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Results of Groundwater Monitoring for the 183-H Solar Evaporation Basins

Reporting Period: July-December 2006

M. J. Hartman

April 2007

Prepared for Fluor Hanford, Inc.
and the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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Richland, Washington 99352

Summary

This is one of a series of reports on *Resource Conservation and Recovery Act* monitoring at the 183-H basins. It fulfills a requirement of WAC 173-303-645(11)(g) to report twice each year on the effectiveness of the corrective action program. This report covers the period from July through December 2006.

The current objective of corrective action monitoring is simply to track trends. Although there is short-term variability in contaminant concentrations, trends over the past 10 years are downward. The current RCRA permit and monitoring plan remain adequate for the objective of tracking trends.

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1.0 Introduction

The 183-H solar evaporation basins (183-H basins) were located in the 100-H Area of the Hanford Site and have been demolished and backfilled under the *Resource Conservation and Recovery Act* (RCRA) in the Hanford Facility RCRA Permit (Ecology 2007). Post-closure actions remain for the 183-H basins. Groundwater is monitored in accordance with Washington Administrative Code (WAC) 173-303-645(11), "Corrective Action Program," and Part VI, Chapter 2 of the Hanford Facility RCRA Permit (Ecology 2007). 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-99, uranium[1]). Between 1985 and 1996, remaining waste was removed, the facility was demolished, and the underlying contaminated soil was removed and replaced with clean fill.

This is one of a series of reports on corrective action monitoring at the 183-H basins. It fulfills a requirement of WAC 173-303-645(11)(g) to report twice each year on the effectiveness of the corrective action program. This report covers the period from July through December 2006.

The regulations in WAC 173-303-645(11) require corrective action activities to reduce contaminant concentrations in groundwater. The post-closure plan (DOE 1997a), which was incorporated into Part VI of the Hanford Facility RCRA Permit in February 1998, deferred further actions at the 183-H basins to the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) interim action for the 100-HR-3 Operable Unit. The post-closure plan also requires monitoring to be conducted as described in the final status RCRA groundwater monitoring plan (Hartman 1997).

2.0 Interim Remedial Measure

The interim remedial action applies to the 100-HR-3 Groundwater Operable Unit, which is under the authority of a CERCLA record of decision (EPA 1996). Groundwater in the 100-H Area is pumped from extraction wells, treated to remove chromium, and injected back into the aquifer. The objective of the interim remedial measure is to reduce the amount of chromium entering the Columbia River, where it is a potential hazard to the ecosystem. Active extraction and injection wells are illustrated in Figure 1.

[1] Groundwater monitoring objectives of RCRA, CERCLA, and the *Atomic Energy Act* (AEA) often differ slightly and the contaminants monitored are not always the same. For RCRA regulated units, monitoring focuses on non-radioactive dangerous waste constituents. Radionuclides (source, special nuclear and by-product materials) may be monitored in some RCRA unit wells to support objectives of monitoring under the AEA and/or CERCLA. Please note that pursuant to RCRA, the source, special nuclear and by-product material component of radioactive mixed wastes, are not regulated under RCRA and are regulated by DOE acting pursuant to its AEA authority. Therefore, while this report may be used to satisfy RCRA reporting requirements, the inclusion of information on radionuclides in such a context is for information only and, may not be used to create conditions or other restrictions set forth in any RCRA permit.

Groundwater is sampled to monitor the performance of the interim remedial measure and to monitor the entire 100-HR-3 Operable Unit (DOE 1997b). This CERCLA monitoring is coordinated with RCRA monitoring.

The pump-and-treat system may be shut down when concentrations of hexavalent chromium are below 22 μg/L in the extraction and compliance wells as specified in the Remedial Design Report and Remedial Action Work Plan (DOE 2003) and data indicate that the concentration will remain below that value. The system may also be shut down if it proves ineffective or if a better treatment technique is found. As of September 2006, chromium concentrations in compliance wells and former compliance wells were below the 22 μg/L remedial action goal.

3.0 RCRA Groundwater Monitoring Program

During the period of time that the CERCLA interim remedial measure for chromium is extracting groundwater, RCRA corrective action monitoring will continue to evaluate new analytical results relative to concentration limits stated in the permit. Additionally, fluoride results will be evaluated relative to previously established trends and to the drinking water standard for fluoride (Part VI, post-closure unit 2 of the Hanford Facility RCRA Permit [Ecology 2007]).

The RCRA groundwater monitoring network includes wells 199-H4-3, 199-H4-8, 199-H4-12A, and 199-H4-12C (Figure 1). The conditions in Part VI, post-closure unit 2 of the Hanford Facility RCRA Permit (Ecology 2007) provide for groundwater sample collection annually in these wells.

All four of the wells in the RCRA network were sampled as scheduled in November 2006. In addition, the wells were sampled for the 100-HR-3 Operable Unit at various times in the reporting period. The RCRA contaminants of interest for groundwater are chromium, nitrate, and fluoride. This report discusses technetium-99 and uranium for information only, as discussed in Section 1.0.

Well 199-H4-12A has been an extraction well since 1997, and well 199-H4-3 was converted to an extraction well in August 2005. Wells 199-H4-3, 199-H4-8, and 199-H4-12A are completed at the top of the unconfined aquifer. Well 199-H4-12C is located adjacent to well 199-H4-12A and is completed deeper in the Ringold Formation. This well consistently has elevated concentrations of chromium without 183-H basins co-contaminants.

4.0 Contaminant Trends

This section discusses concentrations of chromium, fluoride, nitrate, technetium-99, and uranium in groundwater. Results of samples collected during the reporting period are presented in Table 1, and pertinent results are discussed in the following paragraphs.

Chromium concentrations ranged from below the detection limit in one sample from well 199-H4-8 to 92 μg/L in deep well 199-H4-12C during the reporting period. Concentrations have decreased over the past 10 years in all of the monitoring wells (Figure 2). However, chromium showed a “spike” in July in well 199-H4-3, the extraction well nearest the former 183-H basins. This was unusual; concentrations are

usually low in early summer when river stage is high. This was an operable unit sample and none of the other RCRA constituents was analyzed in the July samples. Chromium results from all four wells were less than the 122-μg/L concentration limit (see Table 1). Chromium concentrations have declined overall during the past 10 years.

Fluoride concentrations remained low during the reporting period, ranging from 79.7 to 230 μg/L. These results are no higher than those observed in upgradient wells and far below the 4,000-μg/L drinking water standard.

Nitrate concentrations were all below the 45-mg/L concentration limit during the reporting period (Figure 3). The maximum concentration was 44.3 mg/L in well 199-H4-3 in November 2006. This was the first nitrate result below the concentration limit in this well.

Technetium-99 and uranium concentrations were all low during the reporting period (Figures 4 and 5). Technetium-99 ranged from undetected in well 199-H4-8 to 59.9 pCi/L in well 199-H4-3. Uranium ranged from 0.744 to 14 μg/L (see Table 1). Technetium-99 and uranium concentrations have decreased in well 199-H4-3 and are variable but low in well 199-H4-12A. Wells 199-H4-8 and 199-H4-12C have very low levels of uranium and undetectable levels of technetium-99.

5.0 Conclusions

The current objective of RCRA corrective action monitoring is simply to track trends, not to determine the effectiveness of the interim remedial action. Although there is short-term variability in contaminant concentrations, trends over the past 10 years are downward. The current RCRA permit (Part VI, post-closure unit 2 of Ecology [2007]), and monitoring plan (Hartman 1997), as revised by the 2006 Hanford Facility RCRA Permit Modification, remain adequate for the objective of tracking trends during the period of the CERCLA interim remedial action.

6.0 References

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Table 1. Groundwater Data for 183-H Basins, July through December 2006.

Well	Date	Chromium, µg/L		Fluoride, µg/L		Nitrate, mg/L		Tc-99, pCi/L		Uranium, µg/L
Concentration limit[a]		**122**		**4,000[b]**		**45**		**900**		**20**
199-H4-12A	7/3/2006	23								
199-H4-12A	7/5/2006	20								
199-H4-12A	7/11/2006	14								
199-H4-12A	7/19/2006	21								
199-H4-12A	7/25/2006	22								
199-H4-12A	8/1/2006	17.7								
199-H4-12A	8/8/2006	20								
199-H4-12A	8/15/2006	20								
199-H4-12A	8/15/2006	21								
199-H4-12A	8/15/2006	22								
199-H4-12A	8/15/2006	23								
199-H4-12A	8/22/2006	21								
199-H4-12A	8/29/2006	25								
199-H4-12A	9/5/2006	11								
199-H4-12A	9/12/2006	18								
199-H4-12A	9/26/2006	18								
199-H4-12A	10/2/2006	19								
199-H4-12A	11/1/2006	18								
199-H4-12A	11/6/2006	17								
199-H4-12A	11/8/2006	21.2[c]		150		41.2	D	54.1		11.4
199-H4-12A	11/14/2006	68	ZY			32.4	D	46		8.23
199-H4-12A	11/14/2006	20								
199-H4-12A	11/28/2006	19								
199-H4-12A	12/7/2006	18								
199-H4-12A	12/19/2006	21								
199-H4-12C	7/12/2006	89								
199-H4-12C	11/27/2006	92								
199-H4-12C	11/27/2006	89.8[c]		79.7	B	5.27		2.38	U	1.66
199-H4-12C	11/27/2006	90.3[c]	un							
199-H4-3	7/3/2006	69								
199-H4-3	7/5/2006	73								
199-H4-3	7/11/2006	63								
199-H4-3	7/19/2006	52								
199-H4-3	7/25/2006	42								
199-H4-3	8/1/2006	34.2								
199-H4-3	8/8/2006	30								
199-H4-3	8/15/2006	20								
199-H4-3	8/15/2006	20								
199-H4-3	8/22/2006	16								
199-H4-3	8/29/2006	13								
199-H4-3	9/12/2006	12								
199-H4-3	9/26/2006	12								
199-H4-3	10/2/2006	15								
199-H4-3	11/1/2006	22								
199-H4-3	11/6/2006	7								
199-H4-3	11/9/2006	12.6[c]		230		44.3	D	59.5		14
199-H4-3	11/14/2006	10				41.5	D	55		11.5

Well	Date	Chromium, µg/L		Fluoride, µg/L		Nitrate, mg/L		Tc-99, pCi/L		Uranium, µg/L
199-H4-3	11/14/2006	13								
199-H4-3	11/28/2006	14								
199-H4-3	12/7/2006	14								
199-H4-3	12/19/2006	13								
199-H4-8	7/13/2006	2	U							
199-H4-8	7/13/2006	6								
199-H4-8	11/20/2006	9								
199-H4-8	11/20/2006	7.8[(c)]	B	55.3	B	24.9	D	9.6	U	0.744
199-H4-8	11/20/2006	24.9[(c)]	un							

[(a)]Concentration limits for chromium, nitrate, technetium-99, and uranium defined in Part VI, post-closure unit 2 of Ecology (2007).
[(b)]Fluoride concentration limit is primary drinking water standard, 4,000 µg/L.
[(c)]Total chromium. Others are hexavalent chromium.
B = Less than contract-required detection limit but greater than method detection limit.
D = Sample diluted for analysis. Result corrected for dilution.
U = Below detection limit.
Y = Suspected error.
Z = Potential problem with analysis.
un = unfiltered total chromium.

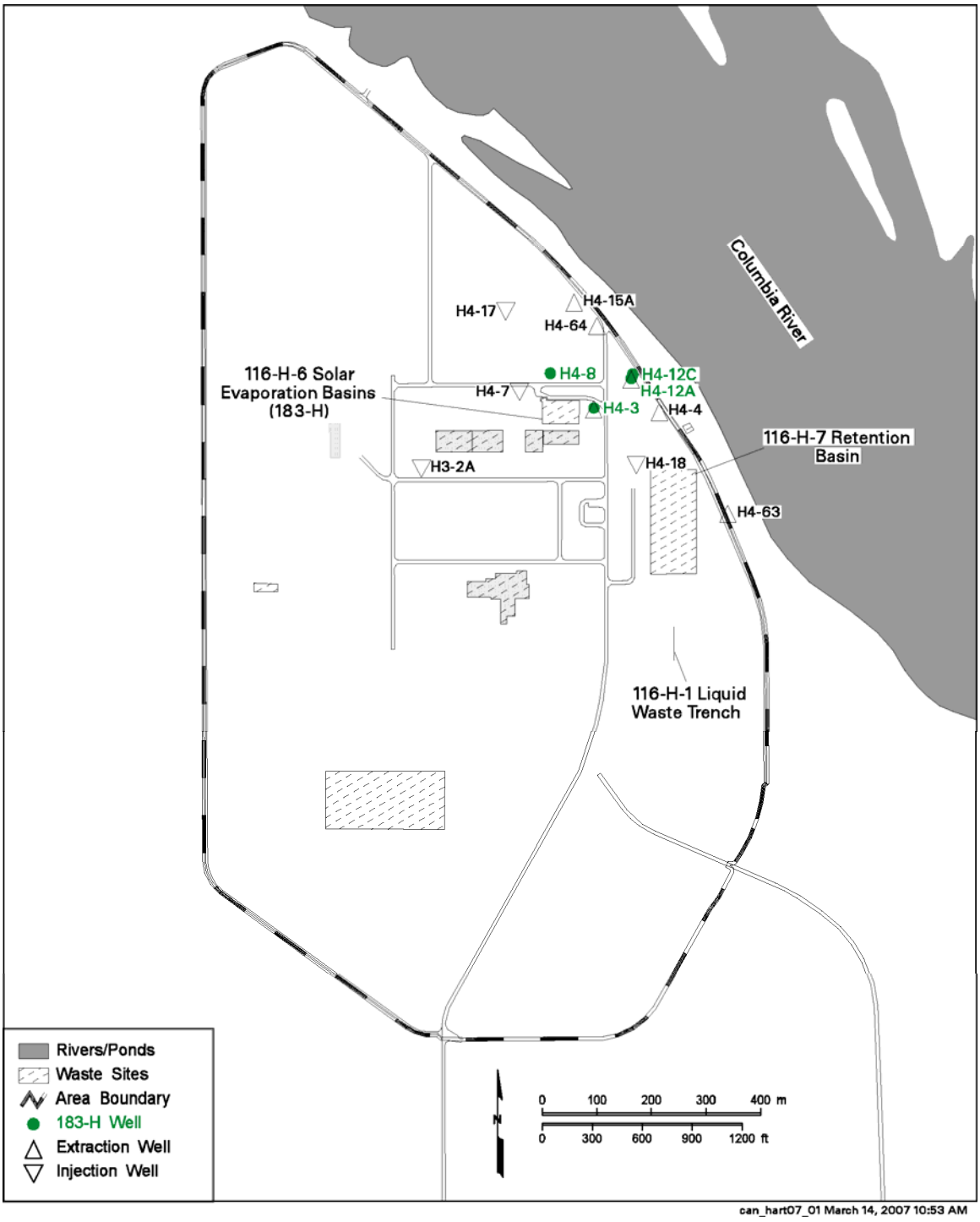

Figure 1. Monitoring Well Locations for 183-H (116-H-6) Basins

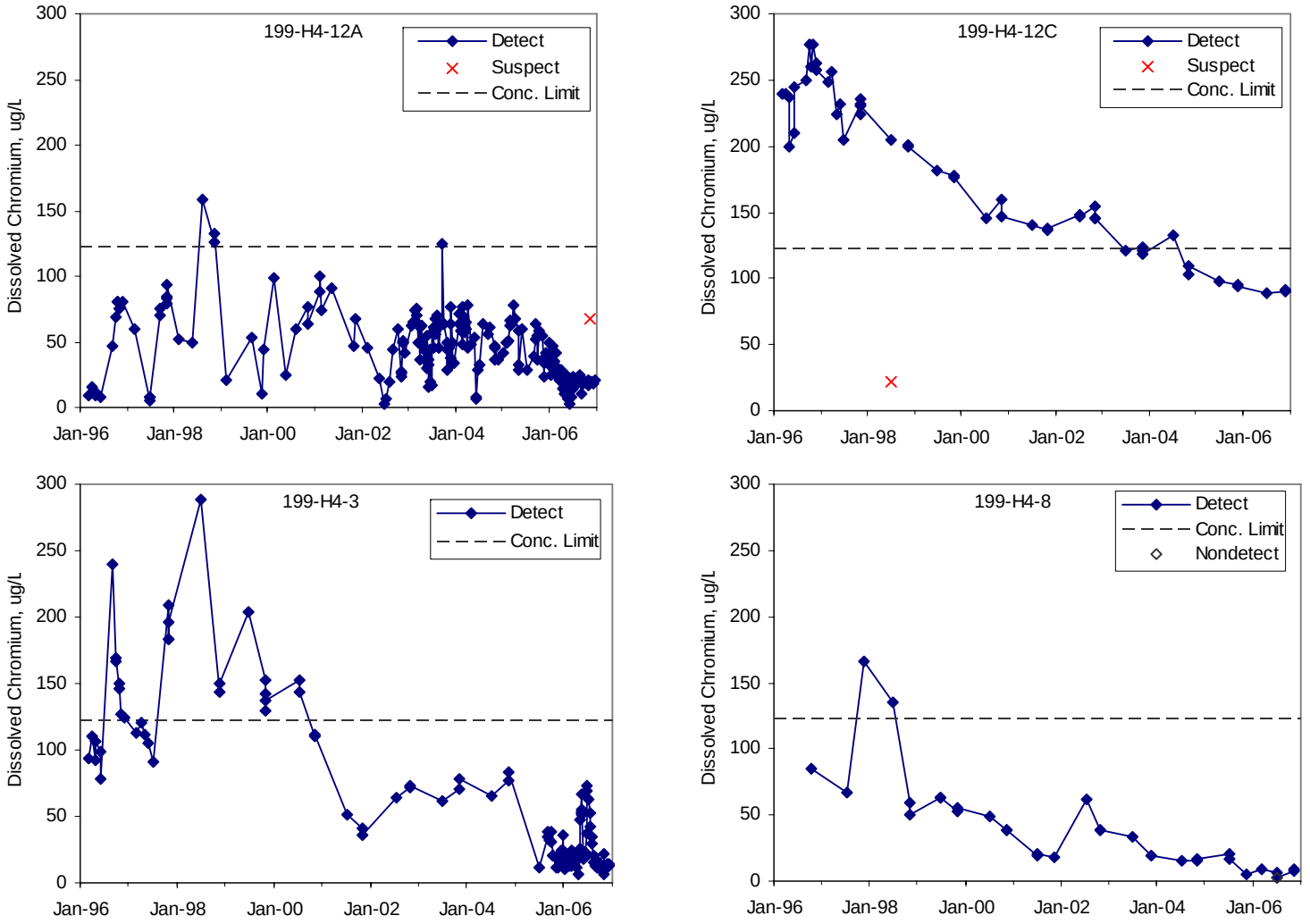

Figure 2. Chromium Concentrations in 183-H Monitoring Wells

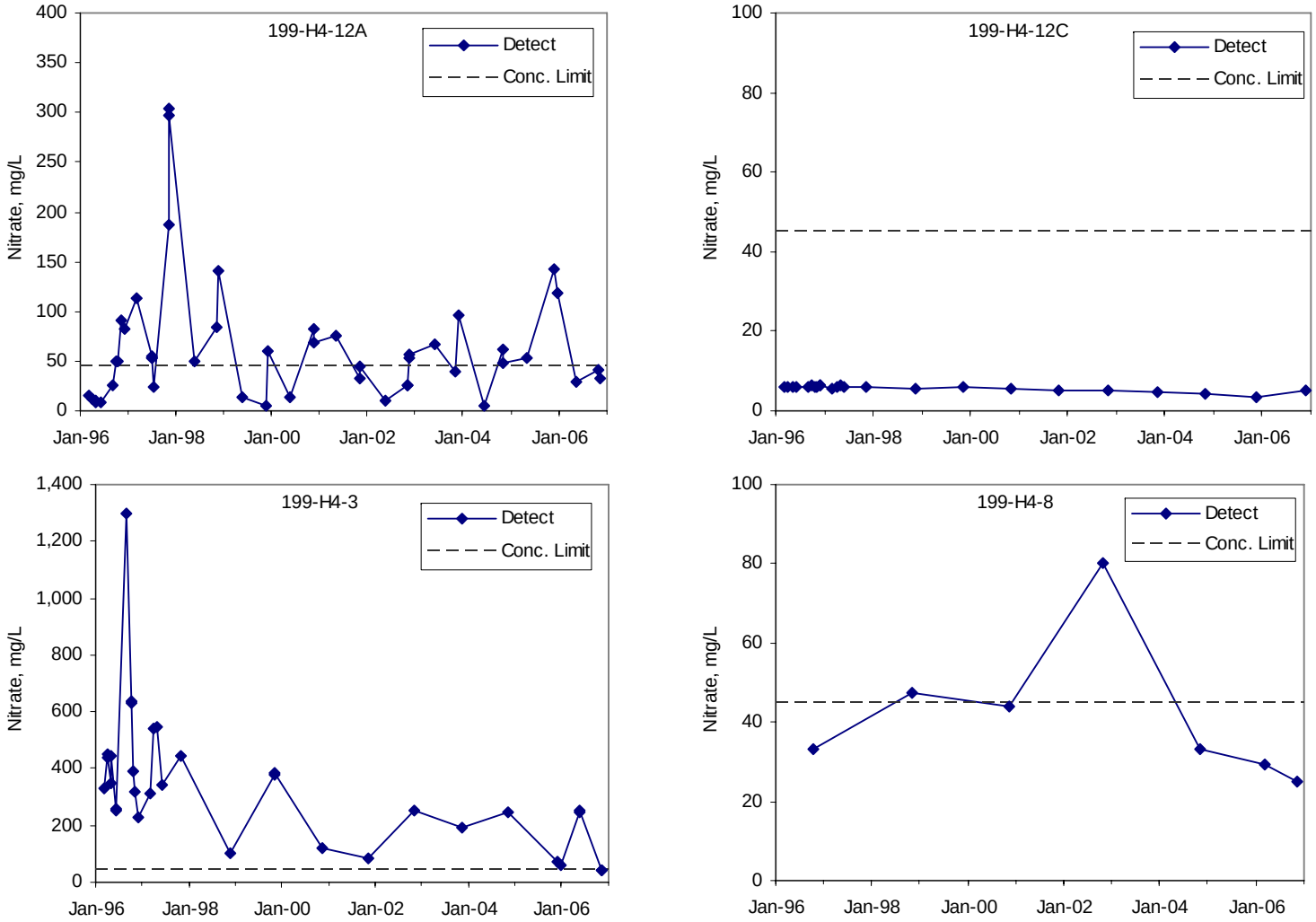

Figure 3. Nitrate Concentrations in 183-H Monitoring Wells

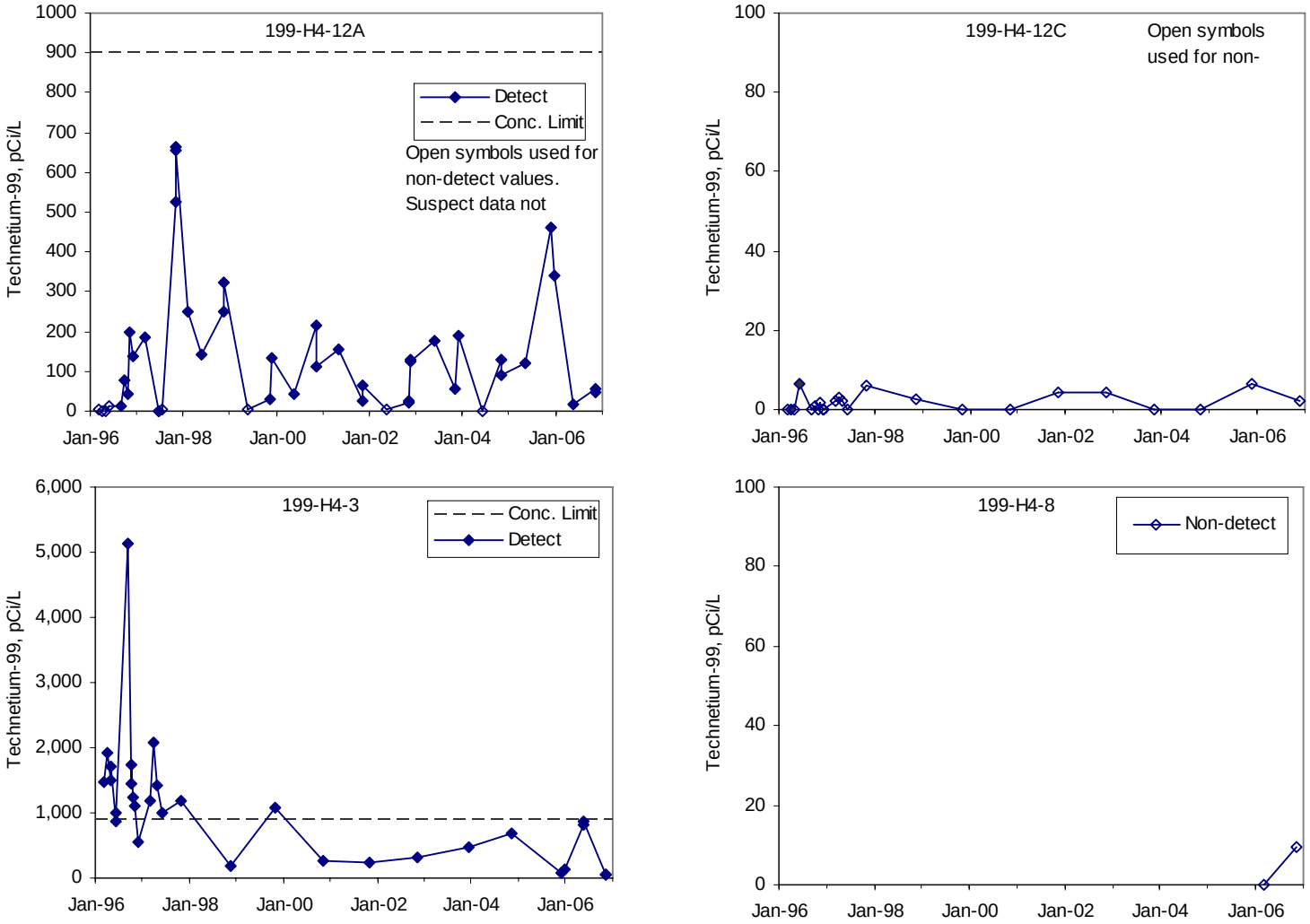

Figure 4. Technetium-99 in 183-H Monitoring Wells

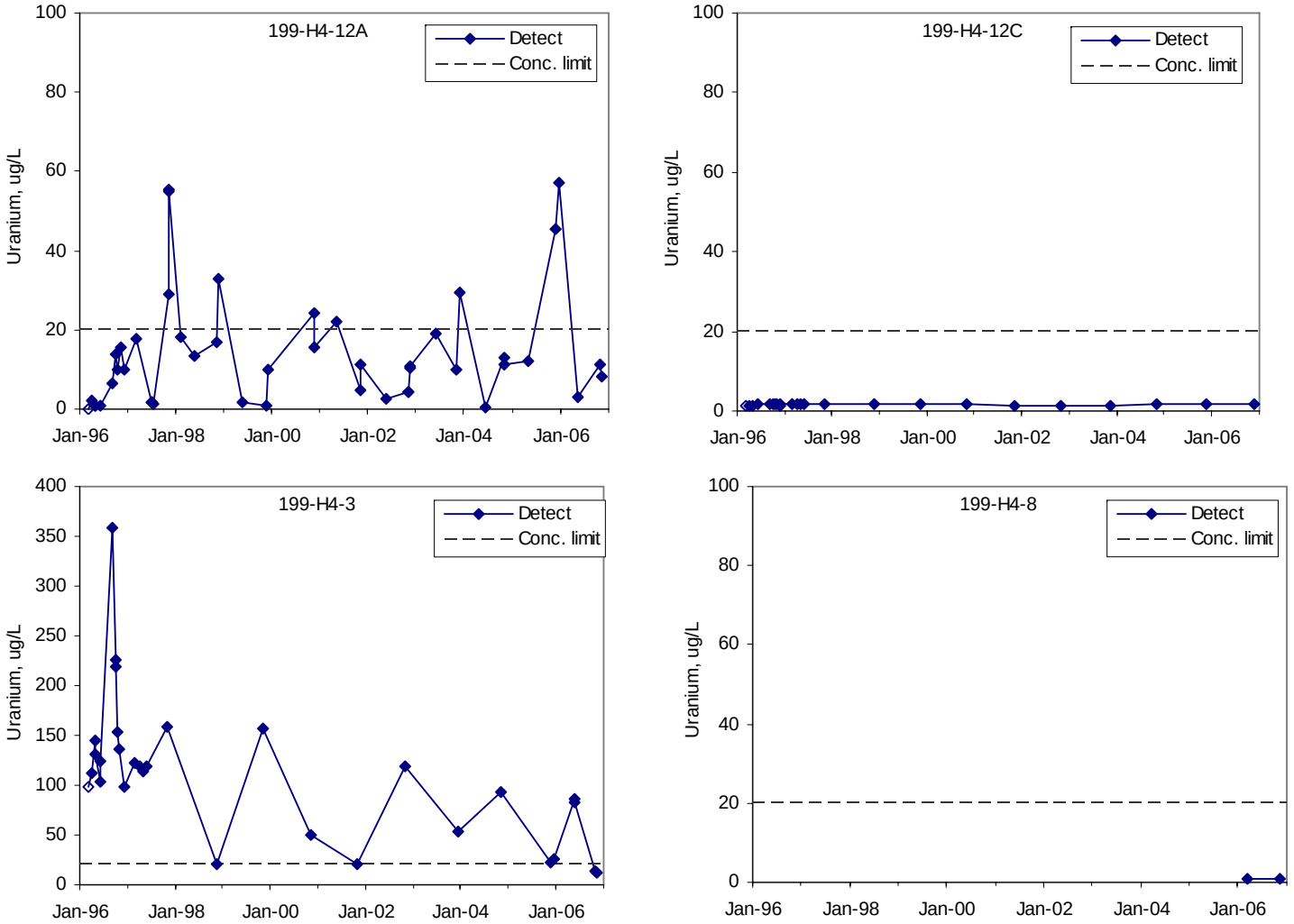

Figure 5. Uranium Concentrations in 183-H Monitoring Wells

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