4. ORGANIC CONTAMINANTS

Carbon tetrachloride, tetrachloroethene (PCE), and methylene chloride have been identified as contaminants of potential concern, primarily for the groundwater ingestion exposure pathway for OU 7-13/14. This section presents sampling results for those contaminants of potential concern followed by sampling results for other organics compounds.

4.1 Carbon Tetrachloride

The primary source of CCl4 at the SDA is Series 743 waste drums shipped from RFP between 1966 and 1970 (Miller and Varvel 2001). Initially 9,691 Series 743 waste drums were buried in multiple pits in the SDA including Pits 4, 5, 6, 9, 10, 11, and 12. In the 1970s all 1,015 drums from Pits 11 and 12 were retrieved, leaving 8,676 drums of Series 743 waste drums in the SDA. The estimated mass of CCl4 contained in these 8,676 drums is 8.2E+05 kg (Miller and Varvel 2001).

Carbon tetrachloride has been detected at the SDA in surficial sediments, vadose zone soil gas, vadose zone soil water (perched water and lysimeters), and the aquifer beneath and surrounding the SDA. Carbon tetrachloride vapor also has been detected emanating from the soil surface by surface isolation flux chambers.

4.1.1 Waste Zone

Carbon tetrachloride was detected in high concentrations in soil-gas samples collected from vapor probes placed in the waste in Pits 4 and 10. The samples were collected in Tedlar bags or Summa canisters using a glovebag and analyzed with an INNOVA Model 1314 photoacoustic multigas analyzer. Some of the field duplicate samples also were analyzed using standard laboratory gas chromatography and mass spectrometry (GC/MS) as an accuracy check on the INNOVA results.

Carbon tetrachloride was detected in nine of the 16 probes that would yield a sample. Table 4-1 contains results for CCl_4 and other volatile organic compounds (VOCs) for which analysis was performed. The maximum CCl_4 concentration measured was 64,031 ppmv at location 743-08-VP2 (4.1 m [13.4 ft] below land surface [bls]) in August 2002. All results at this location are approaching the predicted equilibrium vapor concentration of CCl_4 in Series 743 sludge (93,000).[g] This indicates the Series 743 sludge continues to be a source of CCl_4 and other VOCs.

No waste zone soil moisture samples were collected and analyzed for VOCs in FY 2002 because of arid conditions, limited sample volumes, and analytical priorities.

4.1.2 Vadose Zone

4.1.2.1 Perched Water and Lysimeter. No vadose zone soil moisture samples were collected and analyzed for VOCs in FY 2002 because of arid conditions, limited sample volumes, and analytical priorities. No lysimeter samples have been collected and analyzed for VOCs since September 2000.

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g. Myers, Dennis R., Joel M. Hubbell, Nicholas Josten, Don L. Koeppen, Peter Martian, Michael S. Roddy, Hopi Salomon, Jeffrey A. Sondrup, 2003, "Fiscal Year 2002 Subsurface Disposal Area Probe Summary Report for the Operable Unit 7-13/14 Remedial Investigation/Feasibility Study (Draft)," INEEL/EXT-03-00001, Rev. A, INEEL.

Table 4-1. Volatile organic compound vapor concentration results, considered valid, from Subsurface Disposal Area vapor probes in FY 2002.

Probe	Port Depth (ft)	Date Sampled	Lab[a]	Sample No.	Sample Type	Container	Carbon Tetrachloride (ppmv)	Chloroform (ppmv)	1,1,1-TCA[b] (ppmv)	TCE[b] (ppmv)]	PCE[b] (ppmv)	Freon-113[b] (ppmv)
743-08-VP1	20.2	2/11/02	INNOVA	IPV05601VA	Regular	Tedlar bag	30,233	22,339[c]	974	3,178	470	—
		6/10/02	INNOVA	IPV10601VA	Regular	Tedlar bag	57,466	22,119	1,881	9,723	-800[d]	—
		6/10/02	INNOVA	IPV10602VA	Duplicate	Tedlar bag	58,353	21,910	1,885	9,868	-858[d]	—
		6/10/02	INNOVA	IPV10603VA	Duplicate	Tedlar bag	58,337	21,670	1,873	9,930	-886[d]	—
		6/10/02	INEEL ECL	IPV10601VA	Split	Tedlar bag	55,000	20,000	1,600	12,000	110 U	200
		6/10/02	INEEL ECL	IPV10602VA	Split	Tedlar bag	56,000	21,000	1,700	13,000	110 U	180
		6/10/02	INEEL ECL	IPV10602VT	Duplicate	Summa (250 mL)	59,000	22,000	1,700	14,000[c]	100 U	230
		6/10/02	INEEL ECL	IPV10603VA	Split	Tedlar bag	40,000	15,000	1,100	9,200	100 U	150
		6/10/02	INEEL ECL	IPV10603VT	Duplicate	Summa (250 mL)	59,000	22,000	1,800	14,000[c]	98 U	250[c]
		6/10/02	INEEL ECL	IPV10604VT	Duplicate	Summa (6 L)	55,000	21,000	1,600	14,000[c]	88 U	200
		8/20/02	INNOVA	IPV15001VA	Regular	Tedlar bag	56,070	22,150	1,805	9,901	-802[d]	—
		8/20/02	INNOVA	IPV15001VA	Split	Tedlar bag	56,140	22,120	1,818	10,080	-856[d]	—
		11/20/02	INNOVA	IPV17101VA	Regular	Tedlar bag	44,600	22,200	1,550	7,080	-192[d]	—
743-08-VP2	13.4	2/11/02	INNOVA	IPV05701VA	Regular	Tedlar bag	36,277	15,405	918	1,451	181	—
		2/11/02	INNOVA	IPV05702VA	Duplicate	Tedlar bag	37,782	15,719	946	1,441	170	—
		6/12/02	INNOVA	IPV10701VA	Regular	Tedlar bag	54,231	13,618	1,405	3,106	53	—
		6/12/02	INNOVA	IPV10702VA	Duplicate	Tedlar bag	53,528	13,183	1,385	3,044	49	—
		8/27/02	INNOVA	IPV15601VA	Regular	Tedlar bag	62,171	15,372	1,559	3,405	78	—
		8/27/02	INNOVA	IPV15601VA	Split	Tedlar bag	62,592	15,404	1,571	3,482	73	—
		8/27/02	INNOVA	IPV15602VA	Duplicate	Tedlar bag	63,732	15,246	1,573	3,478	71	—
		8/27/02	INNOVA	IPV15602VA	Split	Tedlar bag	64,031[c]	15,288	1,584	3,550	64	—
		11/20/02	INNOVA	IPV17201VA	Regular	Tedlar bag	54,800	15,800	1,480	3,070	33	—
		11/20/02	INNOVA	IPV17202VA	Duplicate	Tedlar bag	54,500	15,300	1,460	2,940	33	—
743-18-VP4	14.6	2/12/02	INNOVA	IPV05801VA	Regular	Tedlar bag	8,616	1,385	231	1,358	218	—
		6/12/02	INNOVA	IPV10801VA	Regular	Tedlar bag	8,904	1,353	291	1,621	68	—
		8/15/02	INNOVA	IPV15701VA	Regular	Tedlar bag	11,750	1,490	387	2,133	32	—
		8/15/02	INNOVA	IPV15701VA	Split	Tedlar bag	11,770	1,500	390	2,175	34	—
		11/18/02	INNOVA	IPV17301VA	Regular	Tedlar bag	10,800	1,670	374	2,070	66	—
DU-08-VP2	15.8	2/13/02	INNOVA	IPV05101VA	Regular	Tedlar bag	11,359	8,559	2,760	4,957	924	—
		6/11/02	INNOVA	IPV10101VA	Regular	Tedlar bag	12,478	8,571	3,479	6,626	2,331	—
		8/15/02	INNOVA	IPV15001VA	Regular	Tedlar bag	12,750	8,331	3,618	7,663	2,203	—
		8/15/02	INNOVA	IPV15001VA	Split	Tedlar bag	12,470	8,237	3,594	7,752	2,256	—
		11/18/02	INNOVA	IPV16601VA	Regular	Tedlar bag	12,700	8,190	3,790[c]	8,860	1,960	—
DU-10-VP1	11.6	2/12/02	INNOVA	IPV05901VA	Regular	Tedlar bag	941	434	136	360	136	—
		6/11/02	INNOVA	IPV10901VA	Regular	Tedlar bag	1,053	579	271	651	187	—

Table 4-1. (continued).

Probe	Port Depth (ft)	Date Sampled	Lab[a]	Sample No.	Sample Type	Container	Carbon Tetrachloride (ppmv)	Chloroform (ppmv)	1,1,1-TCA[b] (ppmv)	TCE[b] (ppmv)]	PCE[b] (ppmv)	Freon-113[b] (ppmv)
DU-10-VP2	10.0	Feb-02	INNOVA	IPV05201VA	Regular	Tedlar bag	7,026	1,942	1,610	3,187	1,648	—
		6/10/02	INNOVA	IPV10202VA	Regular	Tedlar bag	6,014	1,995	1,729	3,408	1,668	—
		6/10/02	INEEL ECL	IPV10202VA	Split	Tedlar bag	6,000	1,000	1,800	3,800	1,300	40
		6/10/02	INEEL ECL	IPV10202VT	Duplicate	Summa (250 mL)	6,200	1,100	1,700	3,800	1,300	40
		6/10/02	INNOVA	IPV10203VA	Duplicate	Tedlar bag	5,626	1,841	1,668	3,353	1,752	—
		6/10/02	INEEL ECL	IPV10203VA	Split	Tedlar bag	5,100	850	1,500	3,200	1,100	34
		6/10/02	INEEL ECL	IPV10203VT	Duplicate	Summa (250 mL)	5,900	1,000	1,700	3,900	1,400	40
		6/10/02	INNOVA	IPV10204VA	Duplicate	Tedlar bag	5,789	1,882	1,727	3,483	1,815	—
		6/10/02	INEEL ECL	IPV10204VA	Split	Tedlar bag	5,500	930	1,600	3,500	1,300	39
		6/10/02	INEEL ECL	IPV10204VT	Duplicate	Summa (6 L)	4,900	830	1,500	3,400	1,300	34
		6/10/02	INNOVA	IPV10201VA	Regular	Tedlar bag	5,787	1,850	1,721	3,307	1,777	—
		8/20/02	INNOVA	IPV15101VA	Regular	Tedlar bag	7,896	2,701	2,387	4,266	2,129	—
		8/20/02	INNOVA	IPV15101VA	Split	Tedlar bag	7,790	2,696	2,395	4,327	2,179	—
		11/18/02	INNOVA	IPV16701VA	Regular	Tedlar bag	6,220	1,890	2,220	4,160	2,070	—
DU-10-VP3	6.2	2/12/02	INNOVA	IPV05301VA	Regular	Tedlar bag	11,381	1,719	1,310	2,098	1,449	—
		6/11/02	INNOVA	IPV10301VA	Regular	Tedlar bag	14,051	1,904	1,992	3,206	2,205	—
		8/15/02	INNOVA	IPV15201VA	Regular	Tedlar bag	17,360	2,485	2,640	4,259	2,942	—
		8/15/02	INNOVA	IPV15201VA	Split	Tedlar bag	17,360	2,496	2,658	4,339	3,009[c]	—
		11/18/02	INNOVA	IPV16801VA	Regular	Tedlar bag	10,200	1,570	1,880	2,870	2,160	—
DU-14-VP2	11.7	2/12/02	INNOVA	IPV05401VA	Regular	Tedlar bag	6,083	4,515	1,146	7,263	724	—
		6/11/02	INNOVA	IPV10401VA	Regular	Tedlar bag	6,323	4,524	1,360	7,884	365	—
		8/15/02	INNOVA	IPV15301VA	Regular	Tedlar bag	7,453	5,212	1,528	10,090	-62	—
		8/15/02	INNOVA	IPV15301VA	Split	Tedlar bag	7,250	5,240	1,539	10,300	-104[d]	—
		11/18/02	INNOVA	IPV16901VA	Regular	Tedlar bag	7,300	5,110	1,650	10,200	-51.9[d]	—
DU-14-VP3	4.9	2/12/02	INNOVA	IPV05501VA	Regular	Tedlar bag	1,081	541	312	710	381	—
		6/11/02	INNOVA	IPV10501VA	Regular	Tedlar bag	1,558	1,029	694	1,612	810	—
		8/15/02	INNOVA	IPV15401VA	Regular	Tedlar bag	2,062	1,466	902	2,050	986	—
		8/15/02	INNOVA	IPV15401VA	Split	Tedlar bag	2,027	1,471	908	2,086	1,015	—
		11/18/02	INNOVA	IPV17001VA	Regular	Tedlar bag	840	571	449	1,020	546	—

a. ECL = Environmental Chemistry Laboratory
b. 1,1,1-TCA = 1,1,1-trichloroethane, TCE = trichloroethene, PCE = tetrachloroethene, Freon-113 = 1,1,2-Trichloro-1,2,2-trifluoroethane
c. Maximum measured concentration.
d. Negative results are considered undetected.

A single perched water sample was collected by USGS personnel from Well USGS-92 on April 11, 2002. The CCl_4 concentration in that sample was 150 µg/L. Figure 4-1 shows the history of CCl_4 concentration in Well USGS-92. The decline in CCl_4 concentrations in Well USGS-92 is attributed to operation of the organic contamination in the vadose zone (OCVZ) vapor vacuum extraction with treatment (VVET) system.

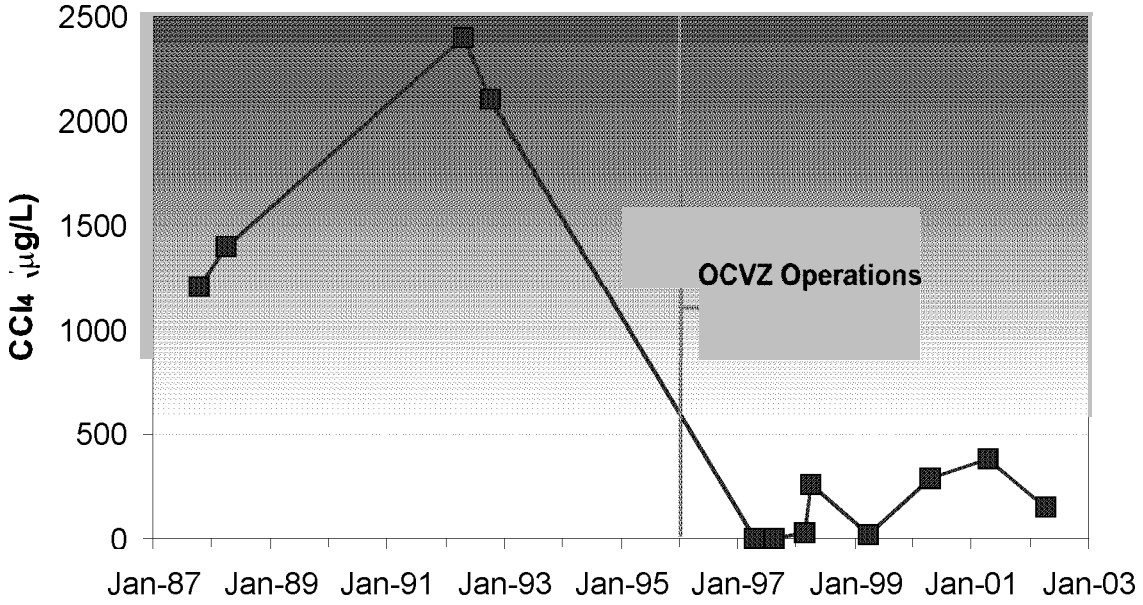


Figure 4-1. History of carbon tetrachloride concentration in Well USGS-92.

4.1.2.2 Soil Gas. Soil-gas monitoring in the vadose zone is accomplished using an extensive system of permanent soil-gas sampling ports inside and outside the SDA boundary. The ports are made of stainless tubing attached to the outside of well casings. The bottom of the tubes are perforated and surrounded by sand. Figures 4-2a and 4-2b show the location of wells with soil-gas sampling ports in the vicinity of the SDA and the depths of the ports. The port depths range from a minimum depth of 4.6 m (15 ft) in Well WWW-1 to a maximum depth of 180.1 m (591 ft), just above the water table in Well M13S.

Hundreds of vadose zone soil-gas samples were collected in FY 2002. The complete set of soil-gas data are being compiled.[h] The highest levels of CCl_4 were located in the central portion of the SDA between Pits 4, 5, 6, and 10 and decrease with distance away from this area. The maximum concentration measured in FY 2002 was 1,600 ppmv in Well 8801 Port 4, at a depth of 23.7 m (78 ft) on April 1, 2002. This is much less than the highest CCl_4 concentration ever measured, which was 4,864 ppmv in Well 9302 Port 6, at a depth of 23.5 m (77 ft) in January 1995. Concentrations in the wells farthest from the SDA, OCVZ-11, and OCVZ-13 are less than 1 ppmv.

h. Housley, L. Todd, 2003, "OU 7-08 Volatile Organic Compound Vapor Monitoring Results from Selected Wells at the Radioactive Waste Management Complex, Supplement 2002 (Draft)," INEEL/EXT-2000-00040 Supplement 2002, INEEL.

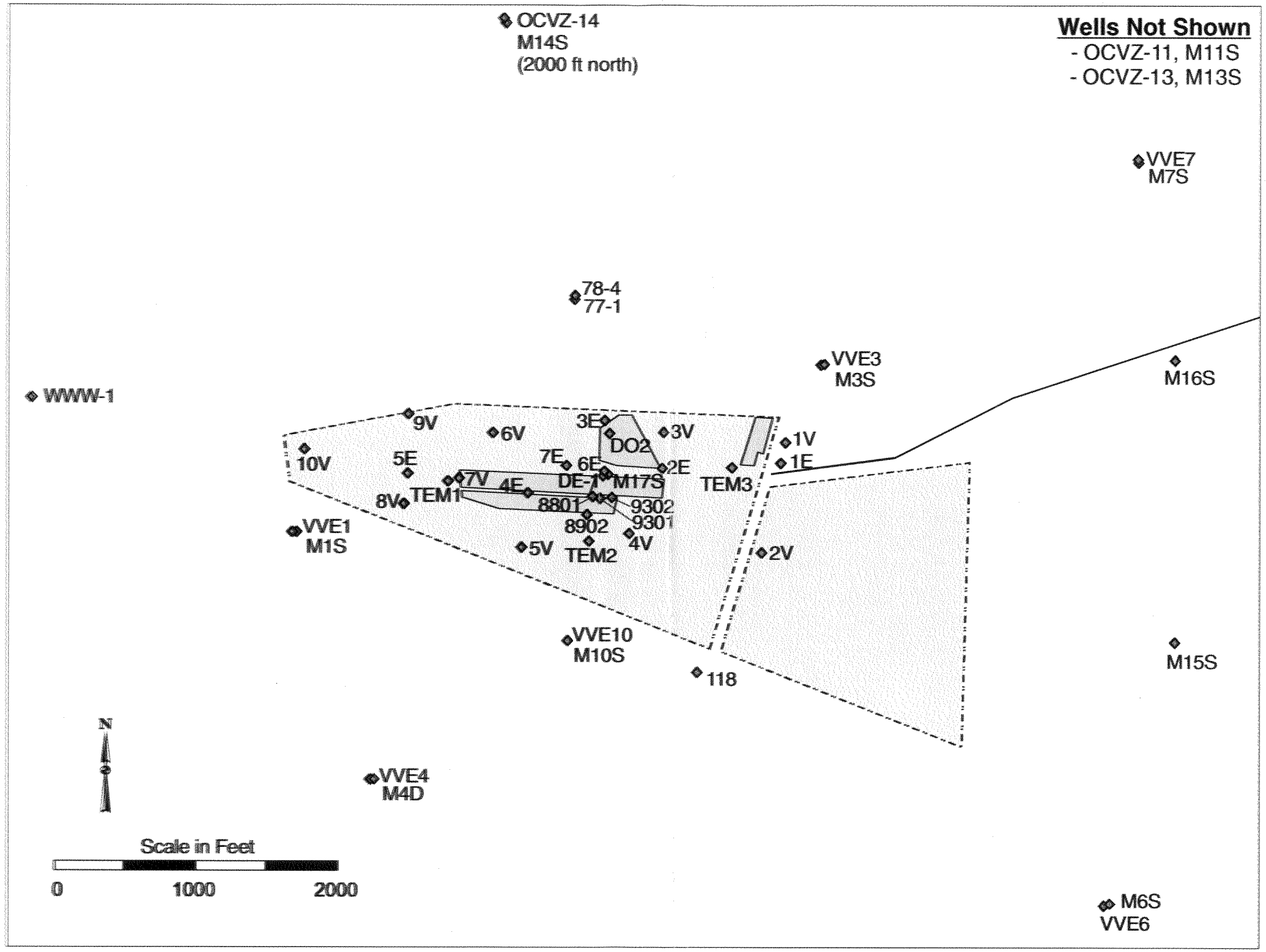


Figure 4-2a. Location of soil-gas sampling wells in the vicinity of the Radioactive Waste Management Complex.

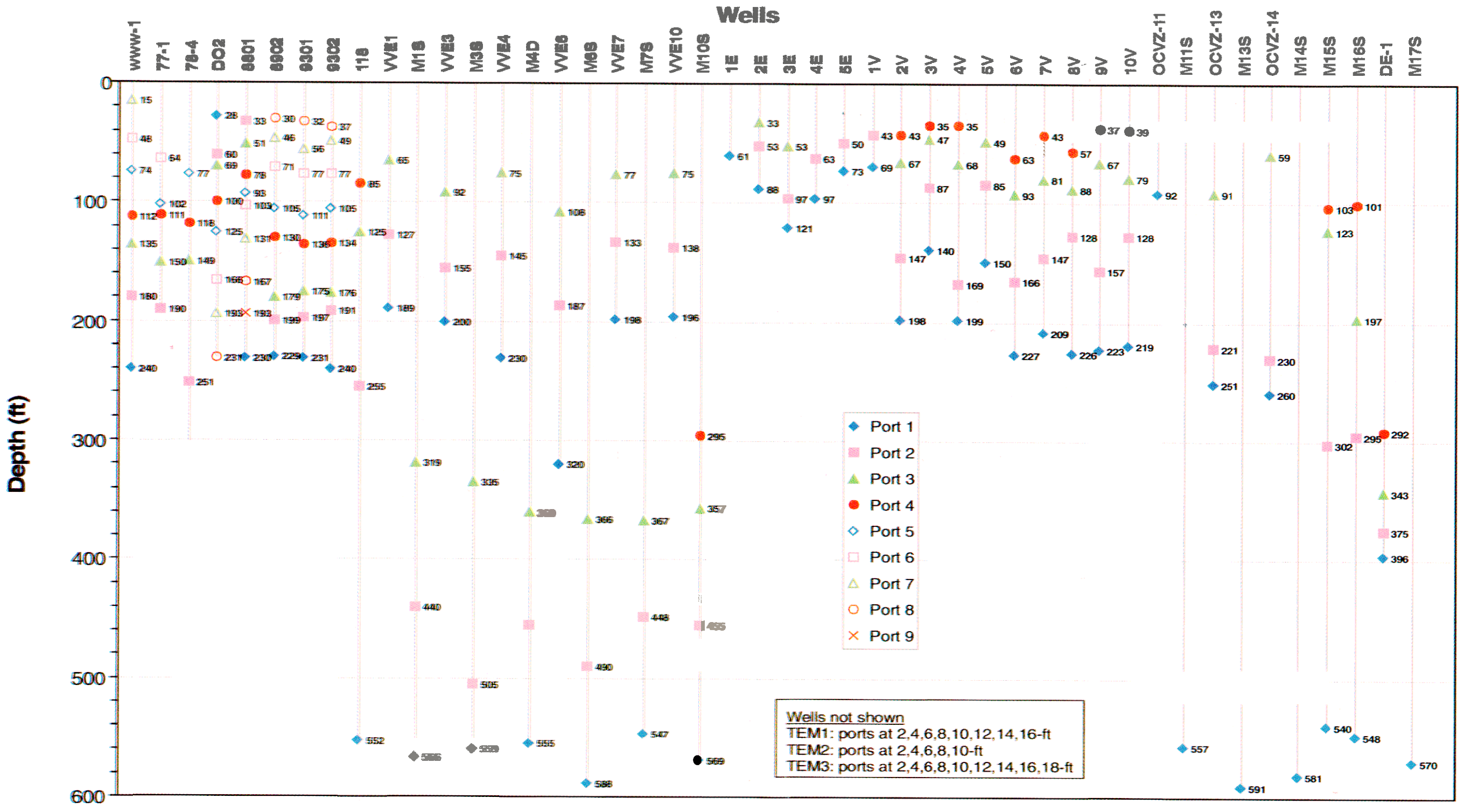


Figure 4-2b. Depth of the sampling ports in wells in the vicinity of the Radioactive Waste Management Complex.

Vertically, the CCl_4 contamination extends from land surface down to the water table. Currently, in the center of the SDA the CCl_4 concentration increases with depth from near zero at land surface to more than 1,000 ppmv above the B-C interbed. Concentrations then decrease sharply across the B-C interbed down to a few hundred ppmv. Below the C-D interbed, concentrations are less than 10 ppmv.

Current concentrations at most locations are much less than before full-time operation of the OCVZ VVET system began in January 1996. Figures 4-3 and 4-4 show the soil gas concentrations at two wells (8801 and 9301) near vapor extraction Well 8901D. In 1993, a treatability study was performed and soil-gas extraction from Well 8901D was performed for approximately 3 months. This event had little lasting impact on the concentration levels. Before 1996, the CCl_4 concentration at about the 23.5-m (77-ft) depth (above the B-C interbed) was approximately 3,000 ppmv in these two wells. However, after full-time extraction began in January 1996, the concentration dropped to about 1,000 ppmv. Near the 40-m (130-ft) depth below the B-C interbed, the concentration dropped from about 600 ppmv before VVE-operations to 100 ppmv after operations. Concentrations in the deeper ports, around 70 m (230 ft), appear to be unchanged by operations. In Well 9V (see Figure 4-5), the initial drop in concentration was not so dramatic, probably because it is located farther from an extraction well; however, the decrease has been steady. Even the deep gas port at 68 m (223 ft) shows a clear decline in concentrations.

4.1.3 Aquifer

Eighty-nine aquifer samples were collected in FY 2002 from 22 monitoring wells in the vicinity of the RWMC by both WAG 7 and USGS personnel. Sixty-three of the samples were collected by WAG 7 personnel from 15 monitoring wells and analyzed for CCl_4. Thirty-four of the 63 samples had detections above the quantitation limit of 1 μg/L. Of those 34 detections, seven exceeded the primary drinking water MCL of 5 μg/L. Samples collected by WAG 7 were collected in November and December 2001, and February, May, and September 2002 from monitoring Wells AllA31, M1S, M3S, M4D, M6S, M7S, M11S, M12S, M13S, M14S, M15S, M16S, M17S, OW2, and USGS-127. The WAG 7 results above the quantitation limit are summarized in Table 4-2.

Twenty-six of the 89 aquifer samples were collected by USGS personnel from eight aquifer wells in the vicinity of the RWMC. Twenty of the 26 samples had detections greater than or equal to the minimum reporting level of 0.2 μg/L. Of the 20 detections, six met or exceeded the primary drinking water MCL of 5 μg/L. Monthly, samples were collected by the USGS from the RWMC production well, and in April and October 2002 from Wells USGS-87, USGS-88, USGS-89, USGS-117, USGS-119, USGS-120 and USGS-127. The USGS sample results greater than or equal to the minimum reporting level also are summarized in Table 4-2.

When FY 2002 WAG 7 and USGS results were combined, CCl_4 was consistently detected in 13 of 22 aquifer-monitoring wells. Concentrations in these wells varied from 0.2 μg/L to 7.2 μg/L, with four wells (A11A31, M7S, M16S and RWMC production) exceeding the MCL. Wells where CCl_4 was not detected include Well OW2, M1S, M4D, M11S, M12S, M13S, USGS-89, USGS-117, and USGS-127. Wells M11S, M12S, M13S, and USGS-127 are more than 2.4 km (1.5 mi) from the SDA.

Figure 4-6 shows the concentration time history of CCl_4 in RWMC vicinity wells. Although concentrations have increased over the past several years, data from the last few years indicate a flat trend in most wells. The only well to exhibit an increasing trend over the past few years is Well A11A31, and the only well with a clearly decreasing trend over the past few years is Well USGS-120.

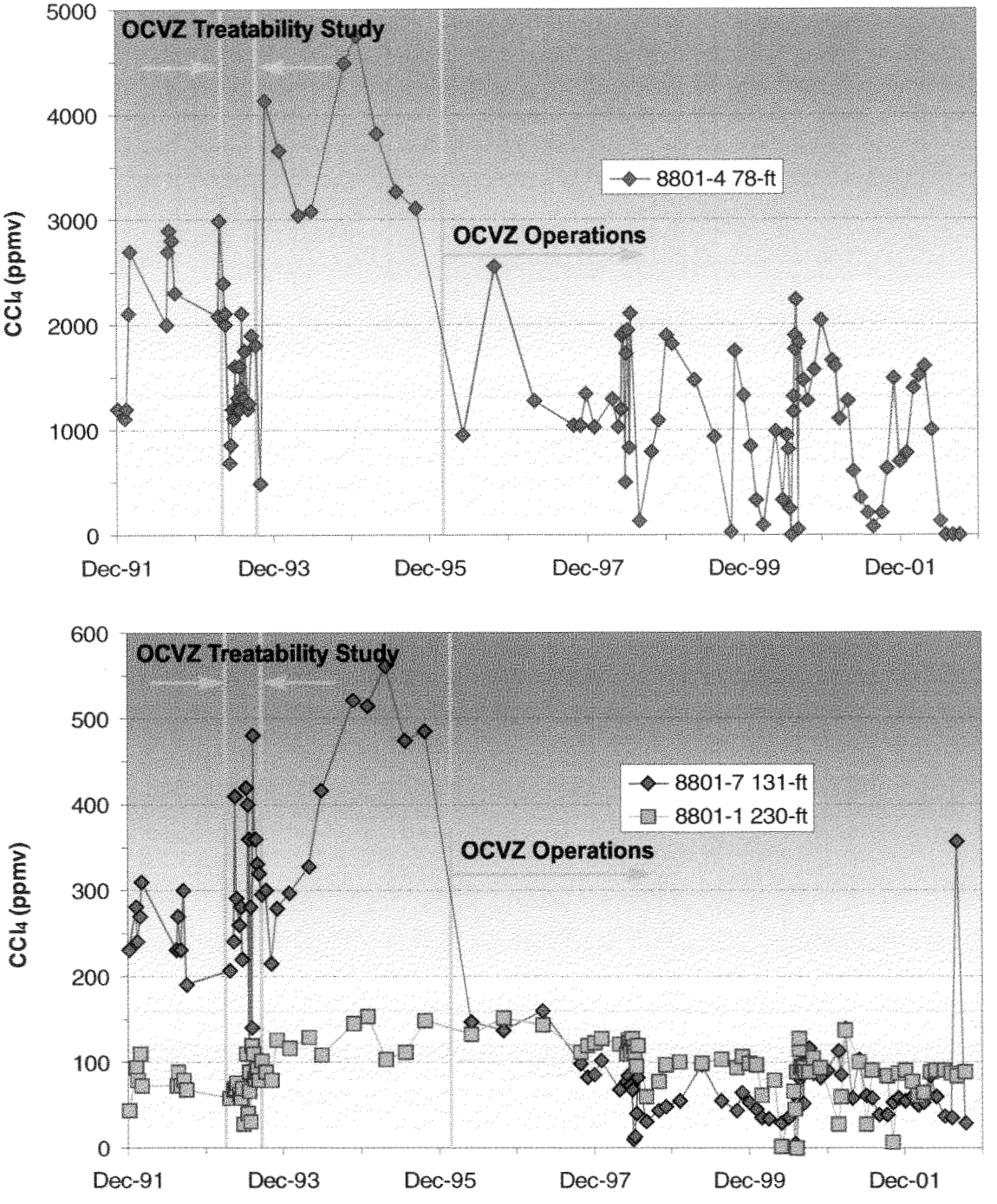
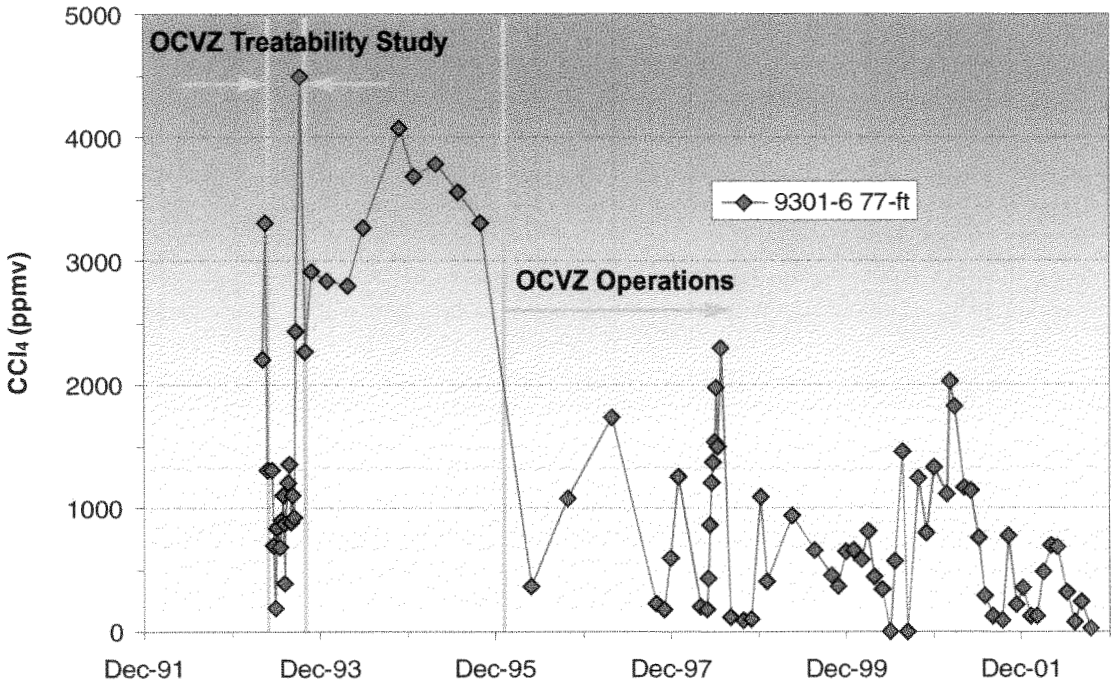


Figure 4-3. Carbon tetrachloride soil gas concentration time history for selected ports in Well 8801.



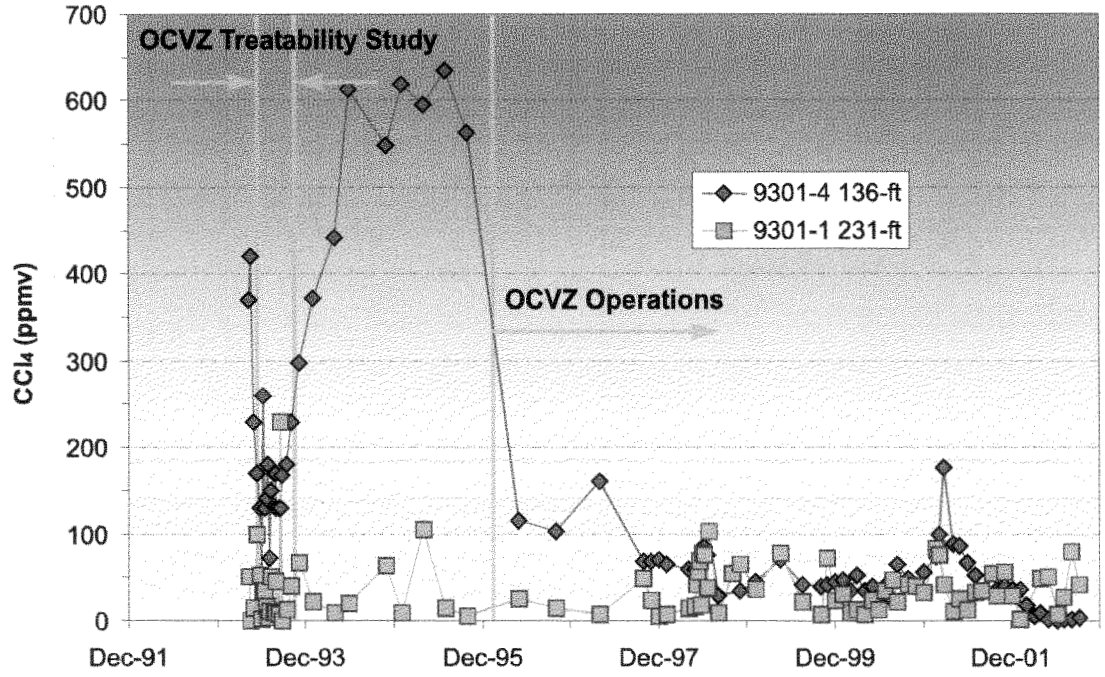


Figure 4-4. Carbon tetrachloride soil gas concentration time history for selected ports in Well 9301.

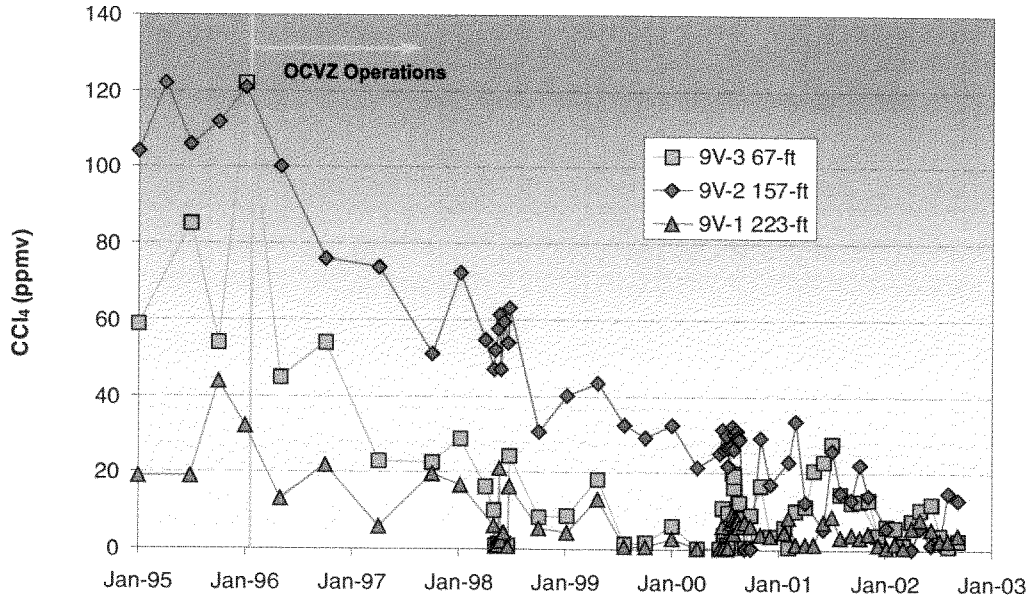


Figure 4-5. Carbon tetrachloride soil gas concentration time history for selected ports in Well 9V.

Table 4-2. Carbon tetrachloride results above quantitation limit (Waste Area Group 7) or minimum reporting level[a] in the aquifer in the vicinity of the Radioactive Waste Management Complex.

Well	Sample Date	Sample Concentration (µg/L)[a]	Quantitation Limit or Minimum Reporting Level (µg/L)	Sample Identifier	Limitations and Validation Report Identifier
Idaho National Engineering and Environmental Laboratory Monitoring Results					
M6S	11/28/01	2.2	1.0	RISM0501VF	HCJ-017-02
M6S	11/28/01	2.3	1.0	RISM0501VG	HCJ-017-02
M15S	11/28/01	1.3	1.0	RISM1101VG	HCJ-017-02
M17S	11/28/01	2.0	1.0	RISM1301VG	HCJ-017-02
A11A31	12/4/01	4.6	1.0	RISM1501VG	HCJ-019-02
M3S	12/5/01	1.8	1.0	RISM0301VG	HCJ-019-02
M7S	12/11/01	4.5	1.0	RISM0601VG	HCJ-020-02
M14S	12/12/01	1.1	1.0	RISM1001VG	HCJ-020-02
M16S	12/4/01	4.9	1.0	RISM1201VG	HCJ-019-02
A11A31	2/25/02	5.4	1.0	RISM4301VG	HCJ-061-02
M3S	2/19/02	2.1	1.0	RISM3101VG	HCJ-042-02
M6S	2/25/02	2.6	1.0	RISM3301VG	HCJ-061-02
M7S	2/19/02	5.6	1.0	RISM3401VF	HCJ-042-02
M14S	2/25/02	1.3	1.0	RISM3801VG	HCJ-061-02
M14S	2/25/02	1.3	1.0	RISM3802VG	HCJ-061-02
M15S	2/25/02	1.5	1.0	RISM3901VG	HCJ-061-02
M16S	2/27/02	6.2	1.0	RISM4001VG	HCJ-061-02
M17S	2/20/02	2.1	1.0	RISM4101VG	HCJ-042-02
AllA31	5/21/02	7.2	1.0	RISM7301VG	HCJ-098-02
M3S	5/15/02	2.1	1.0	RISM6101VG	HCJ-098-02
M6S	5/15/02	2.4	1.0	RISM6301VG	HCJ-098-02
M7S	5/15/02	5.1	1.0	RISM6401VG	HCJ-098-02
M14S	5/15/02	1.1	1.0	RISM6801VG	HCJ-098-02
M14S	5/15/02	1.1	1.0	RISM6802VG	HCJ-098-02
M15S	5/15/02	1.2	1.0	RISM6901VG	HCJ-098-02
M16S	5/15/02	4.7	1.0	RISM7001VG	HCJ-098-02
M17S	5/15/02	2.1	1.0	RISM7101VG	HCJ-098-02
AllA31	9/16/02	6.1	1.0	RISN1301VG	HCJ-156-02
M3S	9/12/02	2.2	1.0	RISN0101VG	HCJ-150-02
M6S	9/11/02	2.1	1.0	RISN0301VG	HCJ-150-02
M7S	9/11/02	5.7_J[b]	1.0	RISN0401VG	HCJ-150-02
M15S	9/16/02	1.1	1.0	RISN0901VG	HCJ-156-02
M16S	9/18/02	4.4	1.0	RISN1001VG	HCJ-156-02
M17S	9/17/02	1.6	1.0	RISN1101VG	HCJ-156-02

Table 4.2. (continued).

Well	Sample Date	Sample Concentration (µg/L)[a]	Quantitation Limit or Minimum Reporting Level (µg/L)	Sample Identifier	Limitations and Validation Report Identifier
U.S. Geological Survey Monitoring Results					
RWMC Production	10/11/01	3.6	0.2	NA	NA
RWMC Production	11/15/01	3.8	0.2	NA	NA
RWMC Production	12/20/01	5.4	0.2	NA	NA
RWMC Production	1/10/02	6.4	0.2	NA	NA
RWMC Production	2/14/02	4.3	0.2	NA	NA
RWMC Production	3/14/02	**5.3**	0.2	NA	NA
RWMC Production	4/11/02	**5.0**	0.2	NA	NA
RWMC Production	5/9/02	**7.2**	0.2	NA	NA
RWMC Production	6/13/02	4.8	0.2	NA	NA
RWMC Production	7/18/02	4.6	0.2	NA	NA
RWMC Production	8/8/02	5.0	0.2	NA	NA
RWMC Production	9/12/02	4.2	0.2	NA	NA
USGS-87	10/11/01	2.5	0.2	NA	NA
USGS-88	10/1/01	1.6_J[b]	0.2	NA	NA
USGS-120	10/11/01	4.4	0.2	NA	NA
USGS-87	4/11/02	2.6	0.2	NA	NA
USGS-88	4/2/02	1.5	0.2	NA	NA
USGS-119	4/4/02	0.3	0.2	NA	NA
USGS-120	4/11/02	2.4	0.2	NA	NA

a. **Red bold font** indicates sample concentrations that exceed the MCL.
b. Concentrations with a "J" subscript were positively identified in the sample and assigned a "J" data qualifier flag. The qualifier flag was assigned because the recovery of one of the surrogates was slightly above the upper control limit. The reported concentrations may not be an accurate representation of the amount actually present in the sample and should only be used as estimated quantities.
MCL = maximum contaminant level
NA = not analyzed

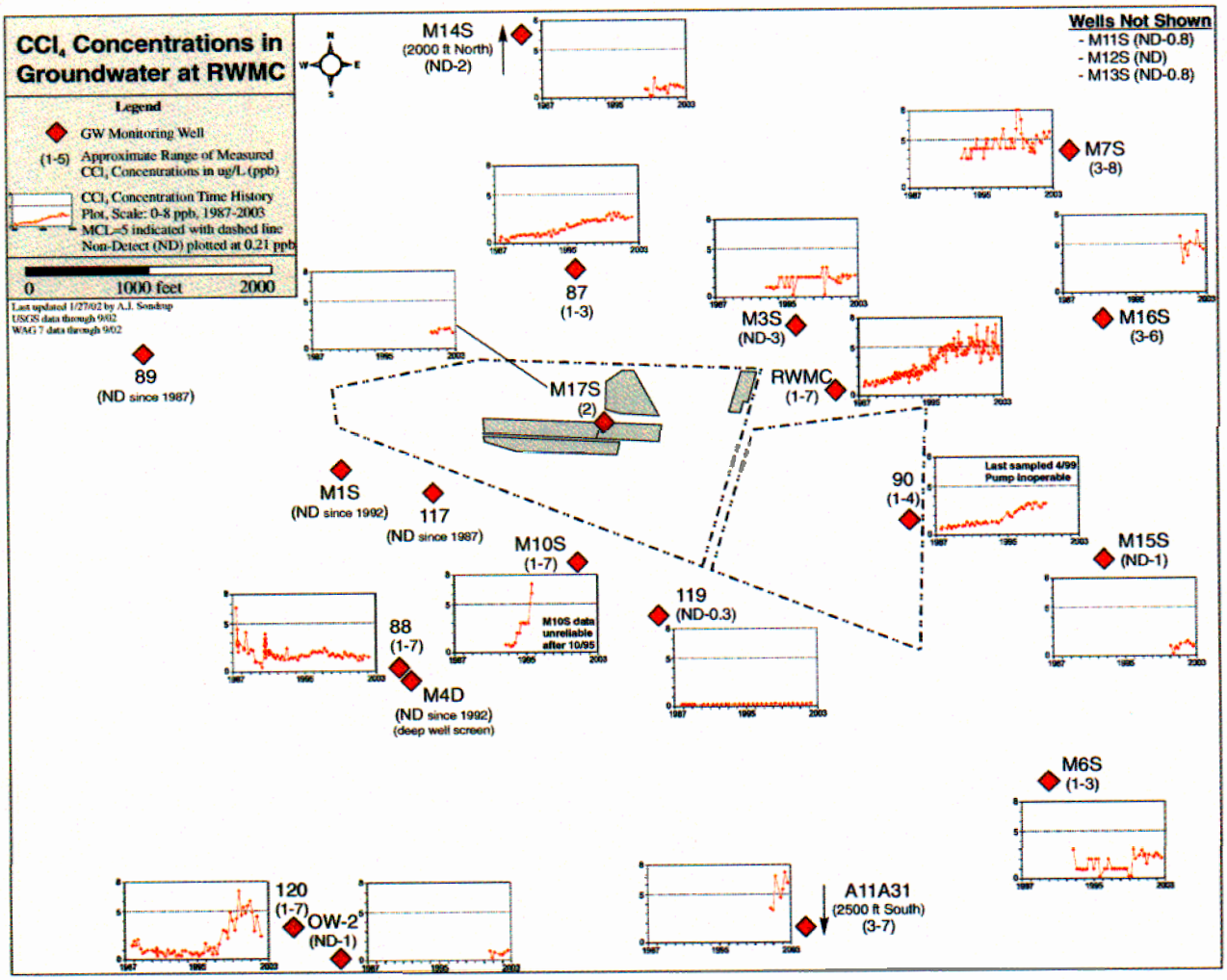


Figure 4-6. Carbon tetrachloride aquifer concentrations in monitoring wells in the vicinity of the Radioactive Waste Management Complex.

4.1.4 Summary of Carbon Tetrachloride

Carbon tetrachloride was detected in FY 2002 in waste zone soil gas, vadose zone soil gas, perched water, and in the aquifer in and around the RWMC. The highest soil gas concentration was 64,031 ppmv, measured in the waste zone soil gas. The maximum soil gas concentration outside the waste zone was 1,600 ppmv measured in Well 8801 Port 4 at 24 m (78 ft) bls. A single perched water sample contained 150 µg/L CCl_4. Carbon tetrachloride concentrations in vadose zone soil gas and perched-water are appreciably lower since the OCVZ Project began operation of a VVET system.

In FY 2002 low levels of CCl_4 were consistently detected in aquifer-monitoring wells in and around the RWMC. The maximum concentration was 7.2 µg/L measured in both Well A11A31 and in the RWMC production well. The concentration exceeded the MCL of 5 µg/L in four wells (Wells AllA31, M7S, M16S, and the RWMC production well). Although concentrations have increased over the past several years, the data indicate a flat trend in most wells. The only well to exhibit an increasing trend over the past few years is Well A11A31, and the only well with a clearly decreasing trend over the past few years is Well USGS-120.

4.2 Tetrachloroethene

The primary source of PCE at the SDA is Series 743 waste. The estimated mass of PCE contained in Series 743 sludge is 9.8E+04 kg (Varvel 2001).

Tetrachloroethene has been detected at the SDA in surficial sediments, vadose zone soil gas, vadose zone soil water (perched water and lysimeters), and groundwater. Tetrachloroethene vapor has also been detected emanating from the soil surface by surface isolation flux chambers.

4.2.1 Waste Zone

Tetrachloroethene was detected in high concentration in gas samples collected from vapor probes placed in the waste in Pits 4 and 10. The samples were collected in Tedlar bags or Summa canisters using a glovebag and analyzed with an INNOVA Model 1314 photoacoustic multigas analyzer. Some of the field duplicate samples also were analyzed using standard laboratory GC/MS as an accuracy check on the INNOVA results.

Tetrachloroethene was detected in all nine of the 16 probes that would yield a vapor sample. Table 4-1 contains the PCE results as well as results for the other gasses for which analyses were performed. The maximum PCE concentration measured was 3,009 ppmv at location DU-10-VP3 (1.9 m [6.2 ft] bls) in August 2002. This is greater than the estimated equilibrium vapor concentration of CCl_4 in Series 743 sludge (1,800 ppmv) (see footnote g). However, the equilibrium vapor concentration for PCE is small because PCE is estimated to be a small fraction of the VOC components in Series 743 sludge. Nevertheless, results indicate that Series 743 sludge continues to be a source of PCE and other VOCs.

No waste zone soil moisture samples were collected and analyzed for VOCs in FY 2002 because of arid conditions, limited sample volumes, and analytical priorities.

4.2.2 Vadose Zone

4.2.2.1 Perched Water and Lysimeter. No vadose zone soil moisture samples were collected and analyzed for VOCs in FY 2002 because of arid conditions, limited sample volumes, and analytical priorities. No lysimeter samples have been collected and analyzed for VOCs since September 2000.

A single perched water sample was collected by USGS personnel from Well USGS-92 on April 11, 2002. The PCE concentration in that sample was 30 µg/L. Tetrachloroethene has consistently been detected in Well USGS-92 since 1987. The maximum concentration was 180 µg/L on February 29, 1996, and the minimum was 23 µg/L on March 30, 1999. Since the OCVZ Project began operating the VVET system, the PCE concentrations have declined in USGS-92.

4.2.2.2 Soil Gas. Tetrachloroethene has consistently been detected in soil gas at the RWMC for several years, but at much lower concentrations than CCl_4. However, during FY 2002, some VOC results (including many PCE results) were uncharacteristically high in several wells. These data prompted an investigation into the soil gas data quality that is still ongoing. The complete set of data, including any revisions, is presented in the 2002 supplement for OCVZ well monitoring at the RWMC (see footnote j).

Most, but not all, of the abnormal data occurred during the March 12 and April 1, 2002, sampling events. A likely cause for many of the unusual measurements was a sulfur-hexaflouride gas injection tracer test that began on March 7, 2002, just outside the SDA. It is possible that the sulfur-hexaflouride interfered with the VOC filters on the INNOVA multigas analyzer. To illustrate the unusual behavior in PCE results in FY 2002, the maximum concentration inside the SDA was 89.6 ppmv in Well M17S Port 1

at a depth of 174 m (570 ft) on April 1, 2002. All PCE concentrations at this location before and after this date were less than 1 ppmv.

Before FY 2002, the maximum PCE concentration anywhere was 135 ppmv in Well 8902 Port 4 at a depth of 39 m (130 ft) on January 4, 1996. Since April 1998, the PCE concentrations in Well 8902 Port 4 have been less than 10 ppmv. Concentrations at other wells inside the SDA have generally been less than 20 ppmv. Inside the SDA, below the C-D interbed, concentrations have been less than 2 ppmv. Before FY 2002, the highest PCE concentration measured in soil gas outside the SDA was 75 ppmv in Well 77-1 Port 2 at a depth of 58 m (190 ft). Concentrations in this port are generally less than 30 ppmv. Outside the SDA, below the C-D interbed, the maximum PCE concentration measured before FY 2002 was 2.98 ppmv in Well 78-4 Port 2 at a depth of 76 m (251 ft). In general, the sample results below the C-D interbed outside the SDA have been less than 1 ppmv.

4.2.3 Aquifer

Eighty-nine aquifer samples were collected in FY 2002 from 22 monitoring wells in and around the RWMC by both WAG 7 and USGS personnel. Sixty-three of the samples were collected by WAG 7 personnel from 15 monitoring wells and analyzed for PCE. None of the 63 samples had detections above the quantitation limit of 1 μg/L. Samples collected by WAG 7 were collected in November and December 2001, and February, May, and September 2002 from monitoring Wells AllA31, M1S, M3S, M4D, M6S, M7S, M11S, M12S, M13S, M14S, M15S, M16S, M17S, OW2, and USGS-127.

Twenty-six of the 89 aquifer samples were collected by USGS personnel from eight aquifer wells in the vicinity of the RWMC. Only three of the 26 samples had detections greater than or equal to the minimum reporting level of 0.2 μg/L, and those were all 0.3 μg/L in the RWMC production well in January, March, and May 2002. Samples were collected by the USGS monthly from the RWMC production well, and in April and October 2002 from Wells USGS-87, USGS-88, USGS-89, USGS-117, USGS-119, USGS-120, and USGS-127.

Positive detections of PCE in SDA-vicinity aquifer wells are infrequent. The historical maximum PCE concentration measured was 0.4 μg/L in Well M7S on five different occasions from 1993 to 1996. This is well below the MCL of 5 μg/L.

4.2.4 Summary of Tetrachloroethene

Tetrachloroethene was detected in FY 2002 in waste zone soil gas, vadose zone soil gas, perched water, and in the aquifer in the vicinity of the RWMC. The highest reliable soil gas concentration was 3,009 ppmv measured in the waste zone soil gas. Vadose zone soil gas concentrations are being reviewed because of some highly uncharacteristic results. A single perched water sample contained 30 μg/L of PCE. Tetrachloroethene was detected in only three of 89 aquifer samples. All three detections were in the RWMC production wells and the concentration of all three samples was 0.3 μg/L, which is barely above the minimum reporting level of 0.2 μg/L. The aquifer detections are typical of previous results.

4.3 Methylene Chloride

Approximately 1.4E+04 kg of methylene chloride was disposed of in the SDA (Holdren et al. 2002). Information about methylene chloride disposal is scant compared to that for other, more prevalent VOCs like CCl_4. It should be noted that CCl_4 can degrade to methylene chloride; thus, considering the large mass of CCl_4 buried in the SDA, detections of methylene chloride in samples may not necessarily be related to the original inventory disposed of in the SDA.

4.3.1 Waste Zone

No waste zone soil moisture samples were collected and analyzed for VOCs in FY 2002 because of arid conditions, limited sample volumes, and analytical priorities. Also, the gas samples collected from the vapor probes in FY 2002 were not analyzed for methylene chloride.

4.3.2 Vadose Zone

4.3.2.1 Perched Water and Lysimeter. No vadose zone soil moisture samples were collected and analyzed for VOCs in FY 2002 because of arid conditions, limited sample volumes, and analytical priorities. No lysimeter samples have been collected and analyzed for VOCs since September 2000.

A single perched water sample was collected by USGS personnel from Well USGS-92 on April 11, 2002. The methylene chloride concentration in that sample was 4.7 μg/L. Methylene chloride has been consistently detected in Well USGS-92 since April 1997. Before that, it was analyzed for but not detected above the minimum reporting level of 0.2 μg/L. The maximum methylene chloride concentration in perched water from Well USGS-92 was 22.4 μg/L on April 17, 2001.

4.3.2.2 Soil Gas. No soil gas samples were collected in FY 2002 from the vadose zone vapor sampling ports analyzed for methylene chloride. However, of hundreds of samples collected previous to FY 2002 and analyzed for methylene chloride; only five returned positive detections and the concentrations were relatively low compared to other VOCs (e.g., CCl_4, trichloroethene [TCE], and PCE).

4.3.3 Aquifer

Eighty-nine aquifer samples were collected in FY 2002 from 22 monitoring wells in the vicinity of the RWMC by WAG 7 and USGS personnel. Sixty-three of the samples were collected by WAG 7 personnel from 15 monitoring wells and analyzed for PCE. None of the 63 samples had detections above the quantitation limit of 1 μg/L. Samples collected by WAG 7 were collected in November and December 2001, and February, May, and September 2002 from monitoring Wells AllA31, M1S, M3S, M4D, M6S, M7S, M11S, M12S, M13S, M14S, M15S, M16S, M17S, OW2, and USGS-127.

Twenty-six of the 89 aquifer samples were collected by USGS personnel from eight aquifer wells in the vicinity of the RWMC. None of the 24 samples had detections greater than or equal to the minimum reporting level of 0.2 μg/L. Samples were collected by the USGS monthly from the RWMC production well and in April and October 2002 from Wells USGS-87, USGS-88, USGS-89, USGS-117, USGS-119, USGS-120, and USGS-127.

Positive detections of methylene chloride in SDA-vicinity aquifer wells are infrequent. The historical maximum methylene chloride concentration measured was 8 μg/L in Well M10S, collected on July 22, 1996, which is greater than the MCL of 5 μg/L. However, five of the total seven detections historically were during the same sampling round (July 1996), which raises the question whether the samples were cross-contaminated before or during analysis. Methylene chloride has not been detected in any aquifer wells since October 1997.

4.3.4 Summary of Methylene Chloride

Methylene chloride was detected in a single perched water sample in FY 2002. Soil gas was not analyzed for methylene chloride and no detections were found in 89 aquifer samples taken in and around the RWMC.

4.4 Other Organic Contaminants

4.4.1 Waste Zone

Besides CCl_4 and PCE, gas samples collected from vapor probes placed in the waste in Pits 4 and 10 were analyzed for TCE, 1,1,1-trichloroethane (1,1,1-TCA), chloroform, and 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113). The samples were collected in Tedlar bags or Summa canisters using a glovebag and then analyzed with an INNOVA Model 1314 photoacoustic multigas analyzer. Some of the field duplicate samples also were analyzed using standard laboratory GC/MS as an accuracy check on the INNOVA results. Freon-113 results were exclusively from GC/MS analysis.

Trichloroethene, 1,1,1-TCA, and chloroform were detected in all nine of the 16 probes that would yield a vapor sample. Twelve samples, six each taken from two ports (743-08-VP1 and DU-10-VP2) on the same day were analyzed for Freon-113 and it showed positively in all samples. Table 4-1 contains all the results and Table 4-3 shows the maximum results for each of the other organics identified in the vapor probes samples.

Table 4-3. Maximum concentrations of trichloroethene, 1,1,1-trichloroethane, chloroform, and Freon-113 detected in soil gas from waste zone vapor probes.

Organic Compound	Sample Date	Well-Port	Depth (ft)	Concentration (ppmv)
Trichloroethene	6/10/02	743-08-VP1	20.2	14,000
1,1,1-trichloroethane	11/18/02	DU-08-VP2	15.8	3,790
Chloroform	2/11/02	743-08-VP1	20.2	22,339
Freon-113	6/10/02	743-08-VP1	20.2	250

No waste zone soil moisture samples were collected and analyzed for VOCs in FY 2002 because of arid conditions, limited sample volumes, and analytical priorities.

4.4.2 Vadose Zone

4.4.2.1 Perched Water and Lysimeter. No vadose zone soil moisture samples collected and analyzed for VOCs in FY 2002, because of arid conditions, limited sample volumes, and analytical priorities. No lysimeter samples have been collected and analyzed for VOCs since September 2000.

A single perched water sample was collected by USGS personnel from Well USGS-92 on April 11, 2002. The concentration of other organics besides CCl_4, tetrachloride, and methylene chloride in that sample is shown in Table 4-4.

Table 4-4. Concentrations of other organic compounds detected in a perched water sample from Well USGS-92 in FY 2002.

Organic Compound	Concentration Level (µg/L)	Maximum Contaminant Level (µg/L)
Chloroform	236	100
1,1-dichloroethane	3.3	NA[a]
1,1,1-trichloroethane	22.4	200
Trichloroethene	198	5
Dichloropropane	1.9	5

a. No maximum contaminant level is listed for 1,1-dichloroethane; however, the concentration corresponding to a Hazard Index of 1 is 1000 µg/L.

4.4.2.2 Soil Gas. Trichloroethene, 1,1,1-TCA, and chloroform are the only other VOCs for which analysis is performed in soil gas samples collected at the SDA. All three compounds are ubiquitous in the vicinity of the RWMC, but at much lower concentrations than CCl_4. However, during FY 2002 VOC soil gas concentrations were uncharacteristically high in several wells. These data prompted an investigation that is still ongoing (see Section 6.2.2.2). The complete set of soil gas data, including any revisions, is presented in the 2002 supplement for OCVZ well monitoring at the RWMC (see in footnote i).

The maximum concentrations detected in FY 2002 both inside and outside the SDA are shown in Table 4-5. The maximum concentrations detected historically both inside and outside the SDA are shown in Table 4-6.

Table 4-5. Maximum concentrations of trichloroethene, 1,1,1-trichloroethane, and chloroform detected in vadose zone soil gas inside and outside the Subsurface Disposal Area in FY 2002.

Organic Compound	Inside or Outside the Subsurface Disposal Area	Sample Date	Well-Port	Depth (ft)	Concentration (ppmv)
Trichloroethene	Inside	4/1/02	8801-4	78	256
1,1,1-trichloroethane	Inside	4/1/02	M17S	570	176[a]
Chloroform	Inside	4/1/02	8801-4	78	430
Trichloroethene	Outside	3/13/02	77-1-4	111	4,240[a]
1,1,1-trichloroethane	Outside	3/13/02	77-1-4	111	361[a]
Chloroform	Outside	3/13/02	77-1-4	111	1,690[a]

a. Data quality is currently being review because of highly uncharacteristic values when compared to previous and subsequent data.

Table 4-6. Historic maximum concentrations of trichloroethene, 1,1,1-trichloroethane, and chloroform detected in vadose zone soil gas inside and outside the Subsurface Disposal Area.

Organic Compound	Inside or Outside the Subsurface Disposal Area	Sample Date	Well-Port	Depth (ft)	Concentration (ppmv)
Trichloroethene	Inside	5/00	9301-6	77	5,539
1,1,1-trichloroethane	Inside	1/96	8801-4	78	199
Chloroform	Inside	1/96	8801-4	78	1,160
Trichloroethene	Outside	3/01	VVE10-3	75	28
1,1,1-trichloroethane	Outside	1/99	M7S-2	448	501
Chloroform	Outside	4/94	VVE10-3	75	25

4.4.3 Aquifer

In addition to CCl_4 and methylene chloride, RWMC aquifer samples in FY 2002 were analyzed for other VOCs and most were nondetections. Chloroform, TCE, toluene, and 1,1,1-TCA were the only compounds detected at concentrations above the quantitation limit (WAG 7) or minimum reporting level (USGS). All compounds were below the respective MCLs (see Table 4-7).

Trichloroethene was consistently detected in Wells M7S, M16S, AllA31, RWMC, USGS-87, USGS-88, and SGS-120. Toluene was detected once in Well M4D and consistently in Well M7S. Chloroform was detected in Wells A11A31, RWMC, USGS-88, and USGS-120. 1,1,1-Trichloroethane was detected in the RWMC production well and Well USGS-120. Samples were analyzed for 54 other organic compounds, but none were detected above the quantitation limit (WAG 7) or minimum reporting level (USGS).

Table 4-7. Concentration of volatile organic compounds detected in the aquifer

Well	Sample Date	Organic Compound	Sample Concentration (µg/L)	Quantitation Limit or Minimum Reporting Level (µg/L)	MCL (µg/L)	Sample Identifier	Limitations and Validation Report Identifier
AllA31	2/25/02	Chloroform	1.3	1.0	100	RISM4301VG	HCJ-061-02
AllA31	5/21/02	Chloroform	1.6	1.0	100	RISM7301VG	HCJ-121-02
AllA31	9/16/02	Chloroform	1.2	1.0	100	RISN1301VG	HCJ-156-02
AllA31	12/4/01	TCE	2.3	1.0	5	RISM1501VG	HCJ-019-02
M16S	12/4/01	TCE	2.0	1.0	5	RISM1201VG	HCJ-020-02
M7S	12/11/01	TCE	1.8	1.0	5	RISM0601VG	HCJ-020-02
AllA31	2/25/02	TCE	2.0	1.0	5	RISM4301VG	HCJ-061-02
M7S	2/19/02	TCE	2.0	1.0	5	RISM3401VF	HCJ-042-02
M16S	2/27/02	TCE	1.9	1.0	5	RISM4001VG	HCJ-061-02
AllA31	5/21/02	TCE	3.2	1.0	5	RISM7301VG	HCJ-121-02
M7S	5/15/02	TCE	2.0	1.0	5	RISM6401VG	HCJ-098-02
M16S	5/15/02	TCE	2.0	1.0	5	RISM7001VG	HCJ-098-02

Table 4-7. (continued).

Well	Sample Date	Organic Compound	Sample Concentration (µg/L)	Quantitation Limit or Minimum Reporting Level (µg/L)	MCL (µg/L)	Sample Identifier	Limitations and Validation Report Identifier
M7S	9/11/02	TCE	2.2$_J$[a]	1.0	5	RISN0401VG	HCJ-150-02
AllA31	9/16/02	TCE	2.9	1.0	5	RISN1301VG	HCJ-156-02
M16S	9/18/02	TCE	2.1	1.0	5	RISN1001VG	HCJ-156-02
AllA31	12/4/01	Toluene	3.0	1.0	1.000	RISM1501VG	HCJ-019-02
M4D	12/11/01	Toluene	3.1	1.0	1,000	RISM0401VG	HCJ-020-02
M7S	12/11/01	Toluene	3.6	1.0	1,000	RISM0601VG	HCJ-020-02
M7S	2/19/02	Toluene	7.4	1.0	1,000	RISM3401VF	HCJ-042-02
M7S	5/15/02	Toluene	8.0	1.0	1,000	RISM6401VG	HCJ-098-02
M7S	9/11/02	Toluene	4.8$_J$[a]	1.0	1,000	RISN0401VG	HCJ-150-02
Prod Well	10/11/01	Chloroform	0.5	0.2	100	NA	NA
Prod Well	11/15/01	Chloroform	0.7	0.2	100	NA	NA
Prod Well	12/20/01	Chloroform	0.8	0.2	100	NA	NA
Prod Well	1/10/02	Chloroform	1.1	0.2	100	NA	NA
Prod Well	2/14/02	Chloroform	0.9	0.2	100	NA	NA
Prod Well	3/14/02	Chloroform	1.1	0.2	100	NA	NA
Prod Well	4/11/02	Chloroform	0.9	0.2	100	NA	NA
Prod Well	5/9/02	Chloroform	0.9	0.2	100	NA	NA
Prod Well	6/13/02	Chloroform	0.9	0.2	100	NA	NA
Prod Well	7/18/02	Chloroform	0.8	0.2	100	NA	NA
Prod Well	8/8/02	Chloroform	0.8	0.2	100	NA	NA
Prod Well	9/12/02	Chloroform	0.7	0.2	100	NA	NA
USGS-88	10/1/01	Chloroform	0.4	0.2	100	NA	NA
USGS-88	4/2/02	Chloroform	0.4	0.2	100	NA	NA
USGS-120	10/11/01	Chloroform	0.8	0.2	100	NA	NA
USGS-120	4/11/02	Chloroform	0.4	0.2	100	NA	NA
Prod Well	10/11/01	TCE	1.6	0.2	5	NA	NA
Prod Well	11/15/01	TCE	1.9	0.2	5	NA	NA
Prod Well	12/20/01	TCE	2.1	0.2	5	NA	NA
Prod Well	1/10/02	TCE	2.8	0.2	5	NA	NA
Prod Well	2/14/02	TCE	2.1	0.2	5	NA	NA
Prod Well	3/14/02	TCE	2.7	0.2	5	NA	NA
Prod Well	4/11/02	TCE	2.4	0.2	5	NA	NA
Prod Well	5/9/02	TCE	2.8	0.2	5	NA	NA

Table 4-7. (continued).

Well	Sample Date	Organic Compound	Sample Concentration (µg/L)	Quantitation Limit or Minimum Reporting Level (µg/L)	MCL (µg/L)	Sample Identifier	Limitations and Validation Report Identifier
Prod Well	6/13/02	TCE	2.3	0.2	5	NA	NA
Prod Well	7/18/02	TCE	2.1	0.2	5	NA	NA
Prod Well	8/8/02	TCE	2	0.2	5	NA	NA
Prod Well	9/12/02	TCE	1.9	0.2	5	NA	NA
USGS-87	10/11/01	TCE	0.6	0.2	5	NA	NA
USGS-87	4/11/02	TCE	0.6	0.2	5	NA	NA
USGS-88	10/1/01	TCE	0.6	0.2	5	NA	NA
USGS-88	4/2/02	TCE	0.6	0.2	5	NA	NA
USGS-120	10/11/01	TCE	1.5	0.2	5	NA	NA
USGS-120	4/11/02	TCE	0.7	0.2	5	NA	NA
Prod Well	10/11/01	1,1,1-TCA	0.4	0.2	200	NA	NA
Prod Well	11/15/01	1,1,1-TCA	0.4	0.2	200	NA	NA
Prod Well	12/20/01	1,1,1-TCA	0.5	0.2	200	NA	NA
Prod Well	1/10/02	1,1,1-TCA	0.6	0.2	200	NA	NA
Prod Well	2/14/02	1,1,1-TCA	0.4	0.2	200	NA	NA
Prod Well	3/14/02	1,1,1-TCA	0.7	0.2	200	NA	NA
Prod Well	4/11/02	1,1,1-TCA	0.5	0.2	200	NA	NA
Prod Well	5/9/02	1,1,1-TCA	0.6	0.2	200	NA	NA
Prod Well	6/13/02	1,1,1-TCA	0.5	0.2	200	NA	NA
Prod Well	7/18/02	1,1,1-TCA	0.4	0.2	200	NA	NA
Prod Well	8/8/02	1,1,1-TCA	0.4	0.2	200	NA	NA
Prod Well	9/12/02	1,1,1-TCA	0.4	0.2	200	NA	NA
USGS-120	10/11/01	1,1,1-TCA	0.4	0.2	200	NA	NA

a. Concentrations with a "J" subscript were positively identified in the sample and assigned a "J" data qualifier flag. The qualifier flag was assigned because the recovery of one of the surrogates was slightly above the upper control limit. The reported concentrations may not be an accurate representation of the amount actually present in the sample and should only be used as estimated quantities.

MCL = maximum contaminant level
NA = not analyzed
1,1,1-TCA = 1,1,1-trichloroethane
TCE = trichloroethene

4.4.4 Summary

Other organics detected during sampling at RWMC include TCE, 1,1,1-TCA, chloroform, Freon-113, toluene, 1,1-dechloroethane, and dichloropropane. Trichloroethene, 1,1,1-TCA, chloroform, and Freon-113 were detected in waste zone soil gas. Chloroform has the highest concentration (22,339 ppmv), followed by TCE (14,000 ppmv), then 1,1,1-TCA (3,790 ppmv), and Freon-113 (250 ppmv). Trichloroethene, 1,1,1-TCA, and chloroform all were detected in vadose zone soil gas. The complete set of soil gas data, including any revisions, are presented in the 2002 supplement for OCVZ well monitoring at the RWMC (see footnote j).

A single perched water sample contained TCE (198 μg/L), 1,1,1-TCA (22.4 μg/L), and chloroform (236 μg/L). These concentrations are appreciably less than before operation of the OCVZ Remediation Project began. During aquifer monitoring in FY 2002, only four other organic compounds (i.e., TCE, 1,1,1-TCA, chloroform, and toluene) were detected in 89 samples. All sample results were below MCLs. Toluene had the highest concentration (8 μg/L) in Well M7S, followed by TCE (3.2 μg/L) in Well A11A31. The maximum chloroform concentration was 1.6 μg/L in Well A11A31 and the maximum 1,1,1-TCA concentration was 0.7 μg/L in the RWMC production well.

Detections of TCE and 1,1,1-TCA are not surprising because those were components of Series 743 sludge. Chloroform detections also are not surprising because it is likely being produced by degradation of the CCl_4. Detections of the other organics like Freon-113 (soil gas), 1,1-dichloroethane and dichloropropane (perched water) and toluene (groundwater) are low-level detections and will continue to be monitored.