-1-16A	17-Feb-99	0.6	ug/L	N	J	
399-1-16A	23-Mar-99	2	ug/L	N	J	
399-1-16A	10-Jun-99	0.29	ug/L	N	U	
399-1-16A	20-Jul-99	0.29	ug/L	N	U	
399-1-16A	23-Aug-99	0.29	ug/L	N	U	
399-1-16A	15-Sep-99	0.6	ug/L	N	J	
399-1-16A	29-Dec-99	0.57	ug/L	N	U	
399-1-16B	10-Dec-96	20	ug/L	N	UD	
399-1-16B	10-Dec-96	0.2	ug/L	N	U	
399-1-16B	08-Jan-97	5	ug/L	N	UD	
399-1-16B	08-Jan-97	5	ug/L	N	UD	
399-1-16B	13-Feb-97	0.2	ug/L	N	U	
399-1-16B	13-Mar-97	0.031	ug/L	N	U	
399-1-16B	19-Jun-97	0.62	ug/L	N	UD	
399-1-16B	17-Jul-97	1.8	ug/L	N	UD	
399-1-16B	19-Aug-97	0.18	ug/L	N	U	
399-1-16B	09-Sep-97	1.8	ug/L	N	UD	
399-1-16B	09-Dec-97	0.18	ug/L	N	U	
399-1-16B	16-Mar-98	0.18	ug/L	N	U	
399-1-16B	20-May-98	1	ug/L	N	J	H
399-1-16B	22-May-98	0.18	ug/L	N	U	H
399-1-16B	26-May-98	0.18	ug/L	N	U	
399-1-16B	16-Jun-98	0.18	ug/L	N	U	
399-1-16B	20-Jul-98	0.18	ug/L	N	U	
399-1-16B	17-Aug-98	0.2	ug/L	N	J	
399-1-16B	16-Sep-98	0.4	ug/L	N	J	
399-1-16B	29-Dec-98	0.5	ug/L	N	J	
399-1-16B	12-Jan-99	0.4	ug/L	N	J	
399-1-16B	17-Feb-99	0.29	ug/L	N	U	
399-1-16B	23-Mar-99	0.29	ug/L	N	U	
399-1-16B	10-Jun-99	0.29	ug/L	N	U	
399-1-16B	20-Jul-99	0.29	ug/L	N	U	
399-1-16B	23-Aug-99	0.29	ug/L	N	U	
399-1-16B	14-Sep-99	0.29	ug/L	N	U	
399-1-16B	30-Dec-99	0.57	ug/L	N	U	
399-1-17A	10-Dec-96	0.8	ug/L	N		
399-1-17A	08-Jan-97	1.2	ug/L	N		
399-1-17A	12-Feb-97	1.2	ug/L	N		
399-1-17A	13-Mar-97	1	ug/L	N		
399-1-17A	19-Jun-97	0.1	ug/L	N	J	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-17A	17-Jul-97	0.18	ug/L	N	U	
399-1-17A	18-Aug-97	0.5	ug/L	N	J	
399-1-17A	09-Sep-97	0.2	ug/L	N	J	
399-1-17A	09-Sep-97	0.18	ug/L	N	U	H
399-1-17A	11-Dec-97	0.7	ug/L	N	J	
399-1-17A	20-May-98	10	ug/L	N		H
399-1-17A	22-May-98	8	ug/L	N		
399-1-17A	26-May-98	7	ug/L	N		
399-1-17A	16-Jun-98	10	ug/L	N		
399-1-17A	20-Jul-98	38	ug/L	N		
399-1-17A	17-Aug-98	10	ug/L	N		
399-1-17A	16-Sep-98	4	ug/L	N	J	
399-1-17A	30-Dec-98	3	ug/L	N	J	
399-1-17A	27-Jan-99	4	ug/L	N	J	
399-1-17A	26-Mar-99	3	ug/L	N	J	
399-1-17A	15-Jun-99	0.29	ug/L	N	U	
399-1-17A	20-Jul-99	0.29	ug/L	N	U	
399-1-17A	24-Aug-99	0.8	ug/L	N	J	
399-1-17A	14-Sep-99	0.8	ug/L	N	J	
399-1-17A	30-Dec-99	0.65	ug/L	N	J	
399-1-17B	10-Dec-96	0.2	ug/L	N		
399-1-17B	08-Jan-97	0.2	ug/L	N	U	
399-1-17B	12-Feb-97	0.2	ug/L	N	U	
399-1-17B	13-Mar-97	0.031	ug/L	N	U	
399-1-17B	19-Jun-97	0.031	ug/L	N	U	
399-1-17B	18-Jul-97	0.18	ug/L	N	U	
399-1-17B	19-Aug-97	0.18	ug/L	N	U	
399-1-17B	09-Sep-97	0.18	ug/L	N	U	
399-1-17B	11-Dec-97	0.18	ug/L	N	U	
399-1-17B	20-May-98	0.18	ug/L	N	U	H
399-1-17B	22-May-98	0.18	ug/L	N	U	H
399-1-17B	26-May-98	0.18	ug/L	N	U	
399-1-17B	17-Jun-98	0.18	ug/L	N	U	
399-1-17B	20-Jul-98	0.18	ug/L	N	U	
399-1-17B	17-Aug-98	0.18	ug/L	N	U	
399-1-17B	16-Sep-98	0.18	ug/L	N	U	
399-1-17B	18-Dec-98	0.11	ug/L	N	U	
399-1-17B	12-Jan-99	0.11	ug/L	N	U	
399-1-17B	17-Feb-99	0.29	ug/L	N	U	
399-1-17B	26-Mar-99	0.29	ug/L	N	U	
399-1-17B	10-Jun-99	0.29	ug/L	N	U	
399-1-17B	10-Jun-99	0.29	ug/L	N	U	
399-1-17B	19-Jul-99	0.29	ug/L	N	U	
399-1-17B	19-Jul-99	0.29	ug/L	N	U	
399-1-17B	23-Aug-99	0.29	ug/L	N	U	
399-1-17B	15-Sep-99	0.29	ug/L	N	U	

	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-	30-Dec-99	0.57	ug/L	N	U	
399-1-	10-Dec-96	0.2	ug/L	N	U	
399-1-	08-Jan-97	0.2	ug/L	N	U	
399-1-	10-Feb-97	0.2	ug/L	N	U	
399-1-	13-Mar-97	0.031	ug/L	N	U	
399-1-	19-Jun-97	0.031	ug/L	N	U	
399-1-	17-Jul-97	0.18	ug/L	N	U	
399-1-	18-Aug-97	0.18	ug/L	N	U	
399-1-	09-Sep-97	0.18	ug/L	N	U	
399-1-	11-Dec-97	0.18	ug/L	N	U	
399-1-	20-May-98	0.18	ug/L	N	U	H
399-1	22-May-98	0.18	ug/L	N	U	
399-1	26-May-98	0.18	ug/L	N	U	
399-1	16-Jun-98	0.18	ug/L	N	U	
399-1	20-Jul-98	0.18	ug/L	N	U	
399-1	13-Aug-98	0.18	ug/L	N	U	
399-1	16-Sep-98	0.18	ug/L	N	U	
399-1	29-Dec-98	0.11	ug/L	N	U	
399-1	12-Jan-99	0.11	ug/L	N	U	
399-1	16-Feb-99	0.29	ug/L	N	U	
399-1	23-Mar-99	0.29	ug/L	N	U	
399-1	10-Jun-99	0.29	ug/L	N	U	
399-1	19-Jul-99	0.29	ug/L	N	U	
399-1	19-Aug-99	0.29	ug/L	N	U	
399-1	14-Sep-99	0.29	ug/L	N	U	
399-1	29-Dec-99	0.57	ug/L	N	U	
399-1-18B	10-Dec-96	0.2	ug/L	N	U	
399-1-18B	08-Jan-97	0.2	ug/L	N	U	
399-1-18B	12-Feb-97	0.2	ug/L	N	U	
399-1-18B	13-Mar-97	0.031	ug/L	N	U	
399-1-18B	19-Jun-97	0.031	ug/L	N	U	
399-1-18B	17-Jul-97	0.18	ug/L	N	U	
399-1-18B	18-Aug-97	0.18	ug/L	N	U	
399-1-18B	09-Sep-97	9	ug/L	N	UD	
399-1-18B	09-Dec-97	0.18	ug/L	N	U	
399-1-18B	20-May-98	0.18	ug/L	N	U	H
399-1-18B	20-May-98	0.18	ug/L	N	U	H
399-1-18B	22-May-98	0.18	ug/L	N	U	
399-1-18B	26-May-98	0.18	ug/L	N	U	
399-1-18B	16-Jun-98	0.18	ug/L	N	U	H
399-1-18B	20-Jul-98	0.18	ug/L	N	U	
399-1-18B	13-Aug-98	0.18	ug/L	N	U	
399-1-18B	16-Sep-98	0.18	ug/L	N	U	
399-1-18B	18-Dec-98	0.11	ug/L	N	U	
399-1-18B	12-Jan-99	0.11	ug/L	N	U	
399-1-18B	16-Feb-99	0.29	ug/L	N	U	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
1-18B	23-Mar-99	0.29	ug/L	N	U	
1-18B	10-Jun-99	0.29	ug/L	N	U	
1-18B	19-Jul-99	0.29	ug/L	N	U	
1-18B	19-Aug-99	0.29	ug/L	N	U	
1-18B	14-Sep-99	0.29	ug/L	N	U	
1-18B	29-Dec-99	0.57	ug/L	N	U	
1-10A	10-Dec-96	0.2	ug/L	N	U	
		Trichloroethene				
1-10A	08-Jan-97	0.2	ug/L	N	U	
1-10A	11-Feb-97	0.2	ug/L	N	U	
1-10A	13-Mar-97	0.09	ug/L	N	J	
1-10A	19-Jun-97	0.05	ug/L	N	J	
1-10A	17-Jul-97	0.4	ug/L	N	U	
1-10A	19-Aug-97	0.4	ug/L	N	U	
1-10A	09-Sep-97	0.4	ug/L	N	U	
1-10A	11-Dec-97	0.4	ug/L	N	U	
1-10A	11-Dec-97	0.4	ug/L	N	U	
1-10A	20-May-98	0.4	ug/L	N	U	H
1-10A	22-May-98	0.4	ug/L	N	U	
1-10A	26-May-98	0.4	ug/L	N	U	
1-10A	16-Jun-98	0.3	ug/L	N	J	
1-10A	20-Jul-98	0.4	ug/L	N	U	
1-10A	17-Aug-98	0.4	ug/L	N	U	
1-10A	16-Sep-98	0.3	ug/L	N	J	
1-10A	29-Dec-98	0.2	ug/L	N	J	
1-10A	12-Jan-99	0.12	ug/L	N	U	
1-10A	17-Feb-99	0.16	ug/L	N	U	
1-10A	24-Mar-99	0.16	ug/L	N	U	
1-10A	10-Jun-99	0.16	ug/L	N	U	
1-10A	20-Jul-99	0.16	ug/L	N	U	
1-10A	19-Aug-99	0.16	ug/L	N	U	
1-10A	14-Sep-99	0.16	ug/L	N	U	
1-10A	29-Dec-99	0.16	ug/L	N	U	
1-10B	10-Dec-96	0.2	ug/L	N	U	
1-10B	08-Jan-97	0.2	ug/L	N	U	
1-10B	12-Feb-97	0.2	ug/L	N	U	
1-10B	13-Mar-97	0.028	ug/L	N	U	
1-10B	19-Jun-97	0.028	ug/L	N	U	
1-10B	22-Jul-97	0.4	ug/L	N	U	
1-10B	18-Aug-97	0.4	ug/L	N	U	
1-10B	09-Sep-97	0.4	ug/L	N	U	
1-10B	09-Dec-97	0.4	ug/L	N	U	
1-10B	20-May-98	0.8	ug/L	N	UD	H
1-10B	22-May-98	0.4	ug/L	N	U	
1-10B	26-May-98	0.4	ug/L	N	U	
1-10B	16-Jun-98	0.4	ug/L	N	U	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-10B	16-Jun-98	0.4	ug/L	N	U	
399-1-10B	20-Jul-98	0.4	ug/L	N	U	
399-1-10B	17-Aug-98	0.4	ug/L	N	U	
399-1-10B	16-Sep-98	0.4	ug/L	N	U	
399-1-10B	18-Dec-98	0.12	ug/L	N	U	
399-1-10B	12-Jan-99	0.12	ug/L	N	U	
399-1-10B	16-Feb-99	0.16	ug/L	N	U	
399-1-10B	24-Mar-99	0.16	ug/L	N	U	
399-1-10B	10-Jun-99	0.16	ug/L	N	U	
399-1-10B	20-Jul-99	0.16	ug/L	N	U	
399-1-10B	19-Aug-99	0.16	ug/L	N	U	
399-1-10B	14-Sep-99	0.16	ug/L	N	U	
399-1-10B	29-Dec-99	0.16	ug/L	N	U	
399-1-16A	10-Dec-96	0.9	ug/L	N		
399-1-16A	08-Jan-97	0.6	ug/L	N		
399-1-16A	12-Feb-97	0.5	ug/L	N		
399-1-16A	13-Mar-97	0.64	ug/L	N		
399-1-16A	19-Jun-97	1	ug/L	N		
399-1-16A	17-Jul-97	0.4	ug/L	N	U	
399-1-16A	19-Aug-97	0.4	ug/L	N	U	
399-1-16A	09-Sep-97	0.5	ug/L	N	J	
399-1-16A	09-Dec-97	0.4	ug/L	N	U	
399-1-16A	20-May-98	0.5	ug/L	N	J	H
399-1-16A	22-May-98	0.5	ug/L	N	J	H
399-1-16A	26-May-98	1	ug/L	N	J	
399-1-16A	16-Jun-98	1	ug/L	N	J	
399-1-16A	20-Jul-98	1	ug/L	N	J	
399-1-16A	13-Aug-98	1	ug/L	N	J	
399-1-16A	16-Sep-98	1	ug/L	N	J	
399-1-16A	29-Dec-98	1	ug/L	N	J	
399-1-16A	12-Jan-99	0.6	ug/L	N	J	
399-1-16A	17-Feb-99	0.16	ug/L	N	U	
399-1-16A	23-Mar-99	0.16	ug/L	N	U	
399-1-16A	10-Jun-99	0.16	ug/L	N	U	
399-1-16A	20-Jul-99	0.16	ug/L	N	U	
399-1-16A	23-Aug-99	0.16	ug/L	N	U	
399-1-16A	15-Sep-99	0.5	ug/L	N	J	
399-1-16A	29-Dec-99	0.39	ug/L	N	J	
399-1-16B	10-Dec-96	2.8	ug/L	N		
399-1-16B	10-Dec-96	20	ug/L	N	UD	
399-1-16B	08-Jan-97	5	ug/L	N	UD	
399-1-16B	08-Jan-97	5	ug/L	N	UD	
399-1-16B	13-Feb-97	5	ug/L	N		
399-1-16B	13-Mar-97	10	ug/L	N		
399-1-16B	19-Jun-97	2	ug/L	N	DJ	
399-1-16B	17-Jul-97	4	ug/L	N	UD	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-16B	19-Aug-97	8	ug/L	N		
399-1-16B	09-Sep-97	5	ug/L	N	DJ	
399-1-16B	09-Dec-97	7	ug/L	N		
399-1-16B	16-Mar-98	6	ug/L	N		
399-1-16B	20-May-98	0.4	ug/L	N	U	H
399-1-16B	22-May-98	6	ug/L	N		H
399-1-16B	26-May-98	6	ug/L	N		
399-1-16B	16-Jun-98	8	ug/L	N		
399-1-16B	20-Jul-98	6	ug/L	N		
399-1-16B	17-Aug-98	5	ug/L	N	J	
399-1-16B	16-Sep-98	5	ug/L	N		
399-1-16B	29-Dec-98	6	ug/L	N		
399-1-16B	12-Jan-99	0.12	ug/L	N	U	
399-1-16B	17-Feb-99	6	ug/L	N		
399-1-16B	23-Mar-99	5	ug/L	N		
399-1-16B	10-Jun-99	5	ug/L	N	J	
399-1-16B	20-Jul-99	4	ug/L	N	J	
399-1-16B	23-Aug-99	4	ug/L	N	J	
399-1-16B	14-Sep-99	4	ug/L	N	J	
399-1-16B	30-Dec-99	3	ug/L	N	J	
399-1-17A	10-Dec-96	0.5	ug/L	N		
399-1-17A	08-Jan-97	0.4	ug/L	N		
399-1-17A	12-Feb-97	0.3	ug/L	N		
399-1-17A	13-Mar-97	0.37	ug/L	N		
399-1-17A	19-Jun-97	0.3	ug/L	N	J	
399-1-17A	17-Jul-97	0.4	ug/L	N	U	
399-1-17A	18-Aug-97	0.4	ug/L	N	U	
399-1-17A	09-Sep-97	0.4	ug/L	N	U	H
399-1-17A	09-Sep-97	0.4	ug/L	N	U	
399-1-17A	11-Dec-97	0.4	ug/L	N	U	
399-1-17A	20-May-98	1	ug/L	N	J	H
399-1-17A	22-May-98	1	ug/L	N	J	
399-1-17A	26-May-98	2	ug/L	N	J	
399-1-17A	16-Jun-98	2	ug/L	N	J	
399-1-17A	20-Jul-98	2	ug/L	N	J	
399-1-17A	17-Aug-98	0.9	ug/L	N	J	
399-1-17A	16-Sep-98	0.8	ug/L	N	J	
399-1-17A	30-Dec-98	0.5	ug/L	N	J	
399-1-17A	27-Jan-99	0.4	ug/L	N	J	
399-1-17A	26-Mar-99	0.16	ug/L	N	U	
399-1-17A	15-Jun-99	0.16	ug/L	N	U	
399-1-17A	20-Jul-99	0.16	ug/L	N	U	
399-1-17A	24-Aug-99	0.16	ug/L	N	U	
399-1-17A	14-Sep-99	0.3	ug/L	N	J	
399-1-17A	30-Dec-99	0.27	ug/L	N	J	
399-1-17B	10-Dec-96	0.2	ug/L	N	U	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-17B	08-Jan-97	0.2	ug/L	N	U	
399-1-17B	12-Feb-97	0.2	ug/L	N	U	
399-1-17B	13-Mar-97	0.028	ug/L	N	U	
399-1-17B	19-Jun-97	0.03	ug/L	N	J	
399-1-17B	18-Jul-97	0.4	ug/L	N	U	
399-1-17B	19-Aug-97	0.4	ug/L	N	U	
399-1-17B	09-Sep-97	0.4	ug/L	N	U	
399-1-17B	11-Dec-97	0.4	ug/L	N	U	
399-1-17B	20-May-98	0.4	ug/L	N	U	H
399-1-17B	22-May-98	0.4	ug/L	N	U	H
399-1-17B	26-May-98	0.4	ug/L	N	U	
399-1-17B	17-Jun-98	0.4	ug/L	N	U	
399-1-17B	20-Jul-98	0.4	ug/L	N	U	
399-1-17B	17-Aug-98	0.4	ug/L	N	U	
399-1-17B	16-Sep-98	0.4	ug/L	N	U	
399-1-17B	18-Dec-98	0.12	ug/L	N	U	
399-1-17B	12-Jan-99	0.12	ug/L	N	U	
399-1-17B	17-Feb-99	0.16	ug/L	N	U	
399-1-17B	26-Mar-99	0.16	ug/L	N	U	
399-1-17B	10-Jun-99	0.16	ug/L	N	U	
399-1-17B	10-Jun-99	0.16	ug/L	N	U	
399-1-17B	19-Jul-99	0.16	ug/L	N	U	
399-1-17B	19-Jul-99	0.16	ug/L	N	U	
399-1-17B	23-Aug-99	0.16	ug/L	N	U	
399-1-17B	15-Sep-99	0.16	ug/L	N	U	
399-1-17B	30-Dec-99	0.16	ug/L	N	U	
399-1-18A	10-Dec-96	0.2	ug/L	N	U	
399-1-18A	08-Jan-97	0.2	ug/L	N	U	
399-1-18A	10-Feb-97	0.2	ug/L	N	U	
399-1-18A	13-Mar-97	0.028	ug/L	N	U	
399-1-18A	19-Jun-97	0.028	ug/L	N	U	
399-1-18A	17-Jul-97	0.4	ug/L	N	U	
399-1-18A	18-Aug-97	0.4	ug/L	N	U	
399-1-18A	09-Sep-97	0.4	ug/L	N	U	
399-1-18A	11-Dec-97	0.4	ug/L	N	U	
399-1-18A	20-May-98	0.4	ug/L	N	U	H
399-1-18A	22-May-98	0.4	ug/L	N	U	
399-1-18A	26-May-98	0.4	ug/L	N	U	
399-1-18A	16-Jun-98	0.4	ug/L	N	U	
399-1-18A	20-Jul-98	0.4	ug/L	N	U	
399-1-18A	13-Aug-98	0.4	ug/L	N	U	
399-1-18A	16-Sep-98	0.4	ug/L	N	U	
399-1-18A	29-Dec-98	0.12	ug/L	N	U	
399-1-18A	12-Jan-99	0.12	ug/L	N	U	
399-1-18A	16-Feb-99	0.16	ug/L	N	U	
399-1-18A	23-Mar-99	0.16	ug/L	N	U	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-18A	10-Jun-99	0.16	ug/L	N	U	
399-1-18A	19-Jul-99	0.16	ug/L	N	U	
399-1-18A	19-Aug-99	0.16	ug/L	N	U	
399-1-18A	14-Sep-99	0.16	ug/L	N	U	
399-1-18A	29-Dec-99	0.16	ug/L	N	U	
399-1-18B	10-Dec-96	0.2	ug/L	N	U	
399-1-18B	08-Jan-97	0.2	ug/L	N	U	
399-1-18B	12-Feb-97	0.2	ug/L	N	U	
399-1-18B	13-Mar-97	0.028	ug/L	N	U	
399-1-18B	19-Jun-97	0.028	ug/L	N	U	
399-1-18B	17-Jul-97	0.4	ug/L	N	U	
399-1-18B	18-Aug-97	0.4	ug/L	N	U	
399-1-18B	09-Sep-97	20	ug/L	N	UD	
399-1-18B	09-Dec-97	0.4	ug/L	N	U	
399-1-18B	20-May-98	0.4	ug/L	N	U	H
399-1-18B	20-May-98	0.4	ug/L	N	U	H
399-1-18B	22-May-98	0.4	ug/L	N	U	
399-1-18B	26-May-98	0.4	ug/L	N	U	
399-1-18B	16-Jun-98	0.4	ug/L	N	U	H
399-1-18B	20-Jul-98	0.4	ug/L	N	U	
399-1-18B	13-Aug-98	0.4	ug/L	N	U	
399-1-18B	16-Sep-98	0.4	ug/L	N	U	
399-1-18B	18-Dec-98	0.12	ug/L	N	U	
399-1-18B	12-Jan-99	0.12	ug/L	N	U	
399-1-18B	16-Feb-99	0.16	ug/L	N	U	
399-1-18B	23-Mar-99	0.16	ug/L	N	U	
399-1-18B	10-Jun-99	0.16	ug/L	N	U	
399-1-18B	19-Jul-99	0.16	ug/L	N	U	
399-1-18B	19-Aug-99	0.16	ug/L	N	U	
399-1-18B	14-Sep-99	0.16	ug/L	N	U	
399-1-18B	29-Dec-99	0.16	ug/L	N	U	
Uranium						
399-1-10A	10-Dec-96	85.4	ug/L	N		
399-1-10A	08-Jan-97	84.7	ug/L	N	B	
399-1-10A	11-Feb-97	73.2	ug/L	N		
399-1-10A	13-Mar-97	75.7	ug/L	N		
399-1-10A	19-Jun-97	18.2	ug/L	N		
399-1-10A	17-Jul-97	56	ug/L	N		
399-1-10A	19-Aug-97	144	ug/L	N		
399-1-10A	09-Sep-97	138	ug/L	N		
399-1-10A	11-Dec-97	96	ug/L	N		
399-1-10A	11-Dec-97	93.2	ug/L	N		
399-1-10A	16-Mar-98	72.4	ug/L	N		
399-1-10A	20-May-98	41.5	ug/L	N		
399-1-10A	22-May-98	38.2	ug/L	N		
399-1-10A	26-May-98	57.2	ug/L	N		

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-10A	16-Jun-98	48.6	ug/L	N		
399-1-10A	20-Jul-98	75.3	ug/L	N		
399-1-10A	17-Aug-98	75.3	ug/L	N		
399-1-10A	16-Sep-98	72.5	ug/L	N		
399-1-10A	29-Dec-98	49.4	ug/L	N		
399-1-10A	12-Jan-99	50.8	ug/L	N		
399-1-10A	17-Feb-99	0.484	ug/L	N		
399-1-10A	24-Mar-99	55.7	ug/L	N		
399-1-10A	10-Jun-99	23.6	ug/L	N		
399-1-10A	20-Jul-99	50.9	ug/L	N		
399-1-10A	19-Aug-99	61.1	ug/L	N		
399-1-10A	14-Sep-99	58.8	ug/L	N		
399-1-10A	29-Dec-99	46	ug/L	N		
399-1-10B	08-Jan-97	0.0286	ug/L	N	JB	
399-1-10B	12-Feb-97	0.0214	ug/L	N	J	
399-1-10B	13-Mar-97	0.331	ug/L	N		
399-1-10B	19-Jun-97	0.122	ug/L	N		
399-1-10B	22-Jul-97	0.0468	ug/L	N	J	
399-1-10B	18-Aug-97	0.0737	ug/L	N		
399-1-10B	09-Sep-97	141	ug/L	N		
399-1-10B	09-Dec-97	0.127	ug/L	N		
399-1-10B	20-May-98	0.153	ug/L	N		
399-1-10B	22-May-98	0.0464	ug/L	N	U	
399-1-10B	26-May-98	0.0874	ug/L	N	J	
399-1-10B	16-Jun-98	0.156	ug/L	N		
399-1-10B	16-Jun-98	0.0434	ug/L	N	U	
399-1-10B	20-Jul-98	0.0462	ug/L	N	U	
399-1-10B	17-Aug-98	0.0336	ug/L	N	J	
399-1-10B	16-Sep-98	0.105	ug/L	N		
399-1-10B	18-Dec-98	0.0924	ug/L	N	J	
399-1-10B	12-Jan-99	0.0676	ug/L	N	U	
399-1-10B	16-Feb-99	0.0408	ug/L	N	U	
399-1-10B	24-Mar-99	0.0639	ug/L	N	U	
399-1-10B	10-Jun-99	0.0619	ug/L	N	U	
399-1-10B	20-Jul-99	0.0387	ug/L	N	U	
399-1-10B	19-Aug-99	0.136	ug/L	N		
399-1-10B	14-Sep-99	0.0375	ug/L	N	U	
399-1-10B	29-Dec-99	0.0108	ug/L	N	U	
399-1-16A	10-Dec-96	123	ug/L	N		
399-1-16A	08-Jan-97	121	ug/L	N	B	
399-1-16A	12-Feb-97	101	ug/L	N		
399-1-16A	13-Mar-97	116	ug/L	N		
399-1-16A	19-Jun-97	44.8	ug/L	N		
399-1-16A	17-Jul-97	64.7	ug/L	N		
399-1-16A	19-Aug-97	120	ug/L	N		
399-1-16A	09-Sep-97	137	ug/L	N		

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-16A	09-Dec-97	121	ug/L	N		
399-1-16A	16-Mar-98	120	ug/L	N		
399-1-16A	20-May-98	52.9	ug/L	N		
399-1-16A	22-May-98	54.9	ug/L	N		
399-1-16A	26-May-98	92.4	ug/L	N		
399-1-16A	16-Jun-98	75.1	ug/L	N		
399-1-16A	20-Jul-98	101	ug/L	N		
399-1-16A	13-Aug-98	119	ug/L	N		
399-1-16A	16-Sep-98	124	ug/L	N		
399-1-16A	29-Dec-98	111	ug/L	N		
399-1-16A	12-Jan-99	75.9	ug/L	N		
399-1-16A	17-Feb-99	84.7	ug/L	N		
399-1-16A	23-Mar-99	96	ug/L	N		
399-1-16A	10-Jun-99	61.5	ug/L	N		
399-1-16A	20-Jul-99	52.3	ug/L	N		
399-1-16A	23-Aug-99	102	ug/L	N		
399-1-16A	15-Sep-99	115	ug/L	N		
399-1-16A	29-Dec-99	74.6	ug/L	N		
399-1-16B	10-Dec-96	2.6	ug/L	N		
399-1-16B	10-Dec-96	2.39	ug/L	N		
399-1-16B	08-Jan-97	5.6	ug/L	N	B	
399-1-16B	08-Jan-97	5.2	ug/L	N	B	
399-1-16B	13-Feb-97	7.74	ug/L	N		
399-1-16B	13-Mar-97	8.73	ug/L	N		
399-1-16B	19-Jun-97	0.927	ug/L	N		
399-1-16B	17-Jul-97	9.91	ug/L	N		
399-1-16B	19-Aug-97	10.2	ug/L	N		
399-1-16B	09-Sep-97	13.5	ug/L	N		
399-1-16B	09-Dec-97	13.6	ug/L	N		
399-1-16B	20-May-98	13.5	ug/L	N		
399-1-16B	22-May-98	14.7	ug/L	N		
399-1-16B	16-Jun-98	14.1	ug/L	N		
399-1-16B	20-Jul-98	13.5	ug/L	N		
399-1-16B	17-Aug-98	14.8	ug/L	N		
399-1-16B	16-Sep-98	14.4	ug/L	N		
399-1-16B	29-Dec-98	11.1	ug/L	N		
399-1-16B	12-Jan-99	13	ug/L	N		
399-1-16B	17-Feb-99	13.4	ug/L	N		
399-1-16B	23-Mar-99	12.4	ug/L	N		
399-1-16B	10-Jun-99	12.6	ug/L	N		
399-1-16B	20-Jul-99	8.19	ug/L	N		
399-1-16B	23-Aug-99	13.9	ug/L	N		
399-1-16B	14-Sep-99	10.4	ug/L	N		
399-1-16B	30-Dec-99	12.5	ug/L	N		
399-1-17A	10-Dec-96	129	ug/L	N		
399-1-17A	08-Jan-97	134	ug/L	N	B	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-17A	12-Feb-97	139	ug/L	N		
399-1-17A	13-Mar-97	157	ug/L	N		
399-1-17A	19-Jun-97	313	ug/L	N		
399-1-17A	17-Jul-97	225	ug/L	N		
399-1-17A	18-Aug-97	267	ug/L	N		
399-1-17A	09-Sep-97	232	ug/L	N		
399-1-17A	09-Sep-97	232	ug/L	N		
399-1-17A	11-Dec-97	113	ug/L	N		
399-1-17A	16-Mar-98	137	ug/L	N		
399-1-17A	20-May-98	103	ug/L	N		
399-1-17A	22-May-98	127	ug/L	N		
399-1-17A	26-May-98	165	ug/L	N		
399-1-17A	16-Jun-98	248	ug/L	N		
399-1-17A	20-Jul-98	118	ug/L	N		
399-1-17A	17-Aug-98	152	ug/L	N		
399-1-17A	16-Sep-98	96.2	ug/L	N		
399-1-17A	30-Dec-98	89.9	ug/L	N		
399-1-17A	27-Jan-99	88.8	ug/L	N		
399-1-17A	26-Mar-99	106	ug/L	N		
399-1-17A	15-Jun-99	104	ug/L	N		
399-1-17A	20-Jul-99	162	ug/L	N		
399-1-17A	24-Aug-99	166	ug/L	N		
399-1-17A	14-Sep-99	127	ug/L	N		
399-1-17A	30-Dec-99	87.8	ug/L	N		
399-1-17B	10-Dec-96	0.0139	ug/L	N	J	
399-1-17B	08-Jan-97	0.0251	ug/L	N	JB	
399-1-17B	12-Feb-97	0.0912	ug/L	N		
399-1-17B	13-Mar-97	0.035	ug/L	N		
399-1-17B	19-Jun-97	0.0884	ug/L	N	J	
399-1-17B	18-Jul-97	0.412	ug/L	N		
399-1-17B	19-Aug-97	0.0159	ug/L	N		
399-1-17B	09-Sep-97	0.0128	ug/L	N	J	
399-1-17B	11-Dec-97	0.0313	ug/L	N		
399-1-17B	20-May-98	0.0223	ug/L	N	U	
399-1-17B	22-May-98	0.012	ug/L	N	U	
399-1-17B	26-May-98	0.0315	ug/L	N	U	
399-1-17B	17-Jun-98	0.123	ug/L	N		
399-1-17B	20-Jul-98	0.0107	ug/L	N	U	
399-1-17B	17-Aug-98	0.00488	ug/L	N	J	
399-1-17B	16-Sep-98	0.0463	ug/L	N	U	
399-1-17B	18-Dec-98	0.00775	ug/L	N	U	
399-1-17B	12-Jan-99	0.00806	ug/L	N	U	
399-1-17B	17-Feb-99	0.0128	ug/L	N	U	
399-1-17B	26-Mar-99	0.0228	ug/L	N	U	
399-1-17B	10-Jun-99	0.00626	ug/L	N	U	
399-1-17B	10-Jun-99	0.00887	ug/L	N	U	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
99-1-17B	19-Jul-99	0.0466	ug/L	N	U	
99-1-17B	19-Jul-99	0.0177	ug/L	N	U	
99-1-17B	23-Aug-99	0	ug/L	N	U	
99-1-17B	15-Sep-99	0.00665	ug/L	N	U	
99-1-17B	30-Dec-99	0.0142	ug/L	N	U	
399-1-18A	10-Dec-96	5.53	ug/L	N		
399-1-18A	08-Jan-97	5.6	ug/L	N	B	
399-1-18A	10-Feb-97	5.46	ug/L	N		
399-1-18A	13-Mar-97	5.27	ug/L	N		
399-1-18A	19-Jun-97	7.28	ug/L	N		
399-1-18A	17-Jul-97	6.92	ug/L	N		
399-1-18A	18-Aug-97	5.68	ug/L	N		
399-1-18A	09-Sep-97	5.81	ug/L	N		
399-1-18A	11-Dec-97	5.61	ug/L	N		
399-1-18A	20-May-98	6.41	ug/L	N		
399-1-18A	22-May-98	6.2	ug/L	N		
399-1-18A	26-May-98	5.93	ug/L	N		
399-1-18A	16-Jun-98	5.91	ug/L	N		
399-1-18A	20-Jul-98	5.76	ug/L	N		
399-1-18A	13-Aug-98	5.82	ug/L	N		
399-1-18A	16-Sep-98	5.91	ug/L	N		
399-1-18A	29-Dec-98	5.79	ug/L	N		
399-1-18A	12-Jan-99	5.78	ug/L	N		
399-1-18A	16-Feb-99	5.93	ug/L	N		
399-1-18A	23-Mar-99	5.64	ug/L	N		
399-1-18A	10-Jun-99	6.29	ug/L	N		
399-1-18A	19-Jul-99	6.13	ug/L	N		
399-1-18A	19-Aug-99	5.65	ug/L	N		
399-1-18A	14-Sep-99	5.71	ug/L	N		
399-1-18A	29-Dec-99	6.01	ug/L	N		
399-1-18B	10-Dec-96	0.0264	ug/L	N	J	
399-1-18B	08-Jan-97	0.0237	ug/L	N	JB	
399-1-18B	12-Feb-97	0.0474	ug/L	N		
399-1-18B	13-Mar-97	0.057	ug/L	N		
399-1-18B	19-Jun-97	0.125	ug/L	N		
399-1-18B	17-Jul-97	0.142	ug/L	N		
399-1-18B	18-Aug-97	0.0256	ug/L	N		
399-1-18B	09-Sep-97	0.0899	ug/L	N	J	
399-1-18B	09-Dec-97	0.0246	ug/L	N		
399-1-18B	20-May-98	0.0318	ug/L	N	U	
399-1-18B	20-May-98	0.0534	ug/L	N	U	
399-1-18B	22-May-98	0.0117	ug/L	N	U	
399-1-18B	26-May-98	0.0186	ug/L	N	U	
399-1-18B	16-Jun-98	0.025	ug/L	N	U	
399-1-18B	20-Jul-98	0.0126	ug/L	N	U	
399-1-18B	13-Aug-98	0.00845	ug/L	N	J	

Well	Date	Result	Units	Filtered	QUALIFIER	Review Flag
399-1-18B	16-Sep-98	0.0132	ug/L	N	U	
399-1-18B	18-Dec-98	0.00828	ug/L	N	U	
399-1-18B	12-Jan-99	0.00661	ug/L	N	U	
399-1-18B	16-Feb-99	0.0157	ug/L	N	U	
399-1-18B	23-Mar-99	0.0287	ug/L	N	U	
399-1-18B	10-Jun-99	0.0209	ug/L	N	U	
399-1-18B	19-Jul-99	0.024	ug/L	N	U	
399-1-18B	19-Aug-99	0.0174	ug/L	N	U	
399-1-18B	14-Sep-99	0.00694	ug/L	N	U	
399-1-18B	29-Dec-99	0.00761	ug/L	N	U	

Results of Groundwater Monitoring for RCRA Corrective Action
at the 183-H Solar Evaporation Basins
July 1997 through December 1999

M.J. Hartman
March, 2000

INTRODUCTION

The 183-H solar evaporation basins were a treatment, storage, or disposal facility that was regulated under the *Resource Conservation and Recovery Act of 1976* (RCRA). The waste discharged to the basins originated in the 300 Area fuel fabrication facility and included solutions of chromic, hydrofluoric, nitric, and sulfuric acids that had been neutralized. The waste solutions contained various metallic and radioactive constituents (e.g., chromium, technetium, uranium). All waste has been removed, the facility has been demolished, and the underlying contaminated soil has been removed and replaced with clean fill.

This is the first of a series of reports on corrective action monitoring at the 183-H Solar Evaporation Basins. It addresses requirement of WAC 173-303-645(11)(g) to report on the effectiveness of the corrective action program. Results of monitoring previously have been reported in groundwater annual reports (e.g. Hartman 1999). This report covers the period since the 100 H Area interim remedial measure began (July 1997) through the end of calendar year 1999. Future reports will be issued semiannually.

The Washington State Department of Ecology issued a RCRA Permit for the Hanford Site in 1994 (Ecology 1994). The 183-H Basins were included in Part V of the Permit, which contains requirements specifically applicable to those treatment, storage, and disposal units that are undergoing closure. A final-status, compliance monitoring program was proposed in 1995 (Hartman and Chou, 1995) to comply with the groundwater monitoring requirements of WAC 173-303-645\.

The first sample set collected during compliance monitoring showed that downgradient concentrations of the contaminants of concern exceeded concentration limits defined in the monitoring plan. The regulations require corrective action activities to reduce contaminant concentrations in groundwater. The Postclosure Plan, which was incorporated into Part VI of the Hanford Site RCRA Permit in February 1998, deferred corrective action to the interim action begin taken for the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) in the 100-HR-3 Operable Unit. The Postclosure Plan also required monitoring to be conducted as described in the revised RCRA groundwater monitoring plan (Hartman 1997).

The objective of RCRA monitoring during the period of interim remediation is to track trends in four contaminants of concern (chromium, nitrate, uranium, and technetium-99) and fluoride. DOE, the regulators, and members of the public will determine methods for final remediation of 100-H Area groundwater some time in the

future. At that time, the RCR monitoring program will be revised to meet the requirements of final remedial easures.

INTERIM REMEDIAL MEA URE

The interim remedial easure applies to the 100-HR-3 groundwater operable unit, which is under the authority a CERCLA record of decision. Groundwater is pumped from four extraction wells, l ated west, north, and east of the 183-H Basins. The effluent is treated to remov romium and injected back into the aquifer in upgradient wells. The objective of the terim remedial measure is to reduce the amount of chromium entering the Co bia River, where it is a potential hazard to the ecosystem.

Groundwater is sa led to monitor the effectiveness of the interim remedial measure and to monitor entire 100-HR-3 Operable Unit (DOE 1996b; Peterson and Raidl, 1996). The effe ness of the interim remedial measure for chromium is described in reports fo 100-HR-3 Operable Unit. The most recent report concluded that chromium concen ns in groundwater were declining but are not consistently below the enforcemen it in compliance wells 199-H4-4, 199-H4-63, and 199-H4-64 (DOE/RL-99-79). Op le unit monitoring is coordinated with RCRA monitoring.

RCRA GROUNDW R MONITORING PROGRAM

Four wells l d in the 183-H chromium plume are monitored for RCRA requirements durin p-and-treat activities (Figure 1). Three of the wells are completed at the to he uppermost aquifer (Hanford formation): wells 199-H4-7 and 199-H4-12A are ex on wells, and well 199-H4-3 is a monitoring well that has historically shown ighest levels of chromium, nitrate, technetium-99, and uranium from the 183-H Ba Well 199-H4-12C is located adjacent to 199-H4-12A and is completed in a silt of the Ringold Formation. This well consistently has elevated concentrations of c nium, though the contaminant source is unknown. This well is monitored to asce whether pumping the shallow aquifer affects chromium concentrations de in the Ringold sediments.

Wells are pled annually for RCRA, generally in November. This is typically a period when ri age is low and the samples reflect nearly pure groundwater instead of a mixture of g dwater and river water held in bank storage. Therefore, contaminant cor rations in November are usually among the highest of the year.

Hartman Chou (1995) identified the following concentration limits for the 183-H Basins co tuents of concern:

- Chromi 122 µg/L. This limit was derived based on background concen ns from upgradient wells 199-H3-2A and 199-H4-6.
- Nitrate 5 mg/L (as NO_3). Based on final maximum contaminant level, 56 FR, Januar), 1991.

- Uranium: 20 µg/L. Based on EPA proposed changes to 40 CFR 141.

- Technetium-99: 900 pCi/L. Interim drinking-water standard, based on national primary drinking water standards (40 CFR 141).

These concentration limits were applied during compliance monitoring to determine whether corrective action was necessary as required under WAC 173-303-645. Contaminant concentrations are not statistically compared to these limits during the period of interim remediation. After completion of the interim remedial measure and future phases of corrective action, the RCRA monitoring program will be revised and contaminant concentrations will be compared to these or alternative limits to determine whether the corrective action was successful. Hartman and Chou (1995) did not identify fluoride as a groundwater contaminant of concern, but it was detected in the vadose zone beneath the former basins and so it is monitored under RCRA (DOE-RL, 1997).

CONTAMINANT TRENDS

This section discusses concentrations of chromium, nitrate, technetium-99, uranium, and fluoride in groundwater. Data for the reporting period (July 1997 through December 1999) are included in the appendix. Trends are examined in relation to the concentration limits defined above. RCRA monitoring specifies annual sampling of the four wells in the network. Some constituents are analyzed more frequently for other purposes. All available data are presented and discussed below.

Concentrations of groundwater contaminants fluctuate seasonally, especially in wells 199-H4-3 and 199-H4-12A. These two wells are directly in the contaminant plume from the 183-H basins and are relatively near the Columbia River. Changing river stage causes the water table to rise and fall. In general, a low water table is associated with higher concentrations of contaminants. Seasonal variations in the water table also cause changes in the direction of groundwater flow.

Chromium

Chromium concentrations in filtered samples from the four RCRA monitoring wells are illustrated in Figure 2. Filtered samples represent dissolved chromium, which is assumed to be in its most soluble form (hexavalent). Seasonal variations are evident in wells 199-H4-12A and 199-H4-3. Concentrations in well 199-H4-3 were above the 122-ug/L concentration limit throughout the reporting period. Concentrations in well 199-H4-12A, near the river, have been mostly below the limit except for samples collected in August and November 1998. This well had similar increases in the other contaminants at that time.

Concentrations in well 199-H4-7 were above the concentration limit in 1997 (unfiltered data) and part of 1998 (filtered and unfiltered data). Levels have declined

since then. Recent concentrations (55 ug/L in December 1999) were the lowest ever observed in this well (see Figure 2).

Well 199-H4-12C is completed in a confined aquifer in the Ringold formation. Chromium concentrations are consistently above the concentration limit, but the other contaminants of concern are low (Figures 3, 4, and 5). Thus the source of the chromium in this deeper aquifer is probably not the 183-H basins. Levels have been declining since 1996 (i.e., before the pump-and-treat system began to operate).

Nitrate

Nitrate concentrations are highest in well 199-H4-3, where they are consistently above the 45-mg/L limit (Figure 3). Sampling frequency decreased in the past two years so seasonal variability is no longer evident. Nitrate concentrations increased sharply in well 199-H4-12A in November 1997. The reason for the increase is not known. Levels subsequently declined but remained above the concentration limit in recent samples.

A spike in nitrate in well 199-H4-7 in July 1997 appears to be related to similar increases in uranium and technetium-99. The fact that spikes occurred in all three of these contaminants indicates they were probably not erroneous values. After these increases were detected, extraction temporarily ceased because high levels of radionuclides were not desired in the treatment system. Extraction began again in 1998 and nitrate levels generally have remained slightly below the concentration limit. Deep well 199-H4-12C has consistently low nitrate concentrations.

Technetium-99

Historically, concentrations of technetium-99 have fluctuated above the 900-pCi/L concentration limit in well 199-H4-3 (Figure 4). The graph shows the reduction in sampling frequency in fiscal years 1998 and 1999 but no overall increasing or decreasing trend. In well 199-H4-12A, technetium-99 concentrations were higher in 1998 and 1999 than in the previous 9 years. The increase may have been a delayed response to high river stage in 1996-97, or may be related to the use of this well for groundwater extraction. Technetium-99 is typically low in wells 199-H4-7 and 199-H4-12C, except for a spike in 199-H4-7 in July 1997.

Uranium

Trends in uranium concentrations are very similar to technetium-99 in all four RCRA monitoring wells (Figure 5). Levels exceeded the 20-ug/L concentration limit in wells 199-H4-12A and 199-H4-3 in fiscal years 1998 and 1999. Concentrations are very low in deep well 199-H4-12C. Extraction well 199-H4-7 detected a spike in uranium in July 1997, like the other contaminants.

Fluoride

Fluoride concentrations in the RCRA wells were in the hundreds of ug/L during the reporting period (Figure 6). These levels are about the same as in wells that are upgradient of the 183-H basins (Figure 7). Concentrations in groundwater are all below the 4,000-ug/L maximum contaminant level and the 2,000-ug/L secondary level. One relatively high value (2,500 ug/L) was reported in well 199-H4-3 in November 1999, but was below the laboratory detection limit. The groundwater project is attempting to have the remaining sample reanalyzed at a lower detection limit. Except for this data point, fluoride concentrations in 1997 through 1999 were lower than in 1994 through 1996.

CONCLUSIONS

Concentrations of the following constituents exceeded concentration limits during July 1997 through December 1999:

- Chromium (122 ug/L): all four wells
- Nitrate (45 mg/L): wells 199-H4-12A, 199-H4-3, 199-H4-7
- Technetium-99 (900 pCi/L): wells 199-H4-3 and 199-H4-7 (July 1997 only)
- Uranium (20 ug/L): wells 199-H4-12A, 199-H4-3, 199-H4-7 (July 1997 only)

Concentrations of these constituents vary with changes in the water table and groundwater flow directions. Concentrations do not appear to be increasing or decreasing overall in the four RCRA wells, with the possible exception of chromium in wells 199-H4-12C and 199-H4-7. Chromium has been gradually decreasing in deep well 199-H4-12C since before the pump-and-treat system began. Chromium has declined sharply after a February 1998 peak in extraction well 199-H4-7, and is currently lower than historical data. Fluoride is not elevated in groundwater monitored by the RCRA wells.

The current RCRA monitoring plan (Hartman 1997) remains adequate for the objective of tracking trends during the period of the interim remedial action.

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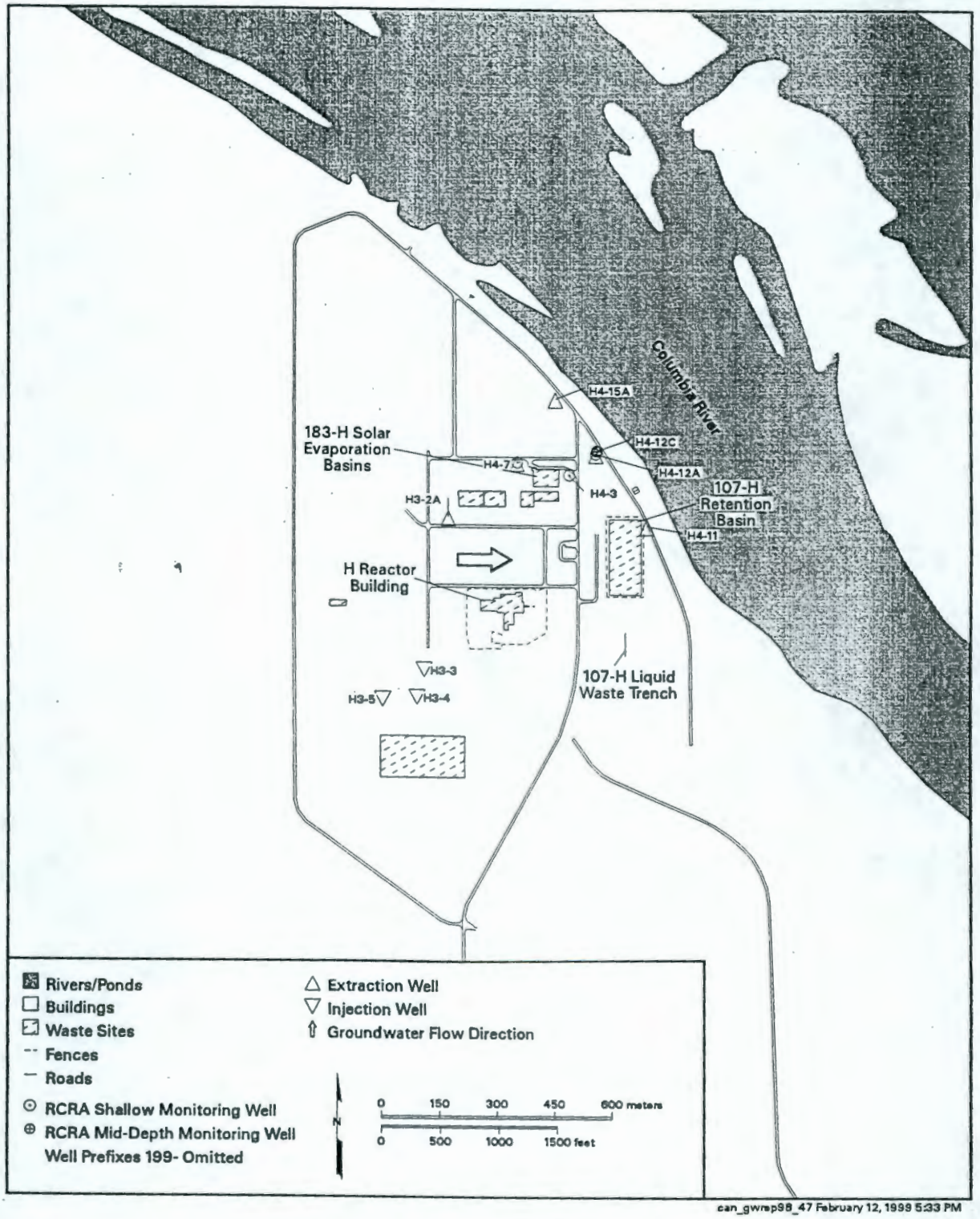

Figure 1. Locations of Monitoring Wells for 183-H Solar Evaporation Basins, and Extraction/Injection Wells for 100-H Area Pump-and-Treat System.

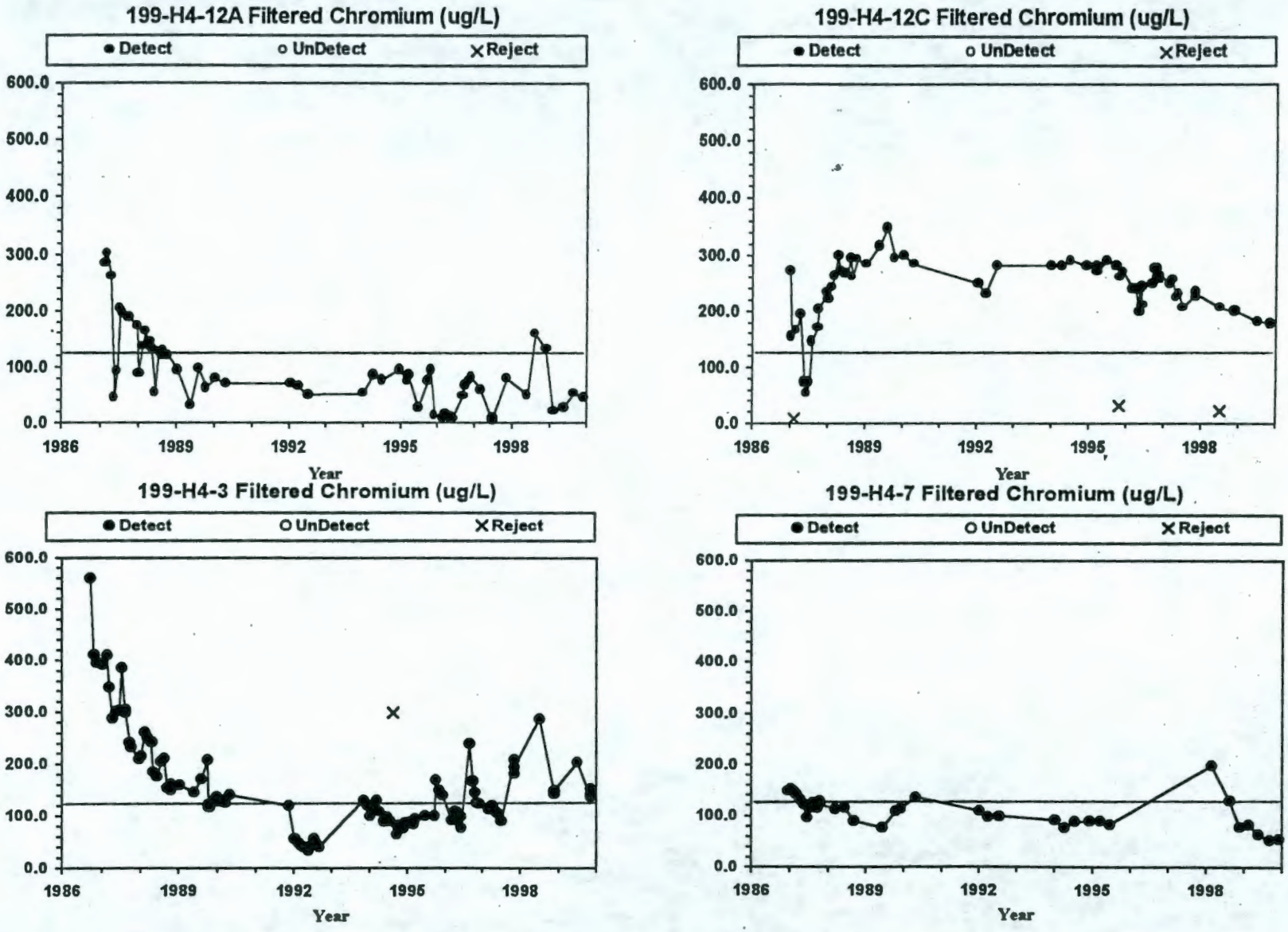

Figure 2. Chromium in filteres samples from 183-H wells. Horizontal lines show 122-ug/L concentration limit.

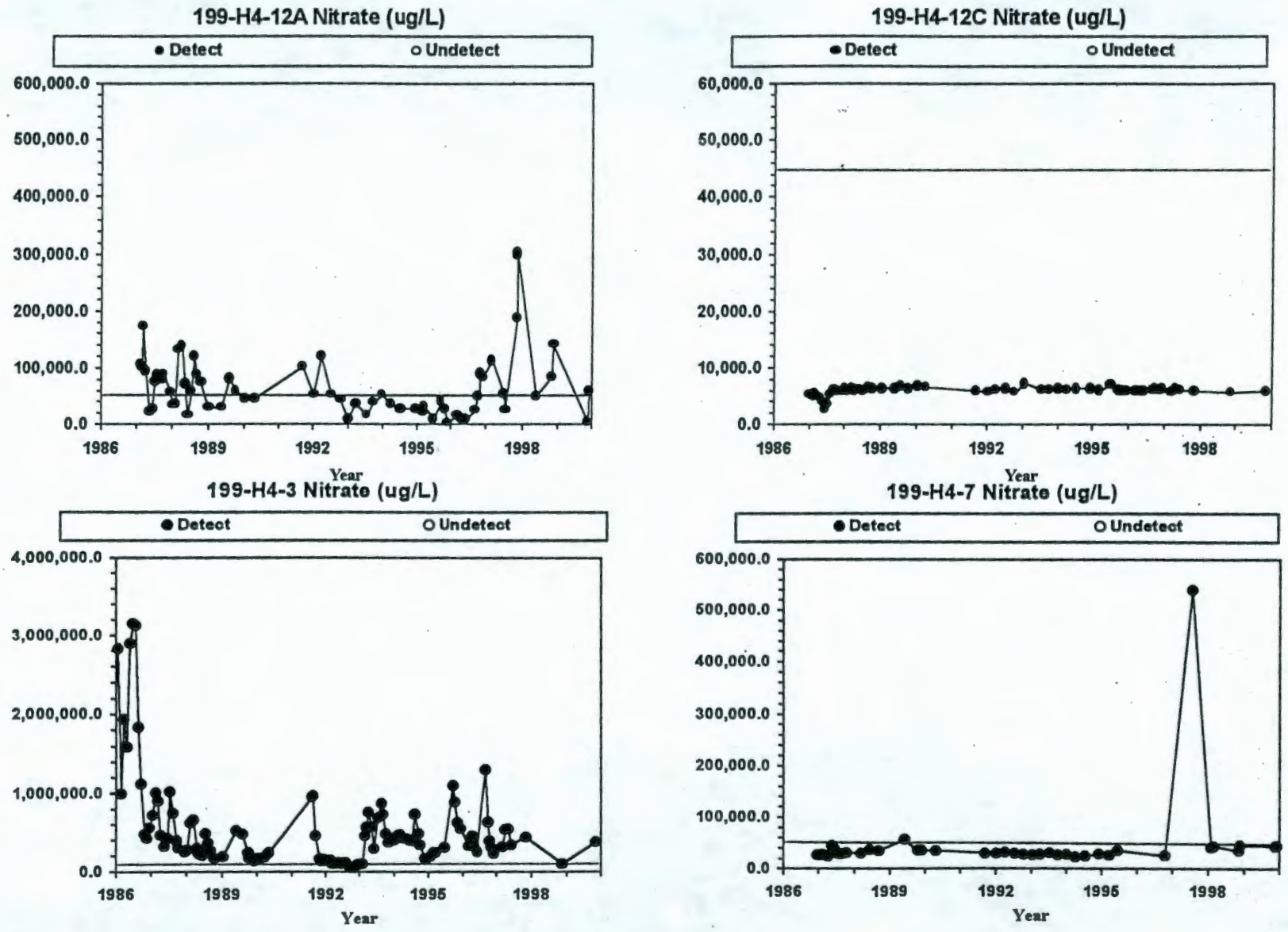

Figure 3. Nitrate in 183-H Wells. Horizontal lines show 45,000-ug/L concentration limit.

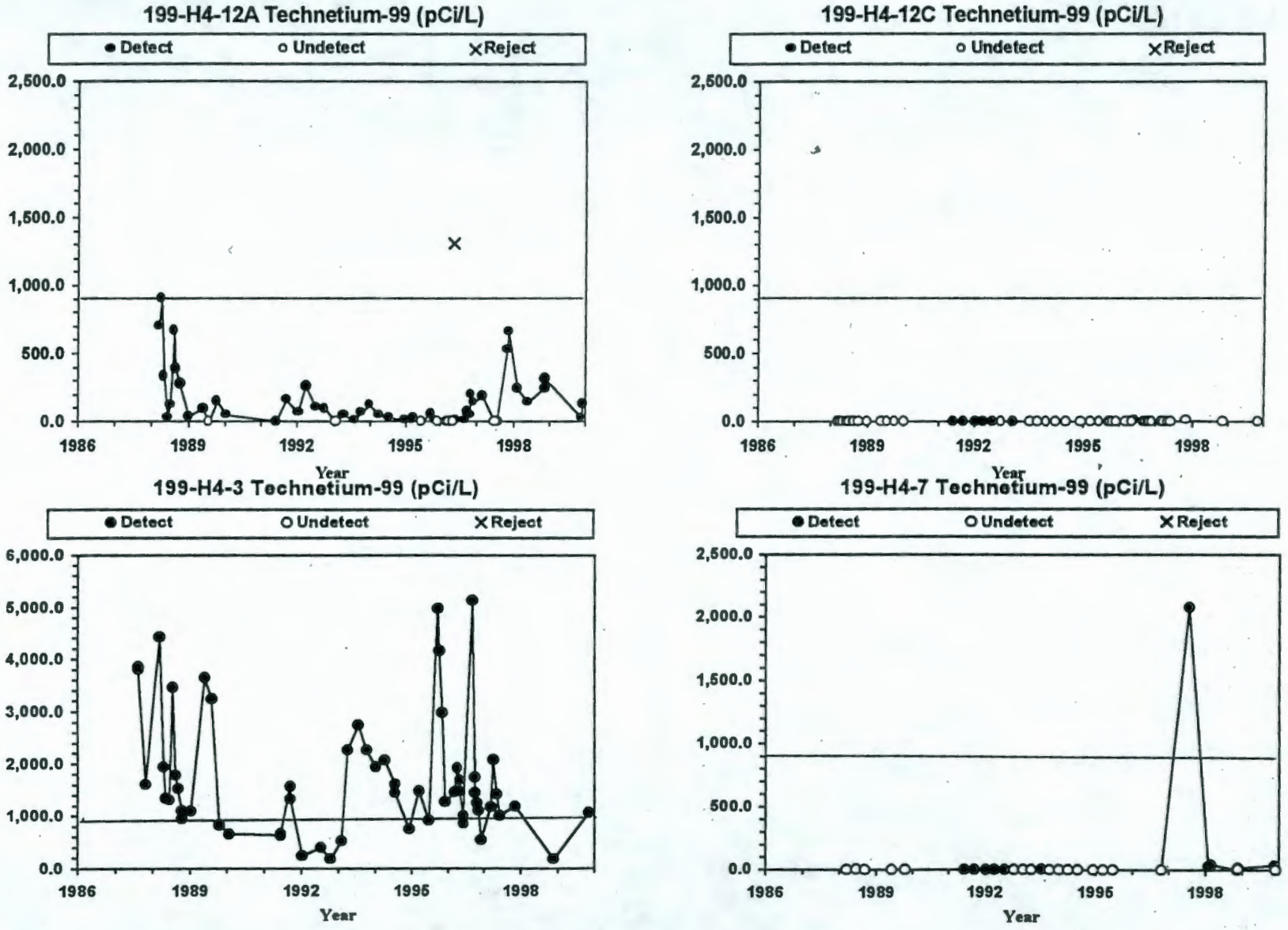

Figure 4. Technetium-99 in 183-H Wells. Horizontal lines show 900-pCi/L concentration limit.

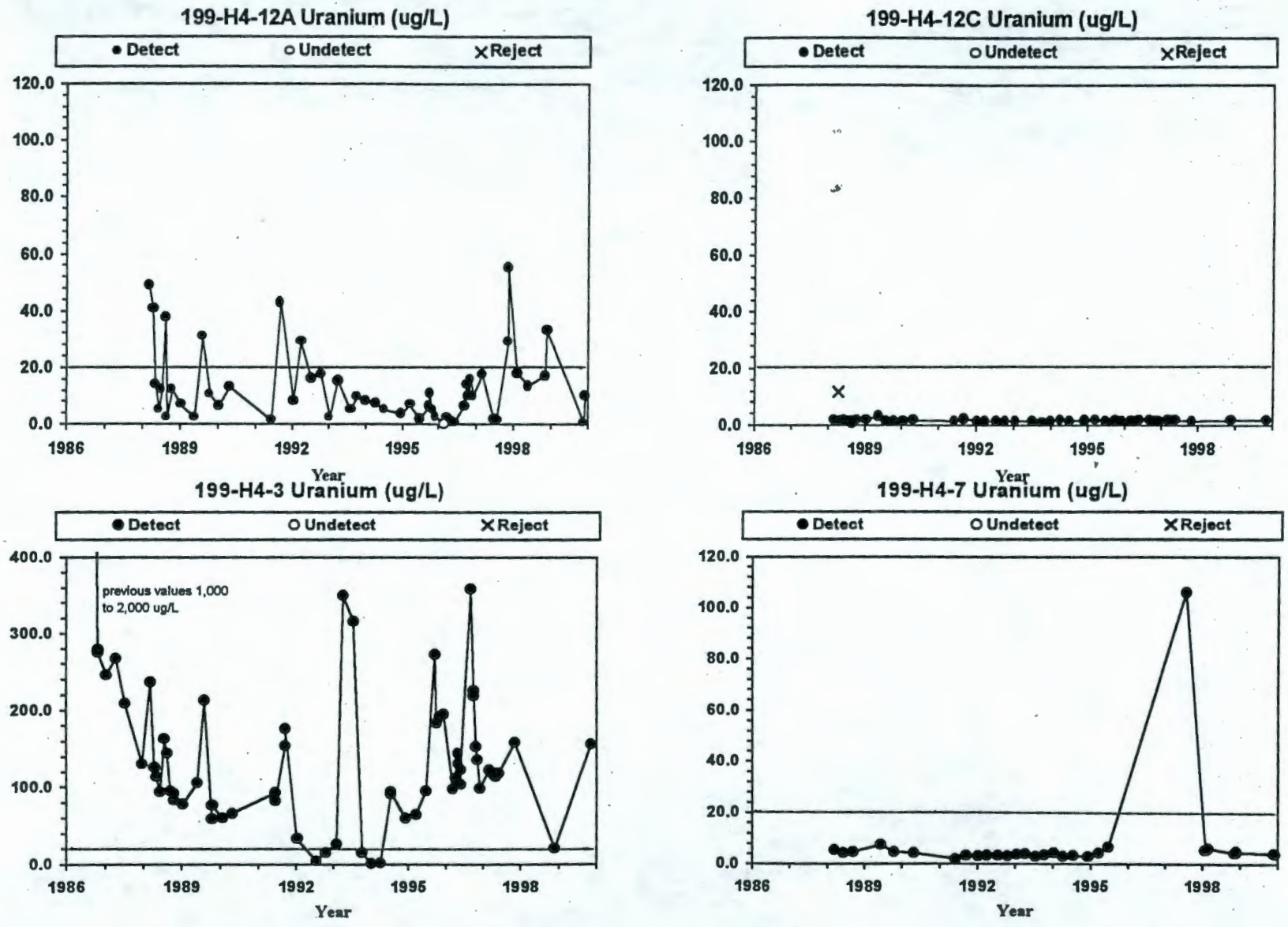

Figure 5. Uranium in 183-H Wells. Horizontal lines show 20-ug/L concentration limit.

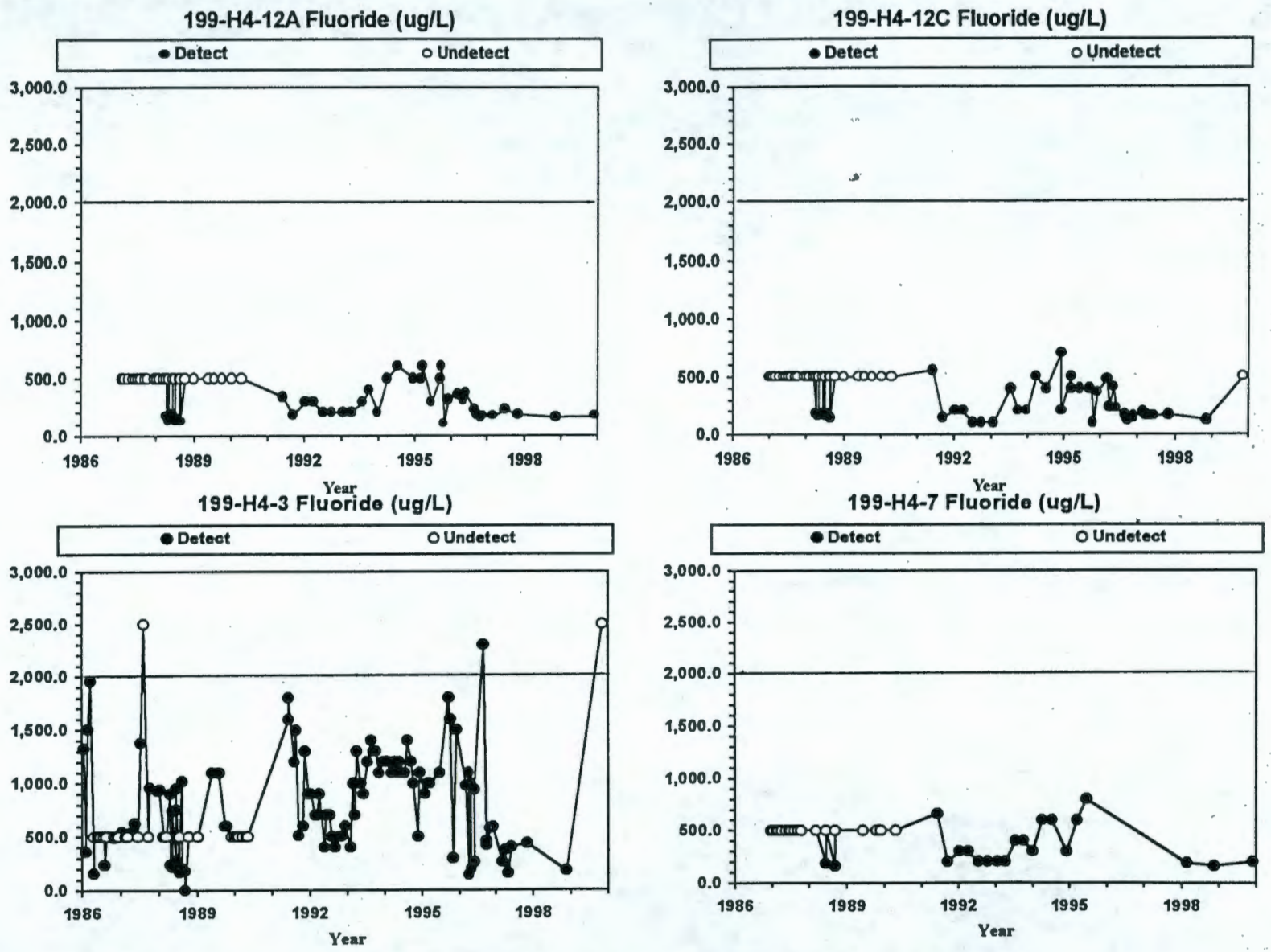

Figure 6. Fluoride in 183-H Wells. Horizontal lines show secondary maximum contaminant level.

Appendix A. Constituents of Interest for RCRA Groundwater Monitoring at 183-H Solar Evaporation Basins, July 1997 through December 1999.

Well	Date	Result	Units	Filtered (a)	Lab Flag (b)	Review Flag (c)
Chromium (filtered samples)						
199-H4-12A	12-Sep-97	70	ug/L	N		
199-H4-12A	18-Sep-97	75	ug/L	N		
199-H4-12A	06-Nov-97	79.7	ug/L	Y		
199-H4-12A	10-Nov-97	83	ug/L	N		
199-H4-12A	10-Nov-97	93	ug/L	N		
199-H4-12A	10-Nov-97	84	ug/L	N		
199-H4-12A	12-Feb-98	52	ug/L	N		
199-H4-12A	26-May-98	49	ug/L	Y		
199-H4-12A	17-Aug-98	158	ug/L	Y		
199-H4-12A	09-Nov-98	126	ug/L	N		
199-H4-12A	17-Nov-98	132	ug/L	Y		
199-H4-12A	12-Feb-99	21	ug/L	Y		
199-H4-12A	18-May-99	27	ug/L	Y		
199-H4-12A	31-Aug-99	53	ug/L	Y		
199-H4-12A	18-Nov-99	10	ug/L	N		
199-H4-12A	02-Dec-99	44.6	ug/L	Y		
199-H4-12C	01-Jul-97	205	ug/L	Y		
199-H4-12C	04-Nov-97	232	ug/L	Y		
199-H4-12C	04-Nov-97	236	ug/L	Y		
199-H4-12C	04-Nov-97	254	ug/L	N		
199-H4-12C	04-Nov-97	224	ug/L	Y		
199-H4-12C	04-Nov-97	231	ug/L	Y		
199-H4-12C	06-Jul-98	205	ug/L	Y		
199-H4-12C	06-Jul-98	22	ug/L	Y		F
199-H4-12C	17-Nov-98	244	ug/L	N		
199-H4-12C	17-Nov-98	201	ug/L	Y		
199-H4-12C	17-Nov-98	200	ug/L	Y		
199-H4-12C	01-Jul-99	182	ug/L	Y		
199-H4-12C	08-Nov-99	177	ug/L	Y		
199-H4-12C	08-Nov-99	178	ug/L	Y		
199-H4-12C	08-Nov-99	234	ug/L	N		
199-H4-3	02-Jul-97	91	ug/L	Y		
199-H4-3	03-Nov-97	196	ug/L	Y		
199-H4-3	03-Nov-97	201	ug/L	N		
199-H4-3	03-Nov-97	183	ug/L	Y		
199-H4-3	03-Nov-97	209	ug/L	Y		
199-H4-3	03-Nov-97	183	ug/L	Y		
199-H4-3	02-Jul-98	288	ug/L	Y		
199-H4-3	17-Nov-98	168	ug/L	N		
199-H4-3	17-Nov-98	150	ug/L	Y		
199-H4-3	17-Nov-98	143	ug/L	Y		
199-H4-3	01-Jul-99	204	ug/L	Y		
199-H4-3	04-Nov-99	153	ug/L	Y		

Well	Date	Result	Units	Filtered (a)	Lab Flag (b)	Review Flag (c)
199-H4-3	04-Nov-99	137	ug/L	Y		
199-H4-3	04-Nov-99	142	ug/L	Y		
199-H4-3	04-Nov-99	151	ug/L	N		
199-H4-7	12-Sep-97	129	ug/L	N		
199-H4-7	18-Sep-97	135	ug/L	N		
199-H4-7	12-Feb-98	207	ug/L	N		
199-H4-7	23-Feb-98	198	ug/L	Y		
199-H4-7	17-Aug-98	130	ug/L	Y		
199-H4-7	09-Nov-98	70	ug/L	N		
199-H4-7	17-Nov-98	78.7	ug/L	Y		
199-H4-7	12-Feb-99	83	ug/L	Y		
199-H4-7	18-May-99	64	ug/L	Y		
199-H4-7	18-May-99	64	ug/L	Y		
199-H4-7	18-May-99	64	ug/L	Y		
199-H4-7	31-Aug-99	53	ug/L	Y		
199-H4-7	18-Nov-99	65	ug/L	N		
199-H4-7	02-Dec-99	54.7	ug/L	Y		
		Fluoride				
199-H4-12A	06-Nov-97	186	ug/L	N		
199-H4-12A	17-Nov-98	155	ug/L	N		
199-H4-12A	02-Dec-99	170	ug/L	N		
199-H4-12C	04-Nov-97	170	ug/L	N		
199-H4-12C	17-Nov-98	120	ug/L	N		
199-H4-12C	08-Nov-99	500	ug/L	N	U	
199-H4-3	03-Nov-97	436	ug/L	N		
199-H4-3	17-Nov-98	180	ug/L	N		
199-H4-3	04-Nov-99	2500	ug/L	N	U	F
199-H4-7	23-Feb-98	191	ug/L	N		
199-H4-7	17-Nov-98	161	ug/L	N		
199-H4-7	02-Dec-99	200	ug/L	N		
		Nitrate				
199-H4-12A	18-Jul-97	24000	ug/L	N		
199-H4-12A	06-Nov-97	187000	ug/L	N	D	H
199-H4-12A	10-Nov-97	297000	ug/L	N		
199-H4-12A	10-Nov-97	304000	ug/L	N		
199-H4-12A	26-May-98	50000	ug/L	N		
199-H4-12A	09-Nov-98	84000	ug/L	N		
199-H4-12A	17-Nov-98	141000	ug/L	N	D	
199-H4-12A	02-Dec-99	59700	ug/L	N	D	H
199-H4-12C	04-Nov-97	5800	ug/L	N		
199-H4-12C	17-Nov-98	5700	ug/L	N		
199-H4-12C	08-Nov-99	6000	ug/L	N		
199-H4-3	03-Nov-97	443000	ug/L	N		
199-H4-3	17-Nov-98	100000	ug/L	N		
199-H4-3	04-Nov-99	380000	ug/L	N		
199-H4-7	18-Jul-97	540000	ug/L	N		
199-H4-7	29-Jan-98	41000	ug/L	N		

Well	Date	Result	Units	Filtered (a)	Lab Flag (b)	Review Flag (c)
199-H4-7	23-Feb-98	43800	ug/L	N	D	
199-H4-7	09-Nov-98	36000	ug/L	N		
199-H4-7	17-Nov-98	46000	ug/L	N	D	
199-H4-7	02-Dec-99	45000	ug/L	N	D	H
		Technetium-99				
199-H4-12A	18-Jul-97	4.11	pCi/L	N	J	
199-H4-12A	06-Nov-97	524	pCi/L	N		
199-H4-12A	10-Nov-97	665	pCi/L	N		
199-H4-12A	10-Nov-97	657	pCi/L	N		
199-H4-12A	12-Feb-98	250	pCi/L	N		
199-H4-12A	26-May-98	143	pCi/L	N		
199-H4-12A	09-Nov-98	250	pCi/L	N		
199-H4-12A	17-Nov-98	323	pCi/L	N		
199-H4-12A	02-Dec-99	135	pCi/L	N		
199-H4-12C	04-Nov-97	6.25	pCi/L	N	U	
199-H4-12C	17-Nov-98	2.5	pCi/L	N	U	
199-H4-12C	08-Nov-99	0	pCi/L	N	U	
199-H4-3	03-Nov-97	1190	pCi/L	N		
199-H4-3	17-Nov-98	187	pCi/L	N		
199-H4-3	04-Nov-99	1070	pCi/L	N		
199-H4-7	18-Jul-97	2080	pCi/L	N		
199-H4-7	29-Jan-98	31.4	pCi/L	N		
199-H4-7	12-Feb-98	31.3	pCi/L	N		
199-H4-7	23-Feb-98	42.9	pCi/L	N		
199-H4-7	09-Nov-98	1.8	pCi/L	N	U	
199-H4-7	17-Nov-98	7.39	pCi/L	N	U	
199-H4-7	17-Nov-98	16	pCi/L	Y		
199-H4-7	02-Dec-99	0.687	pCi/L	N	U	
		Uranium				
199-H4-12A	18-Jul-97	1.33	ug/L	N		
199-H4-12A	06-Nov-97	29.1	ug/L	N		
199-H4-12A	10-Nov-97	55.3	ug/L	N		
199-H4-12A	10-Nov-97	54.8	ug/L	N		
199-H4-12A	12-Feb-98	18.2	ug/L	N		
199-H4-12A	26-May-98	13.5	ug/L	N		
199-H4-12A	09-Nov-98	17	ug/L	N		
199-H4-12A	17-Nov-98	33.1	ug/L	N		
199-H4-12A	02-Dec-99	10.1	ug/L	N		
199-H4-12C	04-Nov-97	1.51	ug/L	N		
199-H4-12C	17-Nov-98	1.67	ug/L	N		
199-H4-12C	08-Nov-99	1.67	ug/L	N		
199-H4-3	03-Nov-97	159	ug/L	N		
199-H4-3	17-Nov-98	21.3	ug/L	N		
199-H4-3	04-Nov-99	157	ug/L	N		
199-H4-7	18-Jul-97	106	ug/L	N		
199-H4-7	29-Jan-98	5.47	ug/L	N		
199-H4-7	12-Feb-98	5.6	ug/L	N		

Well	Date	Result	Units	Filtered (a)	Lab Flag (b)	Review Flag (c)
199-H4-7	23-Feb-98	5.97	ug/L	N		
199-H4-7	09-Nov-98	4.2	ug/L	N		
199-H4-7	17-Nov-98	4.61	ug/L	Y		
199-H4-7	17-Nov-98	4.84	ug/L	N		
199-H4-7	02-Dec-99	3.78	ug/L	N		

(a) N = sample not filtered
Y = sample filtered
(b) U = reported value is below detection limit
D = sample diluted before analysis
J = value is estimated
(c) F = data undergoing review
H = sample exceeded recommended holding time