SGW-51807
Revision 0

Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Operable Unit Carbon Tetrachloride Site, Calendar Year 2011

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

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Plateau Remediation Company
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Richland, Washington 99352

Approved for Public Release;
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Executive Summary

Soil vapor extraction (SVE) is being used to remove carbon tetrachloride from the vadose zone at the 200-PW-1 Operable Unit. The purpose of this document is to report the SVE system operating data and the effectiveness of SVE in remediating carbon tetrachloride contamination based on the existing remedial design. This report covers operations for calendar year (CY) 2011 (January 1, 2011 through December 31, 2011) and provides a general overview of the entire operating period from February 25, 1992 through December 31, 2011.

The 216-Z-9 Trench, 216-Z-1A Tile Field, and 216-Z-18 Crib (216-Z-9, 216-Z-1A, and 216-Z-18 sites, respectively) were used from 1955 through 1973 for soil column disposal of aqueous and organic liquid wastes containing carbon tetrachloride. The SVE operations focus on the vadose zone in the vicinity of these three waste sites.

Two 14.2 m^3/min (500 ft^3/min) SVE systems operated from March 1 through October 31, 2011. One system extracted soil vapor at the combined 216-Z-1A/216-Z-18 well field, and one system extracted soil vapor at the 216-Z-9 well field. During this time, the two SVE systems extracted 195 kg (430 lb) of carbon tetrachloride from the vadose zone. Between April 1991 (when the pilot test was conducted) and December 2011, approximately 79,945 kg (176,247 lb) of carbon tetrachloride were removed from the vadose zone.

Approximately 4 kg (9 lb) of carbon tetrachloride were removed from the vadose zone in CY 2011 using passive SVE systems installed on eight wells in the 216-Z-1A/216-Z-18 well field. Passive SVE is a naturally occurring process driven by barometric pressure fluctuations and is often referred to as “barometric pumping.”

When the SVE systems were not operating in 2011, carbon tetrachloride concentrations did not increase significantly at monitoring locations near the ground surface or the water table. Temporarily suspending operation of the SVE systems appears to have caused minimal detectable vertical transport of carbon tetrachloride through the soil surface to the atmosphere and to have had no negative impact on groundwater quality.

A treatability test using the SVE system and online wells was conducted at the 216-Z-9 site in August and September 2011. The purpose of the test was to evaluate the flux of carbon tetrachloride remaining in the vadose zone to the underlying groundwater.

This estimate is important to the development of a technically defensible strategy for determining when the SVE remediation can be discontinued.

Recommendations for SVE operations include continuing the operation of active and passive extraction systems and continuing the assessment of how the current carbon tetrachloride contamination in the vadose zone is impacting the groundwater.

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Terms

B&K	Brüel & Kjaer
bgs	below ground surface
CCU	Cold Creek unit
CY	calendar year
DNAPL	dense nonaqueous phase liquid
EPA	Environmental Protection Agency
FY	fiscal year
GAC	granular activated carbon
OU	Operable Unit
ROD	Record of Decision
SVE	soil vapor extraction

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1 Summary of Calendar Year 2011 Activities

Soil vapor extraction (SVE) is being used to remove carbon tetrachloride contamination from the vadose zone at the carbon tetrachloride site in the 200-PW-1 Operable Unit (OU). The carbon tetrachloride site includes the three waste sites used from 1955 through 1973 for disposal of waste liquids containing carbon tetrachloride. The purpose of remediation using SVE is to mitigate the threat to the environment caused by migration of carbon tetrachloride vapors through the soil column and into the groundwater.

Between February 1992 and October 2011, SVE was operated as an interim action in accordance with *Action Memorandum: Expedited Response Action Proposal for 200 West Area Carbon Tetrachloride Plume* (Smith and Stanley, 1992). The purpose of this report is to evaluate the SVE system operating data and the effectiveness of SVE in remediating carbon tetrachloride contamination based on the existing remedial design. This report provides a detailed summary of operations for calendar year (CY) 2011 (January 1, 2011, through December 31, 2011) and a general overview of operations from February 25, 1992, through December 31, 2011.

Highlights of SVE activities during 2011 include the following:

- Two SVE systems, each with a maximum capacity of 14.2 m^3/min (500 ft^3/min), operated at the carbon tetrachloride site from March 1 to October 31, 2011. One system operated at the combined 216-Z-1A/216-Z-18 well field, and the other system operated at the 216-Z-9 well field.
- The two SVE systems extracted a combined total of 195 kg (430 lb) of carbon tetrachloride from the vadose zone in 2011.
- Passive SVE removed approximately 4 kg (9 lb) of carbon tetrachloride from the vadose zone in 2011.
- Soil vapor monitoring continued monthly throughout 2011 at wells and probes that were not connected to the SVE system.
- A treatability test was conducted at the 216-Z-9 site during August and September 2011 to evaluate the flux of carbon tetrachloride from the vadose zone to the groundwater under conditions relevant to the 200-PW-1 OU.
- The *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* Record of Decision (ROD) for the 200-PW-1 OU was issued in September 2011 (EPA, 2011). The ROD selected SVE as the final remedial action for vadose zone carbon tetrachloride contamination at these waste sites and the associated vadose zone that received carbon tetrachloride waste liquids. The ROD specifies that SVE will continue to be implemented in accordance with the expedited response action until the remedial design/remedial action work plan is approved. The remedial design/remedial action work plan is to be submitted to the U.S. Environmental Protection Agency (EPA) for review by September 30, 2015 (Section 12.4 of EPA, 2011).

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2 200-PW-1 Operable Unit Soil Vapor Extraction

During 2011, carbon tetrachloride was removed from the vadose zone using two active SVE systems and eight passive SVE systems.

2.1 Soil Vapor Extraction System Description

The active SVE systems use an applied vacuum to extract carbon tetrachloride vapor from the vadose zone. These systems extract vapor through multiple vadose zone borings at the following three primary carbon tetrachloride disposal sites:

- 216-Z-9 Trench
- 216-Z-1A Tile Field
- 216-Z-18 Crib

One of the active SVE systems may also be used for future extraction of vapor through wells at the 216-Z-12 Crib. Extraction from this site was last performed in 1998. The 216-Z-1A, 216-Z-18, and 216-Z-12 sites are discussed together because the well fields at these sites overlap.

The passive SVE systems use naturally occurring changes in barometric pressure to drive the extraction of carbon tetrachloride vapor, a process also referred to as "barometric pumping." In general, falling atmospheric pressure causes subsurface vapor to move to the atmosphere through wells, while rising atmospheric pressure causes atmospheric air to move into the subsurface. The eight passive SVE systems were installed at eight individual vadose zone borings at the 216-Z-1A and 216-Z-18 sites.

The soil vapor extracted by the active and passive SVE systems is treated aboveground using granular activated carbon (GAC) canisters. The GAC adsorbs the carbon tetrachloride from the vapor. The treated, clean soil vapor is then vented to the atmosphere. Descriptions of the active and passive SVE systems are provided in SGW-49388, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Operable Unit Carbon Tetrachloride Site, Calendar Year 2010*.

2.2 History of Operations

Carbon tetrachloride was discharged to the subsurface through engineered disposal facilities from 1955 through 1973. Following discharge, the carbon tetrachloride migrated throughout the vadose zone underlying the disposal sites. SVE has been in operation since 1992 to remove the carbon tetrachloride.

2.2.1 Carbon Tetrachloride Waste Disposal

Carbon tetrachloride contained in aqueous and organic liquid wastes generated during plutonium processing operations at Z Plant—currently called the Plutonium Finishing Plant—was discharged primarily to the following three subsurface infiltration facilities (Figure 2-1):

- 216-Z-9 Trench, 1955 to 1962
- 216-Z-1A Tile Field, 1964 to 1969
- 216-Z-18 Crib, 1969 to 1973

Additional details on the sources of the carbon tetrachloride waste are provided in DOE/RL-91-32, *Expedited Response Action Proposal (EE/CA & EA) for 200 West Area Carbon Tetrachloride Plume*, and DOE/RL-2006-51, *Remedial Investigation Report for the Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit: Includes the 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units*.

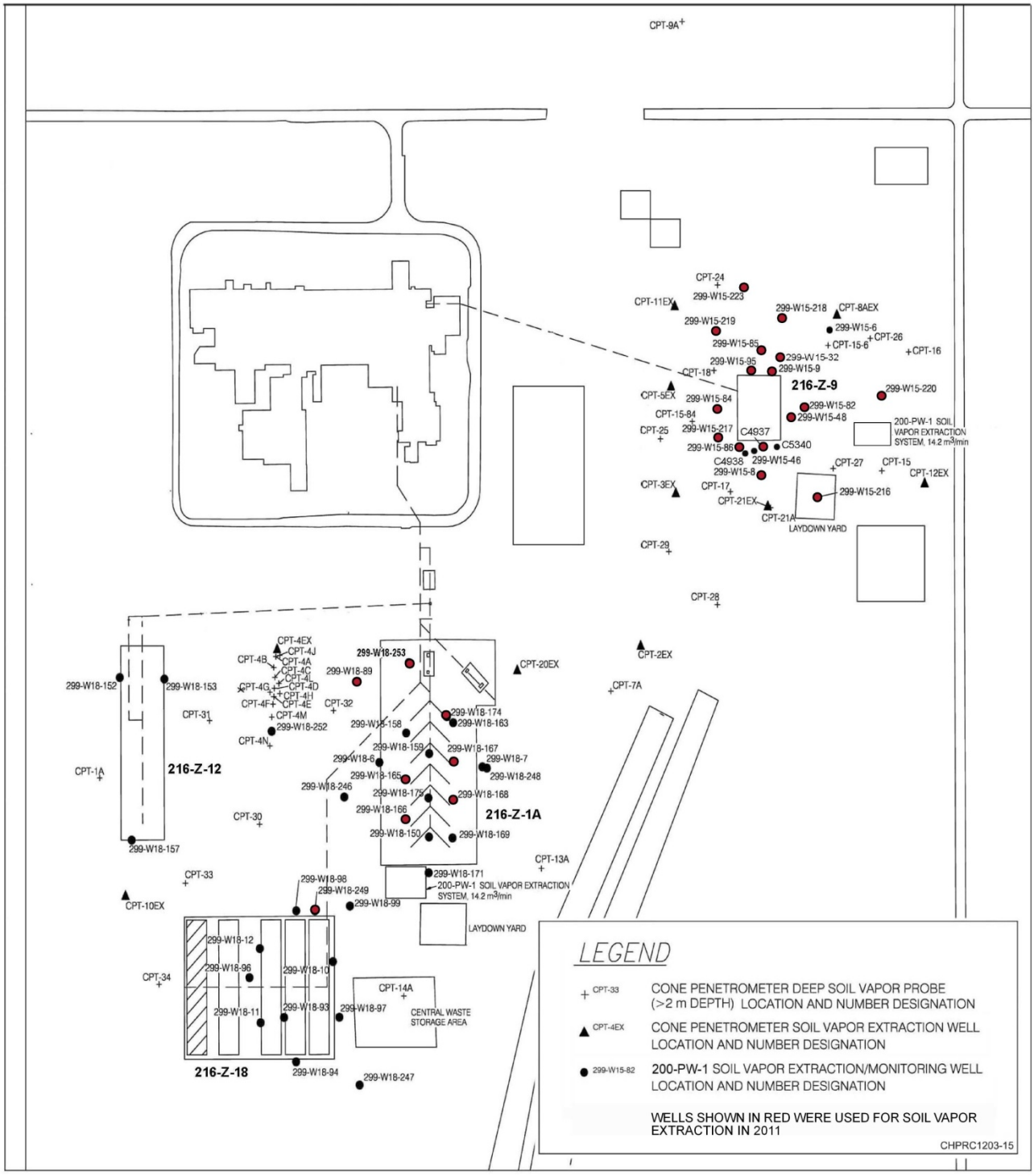

Figure 2-1. Extraction and Monitoring Wells and Deep (>2 m [>6.6 ft]) Soil Vapor Probes at the Carbon Tetrachloride Soil Vapor Extraction Sites

2.2.2 Carbon Tetrachloride Well Field

The vadose zone underlying the primary carbon tetrachloride disposal sites consists of approximately 70 m (230 ft) of relatively permeable sand and gravel within the Ringold Formation (lower portion) and Hanford formation (upper portion). This section is interrupted from a depth of 38 to 45 m (125 to 148 ft)

by the Cold Creek unit (CCU), a less permeable interval composed of 4 m (13 ft) of silt and sand and 3 m (10 ft) of carbonate-rich silt and sand. Because of its higher concentration of calcium carbonate, the less permeable CCU is informally referred to as the "caliche layer." The less permeable CCU interval constitutes a relatively low-flow zone and effectively divides the subsurface into the following two distinct higher flow zones:

- An upper zone from the ground surface to the top of the less permeable layer
- A lower zone from the bottom of the less permeable layer to the water table (greater than 70 m [230 ft] below ground surface [bgs])

During 2011, 52 wells were available for SVE (Figure 2-1). Of the 52 wells, 13 have two open intervals (i.e., screened or perforated casing), creating 65 intervals for vapor extraction. Open interval lengths range from 1.5 to 22 m (5 to 71 ft). Well diameters range from 2 to 20 cm (0.75 to 8 in.). The active SVE system extracts simultaneously from multiple wells that are open above, within, and/or below the CCU layer. All of the passive SVE systems extract from well intervals that are open below the CCU. SGW-49388 shows cross sections through the 216-Z-18/216-Z-12, 216-Z-1A, and 216-Z-9 well fields.

2.2.3 Carbon Tetrachloride Soil Vapor Extraction, 1992 through 2011

Between 1992 and 1997, the strategy for SVE was to operate throughout the year using up to three SVE systems with design capacities of 14.2, 28.3, and 42.5 m^3/min (500; 1,000 ft^3/min; and 1,500 ft^3/min). In 1997, a rebound study was conducted throughout the carbon tetrachloride SVE sites to determine the increase in carbon tetrachloride vapor concentrations following temporary system shutdown (BHI-01105, *Rebound Study Report for the Carbon Tetrachloride Soil Vapor Extraction Site, Fiscal Year 1997*).

The operating strategy was modified based on the results of the rebound study and the declining rate of carbon tetrachloride removal during continuous extraction operations. Rather than operating all three SVE systems, only the 14.2 m^3/min (500 ft^3/min) system was used for carbon tetrachloride removal from 1998 through 2008. Rather than operating all year, this SVE system was operated in a cyclic or periodic mode during these years. The 14.2 m^3/min (500 ft^3/min) system typically operated from April through September each year, alternating between the 216-Z-9 site and the 216-Z-1A/216-Z-18 site (for approximately three months at each site). The system was maintained in standby mode from October through March to allow time for carbon tetrachloride vapor concentrations to rebound.

Two new SVE systems, each with a design capacity of 14.2 m^3/min (500 ft^3/min), were operated from 2009 through 2011. One new SVE system was operated at the 216-Z-1A site, and one system was operated at the 216-Z-9 site. Each system operated for six months in 2009 (April 1 through September 30) and eight months in 2010 and 2011 (March 1 through October 31).

The history of cyclic SVE operations (e.g., operational periods, average flows, and SVE wells) is summarized for 1997 through 2009 in Table 2-1 of SGW-49388 and Appendix A of SGW-44694; Appendix A of SGW-49388 provides the history for 2010. Appendix A of this report provides the history for 2011. Table 2-1 summarizes the mass of carbon tetrachloride removed by year and by waste site.

2.2.4 Carbon Tetrachloride Soil Vapor Extraction in 2011

During 2011, each of the two 14.2 m^3/min (500 ft^3/min) SVE systems operated from March 1 through October 31. One system was used for extraction at the 216-Z-1A well field, and one system was used for extraction at the 216-Z-9 well field. At each location, the extraction strategy followed in 2011 was similar to that used in previous years.

At the 216-Z-1A site, the initial extraction wells were 299-W18-165, 299-W18-166, 299-W18-167, 299-W18-168, and 299-W18-174 (Figure 2-1). Three additional wells (299-W18-89, 299-W18-249, and 299-W18-253) were added during the week ending June 10. At the 216-Z-9 site, the 4 initial extraction wells were 299-W15-9U, 299-W15-9L, 299-W15-82, and 299-W15-217 (Figure 2-1). Six additional wells (299-W15-48, 299-W15-84U, 299-W15-84L, 299-W15-86, 299-W15-218U, and 299-W15-218L) were added online during the week ending June 10. By the week ending July 22, 13 additional wells were online (Appendix A). From August 17 through September 28, a treatability test was conducted using the SVE system at the 216-Z-9 site (Section 2.4). During the test, 22 extraction wells were added online sequentially for single-well testing. On September 29, the 23 wells that were online in July were added back online.

At the 216-Z-1A/216-Z-18 site, passive SVE systems continued operating during 2011 at the following eight wells: 299-W18-6L, 299-W18-7, 299-W18-10L, 299-W18-11L, 299-W18-12, 299-W18-246L, 299-W18-247L, and 299-W18-252L.

2.3 Soil Vapor Extraction System Performance

The operating data that are routinely recorded for each SVE system include carbon tetrachloride concentrations, hours of operation, and system flow rates (Appendix B). These parameters are monitored at the inlet to each SVE system and represent the combined contribution of all extraction wells currently online. In addition, samples are periodically collected at individual wells to obtain well-specific data (Appendix C). Flow meters, vacuum/pressure transmitters, and volatile organic monitors are calibrated, and the calibration data are retained and available for review. The volatile organic compound monitoring instruments are checked periodically with gas standards. The detection limit for carbon tetrachloride using this instrumentation is 1 ppmv.

2.3.1 Concentration Changes Over Time

Carbon tetrachloride concentrations in the extracted soil vapor decreased significantly at the 216-Z-9 and 216-Z-1A/216-Z-18/216-Z-12 well fields during SVE operations. Carbon tetrachloride concentrations in soil vapor extracted from the 216-Z-9 well field using the active SVE systems declined from approximately 30,000 ppmv at startup in 1993 to a maximum of 15 ppmv in 2011 (Figure 2-2). Carbon tetrachloride concentrations in soil vapor extracted from the 216-Z-1A/216-Z-18/216-Z-12 well field using the SVE systems declined from approximately 1,500 ppmv at startup in 1992 to a maximum of 12 ppmv in 2011 (Figure 2-3).

A decrease in concentration with continued extraction is typical of SVE operations and represents removal of the volatile contaminant originally available in the readily swept pore spaces. Once that mass has been effectively removed, peak contaminant vapor concentrations at the beginning of each pumping cycle reflect the amount of carbon tetrachloride released from low-permeability sediments during the preceding nonoperational period. Once pumping has commenced, contaminant concentration rapidly decreases, approaching a concentration level that may reflect the rate of continued contaminant release from low-permeability sediments.

Table 2-1. Carbon Tetrachloride Mass Removed Using Active Soil Vapor Extraction

Site	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Carbon Tetrachloride Removed Each Calendar Year (kg)																						
216-Z-9	--	--	1,065	35,029	11,500	3,150	1,239	524	436	0	375	480	0	90	295	97	217	111	103	101	75	54,887
216-Z-1A/ 216-Z-18/216-Z-12	140	959	2,541	8,757	7,307	2,581	583	258	375	0	335	164	294	167	67	76	63	105	73	92	120	25,057
Yearly Total	**140**	**959**	**3,606**	**43,786**	**18,807**	**5,731**	**1,822**	**782**	**811**	**0**	**710**	**644**	**294**	**257**	**362**	**173**	**280**	**216**	**177**	**193**	**195**	**79,944**
Cumulative Total	**140**	**1,099**	**4,705**	**48,491**	**67,298**	**73,029**	**74,851**	**75,633**	**76,444**	**76,444**	**77,154**	**77,798**	**78,092**	**78,349**	**78,711**	**78,884**	**79,164**	**79,380**	**79,557**	**79,750**	**79,945**	
Volume of Vapor Recovered Per Year of System Operation (1,000 m^3)																						
216-Z-9	--	--	9	3,064	15,685	12,181	4,856	1,585	1,718	0	745	1,632	0	190	1,109	634	1,493	1,046	991	2602	1,491	**51,031**
216-Z-1A/216-Z-18/216-Z-12	47	153	1,418	6,287	15,369	15,740	4,053	1,907	1,837	0	1,776	1,030	2,637	1,678	688	1,228	734	1,152	1,502	2754	2,227	**64,217**
Yearly Total	47	153	1,427	9,351	31,054	27,921	8,909	3,492	3,555	0	2,521	2,662	2,637	1,868	1,797	1,862	2,227	2,198	2,493	5,356	3,718	
Cumulative Total	47	200	1,627	10,978	42,032	69,953	78,862	82,354	85,909	85,909	88,430	91,092	93,729	95,597	97,394	99,256	10,1483	10,3681	10,6174	111,530	115,248	
Ratio of Carbon Tetrachloride Removed to Volume of Vapor Recovered (kg/[1,000 m^3])																						
216-Z-9	--	--	--	--	--	--	0.26	0.33	0.25	0.00	0.50	0.29	0.00	0.47	0.27	0.15	0.15	0.11	0.10	0.04	0.05	
216-Z-1A/216-Z-18/216-Z-12	--	--	--	--	--	--	0.14	0.14	0.20	0.00	0.19	0.16	0.11	0.10	0.10	0.06	0.09	0.09	0.05	0.03	0.05	
Number of Weeks SVE System Operated Each Year																						
216-Z-9	--	--	--	--	--	--	11	13	13	0	11	16	0	4	17	9	19	14	26	36	35	**224**
216-Z-1A/ 216-Z-18/216-Z-12	--	--	--	--	--	--	11	13	13	0	15	10	26	18	12	16	7	12	26	36	35	**250**

Note: SVE has been operated in a cyclic, or periodic, mode since 1997. In 1997, the 42.5 m^3/min SVE system was operated at the 216-Z-9 site, and the 28.3 m^3/min SVE system and the 14.2 m^3/min SVE system were operated at the 216-Z-1A/216-Z-18/216-Z-12 site. From 1998 through 2008, the 14.2 m^3/min SVE system was operated at both sites; the other two SVE systems were not operated. In 2009, two new 14.2 m^3/min SVE systems were operated: one at the 216-Z-1A/216-Z-18/216-Z-12 site and one at the 216-Z-9 site. The two systems operated in 2009 were also operated in 2010 and 2011.

To convert kilograms to pounds, multiply by 2.2046.

To convert cubic meters to cubic feet, multiply by 35.315.

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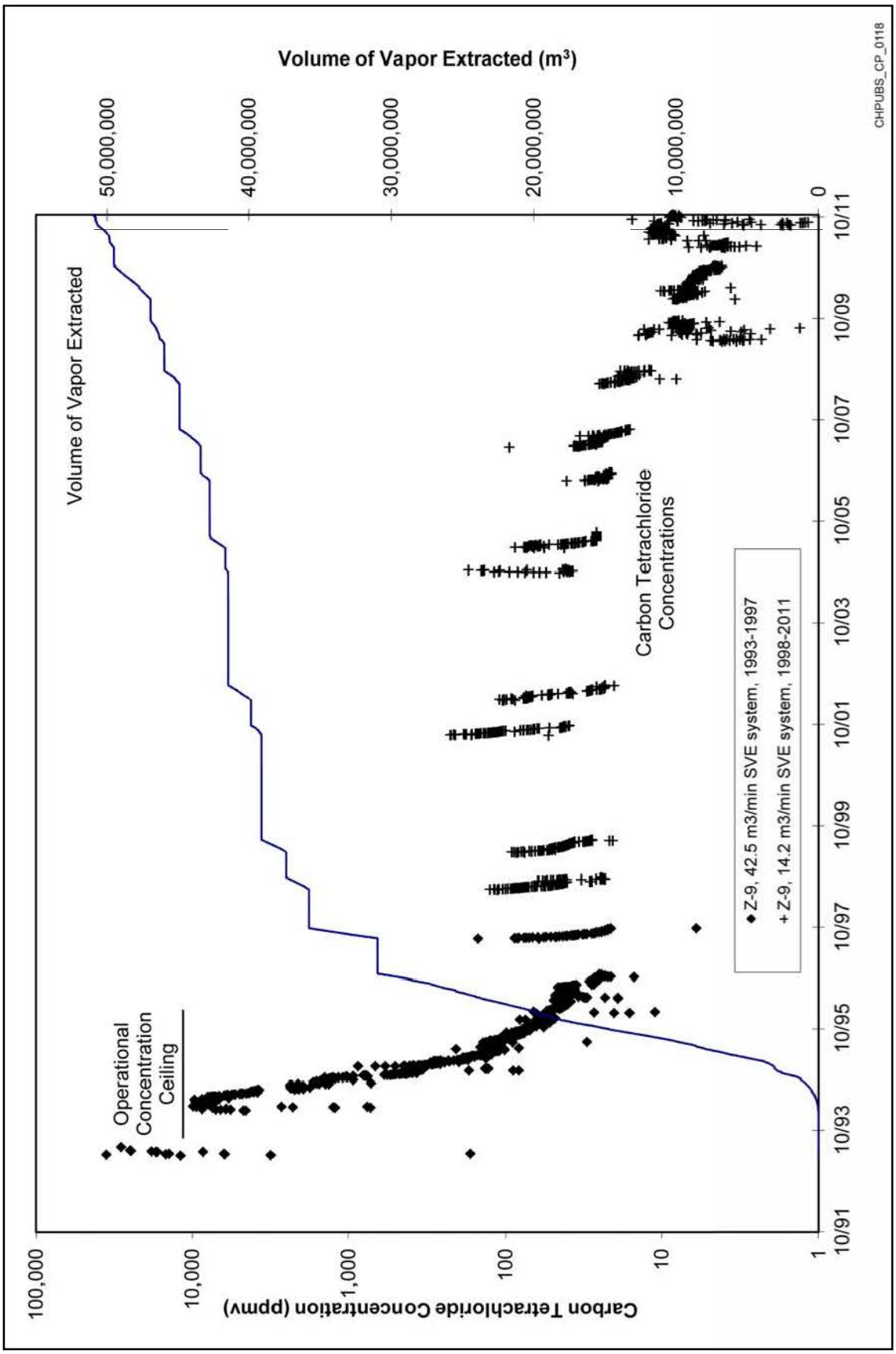


Figure 2-2. Daily Carbon Tetrachloride Concentrations at the 216-Z-9 Site, 1993 through 2011

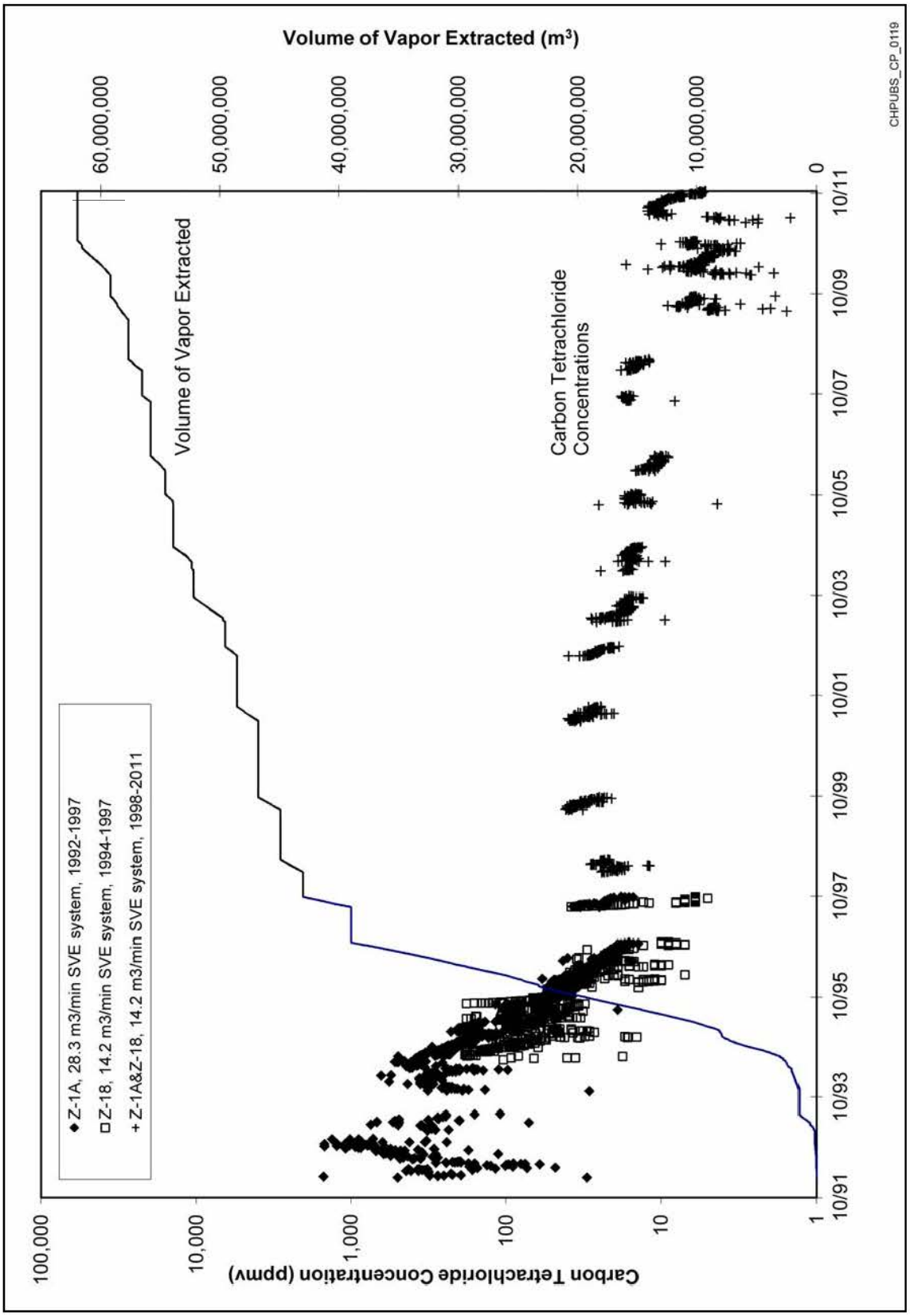


Figure 2-3. Daily Carbon Tetrachloride Concentrations at the 216-Z-1A/216-Z-18/216-Z-12 Site, 1992 through 2011

In 2011, carbon tetrachloride concentrations at both sites increased to approximately the maximum values during the tenth week of operation (early May). At the 216-Z-1A site, the concentration declined to approximately 5 to 6 ppmv by the end of 2011 extraction operations (Figure 2-4). At the 216-Z-9 site, the concentration declined to approximately 8 to 9 ppmv by the end of 2011 extraction operations (Figure 2-5).

Figure 2-6 (216-Z-9 site) and Figure 2-7 (216-Z-1A site) illustrate carbon tetrachloride concentrations measured during each SVE operating period since cyclic operations began in 1997. These figures show that initial concentrations following the inactive (rebound) period declined over the years. Although initial concentrations at the 216-Z-9 site have been much higher than at the 216-Z-1A site, tailing concentrations at the end of the extraction operating periods are similar in magnitude.

2.3.2 Volume of Soil Vapor Treated

For each SVE system, the volume of soil vapor processed was calculated using the hours that the system operated and the measured flow rates. The flow rate measured at the SVE system represents the combined flow from all online wells and changes as the selection of online wells changes. For a given applied vacuum, the flow produced from each well is a function of the air permeability of the soil, open area of the screened or perforated interval, and well diameter.

During 2011 operations, 3.7 million m^3 of extracted vapor were treated. Of that total, 2.2 million m^3 were extracted from 216-Z-1A at an average flow rate of 8.3 m^3/min (294.1 ft^3/min), and 1.5 million m^3 were extracted from 216-Z-9 at an average flow rate of 5.9 m^3/min (207 ft^3/min). Between April 1991 (pilot test) and October 2011, 115.2 million m^3 of soil vapor were extracted and treated. Of this total volume, 51.0 million m^3 were extracted from the 216-Z-9 well field and 64.2 million m^3 were extracted from the 216-Z-1A/216-Z-18/216-Z-12 well field.

The flow rates at individual extraction wells were estimated by apportioning the flow rates measured at the SVE systems among the online wells (Appendix A of BHI-00720, *Performance Evaluation Report for Soil Vapor Extraction Operations at the Carbon Tetrachloride Site, February 1992 – September 2001*). To estimate the flow rate at each well on each day of operation, the system flow rate was multiplied by the ratio of the open area of the well to the sum of the open areas for all of the wells operating on that system on that particular day. The daily flow rates and the number of operating hours were then used to estimate the cumulative flow from each extraction well. At the 216-Z-9 well field, an estimated 33.9 million m^3 of soil vapor was extracted from wells open above the CCU (Table 2-2), and 17.1 million m^3 of soil vapor were extracted from wells open below the CCU (Table 2-3). For the 216-Z-1A/216-Z-18/216-Z-12 well field, an estimated 43.7 million m^3 of soil vapor was extracted from wells open above the CCU (Table 2-2), and 20.5 million m^3 was extracted from wells open below the CCU (Table 2-3).

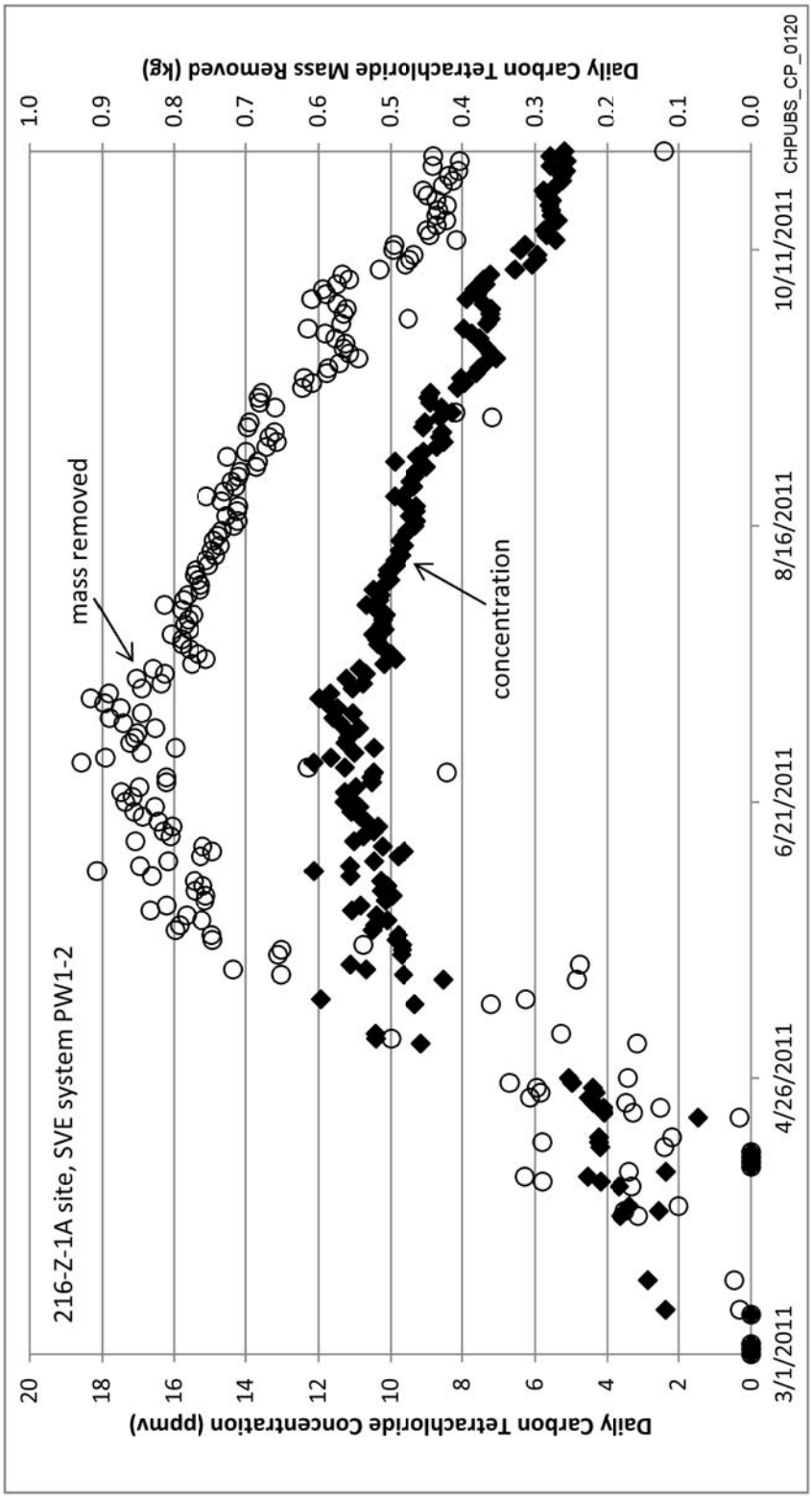


Figure 2-4. Daily Carbon Tetrachloride Concentration and Mass Removed, 216-Z-1A/216-Z-18 Site, 2011

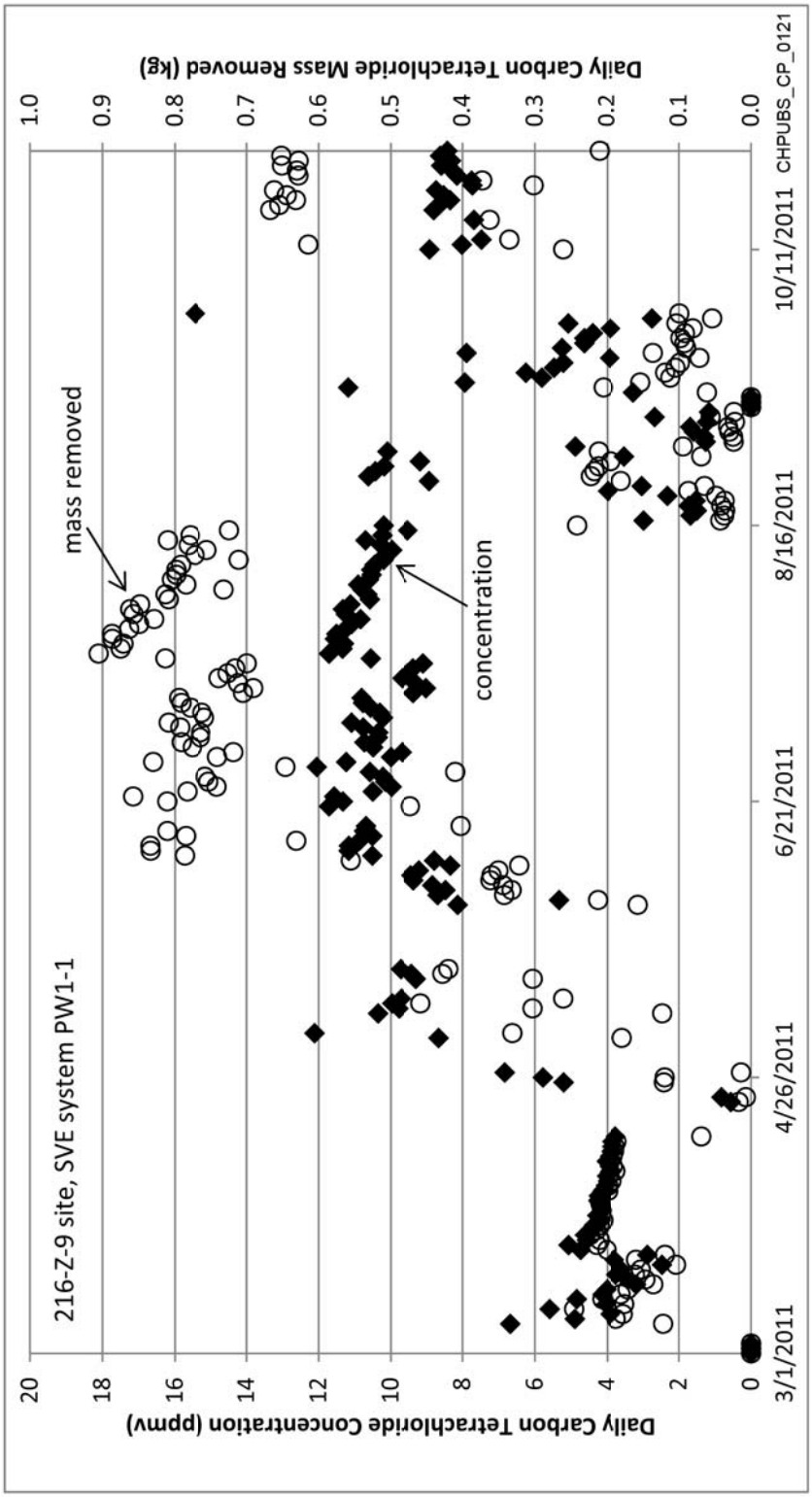


Figure 2-5. Daily Carbon Tetrachloride Concentration and Mass Removed, 216-Z-9 Site, 2011

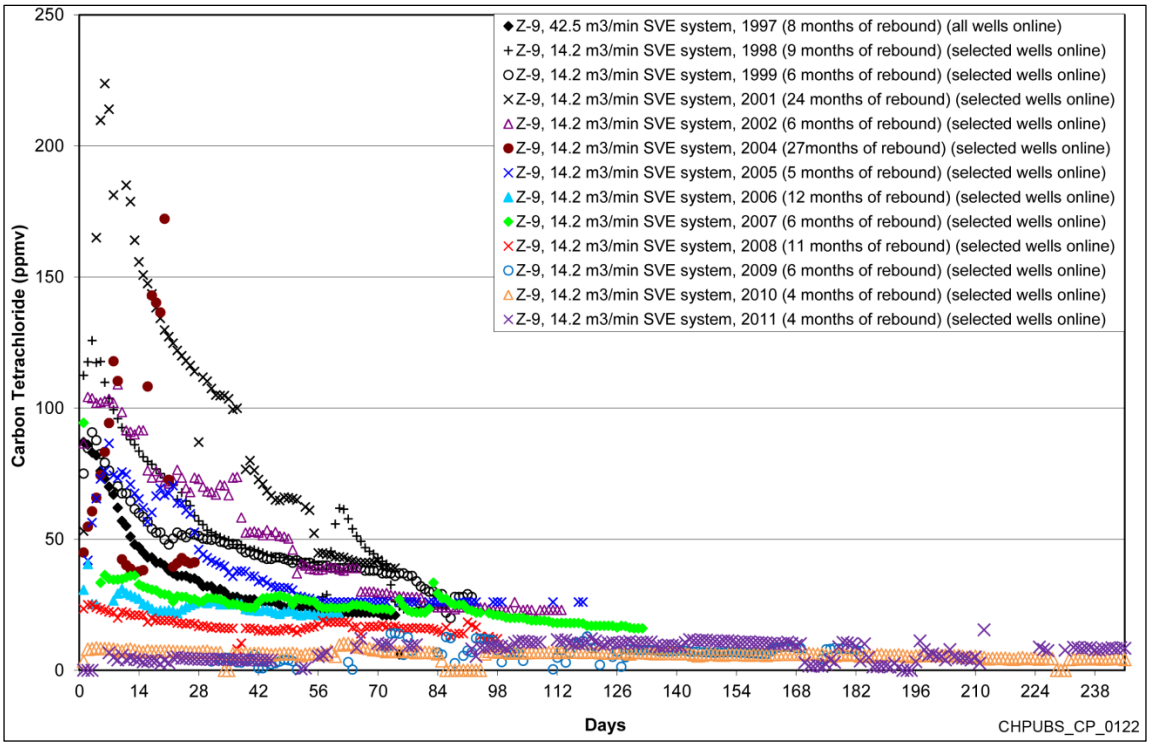


Figure 2-6. Carbon Tetrachloride Concentrations in Vapor Extracted from the 216-Z-9 Site, 1997 through 2011

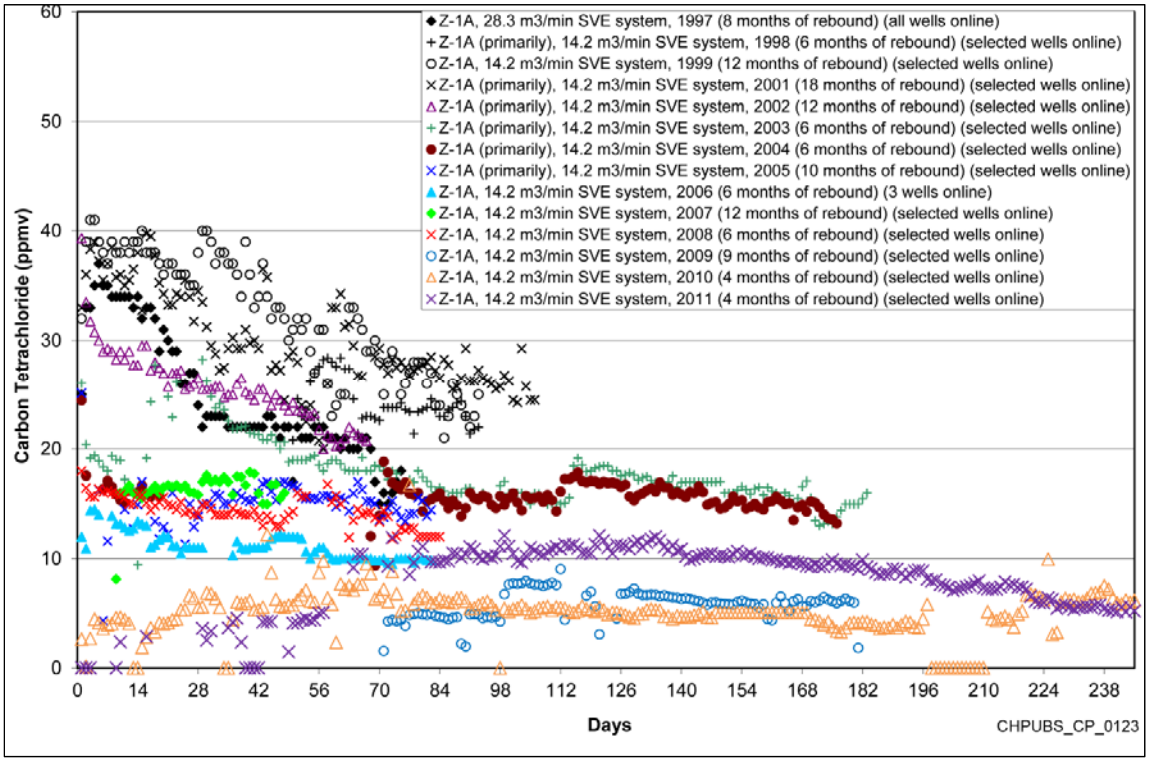


Figure 2-7. Carbon Tetrachloride Concentrations in Vapor Extracted from the 216-Z-1A Site, 1997 through 2011

Table 2-2. Volume of Vapor Extracted from Each Extraction Well above the Cold Creek Unit, April 1991 through October 2011

216-Z-9 Wells, March 1993 to October 2011	Extracted Vapor (1,000 m^3)	216-Z-18/ 216-Z-12 Wells, February 1992 to October 2011	Extracted Vapor (1,000 m^3)	216-Z-1A Wells, April 1991 to October 2011	Extracted Vapor (1,000 m^3)
299-W15-6U	150	299-W18-10U	660	299-W18-6U	190
299-W15-8U	300	299-W18-93	10	299-W18-87L	40
299-W15-9U	1,520	299-W18-94	0	299-W18-87M	20
299-W15-48	1,190	299-W18-96	450	299-W18-87U	40
299-W15-82	6,720	299-W18-97	230	299-W18-89	9,910
299-W15-84U	2,580	299-W18-98	0	299-W18-150L	260
299-W15-85	2,690	299-W18-99	160	299-W18-150M	40
299-W15-95U	1,030	299-W18-152	1,770	299-W18-150U	40
299-W15-216U	610	299-W18-153	480	299-W18-158L	230
299-W15-217	6,770	299-W18-246U	780	299-W18-158M	0
299-W15-218U	3,530	299-W18-249	1,170	299-W18-158U	820
299-W15-219U	2,870	299-W18-252U	1,290	299-W18-159	950
299-W15-220U	2,150	—	—	299-W18-163L	210
299-W15-223	1,680	—	—	299-W18-163M	10
C4937	30	—	—	299-W18-163U	520
C4938	30	—	—	299-W18-165	3,240
C5340	30	—	—	299-W18-166	1,990
CPT-21	20	—	—	299-W18-167	2,600
—	—	—	—	299-W18-168	2,650
—	—	—	—	299-W18-169	150
—	—	—	—	299-W18-171L	500
—	—	—	—	299-W18-171M	390
—	—	—	—	299-W18-171U	460
—	—	—	—	299-W18-174	6,500
—	—	—	—	299-W18-175	580
—	—	—	—	299-W18-248	3,590
—	—	—	—	299-W18-253	710
Total	**33,890**	**Total**	**7,010**	**Total**	**36,650**

Note: To convert cubic meters to cubic feet, multiply by 35.315.

Since system startup, 81 pore volumes of soil vapor have been extracted by the SVE systems above the CCU in the 216-Z-9 area based on an average lateral zone of influence of 55,000 m^2 (592,000 ft^2) above the CCU in the 216-Z-9 area, an average Hanford formation thickness of 38 m (125 ft), an average porosity of 20 percent; and an assumed uniform distribution of flow. Similarly, for the 216-Z-1A/ 216-Z-18/216-Z-12 area, based on an average lateral zone of influence of 155,000 m^2 (1,668,000 ft^2), 37 pore volumes of soil vapor have been extracted by the SVE systems above the CCU.

Based on an average lateral zone of influence of 40,000 m^2 (431,000 ft^2) below the CCU in the 216-Z-9 area, an average Ringold Formation unit E thickness of 21 m (69 ft) in the unsaturated zone, an average porosity of 20 percent, and an assumed uniform distribution of flow, 102 pore volumes of soil vapor have been extracted by the SVE systems below the CCU. Similarly, for the 216-Z-1A/216-Z-18/216-Z-12 site, based on an average lateral zone of influence of 100,000 m^2 (1,076,000 ft^2), 49 pore volumes of soil vapor have been extracted by the SVE systems below the CCU.

Table 2-3. Volume of Vapor Extracted from Each Extraction Well below the Cold Creek Unit, April 1991 through October 2011

216-Z-9 Wells, March 1993 to October 2011	Extracted Vapor (1,000 m^3)	216-Z-18/ 216-Z-12 Wells, February 1992 to October 2011	Extracted Vapor (1,000 m^3)	216-Z-1A Wells, April 1991 to October 2011	Extracted Vapor (1,000 m^3)
299-W15-6L	2,430	299-W18-10L*	2,720	299-W18-6L*	2,360
299-W15-8L	240	299-W18-11L*	240	299-W18-7*	8,880
299-W15-9L	1,780	299-W18-12*	1,040	—	—
299-W15-32	390	299-W18-246L*	1,650	—	—
299-W15-84L	320	299-W18-252L*	3,650	—	—
299-W15-86	1,270	—	—	—	—
299-W15-95L	870	—	—	—	—
299-W15-216L	1,210	—	—	—	—
299-W15-218L	4,090	—	—	—	—
299-W15-219L	2,900	—	—	—	—
299-W15-220L	1,570	—	—	—	—
Total	**17,090**	**Total**	**9,290**	**Total**	**11,240**

Note: To convert cubic meters to cubic feet, multiply by 35.315.

* Based on soil vapor extraction using the active soil vapor extraction systems; the volume of vapor extracted using the passive soil vapor extraction systems is not included.

2.3.3 Carbon Tetrachloride Mass Removed

The mass of carbon tetrachloride removed from each well field was calculated using the measured flow, concentration, and hours of operation data (Appendix B). In 2011, approximately 195 kg (430 lb) of carbon tetrachloride were removed from the vadose zone using the SVE systems. Of that total,

approximately 75 kg (165 lb) of carbon tetrachloride was removed from the 216-Z-9 site and 120 kg (265 lb) were removed from the 216-Z-1A site (Table 2-1).

Between April 1991 (when the pilot test was conducted) and October 2011, approximately 79,945 kg (176,247 lb) of carbon tetrachloride was removed from the vadose zone. Of that total, 54,887 kg (121,004 lb) was removed from the 216-Z-9 well field and 25,057 kg (55,241 lb) was removed from 216-Z-1A/216-Z-18/216-Z-12 well field (Table 2-1).

Carbon tetrachloride removal rates decreased significantly between SVE startup and October 2011 (Figures 2-8 and 2-9; Table 2-1). Some of the variability in mass removed each year during cyclic operations (i.e.,1998 through 2011) is attributed to length of time for rebound, duration of SVE operations, and/or location and number of wells used for extraction. However, mass removal rates are expected to decline as extraction continues and contaminant mass is removed from the subsurface.

The SVE system efficiencies were evaluated for 1998 through 2011 by comparing the mass of carbon tetrachloride removed per volume of vapor extracted from the vadose zone (Table 2-1). At both the 216-Z-9 and 216-Z-1A sites, SVE system efficiencies decreased during the 14 years of cyclic operations (Figure 2-10). The two significant increases in SVE efficiency at the 216-Z-9 site occurred during extraction following extended periods of rebound.

Carbon tetrachloride concentrations were monitored at the eight passive wells in 2011 (Appendix D). These monthly concentrations were used to calculate the mass removed from each well. This calculation assumes the following.

- The wells exhale 50 percent of the time
- During outflow, the average flow rate is one-half of the maximum flow rate
- During outflow, the average concentration is one-half of the maximum concentration
- The concentrations measured each month were maximum values

The maximum flow values were the same as those used in the 2001 calculation (BHI-00720).

The mass of carbon tetrachloride removed using the eight passive SVE wells in 2011 is estimated to be approximately 4 kg (9 lb) (Table 2-4).

2.3.4 System Operation Downtime

The availability of each SVE system is evaluated by comparing the amount of actual operating time to the potential amount of operating time (scheduled outages are excluded from this calculation). Because system operation is most difficult to maintain during the winter months, temporary suspension of operation has continued each winter since 1998. This practice also allows a rebound period each year for concentrations to increase in the vapor phase in the higher flow zones.

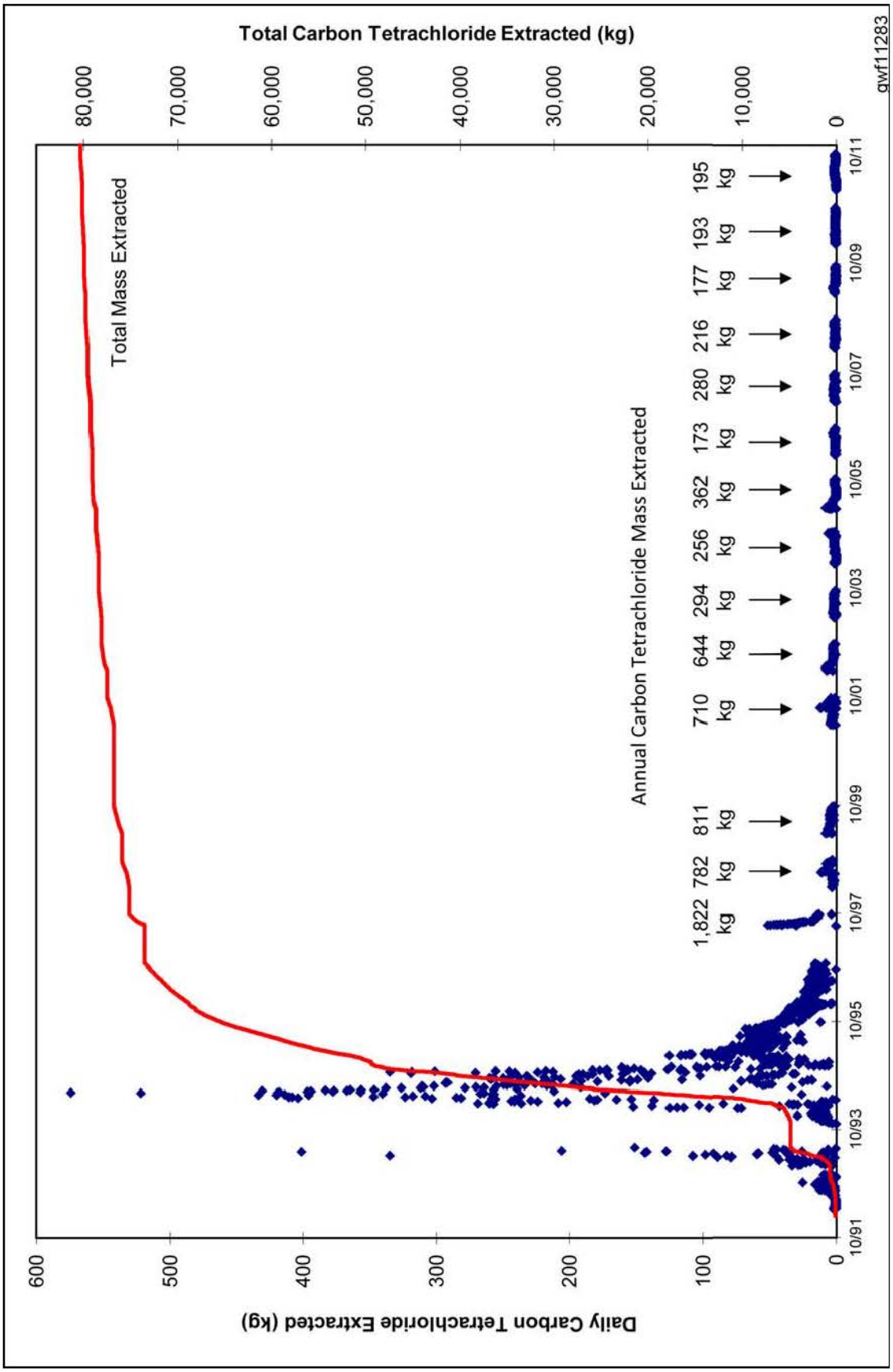


Figure 2-8. Daily Carbon Tetrachloride Mass Extracted, 1992 through 2011

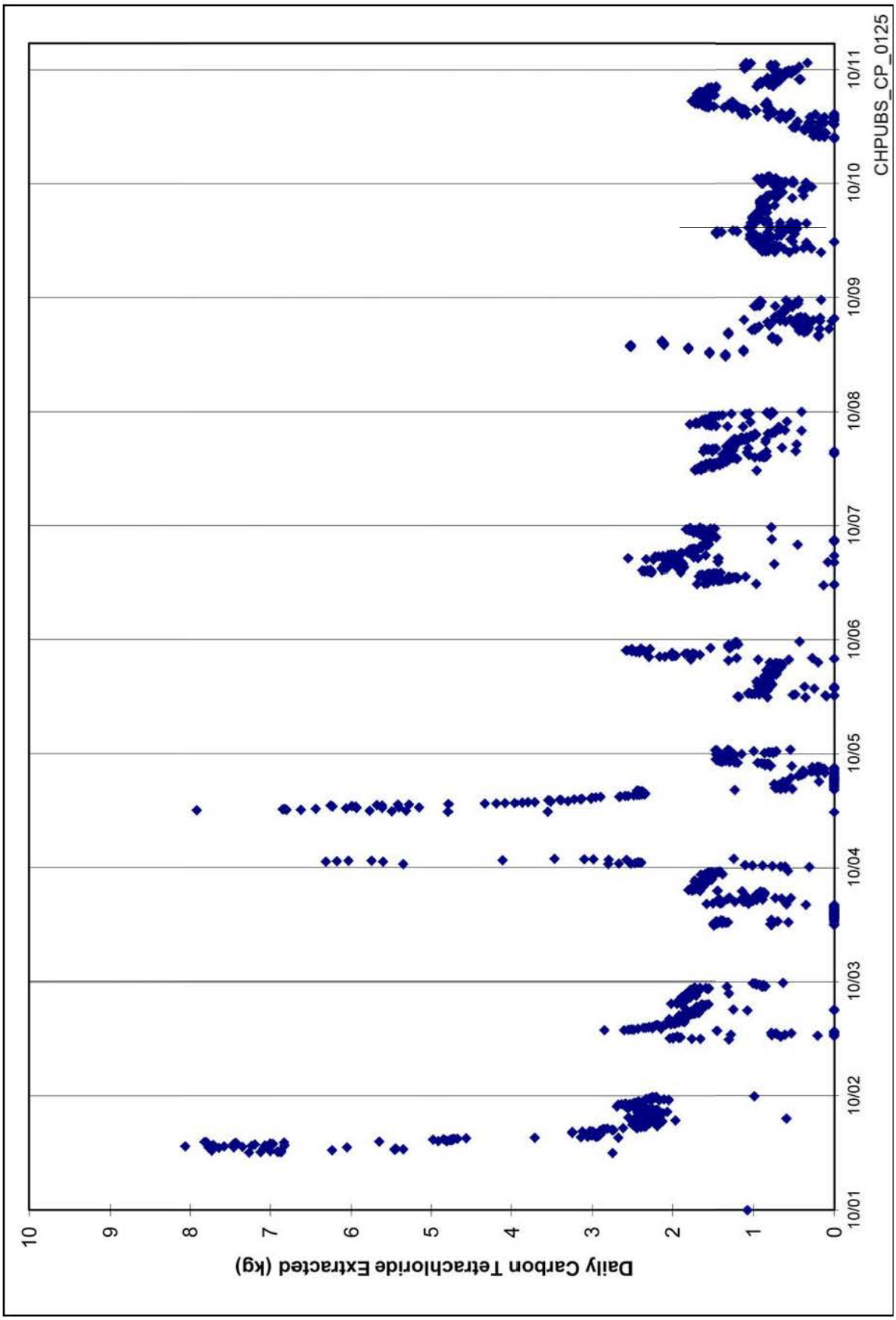
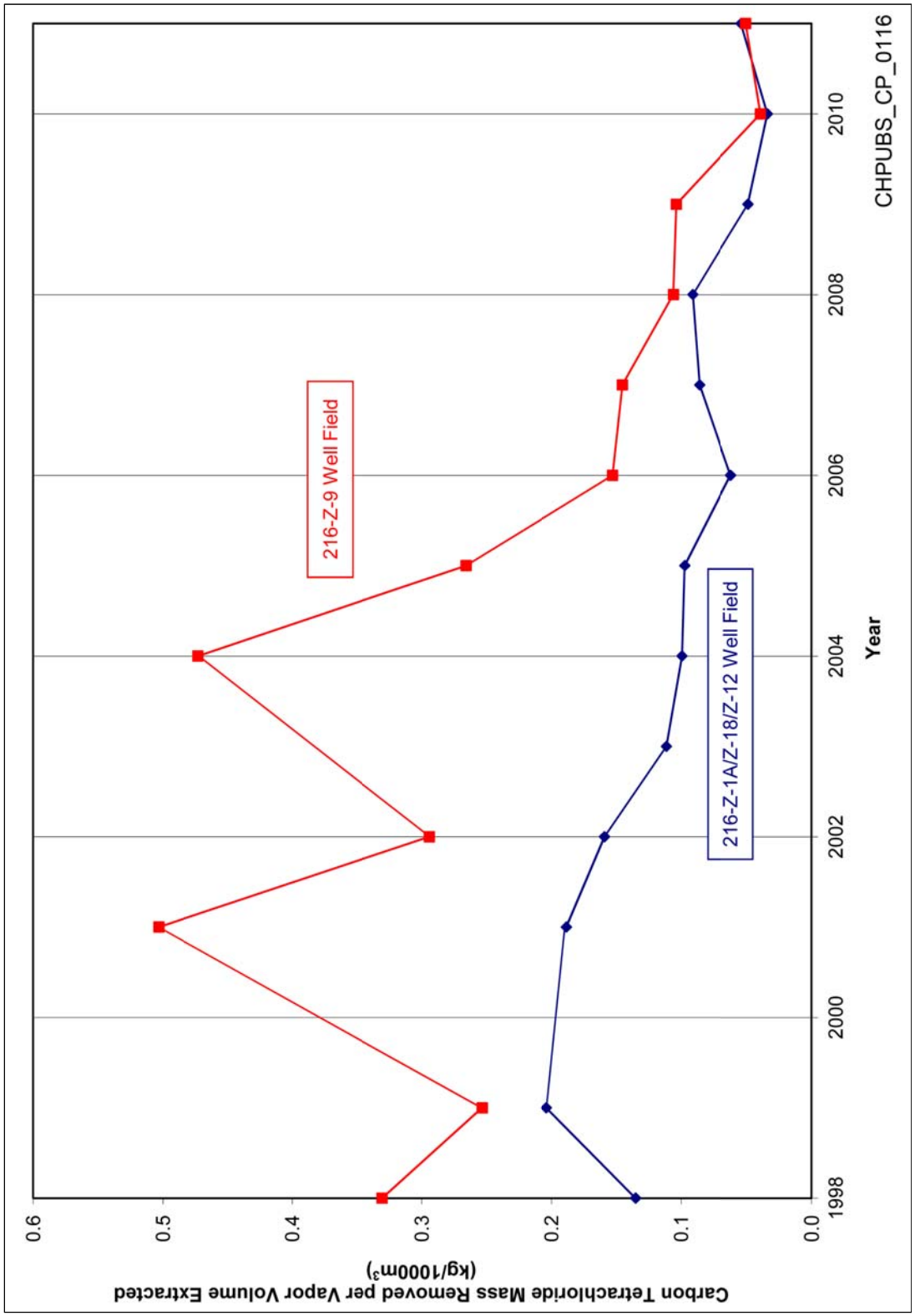


Figure 2-9. Daily Carbon Tetrachloride Mass Extracted, 2002 through 2011



Notes: The soil vapor extraction system was offline in 2000.
Extraction was not conducted at the 216-Z-9 well field in 2003 due to site characterization activities.

Figure 2-10. Carbon Tetrachloride Mass Removed per Volume of Vapor Recovered from the Vadose Zone, 1998 through 2011

Table 2-4. Carbon Tetrachloride Mass Removed Using Passive Soil Vapor Extraction

Well	Carbon Tetrachloride Mass Removed Each Year (kg)										
	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	CY 2010*	CY 2011
299-W18-6L	7.5	4.3	2.8	3.0	2.9	0.5	1.0	1.1	0.6	0.7	0.9
299-W18-7	2.5	2.5	3.8	3.5	2.4	2.0	2.1	2.1	1.5	1.7	0.9
299-W18-10L	0.9	0.6	0.9	0.8	0.6	1.0	0.6	0.7	0.7	0.7	0.5
299-W18-11L	1.1	0.7	0.9	0	0.4	0.4	0.2	0.3	0.3	0.2	0.2
299-W18-12	2.5	0.7	1.2	1.6	0.5	0.3	0.4	0.1	0.2	0.2	0.5
299-W18-246L	1.7	0.4	1.5	2.3	1.4	0.1	0.5	0.5	0.5	0.6	0.7
299-W18-247L	0.7	0.4	0.5	0.4	0.4	0.2	0.2	0.2	0.2	0.1	0.1
299-W18-252L	2.8	1.6	1.7	1.6	0.9	0	0.3	0.4	0.5	0.1	0.1
Yearly Total	**20**	**11**	**13**	**13**	**9**	**5**	**5**	**5**	**4**	**4**	**4**
Cumulative Total	**30**	**41**	**54**	**67**	**77**	**81**	**86**	**91**	**96**	**100**	**104**

Note: To convert kilograms to pounds, multiply by 2.2046.

* Includes mass removed in October through December 2009.

Table 2-5 summarizes the availability of the SVE systems during 2011.

Table 2-5. Soil Vapor Extraction System Availability, 2011

216-Z-9 SVE System Availability (Percent)		Month	216-Z-1A SVE System Availability (Percent)		Month
Average	72	March through October	Average	76	March through October
Minimum	22	May	Minimum	9	March
Maximum	100	July	Maximum	100	July, August, October

2.4 Treatability Test

Recent research associated with vadose zone transport processes for chlorinated organics (e.g., carbon tetrachloride) has provided a basis to examine the flux of vadose zone contaminants across the water table under conditions relevant to the 200-PW-1 OU ("Estimating Persistent Mass Flux of Volatile Contaminants from the Vadose Zone to Ground Water" [Truex et al., 2009]). Additionally, the data set from operation of the 14.2 m^3/min (500 ft^3/min) SVE system in a cyclic mode (e.g., on for six months and off for six months), from 1997 through 2008, is being analyzed to estimate the contaminant mass flux of carbon tetrachloride remaining within the vadose zone (e.g., release of carbon tetrachloride from sorbed phases into the vapor phase where it can transport to the groundwater) and how this mass flux changed over time. Using this analysis, an estimate of vadose zone contaminant mass flux can be applied using an approach based on the method described in Truex et al. (2009) to evaluate the future impact of the remaining vadose zone contamination on the groundwater at the Hanford Site. This analysis is anticipated

to provide the following results, which will be used to assess soil vapor contamination in terms of protection of groundwater:

- Documentation of the decline in SVE mass extraction in a way that can be used to predict likely future carbon tetrachloride extraction given the same operating strategy
- An estimate of how the current carbon tetrachloride contamination in the vadose zone is impacting the groundwater
- Proposal of a technically defensible strategy for determining when the SVE remediation can be discontinued without future impact of vadose zone carbon tetrachloride contamination on the ability to reach groundwater cleanup goals.

During 2011, a treatability test was conducted at the 216-Z-9 site to refine the conceptual site model of the location of the remaining carbon tetrachloride in the vadose zone, in accordance with the treatability test plan (DOE/RL-2010-79, *Treatability Test Plan for Characterization of Vadose Zone Carbon Tetrachloride Source Strength Using Tomographic Methods at the 216-Z-9 Site*). The results of the test and details of the data collection activities will be provided in a separate report.

3 Soil Vapor Monitoring

Nonoperational soil vapor monitoring data are collected at wells and probes that are not directly connected to the SVE systems. The objectives of monitoring the nonoperational wells and probes are as follows:

- To measure carbon tetrachloride concentrations and trends near the vadose/atmosphere and vadose/groundwater interfaces to evaluate whether nonoperation of the SVE systems is negatively impacting the atmosphere or groundwater.
- To be cognizant of carbon tetrachloride concentrations and trends near the CCU to provide an indication of concentrations that can be expected during restart of SVE operations and to support selection of online wells.

For each well field, the period of rebound begins when SVE operations are temporarily suspended.

Carbon tetrachloride concentrations rebound during periods of nonoperation as a result of carbon tetrachloride accumulating in the pore spaces after apparent diffusion from sediment micropores, soil moisture, residual dense nonaqueous phase liquid (DNAPL), and/or low-permeability zones. When operations resume, initial extracted carbon tetrachloride concentrations are higher than the carbon tetrachloride concentrations at the previous shutdown. The initial concentrations typically are lower than the initial concentrations following previous periods of rebound. However, the nonoperational duration for each well field varies from year to year, which also affects the rebound concentrations.

Soil vapor monitoring at offline wells and probes was conducted during 2011 using sampling methods similar to those developed for the rebound study in 1997 (BHI-01105). A low-flow (0.8 L/min [0.2 gal/min]) sampling pump was used to draw soil vapor samples from wells and probes into a 1 L (0.3 gal) Tedlar® bag for analysis using a Brüel & Kjaer™ (B&K) multi-gas monitor. Two purge volumes were drawn before the representative sample was collected. At the wells, a tube was lowered to the target depth where the casing is perforated to minimize the volume of air to be purged. A metal filter attached to the end of the tube also served as a weight. Each well, equipped with a sampling tube, remained sealed at the well head throughout the monitoring period and allowed access to the sampling tubes in the wells.

Soil vapor samples were collected monthly from approximately 30 offline probes and wells, including the 8 passive SVE wells. As in previous years, soil vapor samples were analyzed primarily to monitor for carbon tetrachloride. However, samples were also analyzed for chloroform, methylene chloride, methyl ethyl ketone, and water vapor, because the B&K multi-gas analyzer has been configured to monitor these constituents in support of routine operations. Appendix D provides the passive monitoring data for 2011; the soil vapor monitoring data for 2011 are provided in Appendix E. Both sets of data are included in the 2011 rebound data evaluation.

Based on monitoring performed during 2011, the following maximum carbon tetrachloride soil vapor concentrations were detected in the vadose zone at the 216-Z-9 and 216-Z-1A/216-Z-18 sites:

- The maximum concentration detected near the ground surface (between 2 and 10 m [7 and 33 ft] bgs) was 6 ppmv at a depth of 3 m (10 ft) in the 216-Z-9 well field (probe CPT-17).
- Near the groundwater (between 53 and 66 m [175 and 217 ft] bgs), the maximum concentration was 12 ppmv at a depth of 60 m (197 ft) bgs at the 216-Z-1A site (well 299-W18-7).

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- Near the CCU at depths ranging from 25 to 44 m (83 to 144 ft) bgs, the maximum concentration detected was 186 ppmv at a depth of 26.5 m (87 ft) (probe CPT-28), approximately 90 m (295 ft) south of the 216-Z-9 Trench. This location may be beyond the zone of influence of the SVE system. Within the 216-Z-9 well field, the maximum carbon tetrachloride concentration detected near the CCU was 123 ppmv at a depth of 26 m (86 ft) bgs (CPT-21A). At the 216-Z-1A well field, the maximum carbon tetrachloride concentration detected near the CCU was 55 ppmv at a depth of 40 m (131 ft) bgs (well 299-W18-248).
- The maximum carbon tetrachloride concentration detected in the vadose zone overlying the CCU (between 11 and 23 m [35 and 75 ft] bgs) was 54 ppmv at a depth of 20 m (65 ft) bgs on the south side of the 216-Z-9 Trench (CPT-21A). This relatively elevated carbon tetrachloride soil vapor concentration is associated with a silt layer that contained DNAPL carbon tetrachloride during initial characterization (Section 3.2 of SGW-40456, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Operable Unit Carbon Tetrachloride Site, Fiscal Year 2008*).

For each period of rebound monitoring since 1997, the maximum rebound concentrations have been associated with fine-grained layers near the source units (Figure 3-1). In most years, the fine-grained layers exhibiting significant rebound were those near the CCU. However, from 2008 through 2010, the maximum rebound concentrations were associated with the silt layer at a depth of 20 m (65.6 ft) on the south side of the 216-Z-9 Trench. The first year that this silt layer was monitored was 2008.

Because carbon tetrachloride concentrations did not increase significantly at the near-surface probes, temporarily suspending operation of the SVE systems appears to have caused minimal detectable vertical transport of carbon tetrachloride through the soil surface to the atmosphere. Because carbon tetrachloride concentrations did not increase significantly near the water table during this time, temporarily suspending operation of the SVE systems appears to have had no negative impact on groundwater quality. Soil vapor monitoring results for 2011 suggest that the fine-grained layers near the source sites are the most likely source zones for the observed carbon tetrachloride vapor.

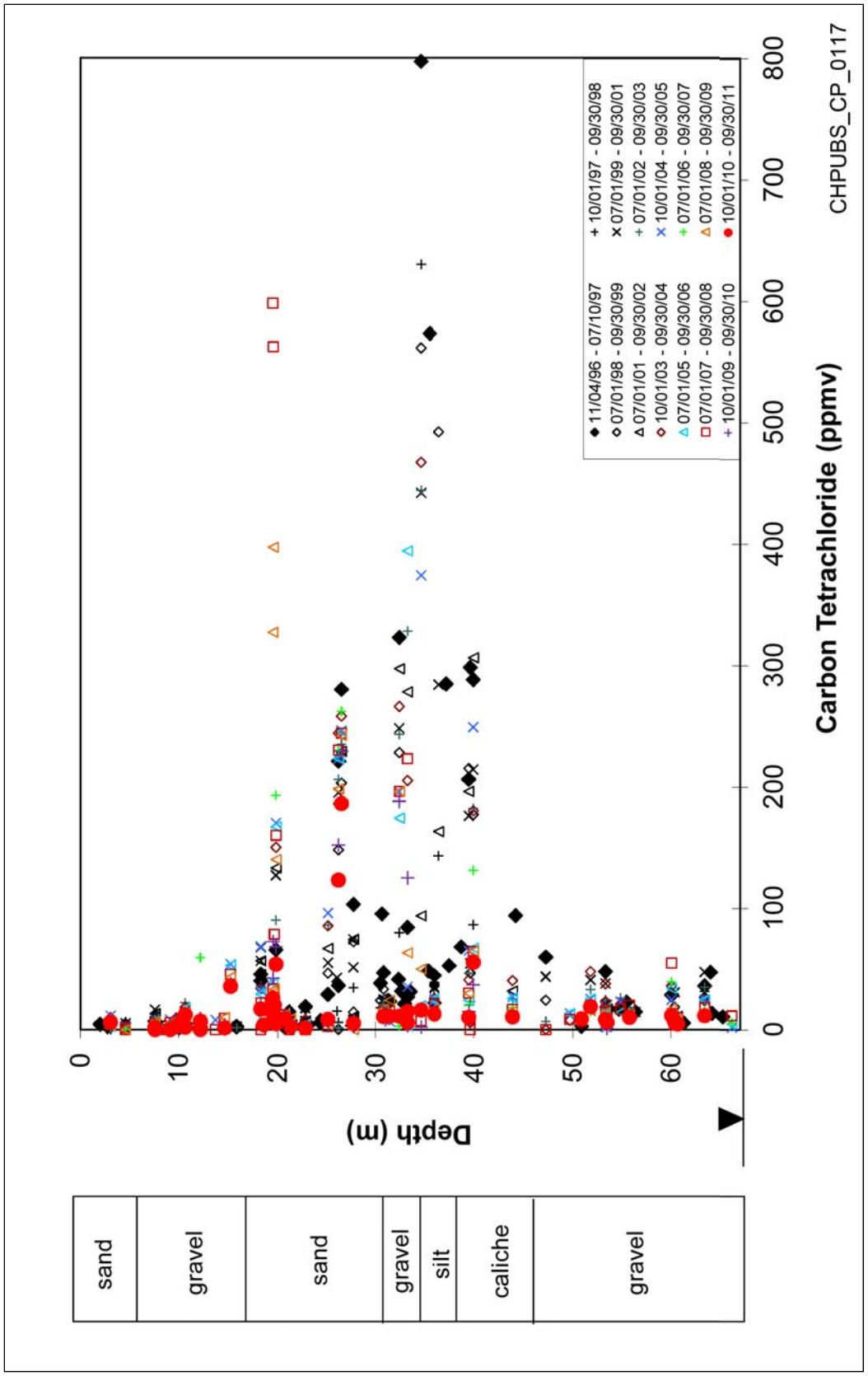

Figure 3-1. Maximum Carbon Tetrachloride Rebound Concentrations, 1997 through 2011

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4 Status of Expedited Response Action

The purpose of the expedited response action is described as follows ("Action Memorandum: Expedited Response Action Proposal for 200 West Area Carbon Tetrachloride Plume" [Smith and Stanley, 1992]):

> *The purpose of this action is to mitigate the threat to site workers, public health, and the environment caused by the migration of carbon tetrachloride vapors through the soil column and into the groundwater. The action is an interim action taken to reduce the mass of carbon tetrachloride in the soil column beneath the 200 West Area pending the final cleanup activities associated with the 200-ZP-1 and 200-ZP-2 Operable Units.*

The final ROD for the 200-PW-1 OU was issued in September 2011 (EPA, 2011). After the remedial design/remedial action work plan is approved, it will supersede the Action Memorandum.

Between 1992 and 2009, carbon tetrachloride concentrations in the upper portion of the unconfined aquifer underlying the primary carbon tetrachloride source waste sites were reduced (DOE/RL-2010-11, *Hanford Site Groundwater Monitoring and Performance Report for 2009: Volumes 1 & 2*). This reduction has likely resulted from the dual application of SVE remediation in the vadose zone and pump-and-treat remediation in the groundwater in the vicinity of the source waste sites.

An interim remedial measure pump-and-treat system is currently operating in the 200-ZP-1 OU and will continue to operate under the requirements established in the interim ROD (EPA/ROD/R10-95/114, *Record of Decision for the USDOE Hanford 200-ZP-1 Operable Unit, 200 Area NPL Site Interim Remedial Measure*) until the treatment system required by the final ROD (*Record of Decision Hanford 200 Area 200-ZP-1 Superfund Site, Benton County, Washington* [EPA et al., 2008]) becomes operational in 2012.

One objective for the pump-and-treat interim remediation is the reduction of the carbon tetrachloride groundwater concentration that is greater than 2,000 µg/L. This goal for groundwater has been met at both the 216-Z-1A and 216-Z-9 sites. Concentrations in groundwater in extraction well 299-W15-47 (near the 216-Z-9 Trench) declined from approximately 8,000 µg/L in 1997 to concentrations ranging from 770 to 1,300 µg/L in 2010, and concentrations in groundwater from well 299-W18-16 (east of the 216-Z-1A Tile Field) ranged from 160 to 240 µg/L.

The history of mass recovery using SVE at the carbon tetrachloride source cribs reflects two phases commonly observed during SVE remediation projects (e.g., Figure 2-8). The first phase is generally characterized by higher rates of mass removal while the readily available volatile contaminant is being removed from the higher permeability zones. With continued extraction, concentrations decrease more slowly as supply of the volatile contaminant becomes limited by desorption and diffusion of the contaminant from micropores and/or lower-permeability soil. In this second phase, diffusion controls contaminant migration.

Although additional carbon tetrachloride can be recovered using SVE, the rate of removal has been decreasing. The decline in the rate of removal can be attributed primarily to the following:

- Reduction in the mass of carbon tetrachloride available for extraction as a result of previous mass removal using SVE
- Diffusion-controlled contaminant migration from low-permeability sediments.

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5 Conclusions and Recommendations

This chapter presents the conclusions and recommendations for the 200-PW-1 OU SVE operations for the 2011 reporting period.

5.1 Conclusions

Operation of the SVE systems from 1991 to 2011 has resulted in the removal of 79,945 kg (176,247 lb) of carbon tetrachloride from the vadose zone underlying the primary carbon tetrachloride disposal sites. Of this total mass of carbon tetrachloride removed, 195 kg (430 lb) was removed in 2011.

During 2011, the two 14.2 m^3/min (500 ft^3/min) SVE systems that were installed and brought online in 2009 operated for 35 weeks from March through October. Removal rates decreased in recent years. Table 2-1 shows that annual recovery of carbon tetrachloride from the vadose zone by SVE ranged from 177 to 280 kg (390 to 645 lb) during the past five years. The most recent data (Figures 2-4 and 2-5) suggest that the increase of carbon tetrachloride concentration in soil vapor during rebound periods is becoming insignificant.

The passive SVE systems removed approximately 104 kg (229 lb) of carbon tetrachloride from the vadose zone between October 1999 and December 2011. Of this total mass of carbon tetrachloride removed using passive SVE systems, approximately 4 kg (9 lb) were removed during 2011. Table 2-4 shows that annual recovery of carbon tetrachloride from the vadose zone by the passive SVE systems ranged from 4 to 5 kg (9 to 11 lb) during the past five years.

5.2 Recommendations

The following actions are recommended to maximize effectiveness of SVE operations and monitoring:

- Continue operation of the passive SVE systems.
- Continue monthly monitoring.
- Consider implementing an SVE operating strategy that supports demonstration of the successful completion of remediation using SVE. For example, potential operating strategies include lengthening the periods of shutdown to allow more time for rebound of vapor concentrations and focusing SVE in targeted areas.
- Continue assessing how the current carbon tetrachloride contamination in the vadose zone is impacting the groundwater.

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6 Soil Vapor Extraction System Cost Data

Actual project costs for the 200-PW-1 OU SVE system can be used to determine labor costs associated with each specific activity over a given period of time. Table 6-1 provides the burdened costs of the following specific activities for the 200-PW-1 OU SVE system for 2011:

- **Design:** Includes environmental and operations engineering support to design activities required for SVE system upgrades, modifications, and other design documentation.
- **Operations and maintenance:** Represents facility supplies, labor, and craft supervision costs associated with operating and maintaining the equipment. It also includes costs associated with routine characterization of online wells and engineering support as required during the course of SVE system operations and periodic maintenance.
- **Performance monitoring:** Includes monthly soil vapor sampling and analysis. It also includes preparation of the annual performance evaluation report.
- **Project support:** Includes project management, planning, and other administrative support required during the course of SVE operations during 2011.
- **Waste management:** Represents the estimated cost for the management of GAC at the 200-PW-1 OU in accordance with applicable laws for suspect hazardous, toxic, and regulated wastes. Waste designation, sampling, and analysis are included.
- **Treatment system capital:** Includes additional equipment expenses incurred to support SVE operation.

Table 6-1. Costs for Operation of 200-PW-1 Operable Unit Soil Vapor Extraction Systems

Activity	Actual Costs ($1,000)						
	FY 2005	**FY 2006**	**FY 2007**	**FY 2008**	**FY 2009**	**CY 2010**	**CY 2011**
Design	50.9	41.7	20.7	16.2	54.0	62.4	61.4
Operations and maintenance	183.8	280.7	345.2	286.6	217.7	378.7	358.9
Performance monitoring	55.6	47.0	85.0	140.5	189.0	214.0	181.2
Project support	72.1	221.8	480.7	257.2	159.7	356.6	335.9
Waste management	7.9	10.5	3.7	6.7	14.7	9.6	28.0
Treatment system capital*	--	--	4.3	815.5	565.8	1,021.7	0
Totals	**370.4**	**601.6**	**939.6**	**1,522.6**	**1,201.0**	**1,045.8**	**966.1**

* Capital costs are not included in the calculation or presentation of cost per cubic meter of vapor treated or cost per gram of carbon tetrachloride removed.

Based on the 2011 costs and yearly production rates of 3.7 million m^3 of vapor treated and 195 kg (430 lb) of carbon tetrachloride removed (Table 2-1), the 2011 treatment costs equate to \$0.26/m^3 of vapor treated and \$4.95/g (\$4,954/kg) (\$2,247/lb) of carbon tetrachloride removed.

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7 Previous Evaluations of Soil Vapor Extraction Data

Detailed information on previous SVE operating periods (1992 through 2010) and on characterization data collected during the 200-PW-1 OU remedial investigation can be obtained from the following reports:

- **FY 1992 through FY 2001:** BHI-00720, *Performance Evaluation Report for Soil Vapor Extraction Operations at the Carbon Tetrachloride Site, February 1992 – September 2001*
- **FY 2002:** WMP-17869, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Carbon Tetrachloride Site, Fiscal Year 2002*
- **FY 2003:** WMP-21327, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Carbon Tetrachloride Site, Fiscal Year 2003*
- **FY 2004:** WMP-26178, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Carbon Tetrachloride Site, Fiscal Year 2004*
- **FY 2005:** WMP-30426, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Carbon Tetrachloride Site, Fiscal Year 2005*
- **FY 2006:** SGW-33746, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Operable Unit Carbon Tetrachloride Site, Fiscal Year 2006*
- **FY 2007:** SGW-37111, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Operable Unit Carbon Tetrachloride Site, Fiscal Year 2007*
- **FY 2008:** SGW-40456, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Operable Unit Carbon Tetrachloride Site, Fiscal Year 2008*
- **FY 2009:** SGW-44694, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Operable Unit Carbon Tetrachloride Site, Fiscal Year 2009*
- **CY 2010:** SGW-49388, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200-PW-1 Operable Unit Carbon Tetrachloride Site, Calendar Year 2010*
- DOE/RL-2006-51, *Remedial Investigation Report for the Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit: Includes the 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units*
- DOE/RL-2006-24, *Remedial Investigation Report for 200-ZP-1 Groundwater Operable Unit*
- DOE/RL-2006-58, *Carbon Tetrachloride Dense Non-Aqueous Phase Liquid (DNAPL) Source Term Interim Characterization Report*
- DOE/RL-2007-22, *Carbon Tetrachloride Dense Non-Aqueous Phase Liquid (DNAPL) Source Term Interim Characterization Report Addendum*

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Appendix A

Wells and Flow Rates for Each Cycle of Soil Vapor Extraction for 2011

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This appendix provides the following data for the wells and flow rates corresponding to each cycle of soil vapor extraction (SVE) during 2011 at two sites in the 200-PW-1 Operable Unit:

- Table A-1 provides a list of the wells and flow rates for SVE at the 216-Z-9 site.
- Table A-2 provides a list of the wells and flow rates for SVE at the 216-Z-1A/216-Z-18/ 216-Z-12 site.

Table A-1. Wells and Flow Rates for Soil Vapor Extraction at the 216-Z-9 Site for 2011

Start	Stop	Average Flow Rate[a] (m^3/min)	Soil Vapor Extraction Wells[b]
03/01/11	03/03/11	4.9	W15-9U, W15-9L, W15-82, W15-217
03/04/11	03/06/11	0.0	W15-9U, W15-9L, W15-82, W15-217
03/07/11	04/14/11	5.1	W15-9U, W15-9L, W15-82, W15-217
04/15/11	04/20/11	0.0	W15-9U, W15-9L, W15-82, W15-217
04/21/11	04/27/11	6.7	W15-9U, W15-9L, W15-82, W15-217
04/28/11	05/03/11	0.0	W15-9U, W15-9L, W15-82, W15-217
05/04/11	05/05/11	5.2	W15-9U, W15-9L, W15-82, W15-217
05/06/11	05/08/11	0.0	W15-9U, W15-9L, W15-82, W15-217
05/09/11	05/12/11	5.1	W15-9U, W15-9L, W15-82, W15-217
05/13/11	05/15/11	0.0	W15-9U, W15-9L, W15-82, W15-217
05/16/11	05/18/11	5.0	W15-9U, W15-9L, W15-82, W15-217
05/19/11	05/30/11	0.0	W15-9U, W15-9L, W15-82, W15-217
05/31/11	06/08/11	4.3	W15-9U, W15-9L, W15-82, W15-217
06/09/11	06/16/11	7.9	W15-9U, W15-9L, W15-82, W15-217, W15-48, W15-84U, W15-84L, W15-86, W15-218U, W15-218L
06/17/11	06/19/11	0.0	W15-9U, W15-9L, W15-82, W15-217, W15-48, W15-84U, W15-84L, W15-86, W15-218U, W15-218L
06/20/11	07/12/11	8.2	W15-9U, W15-9L, W15-82, W15-217, W15-48, W15-84U, W15-84L, W15-86, W15-218U, W15-218L
07/13/11	08/16/11	8.4	W15-9U, W15-9L, W15-82, W15-217, W15-48, W15-84U, W15-84L, W15-86, W15-218U, W15-218L, W15-8U, W15-8L, W15-32, W15-85, W15-95U, W15-216U, W15-216L, W15-219U, W15-219L, W15-220U, W15-220L, W15-223, W15-95L, C4937
08/17/11	08/17/11	2.5	W15-9U
08/18/11	08/21/11	2.6	W15-8L
08/22/11	08/22/11	2.4	W15-84U
08/23/11	08/23/11	2.5	W15-219L
08/24/11	08/24/11	2.4	W15-95U
08/25/11	08/28/11	2.3	W15-95L
08/29/11	08/29/11	2.4	W15-48

Table A-1. Wells and Flow Rates for Soil Vapor Extraction at the 216-Z-9 Site for 2011

Start	Stop	Average Flow Rate[a] (m^3/min)	Soil Vapor Extraction Wells[b]
08/30/11	08/30/11	2.3	W15-85
08/31/11	08/31/11	2.5	W15-86
09/01/11	09/05/11	2.1	W15-218U
09/06/11	09/06/11	2.2	W15-216L
09/07/11	09/07/11	2.4	W15-218L
09/08/11	09/11/11	2.3	W15-82
09/12/11	09/12/11	2.1	W15-32
09/13/11	09/13/11	2.1	W15-86
09/14/11	09/14/11	2.3	W15-84L
09/15/11	09/18/11	2.1	W15-8U
09/19/11	09/19/11	2.2	W15-220L
09/20/11	09/20/11	1.9	W15-217
09/21/11	09/21/11	2.1	W15-216U
09/22/11	09/25/11	2.3	W15-223
09/26/11	09/26/11	2.3	W15-220U
09/27/11	09/27/11	2.1	W15-219U
09/28/11	09/28/11	2.0	W15-9U, W15-82, W15-217, W15-48, W15-84U, W15-84L, W15-86, W15-218U, W15-218L, W15-8U, W15-8L, W15-32, W15-85, W15-95U, W15-216U, W15-216L, W15-219U, W15-219L, W15-220U, W15-220L, W15-223, W15-95L
09/29/11	10/10/11	0.0	W15-9U, W15-9L, W15-82, W15-217, W15-48, W15-84U, W15-84L, W15-86, W15-218U, W15-218L, W15-8U, W15-8L, W15-32, W15-85, W15-95U, W15-216U, W15-216L, W15-219U, W15-219L, W15-220U, W15-220L, W15-223, W15-95L, C4937
10/11/11	10/13/11	8.4	W15-9U, W15-9L, W15-82, W15-217, W15-48, W15-84U, W15-84L, W15-86, W15-218U, W15-218L, W15-8U, W15-8L, W15-32, W15-85, W15-95U, W15-216U, W15-216L, W15-219U, W15-219L, W15-220U, W15-220L, W15-223, W15-95L, C4937
10/14/11	10/16/11	0.0	W15-9U, W15-9L, W15-82, W15-217, W15-48, W15-84U, W15-84L, W15-86, W15-218U, W15-218L, W15-8U, W15-8L, W15-32, W15-85, W15-95U, W15-216U, W15-216L, W15-219U, W15-219L, W15-220U, W15-220L, W15-223, W15-95L, C4937

Table A-1. Wells and Flow Rates for Soil Vapor Extraction at the 216-Z-9 Site for 2011

Start	Stop	Average Flow Rate[a] (m^3/min)	Soil Vapor Extraction Wells[b]
10/17/11	10/31/11	8.4	W15-9U, W15-9L, W15-82, W15-217, W15-48, W15-84U, W15-84L, W15-86, W15-218U, W15-218L, W15-8U, W15-8L, W15-32, W15-85, W15-95U, W15-216U, W15-216L, W15-219U, W15-219L, W15-220U, W15-220L, W15-223, W15-95L, C4937
03/01/11	10/31/11	5.8	W15-9U, W15-9L, W15-82, W15-217, W15-48, W15-84U, W15-84L, W15-86, W15-218U, W15-218L, W15-8U, W15-8L, W15-32, W15-85, W15-95U, W15-216U, W15-216L, W15-219U, W15-219L, W15-220U, W15-220L, W15-223, W15-95L, C4937

Note: To convert cubic meters to cubic feet, multiply by 35.315.

a. System downtimes of less than two days are included in the calculation of the average flow rate. System downtimes of two days or more are shown as intervals with an average flow rate of 0.0 m^3/min.

b. All soil vapor extraction well names are prefixed by "299-." Well name suffixes (L ["lower"] and U ["upper"]) are informal designations used in this report to identify multiple screens or perforated intervals in the same well.

Table A-2. Wells and Flow Rates for Soil Vapor Extraction at the 216-Z-1A/216-Z-18/216-Z-12 for 2011

Start	Stop	Average Flow Rate[a] (m^3/min)	Soil Vapor Extraction Wells[b]
03/01/11	03/03/11	5.6	W18-165, W18-166, W18-167, W18-168, W18-174
03/04/11	03/08/11	0.0	W18-165, W18-166, W18-167, W18-168, W18-174
03/09/11	03/10/11	5.3	W18-165, W18-166, W18-167, W18-168, W18-174
03/11/11	03/15/11	0.0	W18-165, W18-166, W18-167, W18-168, W18-174
03/16/11	06/16/11	5.4	W18-165, W18-166, W18-167, W18-168, W18-174
03/17/11	03/28/11	0.0	W18-165, W18-166, W18-167, W18-168, W18-174
03/29/11	03/31/11	7.6	W18-165, W18-166, W18-167, W18-168, W18-174
04/01/11	04/03/11	0.0	W18-165, W18-166, W18-167, W18-168, W18-174
04/04/11	04/14/11	7.9	W18-165, W18-166, W18-167, W18-168, W18-174
04/15/11	04/17/11	0.0	W18-165, W18-166, W18-167, W18-168, W18-174
04/18/11	04/26/11	7.4	W18-165, W18-166, W18-167, W18-168, W18-174
04/27/11	05/02/11	0.0	W18-165, W18-166, W18-167, W18-168, W18-174
05/03/11	05/05/11	7.3	W18-165, W18-166, W18-167, W18-168, W18-174
05/06/11	05/10/11	0.0	W18-165, W18-166, W18-167, W18-168, W18-174
05/11/11	05/12/11	7.3	W18-165, W18-166, W18-167, W18-168, W18-174
05/13/11	05/15/11	0.0	W18-165, W18-166, W18-167, W18-168, W18-174
05/16/11	06/08/11	8.0	W18-165, W18-166, W18-167, W18-168, W18-174
06/09/11	10/31/11	8.5	W18-165, W18-166, W18-167, W18-168, W18-174, W18-89, W18-249, W18-253
03/01/11	10/31/11	8.2	W18-165, W18-166, W18-167, W18-168, W18-174, W18-89, W18-249, W18-253

Note: To convert cubic meters to cubic feet, multiply by 35.315.

a. System downtimes of less than two days are included in the calculation of the average flow rate. System downtimes of two days or more are shown as intervals with an average flow rate of 0.0 m^3/min.

b. All soil vapor extraction well names are prefixed by "299-." Well name suffixes (L ["lower"] and U ["upper"]) are informal designations used in this report to identify multiple screens or perforated intervals in the same well.

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Appendix B

Daily Soil Vapor Extraction Data for 2011

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This appendix provides the daily data for 2011 soil vapor extraction operations for the following 200-PW-1 Operable Unit sites:

- Table B-1 for the 216-Z-9 site
- Table B-2 for the 216-Z-1A/216-Z-18/216-Z-12 site

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
3/1/2011	0.0	8.0	8.0	4,913.2	2.358	2.4	0.0	0.0
3/2/2011	0.0	24.0	32.0	4,820.9	6.942	9.3	0.0	0.0
3/3/2011	0.0	13.5	45.5	4,937.0	3.999	13.3	0.0	0.0
3/4/2011		0.0	45.5		0.000	13.3		0.0
3/5/2011		0.0	45.5		0.000	13.3		0.0
3/6/2011		0.0	45.5		0.000	13.3		0.0
3/7/2011	6.7	13.0	58.5	3,713.1	2.896	16.2	0.1	0.1
3/8/2011	4.9	24.0	82.5	4,225.8	6.085	22.3	0.2	0.3
3/9/2011	3.9	23.5	106.0	5,116.3	7.214	29.5	0.2	0.5
3/10/2011	5.6	24.0	130.0	4,855.7	6.992	36.5	0.2	0.7
3/11/2011	4.0	24.0	154.0	4,812.5	6.930	43.4	0.2	0.9
3/12/2011	4.8	23.0	177.0	4,921.2	6.791	50.2	0.2	1.1
3/13/2011	4.1	24.0	201.0	4,822.6	6.945	57.2	0.2	1.3
3/14/2011	4.0	24.0	225.0	4,714.3	6.789	63.9	0.2	1.5
3/15/2011	3.2	23.5	248.5	4,796.2	6.763	70.7	0.1	1.6
3/16/2011	3.4	24.0	272.5	4,736.8	6.821	77.5	0.1	1.7
3/17/2011	3.8	24.0	296.5	4,728.9	6.810	84.3	0.2	1.9
3/18/2011	3.6	24.0	320.5	4,674.0	6.731	91.1	0.2	2.1
3/19/2011	2.5	24.0	344.5	4,647.6	6.693	97.8	0.1	2.2

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
3/20/2011	3.8	24.0	368.5	4,627.8	6.664	104.4	0.2	2.3
3/21/2011	2.9	24.0	392.5	4,577.7	6.592	111.0	0.1	2.4
3/22/2011	4.7	24.0	416.5	4,661.3	6.712	117.7	0.2	2.6
3/23/2011	5.1	24.0	440.5	4,673.4	6.730	124.5	0.2	2.9
3/24/2011	4.6	24.0	464.5	5,094.2	7.336	131.8	0.2	3.1
3/25/2011	4.6	24.0	488.5	5,359.0	7.717	139.5	0.2	3.3
3/26/2011	4.4	24.0	512.5	5,347.3	7.700	147.2	0.2	3.5
3/27/2011	4.4	24.0	536.5	5,318.8	7.659	154.9	0.2	3.7
3/28/2011	4.2	24.0	560.5	5,387.4	7.758	162.6	0.2	3.9
3/29/2011	4.3	24.0	584.5	5,387.8	7.758	170.4	0.2	4.1
3/30/2011	4.2	24.0	608.5	5,498.0	7.917	178.3	0.2	4.3
3/31/2011	4.2	24.0	632.5	5,501.3	7.922	186.2	0.2	4.5
4/1/2011	4.2	24.0	656.5	5,477.0	7.887	194.1	0.2	4.8
4/2/2011	4.2	24.0	680.5	5,425.5	7.813	201.9	0.2	5.0
4/3/2011	4.0	24.0	704.5	5,422.4	7.808	209.7	0.2	5.2
4/4/2011	4.0	24.0	728.5	5,398.9	7.774	217.5	0.2	5.4
4/5/2011	4.0	24.0	752.5	5,363.0	7.723	225.2	0.2	5.6
4/6/2011	4.0	24.0	776.5	5,443.5	7.839	233.1	0.2	5.8
4/7/2011	3.9	24.0	800.5	5,366.9	7.728	240.8	0.2	5.9

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
4/8/2011	3.9	24.0	824.5	5,371.4	7.735	248.5	0.2	6.1
4/9/2011	4.0	24.0	848.5	5,382.2	7.750	256.3	0.2	6.3
4/10/2011	3.9	24.0	872.5	5,392.7	7.766	264.0	0.2	6.5
4/11/2011	3.9	24.0	896.5	5,396.1	7.770	271.8	0.2	6.7
4/12/2011	3.9	24.0	920.5	5,400.2	7.776	279.6	0.2	6.9
4/13/2011	3.9	24.0	944.5	5,333.4	7.680	287.3	0.2	7.1
4/14/2011	3.8	9.0	953.5	5,401.4	2.917	290.2	0.1	7.2
4/15/2011		0.0	953.5		0.000	290.2		7.2
4/16/2011		0.0	953.5		0.000	290.2		7.2
4/17/2011		0.0	953.5		0.000	290.2		7.2
4/18/2011		0.0	953.5		0.000	290.2		7.2
4/19/2011		0.0	953.5		0.000	290.2		7.2
4/20/2011		0.0	953.5		0.000	290.2		7.2
4/21/2011	0.6	9.5	963.0	8,501.3	4.846	295.0	0.0	7.2
4/22/2011	0.8	2.8	965.8	8,592.2	1.418	296.5	0.0	7.2
4/23/2011		0.0	965.8		0.000	296.5		7.2
4/24/2011		0.0	965.8		0.000	296.5		7.2
4/25/2011	5.2	11.0	976.8	5,580.2	3.683	300.1	0.1	7.3
4/26/2011	5.8	10.5	987.3	5,225.3	3.292	303.4	0.1	7.4

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
4/27/2011	6.8	1.0	988.3	5,463.7	0.328	303.8	0.0	7.4
4/28/2011			988.3		0.000	303.8		7.4
4/29/2011			988.3		0.000	303.8		7.4
4/30/2011			988.3		0.000	303.8		7.4
5/1/2011		0.0	988.3		0.000	303.8		7.4
5/2/2011		0.0	988.3		0.000	303.8		7.4
5/3/2011		0.0	988.3		0.000	303.8		7.4
5/4/2011	8.7	10.3	998.5	5,349.4	3.290	307.0	0.2	7.6
5/5/2011	12.1	14.3	1,012.8	5,084.6	4.347	311.4	0.3	7.9
5/6/2011		0.0	1,012.8		0.000	311.4		7.9
5/7/2011		0.0	1,012.8		0.000	311.4		7.9
5/8/2011		0.0	1,012.8		0.000	311.4		7.9
5/9/2011	10.4	6.0	1,018.8	5,254.8	1.892	313.3	0.1	8.1
5/10/2011	9.8	16.0	1,034.8	5,145.0	4.939	318.2	0.3	8.4
5/11/2011	10.0	24.0	1,058.8	5,076.2	7.310	325.5	0.5	8.8
5/12/2011	9.7	14.3	1,073.0	5,001.5	4.276	329.8	0.3	9.1
5/13/2011		0.0	1,073.0		0.000	329.8		9.1
5/14/2011		0.0	1,073.0		0.000	329.8		9.1
5/15/2011		0.0	1,073.0		0.000	329.8		9.1

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
5/16/2011	9.3	17.0	1,090.0	5,088.8	5.191	335.0	0.3	9.4
5/17/2011	9.4	24.0	1,114.0	5,015.7	7.223	342.2	0.4	9.8
5/18/2011	9.7	23.0	1,137.0	4,970.0	6.859	349.1	0.4	10.2
5/19/2011			1,137.0		0.000	349.1		10.2
5/20/2011			1,137.0		0.000	349.1		10.2
5/21/2011			1,137.0		0.000	349.1		10.2
5/22/2011			1,137.0		0.000	349.1		10.2
5/23/2011			1,137.0		0.000	349.1		10.2
5/24/2011			1,137.0		0.000	349.1		10.2
5/25/2011			1,137.0		0.000	349.1		10.2
5/26/2011			1,137.0		0.000	349.1		10.2
5/27/2011			1,137.0		0.000	349.1		10.2
5/28/2011			1,137.0		0.000	349.1		10.2
5/29/2011		0.0	1,137.0		0.000	349.1		10.2
5/30/2011		0.0	1,137.0		0.000	349.1		10.2
5/31/2011	8.1	11.3	1,148.3	4,517.7	3.071	352.2	0.2	10.4
6/1/2011	5.3	24.0	1,172.3	4,405.7	6.344	358.5	0.2	10.6
6/2/2011	8.7	24.0	1,196.3	4,353.5	6.269	364.8	0.3	11.0
6/3/2011	8.5	24.0	1,220.3	4,332.2	6.238	371.0	0.3	11.3

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
6/4/2011	8.8	24.0	1,244.3	4,296.4	6.187	377.2	0.3	11.6
6/5/2011	9.4	24.0	1,268.3	4,263.7	6.140	383.3	0.4	12.0
6/6/2011	9.4	24.0	1,292.3	4,213.7	6.068	389.4	0.4	12.4
6/7/2011	9.2	24.0	1,316.3	4,204.3	6.054	395.5	0.4	12.7
6/8/2011	8.3	24.0	1,340.3	4,262.8	6.138	401.6	0.3	13.0
6/9/2011	8.8	24.0	1,364.3	6,984.4	10.058	411.6	0.6	13.6
6/10/2011	10.5	24.0	1,388.3	8,255.0	11.887	423.5	0.8	14.4
6/11/2011	11.2	24.0	1,412.3	8,238.9	11.864	435.4	0.8	15.2
6/12/2011	11.2	24.0	1,436.3	8,246.3	11.875	447.3	0.8	16.0
6/13/2011	10.9	18.8	1,455.1	8,199.2	9.224	456.5	0.6	16.7
6/14/2011	10.5	24.0	1,479.1	8,239.1	11.864	468.4	0.8	17.4
6/15/2011	10.7	24.0	1,503.1	8,329.2	11.994	480.4	0.8	18.3
6/16/2011	10.7	14.3	1,517.3	6,999.0	5.984	486.3	0.4	18.7
6/17/2011		0.0	1,517.3		0.000	486.3		18.7
6/18/2011		0.0	1,517.3		0.000	486.3		18.7
6/19/2011		0.0	1,517.3		0.000	486.3		18.7
6/20/2011	11.7	13.0	1,530.3	8,222.5	6.414	492.8	0.5	19.1
6/21/2011	11.3	23.0	1,553.3	8,244.8	11.378	504.1	0.8	19.9
6/22/2011	11.6	24.0	1,577.3	8,182.8	11.783	515.9	0.9	20.8

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
6/23/2011	10.5	24.0	1,601.3	8,231.0	11.853	527.8	0.8	21.6
6/24/2011	10.0	24.0	1,625.3	8,204.6	11.815	539.6	0.7	22.3
6/25/2011	10.1	24.0	1,649.3	8,188.7	11.792	551.4	0.8	23.1
6/26/2011	10.2	24.0	1,673.3	8,184.2	11.785	563.2	0.8	23.8
6/27/2011	10.6	12.5	1,685.8	8,211.7	6.159	569.3	0.4	24.2
6/28/2011	12.1	17.5	1,703.3	8,114.9	8.521	577.8	0.6	24.9
6/29/2011	11.2	24.0	1,727.3	8,154.6	11.743	589.6	0.8	25.7
6/30/2011	10.0	24.0	1,751.3	8,179.3	11.778	601.4	0.7	26.5
7/1/2011	9.7	24.0	1,775.3	8,194.6	11.800	613.2	0.7	27.2
7/2/2011	10.5	24.0	1,799.3	8,160.1	11.751	624.9	0.8	28.0
7/3/2011	10.7	24.0	1,823.3	8,134.1	11.713	636.6	0.8	28.7
7/4/2011	10.4	24.0	1,847.3	8,146.6	11.731	648.4	0.8	29.5
7/5/2011	10.3	24.0	1,871.3	8,149.2	11.735	660.1	0.8	30.3
7/6/2011	10.8	24.0	1,895.3	8,129.1	11.706	671.8	0.8	31.1
7/7/2011	11.1	24.0	1,919.3	8,049.9	11.592	683.4	0.8	31.9
7/8/2011	10.2	24.0	1,943.3	8,196.6	11.803	695.2	0.8	32.6
7/9/2011	10.3	24.0	1,967.3	8,166.7	11.760	707.0	0.8	33.4
7/10/2011	10.6	24.0	1,991.3	8,134.0	11.713	718.7	0.8	34.2
7/11/2011	10.8	24.0	2,015.3	8,106.9	11.674	730.3	0.8	35.0

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
7/12/2011	10.8	24.0	2,039.3	8,110.2	11.679	742.0	0.8	35.8
7/13/2011	9.4	24.0	2,063.3	8,310.0	11.966	754.0	0.7	36.5
7/14/2011	9.0	24.0	2,087.3	8,462.3	12.186	766.2	0.7	37.2
7/15/2011	9.3	24.0	2,111.3	8,447.3	12.164	778.3	0.7	37.9
7/16/2011	9.7	24.0	2,135.3	8,425.1	12.132	790.5	0.7	38.6
7/17/2011	9.5	24.0	2,159.3	8,422.1	12.128	802.6	0.7	39.3
7/18/2011	9.4	24.0	2,183.3	8,436.7	12.149	814.7	0.7	40.1
7/19/2011	9.1	24.0	2,207.3	8,497.6	12.237	827.0	0.7	40.8
7/20/2011	10.6	24.0	2,231.3	8,504.1	12.246	839.2	0.8	41.6
7/21/2011	11.7	24.0	2,255.3	8,531.2	12.285	851.5	0.9	42.5
7/22/2011	11.3	24.0	2,279.3	8,516.4	12.264	863.8	0.9	43.3
7/23/2011	11.3	24.0	2,303.3	8,505.9	12.249	876.0	0.9	44.2
7/24/2011	11.5	24.0	2,327.3	8,471.8	12.199	888.2	0.9	45.1
7/25/2011	11.5	24.0	2,351.3	8,505.8	12.248	900.5	0.9	46.0
7/26/2011	11.3	24.0	2,375.3	8,469.5	12.196	912.7	0.9	46.9
7/27/2011	11.1	24.0	2,399.3	8,454.8	12.175	924.8	0.8	47.7
7/28/2011	10.8	24.0	2,423.3	8,439.6	12.153	937.0	0.8	48.5
7/29/2011	11.2	24.0	2,447.3	8,416.0	12.119	949.1	0.9	49.4
7/30/2011	11.3	24.0	2,471.3	8,398.3	12.094	961.2	0.9	50.2

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
7/31/2011	11.1	24.0	2,495.3	8,419.8	12.125	973.3	0.8	51.1
8/1/2011	10.6	24.0	2,519.3	8,434.2	12.145	985.5	0.8	51.9
8/2/2011	10.6	24.0	2,543.3	8,428.4	12.137	997.6	0.8	52.7
8/3/2011	10.8	21.3	2,564.6	8,456.3	10.782	1,008.4	0.7	53.5
8/4/2011	10.9	22.8	2,587.3	8,377.5	11.435	1,019.8	0.8	54.2
8/5/2011	10.6	24.0	2,611.3	8,367.9	12.050	1,031.9	0.8	55.0
8/6/2011	10.5	24.0	2,635.3	8,364.2	12.044	1,043.9	0.8	55.8
8/7/2011	10.5	24.0	2,659.3	8,358.6	12.036	1,056.0	0.8	56.6
8/8/2011	10.5	24.0	2,683.3	8,360.7	12.039	1,068.0	0.8	57.4
8/9/2011	10.2	22.0	2,705.3	8,389.8	11.075	1,079.1	0.7	58.1
8/10/2011	10.2	24.0	2,729.3	8,385.0	12.074	1,091.1	0.8	58.9
8/11/2011	10.0	24.0	2,753.3	8,366.5	12.048	1,103.2	0.8	59.7
8/12/2011	10.3	24.0	2,777.3	8,396.2	12.091	1,115.3	0.8	60.4
8/13/2011	10.7	24.0	2,801.3	8,353.2	12.029	1,127.3	0.8	61.3
8/14/2011	10.2	24.0	2,825.3	8,398.0	12.093	1,139.4	0.8	62.0
8/15/2011	9.5	24.0	2,849.3	8,396.4	12.091	1,151.5	0.7	62.8
8/16/2011	10.2	7.8	2,857.1	8,113.8	3.773	1,155.3	0.2	63.0
8/17/2011	3.0	15.3	2,872.3	2,485.0	2.274	1,157.5	0.0	63.0
8/18/2011	1.7	22.7	2,895.0	2,592.8	3.527	1,161.1	0.0	63.1

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
8/19/2011	1.5	24.0	2,919.0	2,652.3	3.819	1,164.9	0.0	63.1
8/20/2011	1.7	24.0	2,943.0	2,645.2	3.809	1,168.7	0.0	63.2
8/21/2011	1.5	24.0	2,967.0	2,633.5	3.792	1,172.5	0.0	63.2
8/22/2011	2.3	23.5	2,990.5	2,355.7	3.322	1,175.8	0.0	63.2
8/23/2011	4.0	23.0	3,013.5	2,512.5	3.467	1,179.3	0.1	63.3
8/24/2011	3.0	23.2	3,036.7	2,432.8	3.386	1,182.7	0.1	63.4
8/25/2011	8.9	23.3	3,060.0	2,300.9	3.217	1,185.9	0.2	63.6
8/26/2011	10.6	24.0	3,084.0	2,316.5	3.336	1,189.2	0.2	63.8
8/27/2011	10.4	24.0	3,108.0	2,307.9	3.323	1,192.5	0.2	64.0
8/28/2011	10.2	24.0	3,132.0	2,299.0	3.311	1,195.9	0.2	64.2
8/29/2011	9.2	23.5	3,155.5	2,395.3	3.377	1,199.2	0.2	64.4
8/30/2011	3.5	23.0	3,178.5	2,255.8	3.113	1,202.3	0.1	64.5
8/31/2011	10.1	22.5	3,201.0	2,471.6	3.337	1,205.7	0.2	64.7
9/1/2011	4.9	22.8	3,223.8	2,248.0	3.068	1,208.7	0.1	64.8
9/2/2011	1.3	24.0	3,247.8	2,121.6	3.055	1,211.8	0.0	64.8
9/3/2011	1.3	24.0	3,271.8	2,134.9	3.074	1,214.9	0.0	64.8
9/4/2011	1.6	24.0	3,295.8	2,104.4	3.030	1,217.9	0.0	64.9
9/5/2011	1.7	24.0	3,319.8	2,083.1	3.000	1,220.9	0.0	64.9
9/6/2011	1.2	22.8	3,342.5	2,150.7	2.936	1,223.8	0.0	64.9

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
9/7/2011	2.7	23.7	3,366.2	2,355.2	3.343	1,227.2	0.1	65.0
9/8/2011	1.2	23.3	3,389.5	2,300.3	3.220	1,230.4	0.0	65.0
9/9/2011	0.0	24.0	3,413.5	2,317.6	3.337	1,233.7	0.0	65.0
9/10/2011	0.0	24.0	3,437.5	2,307.4	3.323	1,237.1	0.0	65.0
9/11/2011	0.0	24.0	3,461.5	2,296.4	3.307	1,240.4	0.0	65.0
9/12/2011	3.3	23.8	3,485.2	2,092.3	2.981	1,243.4	0.1	65.1
9/13/2011	11.2	22.7	3,507.9	2,145.9	2.919	1,246.3	0.2	65.3
9/14/2011	7.9	22.5	3,530.4	2,278.3	3.076	1,249.4	0.2	65.4
9/15/2011	5.8	23.5	3,553.9	2,171.3	3.062	1,252.4	0.1	65.5
9/16/2011	6.2	24.0	3,577.9	2,100.7	3.025	1,255.4	0.1	65.7
9/17/2011	5.5	24.0	3,601.9	2,113.3	3.043	1,258.5	0.1	65.8
9/18/2011	5.2	24.0	3,625.9	2,081.7	2.998	1,261.5	0.1	65.9
9/19/2011	3.9	22.3	3,648.2	2,163.5	2.899	1,264.4	0.1	65.9
9/20/2011	7.9	23.5	3,671.7	1,945.2	2.743	1,267.1	0.1	66.1
9/21/2011	5.3	21.6	3,693.3	2,103.1	2.723	1,269.8	0.1	66.2
9/22/2011	4.6	22.6	3,715.9	2,336.2	3.165	1,273.0	0.1	66.3
9/23/2011	4.6	24.0	3,739.9	2,330.2	3.356	1,276.4	0.1	66.4
9/24/2011	4.4	24.0	3,763.9	2,294.0	3.303	1,279.7	0.1	66.4
9/25/2011	3.9	24.0	3,787.9	2,285.4	3.291	1,283.0	0.1	66.5

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
9/26/2011	5.1	23.2	3,811.1	2,323.7	3.230	1,286.2	0.1	66.6
9/27/2011	2.7	23.2	3,834.2	2,250.4	3.128	1,289.3	0.1	66.7
9/28/2011	15.4	8.5	3,842.7	2,008.1	1.024	1,290.3	0.1	66.8
9/29/2011		0.0	3,842.7		0.000	1,290.3		66.8
9/30/2011		0.0	3,842.7		0.000	1,290.3		66.8
10/1/2011		0.0	3,842.7		0.000	1,290.3		66.8
10/2/2011		0.0	3,842.7		0.000	1,290.3		66.8
10/3/2011		0.0	3,842.7		0.000	1,290.3		66.8
10/4/2011		0.0	3,842.7		0.000	1,290.3		66.8
10/5/2011		0.0	3,842.7		0.000	1,290.3		66.8
10/6/2011		0.0	3,842.7		0.000	1,290.3		66.8
10/7/2011		0.0	3,842.7		0.000	1,290.3		66.8
10/8/2011		0.0	3,842.7		0.000	1,290.3		66.8
10/9/2011		0.0	3,842.7		0.000	1,290.3		66.8
10/10/2011		0.0	3,842.7		0.000	1,290.3		66.8
10/11/2011	8.9	9.3	3,852.0	8,395.5	4.660	1,295.0	0.3	67.0
10/12/2011	8.0	24.0	3,876.0	8,459.7	12.182	1,307.2	0.6	67.7
10/13/2011	7.5	14.1	3,890.1	8,441.5	7.131	1,314.3	0.3	68.0
10/14/2011		0.0	3,890.1		0.000	1,314.3		68.0

Table B-1. Daily Soil Vapor Extraction Data for the 216-Z-9 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
10/15/2011		0.0	3,890.1		0.000	1,314.3		68.0
10/16/2011		0.0	3,890.1		0.000	1,314.3		68.0
10/17/2011	7.7	15.0	3,905.1	8,336.5	7.503	1,321.8	0.4	68.4
10/18/2011		24.0	3,929.1		0.000	1,321.8		68.4
10/19/2011	8.8	24.0	3,953.1	8,376.5	12.062	1,333.9	0.7	69.0
10/20/2011	8.6	24.0	3,977.1	8,353.0	12.028	1,345.9	0.7	69.7
10/21/2011	8.3	24.0	4,001.1	8,356.9	12.034	1,357.9	0.6	70.3
10/22/2011	8.5	24.0	4,025.1	8,352.0	12.027	1,370.0	0.6	71.0
10/23/2011	8.7	24.0	4,049.1	8,370.2	12.053	1,382.0	0.7	71.6
10/24/2011	7.7	12.5	4,061.6	8,284.6	6.213	1,388.2	0.3	71.9
10/25/2011	7.7	15.2	4,076.8	8,386.3	7.648	1,395.9	0.4	72.3
10/26/2011	8.1	24.0	4,100.8	8,509.8	12.254	1,408.1	0.6	72.9
10/27/2011	8.3	24.0	4,124.8	8,405.3	12.104	1,420.2	0.6	73.5
10/28/2011	8.6	24.0	4,148.8	8,368.0	12.050	1,432.3	0.7	74.2
10/29/2011	8.3	24.0	4,172.8	8,332.8	11.999	1,444.3	0.6	74.8
10/30/2011	8.6	24.0	4,196.8	8,348.9	12.022	1,456.3	0.7	75.5
10/31/2011	8.4	8.0	4,204.8	8,294.6	3.981	1,460.3	0.2	75.7

Note: To convert liters to gallons, multiply by 0.2642.

To convert kilograms to pounds, multiply by 2.2046.

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
3/1/2011	0.0	9.0	9.0	5,717.5	3.087	3.1	0.0	0.0
3/2/2011	0.0	24.0	33.0	5,607.2	8.074	11.2	0.0	0.0
3/3/2011	0.0	8.0	41.0	5,568.8	2.673	13.8	0.0	0.0
3/4/2011		0.0	41.0		0.000	13.8		0.0
3/5/2011		0.0	41.0		0.000	13.8		0.0
3/6/2011		0.0	41.0		0.000	13.8		0.0
3/7/2011		0.0	41.0		0.000	13.8		0.0
3/8/2011		0.0	41.0		0.000	13.8		0.0
3/9/2011	0.0	1.0	42.0	5,675.9	0.341	14.2	0.0	0.0
3/10/2011	2.4	3.5	45.5	5,016.9	1.054	15.2	0.0	0.0
3/11/2011		0.0	45.5		0.000	15.2		0.0
3/12/2011		0.0	45.5		0.000	15.2		0.0
3/13/2011		0.0	45.5		0.000	15.2		0.0
3/14/2011		0.0	45.5		0.000	15.2		0.0
3/15/2011		0.0	45.5		0.000	15.2		0.0
3/16/2011	2.9	4.0	49.5	5,398.9	1.296	16.5	0.0	0.0
3/17/2011			49.5		0.000	16.5		0.0
3/18/2011			49.5		0.000	16.5		0.0
3/19/2011			49.5		0.000	16.5		0.0

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
3/20/2011			49.5		0.000	16.5		0.0
3/21/2011			49.5		0.000	16.5		0.0
3/22/2011			49.5		0.000	16.5		0.0
3/23/2011			49.5		0.000	16.5		0.0
3/24/2011		0.0	49.5		0.000	16.5		0.0
3/25/2011		0.0	49.5		0.000	16.5		0.0
3/26/2011		0.0	49.5		0.000	16.5		0.0
3/27/2011		0.0	49.5		0.000	16.5		0.0
3/28/2011		0.0	49.5		0.000	16.5		0.0
3/29/2011	3.6	15.0	64.5	7,629.2	6.866	23.4	0.2	0.2
3/30/2011	2.5	24.0	88.5	7,582.8	10.919	34.3	0.2	0.4
3/31/2011	3.4	10.5	99.0	7,484.9	4.715	39.0	0.1	0.5
4/1/2011		0.0	99.0		0.000	39.0		0.5
4/2/2011		0.0	99.0		0.000	39.0		0.5
4/3/2011		0.0	99.0		0.000	39.0		0.5
4/4/2011	3.7	15.5	114.5	7,727.8	7.187	46.2	0.2	0.6
4/5/2011	4.2	24.0	138.5	7,646.3	11.011	57.2	0.3	0.9
4/6/2011	4.5	24.0	162.5	7,645.7	11.010	68.2	0.3	1.2
4/7/2011	2.4	24.0	186.5	7,929.8	11.419	79.7	0.2	1.4

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
4/8/2011	0.0	24.0	210.5	8,209.9	11.822	91.5	0.0	1.4
4/9/2011	0.0	24.0	234.5	8,251.2	11.882	103.4	0.0	1.4
4/10/2011	0.0	24.0	258.5	8,266.5	11.904	115.3	0.0	1.4
4/11/2011	0.0	11.0	269.5	8,045.1	5.310	120.6	0.0	1.4
4/12/2011	4.2	10.0	279.5	7,541.8	4.525	125.1	0.1	1.5
4/13/2011	4.2	24.0	303.5	7,560.9	10.888	136.0	0.3	1.8
4/14/2011	4.2	9.0	312.5	7,592.8	4.100	140.1	0.1	1.9
4/15/2011		0.0	312.5		0.000	140.1		1.9
4/16/2011		0.0	312.5		0.000	140.1		1.9
4/17/2011		0.0	312.5		0.000	140.1		1.9
4/18/2011	1.5	4.0	316.5	7,400.0	1.776	141.9	0.0	1.9
4/19/2011	4.1	14.0	330.5	7,542.4	6.336	148.2	0.2	2.1
4/20/2011	4.1	10.8	341.3	7,522.8	4.852	153.0	0.1	2.2
4/21/2011	4.4	14.0	355.3	7,456.6	6.264	159.3	0.2	2.4
4/22/2011	4.5	24.0	379.3	7,510.9	10.816	170.1	0.3	2.7
4/23/2011	4.3	24.0	403.3	7,453.7	10.733	180.9	0.3	3.0
4/24/2011	4.4	24.0	427.3	7,464.6	10.749	191.6	0.3	3.3
4/25/2011	5.0	24.0	451.3	7,425.2	10.692	202.3	0.3	3.6
4/26/2011	5.1	12.5	463.8	7,119.7	5.340	207.6	0.2	3.8

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
4/27/2011		0.0	463.8		0.000	207.6		3.8
4/28/2011		0.0	463.8		0.000	207.6		3.8
4/29/2011		0.0	463.8		0.000	207.6		3.8
4/30/2011		0.0	463.8		0.000	207.6		3.8
5/1/2011		0.0	463.8		0.000	207.6		3.8
5/2/2011		0.0	463.8		0.000	207.6		3.8
5/3/2011	9.1	6.3	470.0	7,307.6	2.740	210.4	0.2	4.0
5/4/2011	10.4	17.5	487.5	7,259.6	7.623	218.0	0.5	4.5
5/5/2011	10.4	9.3	496.8	7,262.1	4.030	222.0	0.3	4.7
5/6/2011		0.0	496.8		0.000	222.0		4.7
5/7/2011		0.0	496.8		0.000	222.0		4.7
5/8/2011		0.0	496.8		0.000	222.0		4.7
5/9/2011		0.0	496.8		0.000	222.0		4.7
5/10/2011		0.0	496.8		0.000	222.0		4.7
5/11/2011	9.3	14.0	510.8	7,320.2	6.149	228.2	0.4	5.1
5/12/2011	11.9	9.5	520.3	7,316.3	4.170	232.4	0.3	5.4
5/13/2011		0.0	520.3		0.000	232.4		5.4
5/14/2011		0.0	520.3		0.000	232.4		5.4
5/15/2011		0.0	520.3		0.000	232.4		5.4

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
5/16/2011	8.5	10.0	530.3	7,537.5	4.522	236.9	0.2	5.6
5/17/2011	9.6	24.0	554.3	7,456.9	10.738	247.6	0.7	6.3
5/18/2011	10.7	24.0	578.3	7,411.3	10.672	258.3	0.7	7.0
5/19/2011	11.1	7.5	585.8	7,564.6	3.404	261.7	0.2	7.3
5/20/2011			585.8		0.000	261.7		7.3
5/21/2011	9.7	24.0	609.8	7,465.6	10.751	272.4	0.7	7.9
5/22/2011	9.7	24.0	633.8	7,424.4	10.691	283.1	0.7	8.6
5/23/2011	9.7	24.0	657.8	6,145.9	8.850	292.0	0.5	9.1
5/24/2011	9.8	24.0	681.8	8,366.8	12.048	304.0	0.7	9.8
5/25/2011	9.8	24.0	705.8	8,430.9	12.141	316.2	0.7	10.6
5/26/2011	10.5	24.0	729.8	8,388.7	12.080	328.2	0.8	11.4
5/27/2011	10.4	24.0	753.8	8,380.4	12.068	340.3	0.8	12.2
5/28/2011	10.1	24.0	777.8	8,323.4	11.986	352.3	0.8	12.9
5/29/2011	10.4	24.0	801.8	8,310.1	11.966	364.3	0.8	13.7
5/30/2011	11.1	24.0	825.8	8,303.7	11.957	376.2	0.8	14.6
5/31/2011	10.8	24.0	849.8	8,252.2	11.883	388.1	0.8	15.4
6/1/2011	10.1	24.0	873.8	8,244.4	11.872	400.0	0.8	16.1
6/2/2011	9.9	24.0	897.8	8,383.2	12.072	412.1	0.8	16.9
6/3/2011	10.2	24.0	921.8	8,301.1	11.954	424.0	0.8	17.6

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
6/4/2011	10.1	24.0	945.8	8,305.0	11.959	436.0	0.8	18.4
6/5/2011	10.3	24.0	969.8	8,293.8	11.943	447.9	0.8	19.2
6/6/2011	11.1	24.0	993.8	8,253.1	11.885	459.8	0.8	20.0
6/7/2011	12.1	24.0	1,017.8	8,257.6	11.891	471.7	0.9	20.9
6/8/2011	11.1	24.0	1,041.8	8,406.2	12.105	483.8	0.8	21.8
6/9/2011	10.5	24.0	1,065.8	8,527.0	12.279	496.1	0.8	22.6
6/10/2011	9.8	24.0	1,089.8	8,601.8	12.387	508.5	0.8	23.3
6/11/2011	9.6	24.0	1,113.8	8,562.9	12.331	520.8	0.7	24.1
6/12/2011	10.2	23.0	1,136.8	8,564.8	11.819	532.6	0.8	24.8
6/13/2011	11.0	24.0	1,160.8	8,553.1	12.317	544.9	0.9	25.7
6/14/2011	10.8	24.0	1,184.8	8,260.8	11.896	556.8	0.8	26.5
6/15/2011	10.5	24.0	1,208.8	8,586.8	12.365	569.2	0.8	27.3
6/16/2011	10.3	24.0	1,232.8	8,559.8	12.326	581.5	0.8	28.1
6/17/2011	10.7	24.0	1,256.8	8,502.7	12.244	593.8	0.8	28.9
6/18/2011	10.8	24.0	1,280.8	8,587.7	12.366	606.1	0.8	29.8
6/19/2011	11.1	24.0	1,304.8	8,513.1	12.259	618.4	0.9	30.6
6/20/2011	10.9	24.0	1,328.8	8,391.7	12.084	630.5	0.8	31.5
6/21/2011	11.3	24.0	1,352.8	8,494.1	12.231	642.7	0.9	32.3
6/22/2011	11.2	24.0	1,376.8	8,484.4	12.217	654.9	0.9	33.2

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
6/23/2011	11.3	24.0	1,400.8	8,556.7	12.322	667.2	0.9	34.1
6/24/2011	11.0	24.0	1,424.8	8,541.8	12.300	679.5	0.8	34.9
6/25/2011	10.5	24.0	1,448.8	8,507.4	12.251	691.8	0.8	35.7
6/26/2011	10.5	24.0	1,472.8	8,497.9	12.237	704.0	0.8	36.5
6/27/2011	10.5	12.5	1,485.3	8,525.6	6.394	710.4	0.4	37.0
6/28/2011	11.3	17.5	1,502.8	8,243.9	8.656	719.1	0.6	37.6
6/29/2011	12.1	24.0	1,526.8	8,444.8	12.160	731.2	0.9	38.5
6/30/2011	11.7	24.0	1,550.8	8,475.6	12.205	743.4	0.9	39.4
7/1/2011	11.0	24.0	1,574.8	8,479.3	12.210	755.6	0.8	40.2
7/2/2011	10.5	24.0	1,598.8	8,419.5	12.124	767.8	0.8	41.0
7/3/2011	11.3	24.0	1,622.8	8,447.1	12.164	779.9	0.9	41.9
7/4/2011	11.2	24.0	1,646.8	8,435.5	12.147	792.1	0.9	42.8
7/5/2011	11.1	24.0	1,670.8	8,423.1	12.129	804.2	0.9	43.6
7/6/2011	10.9	24.0	1,694.8	8,385.0	12.074	816.3	0.8	44.4
7/7/2011	11.4	24.0	1,718.8	8,426.3	12.134	828.4	0.9	45.3
7/8/2011	11.6	24.0	1,742.8	8,474.5	12.203	840.6	0.9	46.2
7/9/2011	11.0	24.0	1,766.8	8,441.2	12.155	852.8	0.8	47.0
7/10/2011	11.5	24.0	1,790.8	8,411.8	12.113	864.9	0.9	47.9
7/11/2011	11.8	24.0	1,814.8	8,412.1	12.113	877.0	0.9	48.8

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
7/12/2011	12.0	24.0	1,838.8	8,433.2	12.144	889.1	0.9	49.7
7/13/2011	11.7	24.0	1,862.8	8,425.6	12.133	901.3	0.9	50.6
7/14/2011	11.1	24.0	1,886.8	8,435.5	12.147	913.4	0.8	51.5
7/15/2011	10.8	24.0	1,910.8	8,386.8	12.077	925.5	0.8	52.3
7/16/2011	11.2	24.0	1,934.8	8,379.2	12.066	937.6	0.9	53.1
7/17/2011	10.7	24.0	1,958.8	8,396.5	12.091	949.7	0.8	53.9
7/18/2011	10.9	24.0	1,982.8	8,424.0	12.131	961.8	0.8	54.8
7/19/2011	10.2	24.0	2,006.8	8,403.6	12.101	973.9	0.8	55.5
7/20/2011	9.9	24.0	2,030.8	8,449.8	12.168	986.1	0.8	56.3
7/21/2011	10.0	24.0	2,054.8	8,462.2	12.186	998.2	0.8	57.1
7/22/2011	10.2	24.0	2,078.8	8,436.7	12.149	1,010.4	0.8	57.8
7/23/2011	10.3	24.0	2,102.8	8,412.2	12.114	1,022.5	0.8	58.6
7/24/2011	10.4	24.0	2,126.8	8,384.0	12.073	1,034.6	0.8	59.4
7/25/2011	10.5	24.0	2,150.8	8,459.4	12.182	1,046.8	0.8	60.2
7/26/2011	10.2	24.0	2,174.8	8,451.4	12.170	1,058.9	0.8	61.0
7/27/2011	10.3	24.0	2,198.8	8,449.5	12.167	1,071.1	0.8	61.8
7/28/2011	10.2	24.0	2,222.8	8,427.9	12.136	1,083.2	0.8	62.6
7/29/2011	10.1	24.0	2,246.8	8,412.9	12.115	1,095.4	0.8	63.3
7/30/2011	10.4	24.0	2,270.8	8,378.2	12.065	1,107.4	0.8	64.1

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
7/31/2011	10.7	24.0	2,294.8	8,410.0	12.110	1,119.5	0.8	64.9
8/1/2011	10.3	24.0	2,318.8	8,420.4	12.125	1,131.7	0.8	65.7
8/2/2011	10.3	24.0	2,342.8	8,387.3	12.078	1,143.7	0.8	66.5
8/3/2011	10.5	24.0	2,366.8	8,041.0	11.579	1,155.3	0.8	67.3
8/4/2011	10.2	24.0	2,390.8	8,275.9	11.917	1,167.2	0.8	68.0
8/5/2011	10.0	24.0	2,414.8	8,442.3	12.157	1,179.4	0.8	68.8
8/6/2011	10.1	24.0	2,438.8	8,431.4	12.141	1,191.5	0.8	69.6
8/7/2011	10.1	24.0	2,462.8	8,427.5	12.136	1,203.7	0.8	70.3
8/8/2011	9.9	24.0	2,486.8	8,423.3	12.130	1,215.8	0.8	71.1
8/9/2011	9.9	24.0	2,510.8	8,445.4	12.161	1,228.0	0.8	71.9
8/10/2011	9.7	24.0	2,534.8	8,456.3	12.177	1,240.1	0.7	72.6
8/11/2011	9.8	24.0	2,558.8	8,449.2	12.167	1,252.3	0.7	73.3
8/12/2011	9.6	24.0	2,582.8	8,449.4	12.167	1,264.5	0.7	74.1
8/13/2011	9.7	24.0	2,606.8	8,435.3	12.147	1,276.6	0.7	74.8
8/14/2011	9.6	24.0	2,630.8	8,474.3	12.203	1,288.8	0.7	75.6
8/15/2011	9.5	24.0	2,654.8	8,483.3	12.216	1,301.0	0.7	76.3
8/16/2011	9.3	24.0	2,678.8	8,477.2	12.207	1,313.2	0.7	77.0
8/17/2011	9.3	24.0	2,702.8	8,460.4	12.183	1,325.4	0.7	77.7
8/18/2011	9.5	24.0	2,726.8	8,468.3	12.194	1,337.6	0.7	78.4

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
8/19/2011	9.3	24.0	2,750.8	8,459.5	12.182	1,349.8	0.7	79.2
8/20/2011	9.3	24.0	2,774.8	8,443.3	12.158	1,362.0	0.7	79.9
8/21/2011	9.6	24.0	2,798.8	8,416.7	12.120	1,374.1	0.7	80.6
8/22/2011	9.9	24.0	2,822.8	8,423.6	12.130	1,386.2	0.8	81.4
8/23/2011	9.5	24.0	2,846.8	8,448.6	12.166	1,398.4	0.7	82.1
8/24/2011	9.4	24.0	2,870.8	8,421.8	12.127	1,410.5	0.7	82.8
8/25/2011	9.5	24.0	2,894.8	8,395.5	12.090	1,422.6	0.7	83.5
8/26/2011	9.3	24.0	2,918.8	8,399.2	12.095	1,434.7	0.7	84.2
8/27/2011	9.3	24.0	2,942.8	8,402.4	12.099	1,446.8	0.7	84.9
8/28/2011	9.0	24.0	2,966.8	8,398.7	12.094	1,458.9	0.7	85.6
8/29/2011	9.9	21.5	2,988.3	8,510.6	10.979	1,469.9	0.7	86.3
8/30/2011	9.3	24.0	3,012.3	8,653.9	12.462	1,482.3	0.7	87.0
8/31/2011	9.1	24.0	3,036.3	8,506.7	12.250	1,494.6	0.7	87.7
9/1/2011	8.7	24.0	3,060.3	8,511.6	12.257	1,506.8	0.7	88.4
9/2/2011	8.5	24.0	3,084.3	8,515.7	12.263	1,519.1	0.7	89.1
9/3/2011	8.6	24.0	3,108.3	8,552.3	12.315	1,531.4	0.7	89.7
9/4/2011	8.6	24.0	3,132.3	8,515.2	12.262	1,543.7	0.7	90.4
9/5/2011	9.1	24.0	3,156.3	8,474.4	12.203	1,555.9	0.7	91.1
9/6/2011	9.0	24.0	3,180.3	8,488.6	12.224	1,568.1	0.7	91.8

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
9/7/2011	8.6	13.0	3,193.3	8,482.1	6.616	1,574.7	0.4	92.1
9/8/2011	8.3	15.5	3,208.8	8,436.0	7.845	1,582.5	0.4	92.5
9/9/2011	8.6	24.0	3,232.8	8,483.3	12.216	1,594.8	0.7	93.2
9/10/2011	8.9	24.0	3,256.8	8,447.5	12.164	1,606.9	0.7	93.9
9/11/2011	8.9	24.0	3,280.8	8,426.8	12.135	1,619.1	0.7	94.6
9/12/2011	8.9	24.0	3,304.8	8,421.8	12.127	1,631.2	0.7	95.2
9/13/2011	8.1	24.0	3,328.8	8,447.0	12.164	1,643.4	0.6	95.9
9/14/2011	7.9	24.0	3,352.8	8,460.8	12.184	1,655.5	0.6	96.5
9/15/2011	8.0	24.0	3,376.8	8,506.0	12.249	1,667.8	0.6	97.1
9/16/2011	7.6	24.0	3,400.8	8,536.2	12.292	1,680.1	0.6	97.7
9/17/2011	7.5	24.0	3,424.8	8,597.1	12.380	1,692.5	0.6	98.3
9/18/2011	7.4	24.0	3,448.8	8,557.5	12.323	1,704.8	0.6	98.8
9/19/2011	7.1	24.0	3,472.8	8,516.0	12.263	1,717.0	0.5	99.4
9/20/2011	7.2	24.0	3,496.8	8,530.4	12.284	1,729.3	0.6	99.9
9/21/2011	7.3	24.0	3,520.8	8,529.9	12.283	1,741.6	0.6	100.5
9/22/2011	7.4	23.6	3,544.3	8,492.8	12.016	1,753.6	0.6	101.1
9/23/2011	7.5	24.0	3,568.3	8,463.6	12.188	1,765.8	0.6	101.6
9/24/2011	7.7	24.0	3,592.3	8,431.8	12.142	1,778.0	0.6	102.2
9/25/2011	8.0	24.0	3,616.3	8,519.8	12.269	1,790.2	0.6	102.9

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
9/26/2011	7.3	24.0	3,640.3	8,585.6	12.363	1,802.6	0.6	103.4
9/27/2011	7.2	20.4	3,660.8	8,543.3	10.467	1,813.1	0.5	103.9
9/28/2011	7.2	24.0	3,684.8	8,633.4	12.432	1,825.5	0.6	104.5
9/29/2011	7.2	24.0	3,708.8	8,596.1	12.378	1,837.9	0.6	105.0
9/30/2011	7.4	24.0	3,732.8	8,559.7	12.326	1,850.2	0.6	105.6
10/1/2011	7.9	24.0	3,756.8	8,529.4	12.282	1,862.5	0.6	106.2
10/2/2011	7.6	24.0	3,780.8	8,579.3	12.354	1,874.8	0.6	106.8
10/3/2011	7.7	24.0	3,804.8	8,561.0	12.328	1,887.2	0.6	107.4
10/4/2011	7.4	24.0	3,828.8	8,622.5	12.416	1,899.6	0.6	108.0
10/5/2011	7.4	23.3	3,852.0	8,586.1	11.978	1,911.5	0.6	108.5
10/6/2011	7.2	24.0	3,876.0	8,662.2	12.474	1,924.0	0.6	109.1
10/7/2011	6.5	24.0	3,900.0	8,687.0	12.509	1,936.5	0.5	109.6
10/8/2011	6.1	24.0	3,924.0	8,687.0	12.509	1,949.0	0.5	110.1
10/9/2011	5.9	24.0	3,948.0	8,784.5	12.650	1,961.7	0.5	110.6
10/10/2011	5.9	24.0	3,972.0	8,676.3	12.494	1,974.2	0.5	111.0
10/11/2011	6.4	24.0	3,996.0	8,559.1	12.325	1,986.5	0.5	111.5
10/12/2011	6.3	24.0	4,020.0	8,708.9	12.541	1,999.1	0.5	112.0
10/13/2011	5.4	22.9	4,042.9	8,677.1	11.931	2,011.0	0.4	112.4
10/14/2011	5.7	24.0	4,066.9	8,652.1	12.459	2,023.4	0.4	112.9

Table B-2. Daily Soil Vapor Extraction Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Date	Carbon Tetrachloride Concentration (ppmv)	Daily Operating Hours (hr)	Year-to-Date Operating Hours (hr)	Daily Flow Rate (L/min)	Daily Volume Treated (million L)	Year-to-Date Volume Treated (million L)	Daily Mass Extracted (kg)	Year-to-Date Mass Extracted (kg)
10/15/2011	5.8	24.0	4,090.9	8,616.9	12.408	2,035.8	0.4	113.3
10/16/2011	5.6	24.0	4,114.9	8,611.1	12.400	2,048.2	0.4	113.8
10/17/2011	5.4	24.0	4,138.9	8,669.3	12.484	2,060.7	0.4	114.2
10/18/2011	5.5	24.0	4,162.9	8,667.1	12.481	2,073.2	0.4	114.6
10/19/2011	5.6	24.0	4,186.9	8,616.7	12.408	2,085.6	0.4	115.0
10/20/2011	5.6	23.1	4,210.0	8,630.3	11.953	2,097.6	0.4	115.5
10/21/2011	5.5	24.0	4,234.0	8,685.8	12.508	2,110.1	0.4	115.9
10/22/2011	5.7	24.0	4,258.0	8,673.2	12.489	2,122.6	0.4	116.3
10/23/2011	5.8	24.0	4,282.0	8,694.7	12.520	2,135.1	0.5	116.8
10/24/2011	5.4	24.0	4,306.0	8,693.2	12.518	2,147.6	0.4	117.2
10/25/2011	5.3	23.9	4,329.9	8,692.2	12.473	2,160.1	0.4	117.6
10/26/2011	5.3	24.0	4,353.9	8,790.5	12.658	2,172.7	0.4	118.1
10/27/2011	5.1	24.0	4,377.9	8,700.1	12.528	2,185.3	0.4	118.5
10/28/2011	5.6	24.0	4,401.9	8,743.5	12.591	2,197.9	0.4	118.9
10/29/2011	5.1	24.0	4,425.9	8,691.0	12.515	2,210.4	0.4	119.3
10/30/2011	5.6	24.0	4,449.9	8,697.7	12.525	2,222.9	0.4	119.8
10/31/2011	5.2	7.0	4,456.9	8,765.5	3.681	2,226.6	0.1	119.9

Note: To convert liters to gallons, multiply by 0.2642.

To convert kilograms to pounds, multiply by 2.2046.

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Appendix C

Soil Vapor Extraction Well Characterization Data for 2011

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This appendix provides the well characterization data for 2011 for soil vapor extraction operations at the following 200-PW-1 Operable Unit sites:

- Table C-1 for the 216-Z-9 site
- Table C-2 for the 216-Z-1A/216-Z-18/216-Z-12 site

Table C-1. Soil Vapor Extraction Well Characterization Data for the 216-Z-9 Site for 2011

216-Z-9 Well/ Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)	Comment
W15-8L	7/13/2011	3.7	0.0	6.3	0.0	0.155	1.39	0.390	
W15-8L	7/20/2011	3.7	0.0	7.7	0.0	0.193	2.12	0.514	
W15-8L	7/27/2011	3.5	0.0	7.0	0.0	0.342	2.46	0.443	
W15-8L	8/3/2011	3.5	0.0	6.7	0.0	0.313	1.28	0.281	
W15-8U	7/13/2011	3.7	0.3	1.4	0.0	0.008	0.893	0.427	
W15-8U	7/20/2011	3.7	0.0	5.2	0.0	0.128	1.84	0.642	
W15-8U	7/27/2011	3.2	0.0	4.1	0.0	0.240	1.91	0.600	
W15-8U	8/3/2011	3.0	0.0	2.1	0.0	0.118	1.07	0.365	
W15-9L	3/7/2011	15.4	0.2	3.7	0.0	2.42	0	0	
W15-9L	3/16/2011	13.7	0.1	4.8	0.0	2.74	0	0	
W15-9L	3/24/2011	19.9	0.2	4.3	0.0	2.62	0	0	
W15-9L	3/30/2011	21.9	0.2	4.5	0.0	1.43	1.10	0	
W15-9L	4/6/2011	22.4	0.2	5.3	0.0	1.03	2.89	0.346	
W15-9L	4/14/2011	24.9	0.2	4.8	0.0	0.658	1.87	0.201	
W15-9L	5/19/2011	22.9	0.2	4.1	0.0	0.505	0.967	0.300	
W15-9L	6/2/2011	19.9	0.2	5.3	0.0	0.516	2.16	0.439	
W15-9L	6/9/2011	8.7	0.1	5.5	0.0	0.512	4.66	0.672	
W15-9L	6/15/2011	8.7	0.1	6.1	0.0	0.337	1.67	0.269	
W15-9L	7/13/2011	10.0	0.1	5.8	0.0	0.083	2.35	0.336	
W15-9L	7/20/2011	7.5	0.0	0.2	0.0	0.090	1.15	0.299	

Table C-1. Soil Vapor Extraction Well Characterization Data for the 216-Z-9 Site for 2011

216-Z-9 Well/ Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)	Comment
W15-9L	7/27/2011	7.5	0.0	0.5	0.0	0.156	1.70	0.293	
W15-9L	8/3/2011	7.5	0.0	1.9	0.0	0.220	1.36	0.247	
W15-9L	8/11/2011	6.2	0.1	6.8	0.0	0.113	3.20	0.497	
W15-9U	3/7/2011	13.7	0.2	3.3	0.0	2.87	0	0	
W15-9U	3/16/2011	12.5	0.2	4.3	0.0	2.61	0	0	
W15-9U	3/24/2011	17.9	0.3	4.6	0.0	2.08	0.309	0	
W15-9U	3/30/2011	19.9	0.3	4.0	0.0	1.13	1.56	0	
W15-9U	4/6/2011	19.9	0.3	4.8	0.0	1.03	2.87	0.442	
W15-9U	4/14/2011	22.4	0.2	5.9	0.0	0.769	1.75	0.323	
W15-9U	5/19/2011	19.9	0.3	4.9	0.0	0.326	0.970	0.301	
W15-9U	6/2/2011	17.4	0.2	5.0	0.0	0.645	2.01	0.524	
W15-9U	6/9/2011	8.7	0.1	4.7	0.0	0.627	4.33	0.773	
W15-9U	6/15/2011	8.0	0.1	5.3	0.0	0.401	1.49	0.405	
W15-9U	7/13/2011	9.5	0.1	5.7	0.0	0.179	2.08	0.407	
W15-9U	7/20/2011	7.5	0.0	0.3	0.0	0.096	1.40	0.404	
W15-9U	7/27/2011	7.5	0.0	0.4	0.0	0.160	1.78	0.334	
W15-9U	8/3/2011	7.5	0.0	0.5	0.0	0.076	1.22	0.278	
W15-9U	8/11/2011	5.7	0.1	8.3	0.0	0.231	3.91	0.643	
W15-32	7/13/2011	6.2	0.1	1.0	0.0	0.304	1.48	0.449	
W15-32	7/20/2011	5.0	0.2	1.0	0.0	0.365	1.60	0.502	

Table C-1. Soil Vapor Extraction Well Characterization Data for the 216-Z-9 Site for 2011

216-Z-9 Well/ Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)	Comment
W15-32	7/27/2011	5.0	0.2	0.5	0.0	0.000	2.18	0.344	
W15-32	8/3/2011	5.0	0.2	0.1	0.0	0.209	1.25	0.236	
W15-32	8/11/2011	5.0	0.2	0.2	0.0	0.139	1.58	0.386	
W15-48	6/9/2011	10.2	0.0	12.1	0.0	0.043	4.77	0.570	
W15-48	6/15/2011	7.7	0.2	9.4	0.0	0.204	2.43	0.346	
W15-48	7/13/2011	9.7	0.2	7.2	0.0	0	2.46	0.329	
W15-48	7/20/2011	7.5	0.2	8.1	0.0	0.021	3.07	0.531	
W15-48	7/27/2011	10.0	0.2	7.0	0.0	0.319	3.33	0.448	
W15-48	8/3/2011	7.5	0.2	7.0	0.0	0.067	2.64	0.403	
W15-48	8/11/2011	7.5	0.2	4.2	0.0	0.201	2.39	0.436	
W15-82	3/7/2011	5.0	0.0	0.9	0.0	1.57	0	0	Sampled with ambient air valve open on first separator tank (SP-1).
W15-82	3/16/2011	34.9	0.0	2.9	0.0	2.91	0	0	
W15-82	3/24/2011	26.4	0.0	1.3	0.0	3.02	0	0	
W15-82	3/30/2011	8.7	0.0	4.0	0.0	0.964	1.84	0.026	Sampled with ambient air valve open on first separator tank (SP-1).
W15-82	4/6/2011	8.7	0.0	0.4	0.0	0.416	1.31	0.278	
W15-82	4/14/2011	9.5	0.0	1.7	0.0	0.575	1.05	0.227	
W15-82	5/19/2011	8.7	0.0	2.9	0.0	0.460	0.434	0.404	

Table C-1. Soil Vapor Extraction Well Characterization Data for the 216-Z-9 Site for 2011

216-Z-9 Well/ Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)	Comment
W15-82	6/2/2011	6.7	0.0	0.2	0.0	0.314	0.818	0.320	
W15-82	6/9/2011	10.7	0.0	7.2	0.0	0.415	3.74	0.759	
W15-82	6/15/2011	11.2	0.0	2.5	0.0	0.431	0.481	0.360	
W15-82	7/13/2011	10.2	0.0	1.5	0.0	0	0.742	0.126	
W15-82	7/20/2011	10.5	0.0	1.0	0.0	0.060	7.21	0.379	
W15-82	7/27/2011	10.5	0.0	0.9	0.0	0.106	1.81	0.371	
W15-82	8/3/2011	10.2	0.0	1.7	0.0	0.143	0.905	0.363	
W15-82	8/11/2011	10.5	0.0	1.7	0.0	0.284	1.42	0.389	
W15-84L	6/9/2011	13.2	0.1	10.7	0.0	0.635	5.17	0.673	
W15-84L	6/15/2011	13.7	0.2	9.4	0.0	0.356	2.22	0.299	
W15-84L	7/13/2011	7.5	0.1	8.4	0.0	0.040	1.91	0.242	
W15-84L	7/20/2011	6.5	0.1	9.1	0.0	0.160	3.04	0.607	
W15-84L	7/27/2011	6.2	0.1	8.8	0.0	0.400	3.68	0.578	
W15-84L	8/3/2011	6.5	0.1	9.1	0.0	0.238	3.05	0.604	
W15-84L	8/11/2011	6.2	0.1	9.0	0.0	0.191	2.96	0.492	
W15-84U	6/9/2011	10.0	0.1	1.0	0.0	0.504	4.73	0.732	
W15-84U	6/15/2011	10.0	0.4	1.8	0.0	0.631	0.721	0.098	
W15-84U	7/13/2011	6.0	0.3	5.4	0.0	0.097	1.43	0.352	
W15-84U	7/20/2011	5.0	0.3	6.7	0.0	0.094	2.12	0.591	
W15-84U	7/27/2011	5.0	0.3	2.8	0.0	0.266	2.49	0.569	

Table C-1. Soil Vapor Extraction Well Characterization Data for the 216-Z-9 Site for 2011

216-Z-9 Well/ Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)	Comment
W15-84U	8/3/2011	5.0	0.3	1.6	0.0	0.129	2.06	0.593	
W15-84U	8/11/2011	5.0	0.3	1.9	0.0	0.000	1.79	0.452	
W15-85	7/13/2011	6.5	0.1	0.7	0.0	0.175	2.09	0.753	
W15-85	7/20/2011	5.0	0.2	1.4	0.0	0.286	2.39	0.695	
W15-85	7/27/2011	4.7	0.2	1.4	0.0	0.425	2.91	0.625	
W15-85	8/3/2011	5.0	0.2	3.0	0.0	0.039	2.53	0.585	
W15-85	8/11/2011	4.7	0.2	2.6	0.0	0.255	2.46	0.571	
W15-86	6/9/2011	12.5	0.0	21.2	0.0	0.520	5.75	0.788	
W15-86	6/15/2011	12.5	0.3	19.1	0.0	0.471	2.51	0.490	
W15-86	7/13/2011	6.5	0.2	18.3	0.0	0.376	2.57	0.477	
W15-86	7/20/2011	6.0	0.2	14.7	0.0	0.129	2.78	0.530	
W15-86	7/27/2011	5.5	0.2	11.1	0.0	0.371	2.65	0.361	
W15-86	8/3/2011	5.7	0.2	15.6	0.0	0.169	2.67	0.517	
W15-86	8/11/2011	5.7	0.2	13.5	0.0	0.277	2.63	0.508	
W15-8L	8/11/2011	3.5	0.0	7.2	0.0	0.192	1.74	0.449	
W15-8U	8/11/2011	3.2	0.0	4.6	0.0	0.259	1.44	0.506	
W15-95L	7/20/2011	4.2	0.2	10.9	0.0	0.210	4.44	0.628	
W15-95L	7/27/2011	3.7	0.2	10.9	0.0	0.397	4.97	0.654	
W15-95L	8/3/2011	4.5	0.2	10.6	0.0	0.078	4.44	0.666	
W15-95L	8/11/2011	4.2	0.2	11.0	0.0	0.176	4.64	0.724	

Table C-1. Soil Vapor Extraction Well Characterization Data for the 216-Z-9 Site for 2011

216-Z-9 Well/ Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)	Comment
W15-95U	7/13/2011	4.7	0.3	1.0	0.0	0.331	1.55	0.645	
W15-95U	7/20/2011	4.0	0.3	4.0	0.0	0.321	3.25	0.630	
W15-95U	7/27/2011	3.7	0.3	2.0	0.0	0.132	3.25	0.719	
W15-95U	8/3/2011	3.7	0.3	1.5	0.0	0.280	2.35	0.520	
W15-95U	8/11/2011	3.7	0.3	5.9	0.0	0.000	3.33	0.693	
W15-216L	7/13/2011	9.0	0.0	4.7	0.0	0.180	1.40	0.637	
W15-216L	7/20/2011	7.5	0.0	3.8	0.0	0.182	1.66	0.578	
W15-216L	7/27/2011	7.5	0.0	3.8	0.0	0.379	2.33	0.562	
W15-216L	8/3/2011	7.5	0.0	4.2	0.0	0.256	1.67	0.492	
W15-216L	8/11/2011	7.5	0.0	4.0	0.0	0.113	1.62	0.467	
W15-216U	7/13/2011	8.2	0.0	6.8	0.0	0.334	0.659	0.493	
W15-216U	7/20/2011	7.5	0.0	5.4	0.0	0.214	1.30	0.619	
W15-216U	7/27/2011	6.2	0.1	5.6	0.0	0.352	2.18	0.626	
W15-216U	8/3/2011	7.2	0.0	5.6	0.0	0.175	1.34	0.560	
W15-216U	8/11/2011	6.2	0.1	4.8	0.0	0.204	1.24	0.517	
W15-217	3/7/2011	11.2	0.3	16.6	0.1	1.66	1.25	0	
W15-217	3/16/2011	12.5	0.2	9.4	0.0	2.00	1.86	0	
W15-217	3/24/2011	19.9	0.4	9.1	0.0	2.44	0.578	0	
W15-217	3/30/2011	21.2	0.4	4.5	0.0	1.44	1.34	0.049	
W15-217	4/6/2011	19.9	0.4	8.5	0.0	1.46	3.43	0.556	

Table C-1. Soil Vapor Extraction Well Characterization Data for the 216-Z-9 Site for 2011

216-Z-9 Well/ Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)	Comment
W15-217	4/14/2011	21.2	0.3	6.6	0.0	0.916	2.18	0.360	
W15-217	5/19/2011	21.4	0.4	4.5	0.0	0.364	1.05	0.511	
W15-217	6/2/2011	17.7	0.4	9.5	0.0	0.557	2.91	0.511	
W15-217	6/9/2011	11.2	0.1	8.6	0.0	0.670	4.58	0.726	
W15-217	6/15/2011	10.0	0.3	10.8	0.0	0.430	1.71	0.415	
W15-217	7/13/2011	7.0	0.2	13.5	0.0	0.102	2.30	0.458	
W15-217	7/20/2011	6.0	0.2	12.4	0.0	0.149	2.36	0.558	
W15-217	7/27/2011	5.5	0.2	8.3	0.0	0.203	2.46	0.478	
W15-217	8/3/2011	5.2	0.2	7.1	0.0	0.303	1.93	0.382	
W15-217	8/11/2011	5.5	0.2	9.7	0.0	0.196	2.54	0.465	
W15-218L	6/9/2011	8.7	0.2	4.6	0.0	0.965	3.79	0.623	
W15-218L	6/15/2011	10.5	0.1	5.4	0.0	0.523	2.01	0.362	
W15-218L	7/13/2011	7.0	0.1	7.0	0.0	0.419	2.60	0.455	
W15-218L	7/20/2011	6.2	0.1	5.8	0.0	0.282	3.09	0.573	
W15-218L	7/27/2011	6.2	0.1	5.7	0.0	0.189	3.37	0.538	
W15-218L	8/3/2011	6.2	0.1	10.4	0.0	0.204	5.17	0.733	
W15-218L	8/11/2011	6.2	0.1	9.1	0.0	0.272	4.93	0.671	
W15-218U	6/9/2011	11.2	0.0	3.5	0.0	0.872	3.54	0.633	
W15-218U	6/15/2011	10.0	0.1	2.4	0.0	0.478	1.15	0.418	
W15-218U	7/13/2011	8.5	0.1	1.6	0.0	0.289	1.59	0.584	

Table C-1. Soil Vapor Extraction Well Characterization Data for the 216-Z-9 Site for 2011

216-Z-9 Well/ Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)	Comment
W15-218U	7/20/2011	6.2	0.1	2.1	0.0	0.264	1.91	0.693	
W15-218U	7/27/2011	5.5	0.1	3.3	0.0	0.382	2.92	0.577	
W15-218U	8/3/2011	6.0	0.1	3.3	0.0	0.247	2.33	0.529	
W15-218U	8/11/2011	6.0	0.1	2.3	0.0	0.000	1.85	0.558	
W15-219L	7/13/2011	7.7	0.1	10.8	0.0	0.243	5.05	0.886	
W15-219L	7/20/2011	6.5	0.1	9.9	0.0	0.231	5.07	0.836	
W15-219L	7/27/2011	6.5	0.1	10.1	0.0	0.267	5.75	0.813	
W15-219L	8/3/2011	6.5	0.1	10.8	0.0	0.066	5.42	0.751	
W15-219L	8/11/2011	6.2	0.1	10.3	0.0	0.295	5.39	0.728	
W15-219U	7/13/2011	9.0	0.1	8.6	0.0	0.508	4.02	0.874	
W15-219U	7/20/2011	6.2	0.1	5.2	0.0	0.297	3.40	0.724	
W15-219U	7/27/2011	5.7	0.1	6.9	0.0	0.152	3.74	0.752	
W15-219U	8/3/2011	6.0	0.1	3.2	0.0	0.143	2.56	0.701	
W15-219U	8/11/2011	6.0	0.1	5.2	0.0	0.197	3.77	0.793	
W15-220L	7/13/2011	6.5	0.1	6.7	0.0	0.462	1.07	0.432	
W15-220L	7/20/2011	5.2	0.2	7.3	0.0	0.264	2.66	0.615	
W15-220L	7/27/2011	6.2	0.1	8.1	0.0	0.357	3.31	0.680	
W15-220L	8/3/2011	6.2	0.1	8.3	0.0	0.073	1.87	0.442	
W15-220L	8/11/2011	6.2	0.1	8.4	0.0	0.378	2.83	0.513	
W15-220U	7/13/2011	6.5	0.1	5.5	0.0	0.543	1.28	0.385	

Table C-1. Soil Vapor Extraction Well Characterization Data for the 216-Z-9 Site for 2011

216-Z-9 Well/ Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)	Comment
W15-220U	7/20/2011	6.5	0.1	9.1	0.0	0.181	1.63	0.613	
W15-220U	7/27/2011	5.5	0.1	9.0	0.0	0.250	2.49	0.631	
W15-220U	8/3/2011	5.0	0.2	8.1	0.0	0.212	1.18	0.357	
W15-220U	8/11/2011	5.2	0.1	9.3	0.0	0.076	1.82	0.576	
W15-223	7/13/2011	6.2	0.2	4.0	0.0	0.168	2.75	0.675	
W15-223	7/20/2011	4.7	0.2	5.1	0.0	0.202	2.55	0.664	
W15-223	7/27/2011	3.5	0.3	6.3	0.0	0.278	3.14	0.706	
W15-223	8/3/2011	4.2	0.2	5.9	0.0	0.048	2.03	0.494	
W15-223	8/11/2011	4.0	0.3	5.6	0.0	0.265	2.38	0.602	
C4937	7/20/2011	3.7	0.0	75.8	0.0	1.78	5.07	1.47	
C4937	7/27/2011	3.5	0.0	64.8	0.0	1.41	3.71	1.16	
C4937	8/3/2011	3.5	0.0	46.7	0.0	1.23	3.12	0.925	
C4937	8/11/2011	3.5	0.0	40.7	0.0	1.46	3.32	0.950	

Note: To convert cubic meters to cubic feet, multiply by 35.315.

To convert kilograms to pounds, multiply by 2.2046.

To convert kPa to inches(water), multiply by 4.0149.

CCl_4 = carbon tetrachloride

$CHCl_3$ = chloroform

CH_2Cl_2 = methylene chloride

kPA = kiloPascals

MEK = methyl ethyl ketone

Table C-2. Soil Vapor Extraction Well Characterization Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

216-Z-1A Well/Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)
W18-89	6/9/2011	0.7	0.1	12.8	0.010	0.836	1.75	0.387
W18-89	6/15/2011	0.9	0.2	9.9	0.015	0.601	1.27	0.233
W18-89	7/14/2011	1.0	0.2	7.2	0.013	0.139	0.994	0.402
W18-89	7/20/2011	1.1	0.2	7.0	0.011	0.094	1.71	0.517
W18-89	7/27/2011	1.1	0.2	0.3	0.001	0.118	1.90	0.370
W18-89	8/3/2011	1.1	0.2	8.2	0.013	0.195	1.61	0.420
W18-89	8/11/2011	1.0	0.2	7.7	0.012	0.101	1.72	0.538
W18-89	9/1/2011	0.9	0.2	6.8	0.011	0.165	0.559	0.406
W18-89	9/7/2011	0.9	0.2	7.3	0.013	0.000	1.62	0.705
W18-89	9/15/2011	0.9	0.1	5.4	0.007	0.283	1.28	0.443
W18-89	9/21/2011	0.5	0.2	7.8	0.012	0.990	2.23	0.623
W18-89	10/6/2011	1.0	0.1	6.4	0.008	0.150	0.913	0.343
W18-165	3/10/2011	0.9	0.1	7.9	0.004	1.21	0.424	0
W18-165	3/30/2011	1.2	0.0	9.7	0.002	0.408	1.52	0.065
W18-165	4/6/2011	0.9	0.0	12.3	0.003	1.27	3.27	0.498
W18-165	4/14/2011	0.7	0.0	9.7	0.002	0.969	2.01	0.315
W18-165	4/20/2011	0.5	0.0	7.1	0.002	1.33	2.10	0.808
W18-165	5/19/2011	2.5	0.1	16.6	0.017	0.681	0.383	0.389
W18-165	6/2/2011	2.5	0.1	12.6	0.016	0.862	1.14	0.472
W18-165	6/9/2011	1.3	0.0	16.6	0.004	0.590	1.53	0.530

Table C-2. Soil Vapor Extraction Well Characterization Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

216-Z-1A Well/Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)
W18-165	6/15/2011	1.2	0.1	21.4	0.011	0.253	1.91	0.458
W18-165	7/14/2011	1.1	0.1	24.0	0.012	0.397	1.32	0.463
W18-165	7/20/2011	1.3	0.1	25.2	0.013	0.354	1.91	0.536
W18-165	7/27/2011	1.3	0.1	24.7	0.013	0.408	2.95	0.619
W18-165	8/3/2011	1.2	0.1	22.2	0.011	0.269	1.67	0.420
W18-165	8/11/2011	1.0	0.1	20.6	0.011	0.423	1.57	0.483
W18-165	9/1/2011	1.1	0.0	14.7	0.004	0.000	1.54	1.15
W18-165	9/7/2011	1.1	0.1	14.7	0.008	0.151	1.59	0.634
W18-165	9/15/2011	1.1	0.1	15.0	0.008	0.342	1.51	0.453
W18-165	9/21/2011	0.6	0.1	14.7	0.008	0.213	1.87	0.502
W18-165	10/6/2011	1.6	0.1	14.5	0.007	0.138	1.12	0.280
W18-166	3/10/2011	1.0	0.0	7.2	0.002	1.42	1.74	0
W18-166	3/30/2011	1.1	0.0	10.6	0.003	0.506	1.32	0
W18-166	4/6/2011	0.9	0.0	6.3	0.002	1.04	3.20	0.386
W18-166	4/14/2011	0.8	0.0	5.3	0.001	0.819	1.86	0.265
W18-166	4/20/2011	0.5	0.0	6.6	0.002	1.25	1.90	0.712
W18-166	5/19/2011	2.5	0.1	4.7	0.002	0.535	0.602	0.272
W18-166	6/2/2011	2.5	0.1	5.3	0.004	0.738	1.18	0.392
W18-166	6/9/2011	1.4	0.0	4.0	0.001	0.563	1.79	0.490
W18-166	6/15/2011	1.3	0.0	4.5	0.001	0.244	1.49	0.399

Table C-2. Soil Vapor Extraction Well Characterization Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

216-Z-1A Well/Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)
W18-166	7/14/2011	1.3	0.0	4.3	0.001	0.107	1.18	0.365
W18-166	7/20/2011	1.4	0.0	3.9	0.001	0.071	1.19	0.457
W18-166	7/27/2011	1.4	0.0	3.9	0.001	0.129	2.30	0.501
W18-166	8/3/2011	1.3	0.0	4.2	0.001	0.135	1.23	0.347
W18-166	8/11/2011	1.0	0.0	4.1	0.001	0.313	1.28	0.353
W18-166	9/1/2011	1.2	0.0	3.9	0.001	0.144	0.771	0.303
W18-166	9/7/2011	1.2	0.0	3.8	0.001	0.000	1.50	0.666
W18-166	9/15/2011	1.2	0.0	3.2	0.001	0.243	1.24	0.315
W18-166	9/21/2011	0.6	0.0	3.7	0.001	0.660	1.75	0.456
W18-166	10/6/2011	1.6	0.0	3.7	0.001	0.091	0.829	0.262
W18-167	3/10/2011	0.4	0.3	6.3	0.014	1.79	0.204	0
W18-167	3/30/2011	1.3	0.5	6.8	0.028	0.707	1.09	0.017
W18-167	4/6/2011	1.2	0.4	10.8	0.039	1.13	2.66	0.361
W18-167	4/14/2011	1.4	0.4	8.6	0.031	1.15	1.94	0.335
W18-167	4/20/2011	1.1	0.5	2.5	0.011	0.925	1.62	0.722
W18-167	5/19/2011	1.2	0.4	10.4	0.037	0.548	0.698	0.275
W18-167	6/2/2011	1.4	0.4	11.5	0.044	1.12	1.55	0.380
W18-167	6/9/2011	0.8	0.4	8.7	0.034	0.675	1.76	0.378
W18-167	6/15/2011	0.7	0.3	1.3	0.003	0.145	0.819	0.258
W18-167	7/14/2011	0.8	0.3	15.9	0.037	0.352	1.96	0.421

Table C-2. Soil Vapor Extraction Well Characterization Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

216-Z-1A Well/Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)
W18-167	7/20/2011	0.8	0.3	15.4	0.036	0.134	1.99	0.530
W18-167	7/27/2011	0.9	0.2	14.9	0.031	0.452	2.74	0.510
W18-167	8/3/2011	0.9	0.3	16.6	0.038	0.097	1.91	0.479
W18-167	8/11/2011	0.9	0.3	16.9	0.039	0.352	2.10	0.395
W18-167	9/1/2011	0.8	0.3	13.5	0.035	0.276	1.35	0.314
W18-167	9/7/2011	0.7	0.3	12.6	0.032	0.000	2.99	1.04
W18-167	9/15/2011	0.7	0.2	11.3	0.023	0.543	1.70	0.466
W18-167	9/21/2011	0.5	0.3	10.8	0.025	0.274	1.91	0.489
W18-167	10/6/2011	0.9	0.2	11.8	0.021	0.188	1.38	0.365
W18-168	3/10/2011	0.7	0.0	4.5	0.001	1.20	0	0
W18-168	3/30/2011	1.5	0.0	10.2	0.003	0.745	1.09	0
W18-168	4/6/2011	1.0	0.0	16.7	0.004	1.22	3.49	0.367
W18-168	4/14/2011	1.6	0.0	12.7	0.003	1.19	2.33	0.322
W18-168	4/20/2011	1.3	0.0	4.7	0.001	1.14	1.67	0.682
W18-168	5/19/2011	1.3	0.0	11.8	0.003	0.436	1.06	0.277
W18-168	6/2/2011	1.5	0.0	15.4	0.004	0.886	1.70	0.322
W18-168	6/9/2011	0.9	0.0	6.4	0.002	0.459	1.56	0.434
W18-168	6/15/2011	0.8	0.0	1.9	0.000	0.389	0.676	0.271
W18-168	7/14/2011	0.8	0.0	2.5	0.001	0.096	0.634	0.173
W18-168	7/20/2011	1.0	0.0	12.6	0.003	0.044	1.73	0.402

Table C-2. Soil Vapor Extraction Well Characterization Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

216-Z-1A Well/Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)
W18-168	7/27/2011	1.0	0.0	0.6	0.000	0.127	1.77	0.369
W18-168	8/3/2011	0.9	0.0	15.6	0.004	0.033	1.66	0.381
W18-168	8/11/2011	1.0	0.0	0.5	0.000	0.750	1.80	0.616
W18-168	9/1/2011	0.7	0.0	15.0	0.004	0.113	1.44	0.333
W18-168	9/7/2011	0.8	0.0	9.7	0.003	0.000	2.39	0.774
W18-168	9/15/2011	0.8	0.0	0.9	0.000	0.229	0.781	0.213
W18-168	9/21/2011	0.5	0.0	6.0	0.002	0.650	1.48	0.442
W18-168	10/6/2011	1.1	0.0	4.7	0.001	0.209	0.703	0.165
W18-174	3/10/2011	2.1	0.0	7.7	0.002	0.619	1.19	0
W18-174	3/30/2011	2.5	0.0	8.8	0.002	0.759	0.795	0
W18-174	4/6/2011	3.7	0.0	9.0	0.002	1.12	1.92	0.441
W18-174	4/14/2011	2.2	0.0	7.8	0.002	0.868	1.33	0.228
W18-174	4/20/2011	1.4	0.0	6.8	0.002	1.25	1.83	0.677
W18-174	5/19/2011	2.5	0.0	6.7	0.002	0.568	0.016	0.335
W18-174	6/2/2011	3.0	0.0	7.0	0.002	0.842	0.607	0.427
W18-174	6/9/2011	1.5	0.0	5.9	0.002	0.803	0.999	0.430
W18-174	6/15/2011	1.5	0.0	3.6	0.001	0.336	0.827	0.445
W18-174	7/14/2011	1.4	0.0	4.0	0.001	0.114	0.533	0.321
W18-174	7/20/2011	1.5	0.0	3.2	0.001	0.147	0.837	0.413
W18-174	7/27/2011	1.5	0.0	3.6	0.001	0.268	1.65	0.432

Table C-2. Soil Vapor Extraction Well Characterization Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

216-Z-1A Well/Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)
W18-174	8/3/2011	1.4	0.0	3.8	0.001	0.147	0.458	0.289
W18-174	8/11/2011	1.0	0.0	0.1	0.000	0.364	1.32	0.477
W18-174	9/1/2011	1.4	0.0	4.6	0.001	0.145	0.543	0.253
W18-174	9/7/2011	1.3	0.0	3.8	0.001	0.000	1.29	0.681
W18-174	9/15/2011	1.3	0.0	1.7	0.000	0.132	0.932	0.348
W18-174	9/21/2011	0.6	0.0	3.9	0.001	0.189	1.03	0.458
W18-174	10/6/2011	1.8	0.0	4.2	0.001	0.086	0.513	0.233
W18-249	6/9/2011	0.8	0.4	5.7	0.019	0.659	1.53	0.392
W18-249	6/15/2011	0.9	0.2	3.7	0.008	0.438	1.14	0.288
W18-249	7/14/2011	0.9	0.3	3.4	0.008	0.284	1.19	0.371
W18-249	7/20/2011	1.0	0.3	2.7	0.006	0.053	0.967	0.456
W18-249	7/27/2011	1.0	0.2	2.6	0.005	0.048	1.96	0.464
W18-249	8/3/2011	1.0	0.3	2.7	0.006	0.098	0.978	0.304
W18-249	8/11/2011	1.0	0.3	2.7	0.006	0.352	1.36	0.316
W18-249	9/1/2011	0.9	0.3	2.1	0.006	0.251	0.724	0.354
W18-249	9/7/2011	0.8	0.3	2.9	0.007	0.000	3.53	1.37
W18-249	9/15/2011	0.8	0.3	2.1	0.005	0.343	1.43	0.442
W18-249	9/21/2011	0.5	0.3	2.3	0.006	0.266	1.19	0.321
W18-249	10/6/2011	1.0	0.2	2.1	0.004	0.252	0.529	0.191
W18-253	6/9/2011	1.3	0.0	5.1	0.001	0.525	1.30	0.387

Table C-2. Soil Vapor Extraction Well Characterization Data for the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

216-Z-1A Well/Interval	Date	Well Vacuum (kPa)	Flow (m^3/min)	CCl_4 (ppmv)	CCl_4 Flux (kg/day)	$CHCl_3$ (ppmv)	CH_2Cl_2 (ppmv)	MEK (ppmv)
W18-253	6/15/2011	1.2	0.0	3.9	0.001	0.000	0.922	0.316
W18-253	7/14/2011	1.2	0.0	6.8	0.002	0.236	0.789	0.378
W18-253	7/20/2011	1.3	0.0	5.7	0.001	0.072	1.17	0.538
W18-253	7/27/2011	1.3	0.0	6.6	0.002	0.286	2.21	0.583
W18-253	8/3/2011	1.2	0.1	6.9	0.004	0.157	1.02	0.448
W18-253	8/11/2011	1.0	0.0	6.5	0.002	0.216	0.971	0.416
W18-253	9/1/2011	1.1	0.0	4.6	0.001	0.125	0.000	0.332
W18-253	9/7/2011	1.1	0.0	6.0	0.002	0.000	1.16	0.673
W18-253	9/15/2011	1.1	0.0	6.6	0.002	0.192	1.15	0.475
W18-253	9/21/2011	0.6	0.0	6.3	0.002	0.157	1.57	0.563
W18-253	10/6/2011	1.5	0.1	5.2	0.003	0.080	0.613	0.275

Note: To convert kPa to inches (water), multiply by 4.0149.

To convert cubic meters to cubic feet, multiply by 35.315.

To convert kilograms to pounds, multiply by 2.2046.

CCl_4 = carbon tetrachloride

$CHCl_3$ = chloroform

CH_2Cl_2 = methylene chloride

kPA = kiloPascals

MEK = methyl ethyl ketone

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Appendix D

Passive Soil Vapor Extraction Data for 2011

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This appendix contains the following four tables providing passive soil vapor extraction data for 2011:

- Table D-1 provides passive soil vapor extraction well monitoring data for the 216-Z-1A/ 216-Z-18/216-Z-12 site.
- Table D-2 provides data on carbon tetrachloride concentration standard analyses.
- Table D-3 provides data on blank analyses.
- Table D-4 provides data on field blank analyses.

Table D-1. Passive Soil Vapor Extraction Well Monitoring Data at the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
299-W18-6L	63	2/17/11 8:04	1.0 U	1.0 U	1.0 U	1.0 U	5,550	
299-W18-6L	63	3/24/11 8:00	4.22	1.0 U	1.0 U	1.0 U	7,780	
299-W18-6L	63	3/24/11 8:00	4.11	1.0 U	1.0 U	1.0 U	7,650	Duplicate Sample Analysis
299-W18-6L	63	4/20/11 7:50	5.03	1.0 U	1.0 U	1.0 U	6,810	
299-W18-6L	63	6/9/11 8:17	4.74	1.0 U	1.0 U	1.16	12,400	
299-W18-6L	63	6/30/11 8:25	5.54	1.0 U	1.0 U	1.11	9,560	
299-W18-6L	63	7/20/11 7:51	4.4	1.0 U	1.0 U	1.26	11,100	
299-W18-6L	63	8/25/11 13:20	8.17	1.0 U	1.0 U	1.79	18,200	
299-W18-6L	63	9/14/11 7:50	11.4	1.0 U	1.0 U	1.76	11,500	
299-W18-6L	63	12/18/11 9:14	6.99	1.0 U	1.0 U	1.0 U	6,660	
299-W18-7	60	2/17/11 7:45	1.0 U	1.0 U	1.0 U	1.0 U	5,600	
299-W18-7	60	2/17/11 7:45	1.0 U	1.0 U	1.0 U	1.0 U	5,810	Duplicate Sample Analysis
299-W18-7	60	3/24/11 7:42	10.4	1.0 U	1.0 U	1.04	7,390	
299-W18-7	60	4/20/11 7:35	11.5	1.0 U	1.0 U	1.0 U	6,360	
299-W18-7	60	6/9/11 7:57	10.2	1.0 U	1.0 U	1.15	12,500	
299-W18-7	60	6/30/11 8:09	2.2	1.0 U	1.0 U	1.37	10,200	
299-W18-7	60	7/20/11 7:43	2.68	1.0 U	1.0 U	1.0 U	12,100	
299-W18-7	60	8/25/11 13:08	3.77	1.0 U	1.0 U	1.61	17,900	
299-W18-7	60	9/14/11 7:40	4.71	1.0 U	1.0 U	1.0 U	11,600	
299-W18-7	60	9/14/11 7:41	4.65	1.0 U	1.0 U	1.0 U	11,400	Duplicate Sample Analysis
299-W18-7	60	12/18/11 8:45	7.14	1.0 U	1.0 U	1.17	6,680	
299-W18-10L	56	2/17/11 8:36	5.63	1.0 U	1.0 U	1.0 U	6,780	

Table D-1. Passive Soil Vapor Extraction Well Monitoring Data at the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
299-W18-10L	56	3/24/11 8:34	10.0	1.0 U	1.0 U	1.0 U	8,320	
299-W18-10L	56	4/20/11 8:22	8.28	1.0 U	1.0 U	1.0 U	7,320	
299-W18-10L	56	6/9/11 9:15	5.95	1.0 U	1.0 U	1.14	12,000	
299-W18-10L	56	6/30/11 9:25	5.35	1.0 U	1.0 U	1.09	10,100	
299-W18-10L	56	6/30/11 9:25	5.86	1.0 U	1.0 U	1.63	10,500	Duplicate Sample Analysis
299-W18-10L	56	7/20/11 8:20	3.6	1.0 U	1.0 U	1.0 U	14,400	
299-W18-10L	56	8/25/11 13:42	3.39	1.0 U	1.0 U	1.76	16,300	
299-W18-10L	56	9/14/11 8:23	3.96	1.0 U	1.0 U	1.0 U	12,500	
299-W18-10L	56	12/18/11 10:03	3.22	1.0 U	1.0 U	1.1	6,370	
299-W18-10L	56	12/18/11 10:03	3.29	1.0 U	1.0 U	1.19	6,400	Duplicate Sample Analysis
299-W18-11L	61	2/17/11 8:26	1.7	1.0 U	1.0 U	1.0 U	6,140	
299-W18-11L	61	3/24/11 8:27	4.57	1.0 U	1.0 U	1.0 U	8,040	
299-W18-11L	61	4/20/11 8:12	2.13	1.0 U	1.0 U	1.0 U	6,020	
299-W18-11L	61	6/9/11 9:04	1.35	1.0 U	1.0 U	1.0 U	10,900	
299-W18-11L	61	6/9/11 9:04	1.4	1.0 U	1.0 U	1.43	10,800	Duplicate Sample Analysis
299-W18-11L	61	6/30/11 9:17	1.55	1.0 U	1.0 U	1.34	8,900	
299-W18-11L	61	7/20/11 8:12	1.11	1.0 U	1.0 U	1.13	10,100	
299-W18-11L	61	8/25/11 13:36	2.88	1.0 U	1.0 U	1.66	16,700	
299-W18-11L	61	9/14/11 8:22	1.05	1.0 U	1.0 U	1.0 U	10,200	
299-W18-11L	61	12/18/11 9:57	3.51	1.0 U	1.0 U	1.0 U	6,390	
299-W18-12	60	2/17/11 8:45	1.0 U	1.0 U	1.0 U	1.0 U	7,360	
299-W18-12	60	3/24/11 8:41	1.71	1.0 U	1.0 U	1.0 U	8,690	

Table D-1. Passive Soil Vapor Extraction Well Monitoring Data at the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
299-W18-12	60	4/20/11 8:32	3.15	1.0 U	1.0 U	1.0 U	7,280	
299-W18-12	60	6/9/11 9:22	3.07	1.0 U	1.0 U	1.27	12,200	
299-W18-12	60	6/30/11 9:32	1.39	1.0 U	1.0 U	1.13	8,470	
299-W18-12	60	7/20/11 8:26	4.43	1.0 U	1.0 U	1.0 U	12,100	
299-W18-12	60	7/20/11 8:26	4.79	1.0 U	1.0 U	1.0 U	12,300	Duplicate Sample Analysis
299-W18-12	60	8/25/11 13:47	1.5	1.0 U	1.0 U	1.51	16,600	
299-W18-12	60	9/14/11 8:28	3.73	1.0 U	1.0 U	1.0 U	11,200	
299-W18-12	60	12/18/11 10:15	6.65	1.0 U	1.0 U	1.0 U	6,570	
299-W18-246L	52	2/17/11 8:15	6.84	1.0 U	1.0 U	1.0 U	5,930	
299-W18-246L	52	3/24/11 8:14	3.81	1.0 U	1.0 U	1.0 U	7,560	
299-W18-246L	52	4/20/11 8:00	12.4	1.0 U	1.0 U	1.0 U	6,660	
299-W18-246L	52	4/20/11 8:00	13.1	1.0 U	1.0 U	1.0 U	6,870	Duplicate Sample Analysis
299-W18-246L	52	6/9/11 8:24	5.38	1.0 U	1.0 U	1.37	12,200	
299-W18-246L	52	6/30/11 8:35	9.4	1.0 U	1.0 U	1.0 U	9,840	
299-W18-246L	52	7/20/11 7:56	5.44	1.0 U	1.0 U	1.0 U	11,000	
299-W18-246L	52	8/25/11 13:25	18.8	1.0 U	1.0 U	2.15	18,100	
299-W18-246L	52	9/14/11 7:51	11.2	1.0 U	1.0 U	1.0 U	12,400	
299-W18-246L	52	12/18/11 9:21	1.0 U	1.0 U	1.0 U	1.0 U	6,620	
299-W18-247L	51	2/17/11 8:57	1.0 U	1.0 U	1.0 U	1.0 U	7,550	
299-W18-247L	51	3/24/11 8:49	1.0 U	1.0 U	1.0 U	1.0 U	9,160	
299-W18-247L	51	4/20/11 8:43	4.77	1.0 U	1.0 U	1.0 U	8,400	
299-W18-247L	51	6/9/11 9:30	1.38	1.0 U	1.0 U	1.24	12,500	

Table D-1. Passive Soil Vapor Extraction Well Monitoring Data at the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
299-W18-247L	51	6/30/11 9:39	2.85	1.0 U	1.0 U	1.02	10,400	
299-W18-247L	51	7/20/11 8:37	2.89	1.42	1.0 U	1.0 U	16,500	
299-W18-247L	51	8/25/11 13:57	8.85	1.41	1.0 U	1.4	26,800	
299-W18-247L	51	8/25/11 13:57	8.82	1.27	1.0 U	1.88	26,700	Duplicate Sample Analysis
299-W18-247L	51	9/14/11 8:33	4.27	1.0 U	1.0 U	1.06	12,600	
299-W18-247L	51	12/18/11 10:22	1.61	1.0 U	1.0 U	1.0 U	6,460	
299-W18-252L	53	2/17/11						Unable to sample; well being repaired
299-W18-252L	53	3/24/11						Unable to sample; well being repaired
299-W18-252L	53	4/20/11						Unable to sample; well being repaired
299-W18-252L	53	6/09/11						Unable to sample; well being repaired
299-W18-252L	53	6/30/11						Unable to sample; well being repaired
299-W18-252L	53	7/20/11						Unable to sample; well being repaired
299-W18-252L	53	8/25/11						Unable to sample; well being repaired
299-W18-252L	53	9/14/11						Unable to sample; well being repaired
299-W18-252L	53	12/18/11 9:34	8.24	1.0 U	1.0 U	1.0 U	6,750	

Note: To convert from meters to feet, multiply by 3.2808.

bgs = below ground surface

CCl_4 = carbon tetrachloride

$CHCl_3$ = chloroform

CH_2Cl_2 = methylene chloride

MEK = methyl ethyl ketone

U = analyzed for but not detected; value reported in the reporting limit

Table D-2. Carbon Tetrachloride Concentration Standard Analyses

Carbon Tetrachloride Concentration Standard (ppmv)	Carbon Tetrachloride Concentration Analyzed (ppmv)	Date Analyzed	Time Analyzed	B&K™ Serial Number
24.984	20.90	2/17/11	9:30	1715232
24.984	21.00	2/17/11	10:18	1715232
24.984	20.70	3/24/11	9:34	1715232
24.984	20.60	3/24/11	10:26	1715232
24.984	20.70	4/20/11	9:14	1715232
24.984	20.70	4/20/11	10:02	1715232
24.984	21.20	6/09/11	11:33	1715232
24.984	21.40	6/09/11	12:45	1715232
24.984	20.80	6/30/11	11:41	1715232
24.984	21.70	6/30/11	13:12	1715232
24.984	21.00	7/20/11	9:06	1715232
24.984	20.90	7/20/11	10:00	1715232
24.984	20.90	8/25/11	14:15	1715232
24.984	21.10	8/25/11	15:13	1715232
24.984	20.90	9/14/11	10:23	1715232
24.984	20.90	9/14/11	11:01	1715232
24.984	20.50	12/18/11	12:14	1715232
24.984	20.40	12/18/11	13:38	1715232

B&K™ = Brüel & Kjær (trademark of Brüel & Kjær North America, Inc., Norcross, Georgia)

Table D-3. Blank Analyses

Sample Location	Sample Date	Sample Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)
Blank	2/17/11	9:32	1.0 U	1.0 U	1.0 U	1.0 U	3,850
Blank	2/17/11	10:20	1.0 U	1.0 U	1.0 U	1.0 U	4,100
Blank	3/24/11	9:36	1.0 U	1.0 U	1.0 U	1.0 U	5,840
Blank	3/24/11	10:28	1.0 U	1.0 U	1.0 U	1.0 U	6,180
Blank	4/20/11	9:12	1.0 U	1.0 U	1.0 U	1.0 U	4,330
Blank	4/20/11	10:04	1.0 U	1.0 U	1.0 U	1.0 U	4,620
Blank	6/09/11	11:35	1.0 U	1.0 U	1.0 U	1.0 U	7,010
Blank	6/09/11	12:47	1.0 U	1.0 U	1.0 U	1.0 U	8,030
Blank	6/30/11	11:43	1.0 U	1.0 U	1.0 U	1.0 U	7,150
Blank	6/30/11	13:14	1.0 U	1.0 U	1.0 U	1.0 U	7,780
Blank	7/20/11	9:08	1.0 U	1.0 U	1.0 U	1.0 U	8,850
Blank	7/20/11	10:02	1.0 U	1.0 U	1.0 U	1.0 U	9,280
Blank	8/25/11	14:17	1.0 U	1.0 U	1.0 U	1.0 U	10,800
Blank	8/25/11	15:15	1.0 U	1.0 U	1.0 U	1.0 U	11,600
Blank	9/14/11	10:25	1.0 U	1.0 U	1.0 U	1.0 U	6,530
Blank	9/14/11	11:03	1.0 U	1.0 U	1.0 U	1.0 U	7,070
Blank	12/18/11	12:12	1.0 U	1.0 U	1.0 U	1.0 U	5,720
Blank	12/18/11	13:40	1.0 U	1.0 U	1.0 U	1.0 U	5,540

CCl_4 = carbon tetrachloride
$CHCl_3$ = chloroform
CH_2Cl_2 = methylene chloride
MEK = methyl ethyl ketone
ppmv = parts per million by volume
U = analyzed for but not detected; value reported in the reporting limit

Table D-4. Field Blank Analyses

Sample Location	Sample Date	Sample Time	Analysis Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
Field blank	2/17/11	9:03	10:04	1.0 U	1.0 U	1.0 U	1.0 U	7,380	Previously used Tedlar® bag was from well CPT-18 white.
Field blank	3/24/11	8:55	10:10	1.0 U	1.0 U	1.0 U	1.0 U	7,200	Previously used Tedlar bag was from well 299-W15-8L.
Field blank	4/20/11	8:49	9:46	1.0 U	1.0 U	1.0 U	1.0 U	5,150	Previously used Tedlar bag was from well 299-W18-248.
Field blank	6/09/11	9:35	11:53	1.0 U	1.0 U	1.0 U	1.0 U	11,000	Previously used Tedlar bag was from well 299-W15-82L.
Field blank	6/30/11	9:44	12:42	1.0 U	1.0 U	1.0 U	1.0 U	8,260	Previously used Tedlar bag was from well 299-W18-167.
Field blank	7/20/11	8:41	9:42	1.0 U	1.0 U	1.0 U	1.19	10,000	Previously used Tedlar bag was from well CPT-33 green.
Field blank	8/25/11	14:02	14:55	1.0 U	1.0 U	1.0 U	1.75	14,000	Previously used Tedlar bag was from well CPT-27 blue.
Field blank	9/14/11	7:37	10:43	1.0 U	1.0 U	1.0 U	1.0 U	9,650	Previously used Tedlar bag was from well 299-W15-217.
Field blank	12/18/11	10:27	13:20	1.0 U	1.0 U	1.0 U	1.0 U	6,280	Previously used Tedlar bag was from well CPT-34 green.

CCl_4 = carbon tetrachloride

$CHCl_3$ = chloroform

CH_2Cl_2 = methylene chloride

MEK = methyl ethyl ketone

U = analyzed for but not detected; value reported in the reporting limit

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Appendix E

Soil Vapor Monitoring Data for 2011

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This appendix contains the following five tables providing soil vapor monitoring data for 2011:

- Table E-1 provides monitoring data for nonoperational wells and probes at the 216-Z-1A/216-Z-18/216-Z-12 site.
- Table E-2 provides monitoring data for nonoperational wells and probes at the 216-Z-9 site.
- Table E-3 provides data for carbon tetrachloride concentration standard analyses.
- Table E-4 provides data on blank analyses.
- Table E-5 provides data on field blank analyses.

Table E-1. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
CPT-4E/25 ft	8	3/23/11 8:36	1.0 U	1.0 U	1.0 U	1.0 U	7,500	
CPT-4E/25 ft	8	4/19/11 8:21	1.0 U	1.0 U	1.0 U	1.0 U	6,940	
CPT-4E/25 ft	8	6/9/11 8:45	1.0 U	1.0 U	1.0 U	1.19	12,900	
CPT-4E/25 ft	8	6/30/11 8:55	1.0 U	1.0 U	1.0 U	1.0 U	10,600	
CPT-4E/25 ft	8	7/21/11 8:10	1.0 U	1.0 U	1.0 U	1.0 U	12,800	
CPT-4E/25 ft	8	7/21/11 8:22	1.0 U	1.0 U	1.0 U	1.0 U	11,900	Duplicate Sample Analysis*
CPT-4E/25 ft	8	8/24/11 9:31	1.0 U	1.0 U	1.03	1.16	14,200	
CPT-4E/25 ft	8	9/14/11 8:08	1.0 U	1.0 U	1.0 U	1.0 U	12,400	
CPT-32/25 ft	8	2/16/11 9:53	1.0 U	1.0 U	1.0 U	1.0 U	6,480	
CPT-32/25 ft	8	3/23/11 8:18	1.13	1.0 U	1.0 U	1.0 U	7,190	
CPT-32/25 ft	8	4/19/11 8:00	1.35	1.0 U	1.0 U	1.0 U	6,280	
CPT-32/25 ft	8	6/9/11 8:08	1.0 U	1.0 U	1.0 U	1.22	12,600	
CPT-32/25 ft	8	6/9/11 8:08	1.0 U	1.0 U	1.0 U	1.32	12,800	Duplicate Sample Analysis
CPT-32/25 ft	8	6/30/11 8:18	1.0 U	1.0 U	1.0 U	1.0 U	10,100	
CPT-32/25 ft	8	7/21/11 7:53	1.0 U	1.0 U	1.0 U	1.03	12,400	
CPT-32/25 ft	8	8/24/11 9:06	1.0 U	1.0 U	1.0 U	1.03	13,900	
CPT-32/25 ft	8	9/14/11 7:46	1.0 U	1.0 U	1.0 U	1.0 U	11,300	
CPT-32/25 ft	8	12/18/11 9:11	1.06	1.0 U	1.0 U	1.0 U	6,930	
CPT-13A/30 ft	9	2/16/11 10:43	1.0 U	1.0 U	1.0 U	1.0 U	6,780	
CPT-13A/30 ft	9	3/23/11 8:57	1.0 U	1.0 U	1.0 U	1.0 U	7,710	
CPT-13A/30 ft	9	4/19/11 8:45	1.0 U	1.0 U	1.0 U	1.0 U	7,120	
CPT-13A/30 ft	9	6/9/11 9:42	1.0 U	1.0 U	1.0 U	1.0 U	12,700	

Table E-1. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
CPT-13A/30 ft	9	6/30/11 9:50	1.0 U	1.0 U	1.0 U	1.0 U	10,900	
CPT-13A/30 ft	9	7/21/11 8:45	1.0 U	1.0 U	1.0 U	1.0 U	14,800	
CPT-13A/30 ft	9	8/24/11 9:53	1.0 U	1.0 U	1.0 U	1.28	15,200	
CPT-13A/30 ft	9	9/14/11 8:40	1.0 U	1.0 U	1.0 U	1.0 U	11,900	
CPT-13A/30 ft	9	12/18/11 10:31	1.0 U	1.0 U	1.0 U	1.0 U	6,330	
CPT-7A/32 ft	10	2/16/11 8:47	2.16	1.0 U	1.0 U	1.0 U	5,840	
CPT-7A/32 ft	10	3/23/11 8:03	2.25	1.0 U	1.0 U	1.0 U	6,490	
CPT-7A/32 ft	10	3/23/11 8:03	1.91	1.0 U	1.0 U	1.0 U	6,630	Duplicate Sample Analysis
CPT-7A/32 ft	10	4/19/11 7:45	1.97	1.0 U	1.0 U	1.0 U	5,970	
CPT-7A/32 ft	10	6/9/11 7:47	1.62	1.0 U	1.0 U	1.25	12,600	
CPT-7A/32 ft	10	6/30/11 7:58	1.93	1.0 U	1.0 U	1.0 U	10,400	
CPT-7A/32 ft	10	7/21/11 7:41	1.46	1.0 U	1.0 U	1.0 U	12,800	
CPT-7A/32 ft	10	8/24/11 8:41	1.0 U	1.0 U	1.0 U	1.03	14,600	
CPT-7A/32 ft	10	9/14/11 7:24	1.40	1.0 U	1.0 U	1.0 U	11,200	
CPT-7A/32 ft	10	12/18/11 8:34	1.37	1.0 U	1.0 U	1.0 U	6,750	
CPT-1A/35 ft	11	2/16/11 10:18	3.33	1.0 U	1.0 U	1.0 U	6,020	
CPT-1A/35 ft	11	3/23/11 8:41	3.71	1.0 U	1.0 U	1.15	7,620	
CPT-1A/35 ft	11	4/19/11 8:30	3.25	1.0 U	1.0 U	1.0 U	6,420	
CPT-1A/35 ft	11	6/9/11 8:49	4.37	1.0 U	1.0 U	1.71	12,500	
CPT-1A/35 ft	11	6/30/11 9:01	5.71	1.0 U	1.0 U	1.74	10,500	
CPT-1A/35 ft	11	7/21/11 8:29	6.68	1.0 U	1.0 U	1.77	13,500	
CPT-1A/35 ft	11	8/24/11 9:37	5.96	1.0 U	1.0 U	1.78	14,200	

Table E-1. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
CPT-1A/35 ft	11	8/24/11 9:37	6.56	1.09	1.0 U	1.90	14,300	Duplicate Sample Analysis
CPT-1A/35 ft	11	9/14/11 8:13	12.1	1.0 U	1.0 U	1.52	12,500	
CPT-1A/35 ft	11	12/18/11 9:52	6.12	1.0 U	1.0 U	1.0 U	6,540	
CPT-34/40 ft	12	3/23/11 8:52	1.0 U	1.0 U	1.0 U	1.0 U	7,980	
CPT-34/40 ft	12	4/19/11 8:40	1.0 U	1.0 U	1.0 U	1.03	7,050	
CPT-34/40 ft	12	6/9/11 9:00	1.0 U	1.0 U	1.0 U	1.78	12,500	
CPT-34/40 ft	12	6/30/11 9:11	1.0 U	1.0 U	1.0 U	1.16	10,800	
CPT-34/40 ft	12	7/21/11 8:40	1.0 U	1.0 U	1.0 U	1.08	12,700	
CPT-34/40 ft	12	8/24/11 9:48	1.0 U	1.0 U	1.0 U	1.43	14,700	
CPT-34/40 ft	12	9/14/11 8:18	1.0 U	1.0 U	1.0 U	1.0 U	12,500	
CPT-30/48 ft	15	2/16/11 10:00	1.19	1.0 U	1.0 U	1.25	6,410	
CPT-30/48 ft	15	3/23/11 8:25	1.30	1.0 U	1.0 U	1.48	7,180	
CPT-30/48 ft	15	4/19/11 8:09	1.0 U	1.0 U	1.0 U	1.88	6,860	
CPT-30/48 ft	15	6/9/11 8:33	1.0 U	1.0 U	1.0 U	3.67	13,100	
CPT-30/48 ft	15	6/30/11 8:44	1.0 U	1.0 U	1.0 U	2.86	10,700	
CPT-30/48 ft	15	6/30/11 8:44	1.0 U	1.0 U	1.0 U	2.86	10,600	Duplicate Sample Analysis
CPT-30/48 ft	15	7/21/11 8:00	1.0 U	1.0 U	1.0 U	2.73	13,700	
CPT-30/48 ft	15	8/24/11 9:18	1.0 U	1.0 U	1.0 U	2.71	15,300	
CPT-30/48 ft	15	9/14/11 8:00	1.0 U	1.0 U	1.0 U	1.92	12,600	
CPT-30/48 ft	15	12/18/11 9:30	1.0 U	1.0 U	1.0 U	1.18	6,670	
C3872/62.5 ft	19	2/16/11 8:54	2.76	1.0 U	1.0 U	1.0 U	6,000	
C3872/62.5 ft	19	3/23/11 8:12	3.89	1.0 U	1.0 U	1.0 U	6,900	

Table E-1. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
C3872/62.5 ft	19	4/19/11 10:33	3.53	1.0 U	1.0 U	1.35	10,200	
C3872/62.5 ft	19	4/19/11 10:33	3.42	1.0 U	1.0 U	1.06	9,710	Duplicate Sample Analysis
C3872/62.5 ft	19	6/9/11 7:53	2.55	1.0 U	1.0 U	1.43	12,600	
C3872/62.5 ft	19	6/30/11 8:03	2.56	1.0 U	1.0 U	1.46	10,200	
C3872/62.5 ft	19	7/21/11 7:48	1.79	1.0 U	1.0 U	1.42	12,900	
C3872/62.5 ft	19	8/24/11 8:58	1.0 U	1.0 U	1.0 U	1.57	14,700	
C3872/62.5 ft	19	9/14/11 7:37	1.0 U	1.0 U	1.0 U	1.0 U	12,500	
C3872/62.5 ft	19	12/18/11 8:40	1.08	1.0 U	1.0 U	1.0 U	6,790	
CPT-1A/68 ft	21	3/23/11 8:43	8.87	1.0 U	1.0 U	1.43	7,530	
CPT-1A/68 ft	21	4/19/11 8:32	8.04	1.0 U	1.0 U	1.56	6,670	
CPT-1A/68 ft	21	6/9/11 8:51	7.98	1.01	1.0 U	2.18	13,100	
CPT-1A/68 ft	21	6/30/11 9:03	5.85	1.0 U	1.0 U	2.24	10,700	
CPT-1A/68 ft	21	7/21/11 8:31	8.12	1.39	1.0 U	1.63	14,300	
CPT-1A/68 ft	21	8/24/11 9:41	7.72	1.31	1.0 U	2.09	15,700	
CPT-1A/68 ft	21	9/14/11 8:15	7.93	1.24	1.0 U	1.25	11,900	
CPT-32/70 ft	21	3/23/11 8:20	1.13	1.0 U	1.0 U	1.0 U	7,130	
CPT-32/70 ft	21	4/19/11 8:03	1.50	1.0 U	1.0 U	1.18	6,310	
CPT-32/70 ft	21	6/9/11 8:12	1.96	1.0 U	1.0 U	2.09	12,900	
CPT-32/70 ft	21	6/30/11 8:20	1.88	1.0 U	1.0 U	1.99	10,500	
CPT-32/70 ft	21	7/21/11 7:55	2.54	1.0 U	1.0 U	1.94	13,900	
CPT-32/70 ft	21	8/24/11 9:08	1.97	1.0 U	1.03	2.36	15,100	
CPT-32/70 ft	21	9/14/11 7:49	1.61	1.0 U	1.0 U	1.0 U	13,100	

Table E-1. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
CPT-1A/91 ft	28	3/23/11 8:47	1.0 U	1.0 U	1.0 U	1.0 U	7,560	
CPT-1A/91 ft	28	4/19/11 8:34	1.0 U	1.0 U	1.0 U	1.0 U	5,350	
CPT-1A/91 ft	28	6/9/11 8:55	5.02	1.0 U	1.0 U	1.75	11,800	
CPT-1A/91 ft	28	6/30/11 9:06	5.18	1.0 U	1.0 U	1.68	9,670	
CPT-1A/91 ft	28	7/21/11 8:34	2.01	1.0 U	1.0 U	1.31	11,000	
CPT-1A/91 ft	28	8/24/11 9:44	1.0 U	1.0 U	1.0 U	1.18	13,000	
CPT-1A/91 ft	28	9/14/11 8:16	1.0 U	1.0 U	1.0 U	1.0 U	9,130	
299-W18-152/101 ft	31	2/16/11 10:09	10.0	1.0 U	1.0 U	1.35	6,460	
299-W18-152/101 ft	31	12/18/11 9:48	10.6	1.0 U	1.0 U	1.25	6,680	
299-W18-167/106 ft	32	2/16/11 9:39	6.74	1.0 U	1.0 U	1.66	6,260	
299-W18-167/106 ft	32	12/18/11 9:03	11.0	1.0 U	1.0 U	1.05	6,650	
CPT-4F/109 ft	33	3/23/11 8:30	5.82	1.0 U	1.0 U	1.0 U	7,340	
CPT-4F/109 ft	33	4/19/11 8:16	4.26	1.0 U	1.0 U	1.0 U	6,260	Pump flow-faulted several times; started to pump small amount of condensation.
CPT-4F/109 ft	33	6/9/11 8:40	2.75	1.0 U	1.0 U	1.32	12,800	
CPT-4F/109 ft	33	6/30/11 8:52	1.85	1.0 U	1.0 U	1.0 U	10,100	
CPT-4F/109 ft	33	7/21/11 8:06	1.73	1.0 U	1.0 U	1.47	12,500	
CPT-4F/109 ft	33	8/24/11 9:28	1.48	1.0 U	1.0 U	1.63	14,600	
CPT-4F/109 ft	33	9/14/11 8:07	1.61	1.0 U	1.0 U	1.43	12,000	
299-W18-165/109 ft	33	2/16/11 9:22	9.79	1.0 U	1.0 U	1.49	6,100	
299-W18-165/109 ft	33	12/18/11 9:00	14.9	3.00	1.0 U	5.52	6,710	
299-W18-249/130 ft	40	2/16/11 10:30	5.64	1.0 U	1.0 U	1.29	6,490	

Table E-1. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-1A/216-Z-18/216-Z-12 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
299-W18-249/130 ft	40	12/18/11 10:12	9.92	1.0 U	1.0 U	1.02	6,590	
299-W18-248/131 ft	40	2/16/11 9:01	28.2	1.0 U	1.0 U	1.37	5,940	
299-W18-248/131 ft	40	12/18/11 8:52	55.3	1.0 U	1.0 U	1.70	6,720	

Note: To convert meters to feet, multiply by 3.2808.

* While collecting the duplicate sample at CPT-4F/109 ft, water/condensation was pulled into tubing. Duplicate sample was then collected from CPT-4E/25 ft.

bgs = below ground surface
CCl_4 = carbon tetrachloride
$CHCl_3$ = chloroform
CH_2Cl_2 = methylene chloride
MEK = methyl ethyl ketone

Table E-2. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-9 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
CPT-17/10 ft	3	2/16/11 10:54	3.36	1.0 U	1.0 U	1.19	6,690	
CPT-17/10 ft	3	3/23/11 9:08	1.93	1.0 U	1.0 U	1.01	8,050	
CPT-17/10 ft	3	4/19/11 9:02	4.62	1.0 U	1.0 U	1.0 U	7,560	
CPT-17/10 ft	3	6/9/11 9:53	3.71	1.0 U	1.0 U	1.11	12,400	
CPT-17/10 ft	3	6/30/11 10:01	3.77	1.0 U	1.0 U	1.0 U	10,900	
CPT-17/10 ft	3	7/21/11 8:59	3.35	1.0 U	1.0 U	1.0 U	14,800	
CPT-17/10 ft	3	8/24/11 10:03	3.34	1.0 U	1.0 U	1.44	15,900	
CPT-17/10 ft	3	9/14/11 8:51	4.24	1.0 U	1.0 U	1.0 U	12,200	
CPT-17/10 ft	3	12/18/11 10:41	6.00	1.0 U	1.0 U	1.0 U	6,310	
CPT-16/25 ft	8	2/16/11 13:11	1.08	1.0 U	1.0 U	1.0 U	8,820	
CPT-16/25 ft	8	3/23/11 9:40	1.78	1.0 U	1.0 U	1.0 U	8,730	
CPT-16/25 ft	8	4/19/11 9:51	1.69	1.0 U	1.0 U	1.0 U	8,430	
CPT-16/25 ft	8	6/9/11 10:22	1.41	1.0 U	1.0 U	1.11	12,400	
CPT-16/25 ft	8	6/30/11 10:29	1.67	1.0 U	1.0 U	1.0 U	11,100	
CPT-16/25 ft	8	7/21/11 9:30	1.04	1.0 U	1.0 U	1.0 U	14,500	
CPT-16/25 ft	8	8/24/11 10:37	1.21	1.0 U	1.0 U	1.29	15,800	
CPT-16/25 ft	8	9/14/11 9:18	1.0 U	1.0 U	1.0 U	1.0 U	12,400	
CPT-16/25 ft	8	12/18/11 11:43	1.26	1.0 U	1.0 U	1.0 U	6,630	
CPT-27/33 ft	10	2/16/1112:28	2.84	1.0 U	1.0 U	1.18	7,640	
CPT-27/33 ft	10	3/23/11 9:35	3.49	1.0 U	1.0 U	1.0 U	8,890	
CPT-27/33 ft	10	4/19/11 9:27	4.43	1.0 U	1.0 U	1.0 U	7,880	
CPT-27/33 ft	10	6/9/11 10:18	3.13	1.0 U	1.0 U	1.23	12,700	

Table E-2. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-9 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
CPT-27/33 ft	10	6/30/11 10:24	3.52	1.0 U	1.0 U	1.0 U	11,100	
CPT-27/33 ft	10	7/21/11 9:25	1.73	1.0 U	1.0 U	1.0 U	14,700	
CPT-27/33 ft	10	8/24/11 10:25	3.12	1.0 U	1.0 U	1.70 U	16,500	
CPT-27/33 ft	10	9/14/11 9:11	1.0 U	1.0 U	1.0 U	1.0 U	12,700	
CPT-27/33 ft	10	12/18/11 11:25	3.76	1.0 U	1.0 U	1.0 U	6,520	
CPT-18/35 ft	10	2/16/11 11:15	1.03	1.0 U	1.0 U	1.26	6,910	
CPT-18/35 ft	10	3/23/11 9:14	1.02	1.0 U	1.0 U	1.0 U	8,180	
CPT-18/35 ft	10	4/19/11 9:05	1.92	1.0 U	1.0 U	1.0 U	7,540	
CPT-18/35 ft	10	6/9/11 9:58	1.0 U	1.0 U	1.0 U	1.0 U	12,300	
CPT-18/35 ft	10	6/30/11 10:05	1.38	1.0 U	1.0 U	1.0 U	10,600	
CPT-18/35 ft	10	7/21/11 9:03	1.17	1.0 U	1.0 U	1.0 U	14,600	
CPT-18/35 ft	10	8/24/11 10:06	1.25	1.0 U	1.0 U	1.55	15,200	
CPT-18/35 ft	10	9/14/11 8:54	1.70	1.0 U	1.0 U	1.0 U	12,300	
CPT-18/35 ft	10	12/18/11 10:48	1.03	1.0 U	1.0 U	1.0 U	6,270	
CPT-28/40 ft	12	3/23/11 9:04	6.91	1.0 U	1.0 U	1.0 U	7,990	
CPT-28/40 ft	12	4/19/11 8:56	2.22	1.0 U	1.0 U	1.0 U	7,370	
CPT-28/40 ft	12	6/9/11 9:46	2.87	1.0 U	1.0 U	1.0 U	12,600	
CPT-28/40 ft	12	6/30/11 9:56	2.63	1.0 U	1.0 U	1.0 U	10,500	
CPT-28/40 ft	12	7/21/11 8:53	1.96	1.0 U	1.0 U	1.0 U	13,800	
CPT-28/40 ft	12	8/24/11 9:57	1.37	1.0 U	1.0 U	1.27	14,800	
CPT-28/40 ft	12	9/14/11 8:44	1.24	1.0 U	1.0 U	1.0 U	12,100	
CPT-9A/50 ft	15	2/16/11 8:35	34.8	1.0 U	1.0 U	3.62	5,600	

Table E-2. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-9 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
CPT-9A/50 ft	15	3/23/11 7:52	34.4	1.0 U	1.0 U	3.40	6,580	
CPT-9A/50 ft	15	4/19/11 7:36	35.0	1.0 U	1.0 U	3.07	5,930	
CPT-9A/50 ft	15	6/9/11 7:37	35.6	1.0 U	1.0 U	4.03	12,000	
CPT-9A/50 ft	15	6/30/11 7:48	32.9	1.0 U	1.0 U	3.59	9,870	
CPT-9A/50 ft	15	7/21/11 7:32	33.6	1.0 U	1.0 U	3.44	12,300	
CPT-9A/50 ft	15	8/24/11 8:27	33.6	1.0 U	1.0 U	4.26	15,300	
CPT-9A/50 ft	15	9/14/11 7:14	32.7	1.0 U	1.0 U	3.00	11,100	
CPT-9A/50 ft	15	12/18/11 8:22	34.1	1.0 U	1.0 U	3.78	6,830	
CPT-9A/60 ft	18	2/16/11 8:31	16.0	1.0 U	1.0 U	1.61	5,340	
CPT-9A/60 ft	18	2/16/11 8:31	16.9	1.0 U	1.0 U	1.0 U	5,600	Duplicate Sample
CPT-9A/60 ft	18	3/23/11 7:50	7.04	1.0 U	1.0 U	1.14	5,950	
CPT-9A/60 ft	18	4/19/11 7:32	11.1	1.0 U	1.0 U	1.61	5,410	
CPT-9A/60 ft	18	6/9/11 7:34	9.28	1.0 U	1.0 U	1.68	12,100	
CPT-9A/60 ft	18	6/30/11 7:46	13.2	1.0 U	1.0 U	2.05	9,760	
CPT-9A/60 ft	18	7/21/11 7:30	14.8	1.0 U	1.0 U	2.08	12,100	
CPT-9A/60 ft	18	8/24/11 8:24	7.63	1.0 U	1.0 U	1.54	13,600	
CPT-9A/60 ft	18	9/14/11 7:12	6.46	1.0 U	1.0 U	1.21	9,040	
CPT-9A/60 ft	18	12/18/11 8:16	11.2	1.0 U	1.0 U	1.76	6,610	
CPT-9A/60 ft	18	12/18/11 8:16	11.2	1.0 U	1.0 U	1.39	6,730	Duplicate Sample
C4938 (P69C)/64.0 ft	20	2/16/11 12:03	13.7	1.0 U	1.0 U	3.80	7,630	
C4938 (P69C)/64.0 ft	20	12/18/11 11:03	1.0 U	1.0 U	1.0 U	1.0 U	6,430	
C4937 (P66D)/64.1 ft	20	2/16/11 12:09	16.7	1.0 U	1.0 U	6.63	7,590	

Table E-2. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-9 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
C4937 (P66D)/64.1 ft	20	12/18/11 11:08	1.0 U	1.0 U	1.0 U	1.0 U	6,480	
C5340 (P68C)/64.5 ft	20	2/16/11 12:14	20.1	1.0 U	1.0 U	10.9	7,670	
C5340 (P68C)/64.5 ft	20	12/18/11 11:12	1.0 U	1.0 U	1.0 U	1.0 U	6,510	
CPT-9A/64 ft	20	2/16/11 8:39	25.8	1.0 U	1.0 U	2.62	5,880	
CPT-9A/64 ft	20	3/23/11 7/:55	25.3	1.0 U	1.0 U	2.73	6,730	
CPT-9A/64 ft	20	4/19/11 7:39	25.5	1.0 U	1.0 U	2.61	6,070	
CPT-9A/64 ft	20	6/9/11 7:41	24.4	1.0 U	1.0 U	3.28	12,400	
CPT-9A/64 ft	20	6/30/11 7:51	25.7	1.0 U	1.0 U	2.81	10,000	
CPT-9A/64 ft	20	7/21/11 7:35	25.1	1.0 U	1.0 U	3.03	12,200	
CPT-9A/64 ft	20	8/24/11 8:29	25.0	1.0 U	1.0 U	3.34	15,300	
CPT-9A/64 ft	20	9/14/11 7:17	24.3	1.0 U	1.0 U	2.55	11,300	
CPT-9A/64 ft	20	12/18/11 8:25	24.8	1.0 U	1.0 U	2.38	6,780	
CPT-16/65 ft	20	3/23/11 9:42	4.77	1.0 U	1.0 U	1.0 U	8,410	
CPT-16/65 ft	20	4/19/11 9:53	3.63	1.0 U	1.0 U	1.0 U	8,590	
CPT-16/65 ft	20	6/9/11 10:25	4.07	1.0 U	1.0 U	1.66	12,300	
CPT-16/65 ft	20	6/30/11 10:31	4.45	1.0 U	1.0 U	1.0 U	11,100	
CPT-16/65 ft	20	7/21/11 9:32	1.39	1.0 U	1.0 U	1.0 U	14,400	
CPT-16/65 ft	20	8/24/11 10:40	2.53	1.0 U	1.0 U	1.87	15,500	
CPT-16/65 ft	20	9/14/11 9:20	3.61	1.0 U	1.0 U	1.0 U	11,900	
CPT-21A/65 ft	20	2/16/11 12:19	53.8	1.0 U	1.0 U	1.69	7,680	
CPT-21A/65 ft	20	3/23/11 9:28	46.5	1.0 U	1.0 U	1.62	8,430	
CPT-21A/65 ft	20	4/19/11 9:19	44.2	1.0 U	1.0 U	1.81	7,810	

Table E-2. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-9 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
CPT-21A/65 ft	20	6/9/11 10:11	44.7	1.0 U	1.04	3.33	12,600	
CPT-21A/65 ft	20	6/30/11 10:18	45.1	1.0 U	1.0 U	1.74	11,200	
CPT-21A/65 ft	20	7/21/11 9:17	41.9	1.0 U	1.0 U	2.56	14,800	
CPT-21A/65 ft	20	8/24/11 10:18	36.0	1.0 U	1.03	2.58	15,500	
CPT-21A/65 ft	20	9/14/11 9:07	38.5	1.0 U	1.0 U	1.64	13,000	
CPT-21A/65 ft	20	12/18/11 11:18	39.1	1.0 U	1.0 U	1.07	6,500	
CPT-18/75 ft	23	3/23/11 9:16	1.26	1.0 U	1.0 U	1.0 U	8,270	
CPT-18/75 ft	23	4/19/11 9:08	1.19	1.0 U	1.0 U	1.0 U	7,710	
CPT-18/75 ft	23	6/9/11 0:00	1.0 U	1.0 U	1.0 U	1.0 U	12,500	
CPT-18/75 ft	23	6/30/11 10:07	1.27	1.0 U	1.0 U	1.14	11,100	
CPT-18/75 ft	23	7/21/11 9:05	1.0 U	1.0 U	1.0 U	1.01	15,300	
CPT-18/75 ft	23	8/24/11 10:08	1.13	1.0 U	1.0 U	1.42	15,600	
CPT-18/75 ft	23	9/14/11 9:00	1.22	1.0 U	1.0 U	1.0 U	12,800	
299-W15-82/83 ft	25	2/16/11 12:36	8.39	1.0 U	1.0 U	2.44	7,920	
299-W15-82/83 ft	25	12/18/11 11:30	2.60	1.0 U	1.0 U	2.02	6,620	
CPT-21A/86 ft	26	2/16/11 12:23	121	1.0 U	1.0 U	2.50	7,650	
CPT-21A/86 ft	26	3/23/11 9:30	119	1.0 U	1.0 U	2.16	8,480	
CPT-21A/86 ft	26	4/19/11 9:22	123	1.0 U	1.0 U	2.26	7,610	
CPT-21A/86 ft	26	6/9/11 10:14	75.9	1.0 U	1.0 U	3.01	13,100	
CPT-21A/86 ft	26	6/30/11 10:20	73.4	1.0 U	1.0 U	2.46	12,000	
CPT-21A/86 ft	26	7/21/11 9:20	73.1	1.0 U	1.0 U	2.20	15,800	
CPT-21A/86 ft	26	8/24/11 10:21	69.8	1.0 U	1.0 U	3.20	15,000	

Table E-2. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-9 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
CPT-21A/86 ft	26	9/14/11 9:09	69.8	1.0 U	1.0 U	1.97	12,400	
CPT-21A/86 ft	26	12/18/11 11:20	69.6	1.0 U	1.0 U	1.85	6,490	
CPT-28/87 ft	27	2/16/11 10:49	186	1.0 U	1.0 U	3.09	6,960	
CPT-28/87 ft	27	3/23/11 9:02	164	1.0 U	1.0 U	2.98	7,880	
CPT-28/87 ft	27	4/19/11 8:58	160	1.0 U	1.0 U	2.62	7,280	
CPT-28/87 ft	27	6/9/11 9:50	178	1.0 U	1.13	3.63	13,500	
CPT-28/87 ft	27	6/30/11 9:58	177	1.0 U	1.0 U	2.58	11,800	
CPT-28/87 ft	27	7/21/11 8:55	173	1.0 U	1.12	3.48	16,400	
CPT-28/87 ft	27	8/24/11 10:00	180	1.0 U	1.32	3.60	14,900	
CPT-28/87 ft	27	9/14/11 8:46	174	1.0 U	1.07	2.71	12,000	
CPT-28/87 ft	27	12/18/11 10:37	174	1.0 U	1.02	2.77	6,550	
299-W15-8U/103 ft	31	2/16/11 11:34	11.0	1.0 U	1.0 U	5.64	7,070	Sample tubing could not be installed below approximately 80 ft bgs (24.4 m).
299-W15-8U/103 ft	31	12/18/11 10:53	1.96	1.0 U	1.0 U	1.63	6,310	
299-W15-217/114 ft	35	2/16/11 11:05	16.0	1.0 U	1.0 U	3.07	6,970	
299-W15-217/114 ft	35	12/18/11 10:45	1.68	1.0 U	1.0 U	1.0 U	6,350	
CPT-24/118 ft	36	3/23/11 9:21	12.7	1.0 U	1.0 U	4.24	7,970	
CPT-24/118 ft	36	4/19/11 9:13	12.5	1.0 U	1.04	4.23	7,470	
CPT-24/118 ft	36	6/9/11 10:06	12.3	1.0 U	1.15	4.88	12,500	
CPT-24/118 ft	36	6/30/11 10:13	12.3	1.0 U	1.01	4.32	11,200	
CPT-24/118 ft	36	7/21/11 9:11	12.2	1.0 U	1.12	5.05	14,100	

Table E-2. Monitoring Data for Nonoperational Wells and Probes at the 216-Z-9 Site for 2011

Sample Location	Depth (m bgs)	Sample Date Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
CPT-24/118 ft	36	8/24/11 10:13	11.7	1.0 U	1.43	5.01	15,000	
CPT-24/118 ft	36	9/14/11 9:04	11.8	1.0 U	1.0 U	197	12,200	
299-W15-95L/144 ft	44	2/16/11 13:01	10.5	1.0 U	1.0 U	4.69	8,250	
299-W15-95L/144 ft	44	12/18/11 11:39	8.65	1.0 U	1.0 U	4.21	6,460	
299-W15-9L/176 ft	54	2/16/11 12:56	5.90	1.0 U	1.0 U	2.75	8,250	
299-W15-9L/176 ft	54	12/18/11 11:34	4.38	1.0 U	1.0 U	2.04	6,610	
299-W15-8L/180 ft	55	2/16/11 11:52	7.25	1.0 U	1.0 U	2.68	7,650	
299-W15-8L/180 ft	55	12/18/11 10:57	6.02	1.0 U	1.0 U	8.75	6,460	

Note: To convert meters to feet, multiply by 3.2808.

bgs = below ground surface
CCl_4 = carbon tetrachloride
$CHCl_3$ = chloroform
CH_2Cl_2 = methylene chloride
MEK = methyl ethyl ketone

Table E-3. Carbon Tetrachloride Concentration Standard Analyses

Carbon Tetrachloride Concentration Standard (ppmv)	Carbon Tetrachloride Concentration Analyzed (ppmv)	Date Analyzed	Time Analyzed	B&K™ Serial Number
24.984	20.4	02/16/11	13:41	1715232
24.984	20.4	02/16/11	14:51	1715232
200.000	196.0	02/16/11	14:53	1715232
24.984	20.8	03/23/11	10:06	1715232
24.984	20.9	03/23/11	11:06	1715232
200.000	206.0	03/23/11	11:10	1715232
24.984	21.1	04/19/11	11:01	1715232
24.984	21.1	04/19/11	11:01	1715232
200.000	215.0	04/19/11	12:05	1715232
24.984	21.3	06/09/11	10:49	1715232
24.984	21.1	06/09/11	12:17	1715232
200.000	205.0	06/09/11	12:55	1715232
24.984	21.1	06/30/11	10:51	1715232
24.984	20.2	06/30/11	12:19	1715232
200.000	196.0	06/30/11	13:17	1715232
24.984	20.9	07/21/11	9:50	1715232
24.984	20.8	07/21/11	10:48	1715232
200.000	200.0	07/21/11	10:55	1715232
24.984	21.3	08/24/11	11:00	1715232
24.984	21.1	08/24/11	12:00	1715232
200.000	203.0	08/24/11	12:07	1715232
24.984	20.9	09/14/11	9:37	1715232
24.984	21.2	09/14/11	11:35	1715232
200.000	197.0	09/14/11	11:40	1715232
24.984	20.5	12/18/11	12:14	1715232
24.984	20.5	12/18/11	14:18	1715232
200.000	200	12/18/11	14:22	1715232

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Table E-4. Blank Analyses

Sample Location	Analyzed Date	Analyzed Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)
Blank	02/16/11	13:43	1.0 U	1.0 U	1.0 U	1.0 U	2,000
Blank	02/16/11	14:49	1.0 U	1.0 U	1.0 U	1.0 U	4,890
Blank	03/23/11	10:08	1.0 U	1.0 U	1.0 U	1.0 U	3,580
Blank	03/23/11	11:08	1.0 U	1.0 U	1.0 U	1.0 U	5,090
Blank	04/19/11	11:03	1.0 U	1.0 U	1.0 U	1.0 U	4,010
Blank	04/19/11	12:03	1.0 U	1.0 U	1.0 U	1.0 U	5,350
Blank	06/09/11	10:51	1.0 U	1.0 U	1.0 U	1.0 U	5,710
Blank	06/09/11	12:19	1.0 U	1.0 U	1.0 U	1.0 U	7,700
Blank	06/30/11	10:53	1.0 U	1.0 U	1.0 U	1.0 U	6,390
Blank	06/30/11	12:21	1.0 U	1.0 U	1.0 U	1.0 U	7,460
Blank	07/21/11	9:52	1.0 U	1.0 U	1.0 U	1.0 U	9,020
Blank	07/21/11	10:52	1.0 U	1.0 U	1.0 U	1.0 U	9,190
Blank	08/24/11	11:02	1.0 U	1.0 U	1.0 U	1.0 U	8,990
Blank	08/24/11	12:02	1.0 U	1.0 U	1.0 U	1.0 U	9,930
Blank	09/14/11	9:35	1.0 U	1.0 U	1.0 U	1.0 U	5,650
Blank	09/14/11	11:33	1.0 U	1.0 U	1.0 U	1.0 U	7,440
Blank	12/18/11	12:12	1.0 U	1.0 U	1.0 U	1.0 U	5,720
Blank	12/18/11	14:20	1.0 U	1.0 U	1.0 U	1.0 U	5,510

CCl_4 = carbon tetrachloride
$CHCl_3$ = chloroform
CH_2Cl_2 = methylene chloride
MEK = methyl ethyl ketone
U = analyzed for but not detected; value reported in the reporting limit

Table E-5. Field Blank Analyses

Sample Location	Sample Date	Sample Time	Analysis Time	CCl_4 (ppmv)	$CHCl_3$ (ppmv)	MEK (ppmv)	CH_2Cl_2 (ppmv)	Water (ppmv)	Comment
Field blank	2/16/11	13:14	14:47	1.0 U	1.0 U	1.0 U	1.0 U	6,830	The previously used Tedlar® bag was from well 299-W18-253.
Field blank	3/23/11	9:44	11:04	1.0 U	1.0 U	1.0 U	1.0 U	8,450	The previously used Tedlar bag was from well CPT-18 white.
Field blank	4/19/11	9:55	11:55	1.0 U	1.0 U	1.0 U	1.0 U	6,130	The previously used Tedlar bag was from well 299-W15-9L.
Field blank	6/9/11	10:27	12:43	1.0 U	1.0 U	1.0 U	1.40	10,700	The previously used Tedlar bag was from well 299-W18-249.
Field blank	6/30/11	9:13	11:57	1.0 U	1.0 U	1.0 U	1.0 U	8,290	The previously used Tedlar bag was from well 299-W18-167.
Field blank	7/21/11	8:48	10:50	1.0 U	1.0 U	1.0 U	1.02	9,940	The previously used Tedlar bag was from well CPT-30 green.
Field blank	8/24/11	10:42	11:58	1.0 U	1.0 U	1.0 U	1.49	12,200	The previously used Tedlar bag was from well C5340.
Field blank	9/14/11	9:23	11:31	1.0 U	1.0 U	1.0 U	1.0 U	8,720	The previously used Tedlar bag was from well 299-W18-152.
Field blank	12/18/11	11:45	14:16	1.0 U	1.0 U	1.0 U	1.0 U	6,430	The previously used Tedlar bag was from well 299-W18-253.

CCl_4 = carbon tetrachloride

$CHCl_3$ = chloroform

CH_2Cl_2 = methylene chloride

MEK = methyl ethyl ketone

U = analyzed for but not detected; value reported in the reporting limit

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