WASHINGTON STATE DEPARTMENT OF ECOLOGY

Shelton Laundry and Cleaners, August 2005 through May 2006 Groundwater Monitoring Results

Abstract

Groundwater samples to be tested for volatile organic analysis were collected from five monitoring wells quarterly from August 2005 through May 2006 at Shelton Laundry and Cleaners in Shelton, Washington.

Samples were collected to monitor the concentration and distribution of tetrachloroethylene (PCE) after the injection of a hydrogen release compound (HRC) to remediate the remaining contaminants present in the vicinity of well 4W.

PCE contamination of the shallow groundwater was discovered in 1997. The source of contamination was assumed to be a 1993 spill outside a dry cleaning facility. Monitoring of four shallow wells in 1998 detected PCE in one well (4W) at a concentration of 280 µg/L.

In 2002 Ecology installed four deep wells and began monitoring groundwater quality of the eight on-site wells. From 2002 through early 2005, PCE concentrations in well 4W ranged from 10 to 25 µg/L. PCE was not detected in the four deep wells.

During August 2005 through May 2006, PCE concentrations in well 4W increased after the injection of HRC in June 2005. PCE concentrations in this well ranged from 6.8 µg/L in November 2005 to 324 µg/L in May 2006. The Model Toxic Control Act (MTCA) Method A cleanup standard for PCE is 5.0 µg/L.

Trichloroethylene (TCE) and cis-1,2-dichloroethylene (DCE) concentrations also increased in well 4W to 13 µg/L and 16 µg/L, respectively, in May 2006. The TCE concentration exceeds the MTCA cleanup standard of 5.0 µg/L. The DCE concentration was well below the cleanup standard of 70 µg/L.

Increases in contaminant concentrations such as detected in well 4W have been reported at other HRC sites as biosurfactants solubilize the volatile organics that are absorbed to the aquifer media. These increases are typically temporary. Groundwater monitoring should continue on a quarterly basis for a minimum of another year to determine if the remedial treatment with HRC has been effective.

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Background

Tetrachloroethylene (PCE) contamination of the shallow groundwater was discovered in 1997 during an environmental site assessment/subsurface investigation (Building Analytics, 1997) of a property in Shelton, Washington (Figure 1). PCE was detected at a concentration of 130 µg/L in groundwater collected from a shallow boring. The Model Toxic Control Act (MTCA) Method A cleanup level for PCE in groundwater is 5 µg/L.

The Washington State Department of Ecology (Ecology) was notified of the contamination when it received copies of the Environmental Site Assessment Reports in June 1997 (Building Analytics, 1997). Based on these reports, Shelton Laundry and Cleaners was listed on Ecology's *Confirmed and Suspected Contaminated Sites List* in December 1997, and ranked under the Washington Ranking System.

The most likely source of the contamination was identified as the dry cleaning facility occupied by Shelton Laundry and Cleaners, which is located adjacent to the property where the site assessment was conducted. A commerical laundry and dry cleaning facility has been in operation at this site since 1935. In 1993, a new dry cleaning machine was installed. As the old cleaning machine was removed, an unknown quantity of dry cleaning solvent, assumed to be PCE, was reportedly spilled and infiltrated through the broken asphalt in the alley behind the building.
This spill event is assumed to be the source of groundwater contamination.

Several investigations were conducted at the Shelton Laundry and Cleaners site during 1997 and 1998. During these investigations, several shallow borings were drilled to collect both soil and groundwater samples. In July 1998, four shallow (15 feet deep) monitoring wells were installed (1W, 4W, 7W, and 8W). Groundwater was sampled from these wells four times between July 1998 and September 2000. PCE contamination was primarily detected in the well (4W) located nearest to where the spill was reported to have occurred, with concentrations ranging from 280 µg/L (July 1998) to 25 µg/L (September 2000).

Ecology conducted a follow-up investigation in 2002 to determine the status of the PCE groundwater contamination. As part of the invesitgation, four additional wells (MW-5 through MW-8) were installed to gain a better understanding of contaminant concentrations at greater depths. Three of the wells were installed to a depth of 45 feet adjacent to existing shallow wells. The fourth well was installed to a depth of 60 feet south of the site. PCE was not detected in any of the deeper wells during the 2002 monitoring (Marti, 2003).

Because PCE concentrations exceeded the MTCA cleanup standard in well 4W, Ecology has continued to monitor the groundwater quality of the site since July 2002. During this time PCE concentrations in well 4W have ranged from approximately 10 to 25 µg/L. In an effort to remediate the remaining contaminants, 1,050 pounds of a hydrogen release compound (HRC) was injected into the shallow groundwater between wells 4W and 7W in June 2005. The HRC was injected at depths of 5 to 20 feet below the ground surface at 16 locations which were spaced at 8-foot intervals and covered an area of about 60 feet by 15 feet.

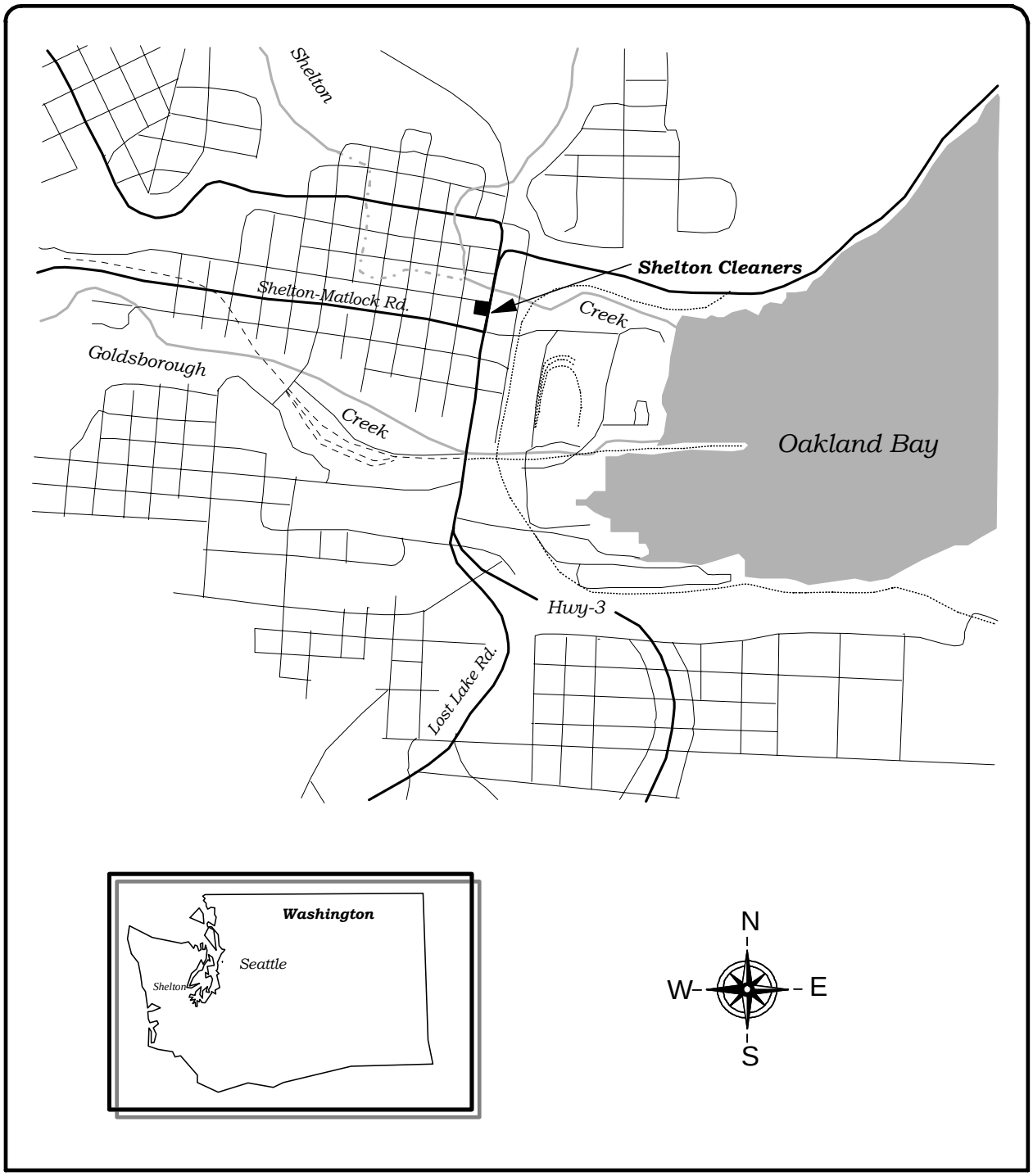

Figure 1: Shelton Laundry & Cleaners Site Location

In general, project well logs indicate that the site is covered with a thin layer of fill and two to six feet of silty sand, which is underlain by an undetermined thickness of sandy gravel with some sand interbeds. The well log for 4W shows that a silty, fine gravel with some fine to coarse sand is present from six to 14 feet below ground surface. The sandy gravel in which all eight monitoring wells are screened is part of the Vashon recessional outwash deposits which underlay the western outwash plain between Shelton and the Skokomish Valley to the north. Deeper production well logs near the site indicate that the recessional deposits can attain a thickness of more than 100 feet in the area of Oakland Bay.

The depth to the water table on the project site ranged from about three to six feet over the 1997 – 2006 study period. Regionally, groundwater flow is described as being southward in the loose sand and gravel toward the Shelton Valley and Oakland Bay (Molenaar and Noble, 1970).

Methods

Groundwater Sampling

Groundwater samples to be tested for volatile organic analysis (VOAs) were collected in August and November of 2005 and in February and May of 2006 from three shallow and two deep monitoring wells (Figure 2) to monitor concentrations of PCE following the injection of HRC to remediate the remaining contaminants in the vicinity of well 4W.

The three shallow wells installed in 1998 (1W, 4W, and 7W) were constructed of 1-inch diameter PVC to a depth of about 15 feet with 10-foot screens. The two deep wells installed in 2002 (MW-5 and MW-6) were constructed of 2-inch diameter PVC to a depth of about 45 feet, with the screened interval from 35-45 feet below ground surface (bgs).

Static water levels were measured in all wells, prior to well purging and sampling, using a Solinst water level meter with a ¼-inch diameter probe. Measurements were recorded to 0.01 foot and are accurate to 0.03 foot. The probe was rinsed with deionized water between measurements. Wells were purged through a continuous flow cell until pH, specific conductivity, and temperature readings stabilized. Purge water from all the wells was collected and stored on-site in a 55-gallon drum. The purge water was transported and disposed of in accordance with Washington State Dangerous Waste Regulations (Chapter 173-340 WAC).

Monitoring wells MW-5 and MW-6 were purged and sampled using a stainless steel submersible pump, using a pump rate of less than 1-liter/minute. At the completion of purging, samples were collected from the wells directly from the dedicated pump discharge tubing into laboratory supplied containers. The pump was decontaminated between each well by circulating laboratory grade detergent/water though the pump followed by a clean water rinse, with each cycle lasting five minutes.

Because of their small diameter (1 inch), wells 1W, 4W, and 7W were purged and sampled with a peristaltic pump. Although studies have shown that there can be a loss of volatile analytes in samples collected with suction lift devices such as a peristaltic pump, in some situations the loss may be small if the sample lift is small and a slow pump rate is used in conjunction with less sorptive tubing material (Parker, 1994). To minimize the loss of volatile analytes in wells 1W, 4W, and 7W, dedicated polyethylene tubing was used in each well and pumped at a rate of less than 1-liter/minute. The sample lift was less than six feet. At the completion of purging, the polyethylene tubing was disconnected from the pump, plugged, and removed from the well. Water collected in the tubing was allowed to drain into pre-cleaned sample vials.

VOA samples were collected free of headspace in three 40-mL glass vials with Teflon-lined septa lids and preserved with 1:1 hydrochloric acid. Upon sample collection and proper labeling, all samples were stored in an ice-filled cooler. Samples were transported to Ecology's Operation Center in Lacey. Samples were kept in the walk-in cooler until picked up by the courier to the Ecology/EPA Manchester Environmental Laboratory in Manchester, Washington. Chain-of-custody procedures were followed according to Manchester Environmental Laboratory protocol (Ecology, 2005).

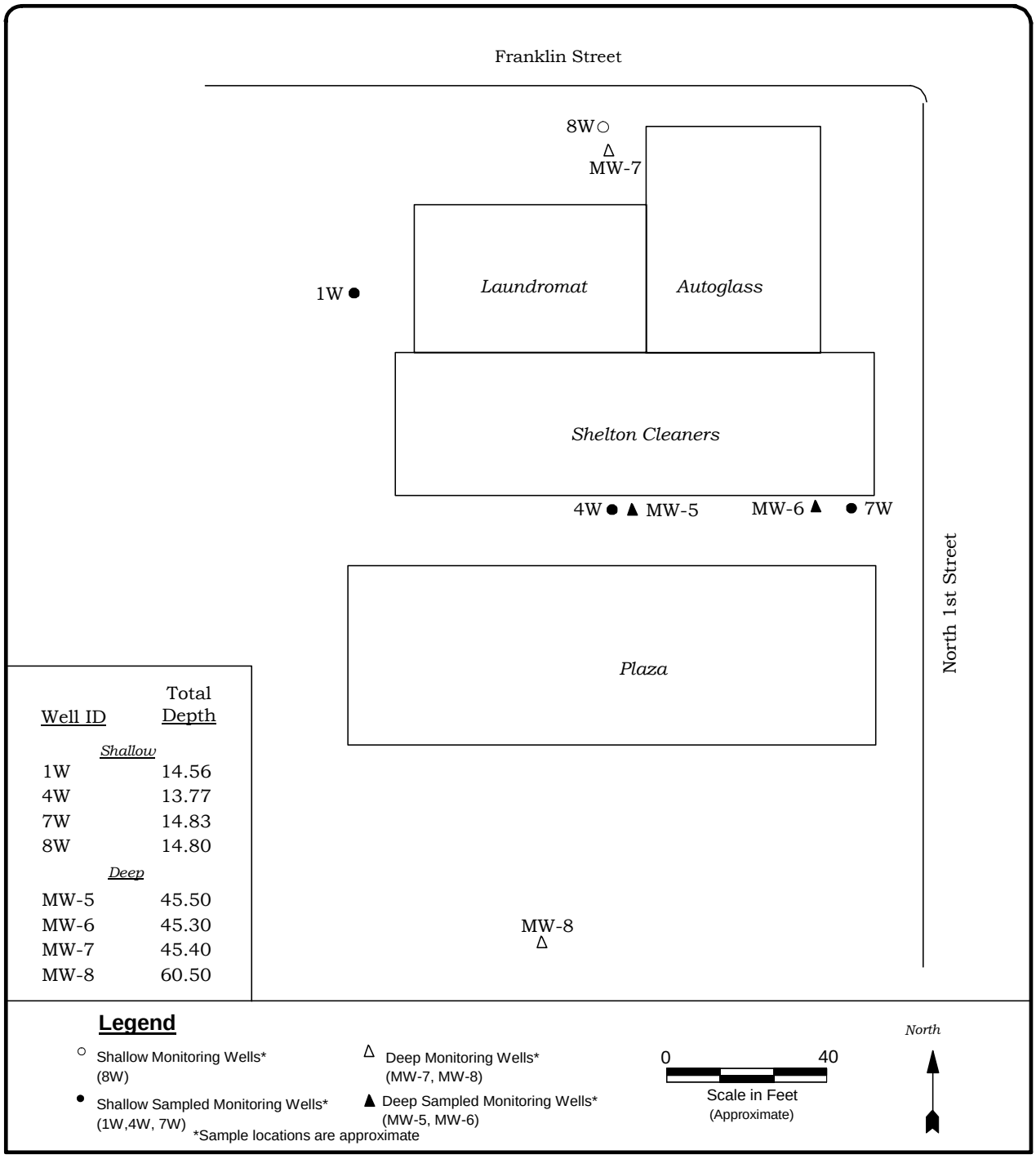

Figure 2: Shelton Laundry & Cleaners Sample Locations

Laboratory

Analytes, analytical methods, and detection limits for both field and laboratory parameters are listed in Table 1. All groundwater samples were analyzed for volatile organics (VOAs) by the Ecology/EPA Manchester Environmental Laboratory.

Table 1. Field and Laboratory Methods

Analytes	Method	Reference	Reporting Limit
Field			
Water Level	Solinst Water Level Meter	NA	0.03 feet
pH	Orion 25A Field Meter	NA	0.1 std. units
Temperature	YSI 3510 Temperature Probe	NA	0.1 ºC
Specific Conductance	YSI 3520 Conductivity Cell	NA	10 umhos/cm
Laboratory			
VOAs	EPA SW-846 Method 8260B	EPA 1996	1-5 µg/L

Data Quality

Quality control samples collected in the field consisted of blind field duplicates. Field duplicates were collected by splitting the pump discharge between two sets of sample bottles, which provides a measure of the overall sampling and analytical precision. Precision estimates are influenced not only by the random error introduced by collection and measurement procedures, but are also influenced by the natural variability of the concentrations in the media being sampled. Field duplicates were collected from well 4W during all sample rounds.

Table 2 shows the results of the duplicate samples and the relative percent difference (RPD). RPD is calculated as the difference between sample results, divided by the mean and expressed as a percent.

Table 2. Relative Percent Difference (RPD) of PCE Duplicate Sample Results (ug/L) from August 2005 through May 2006

Well Sample ID	August 2005	November 2005	February 2006	May 2006
4W	54	6.8	7.1	324
4W-A	16	6.4	28	260
RPD (%)	108%	6%	119%	22%

Between August 2005 and May 2006, the RPD for duplicate samples from monitoring well 4W ranged from 6% to 119%. Data for November 2005 and May 2006 met measurement quality objectives established in the Quality Assurance Project Plan (Marti, 2002).

Data for August 2005 and February 2006 were far outside of the data quality objectives. Field duplicates are expected to have higher variability because they incorporate environmental and sampling variability. The large variability in the duplicate results may be attributed to presence of the HRC or the resulting microbial growth in the subsurface. It was noted that clumps of an unknown substance were present in the groundwater pumped from well 4W. Due to the high RPDs for the August and February results, average concentrations of the duplicate samples for PCE will be used in the remainder of this report and will be "J" qualified as estimated.

Overall, a review of the data quality control and quality assurance from laboratory case narratives indicates analytical performance was good. The reviews include descriptions of analytical methods, holding times, instrument calibration checks, blank results, surrogate recoveries, and laboratory control samples. No problems were reported that compromised the usefulness or validity of the sample results. No data were rejected, and all results were usable as qualified. Quality assurance case narratives and laboratory reporting sheets are available upon request.

All field measurements and analytical result data are available in electronic format from Ecology's Environmental Information Management (EIM) database: www.ecy.wa.gov/eim/index.htm

Results

Field Observations

Total depth of each monitoring well, as well as the range of depth-to-water, temperature, pH, and specific conductance readings, at the time of sampling are listed in Table 3. All field data are presented in Appendix A.

Table 3. Summary of Field Parameter Results for August 2005 through May 2006

Well	Total Depth (feet)[1]	Depth to Water (feet)[1]		Temperature (°C)		pH (standard units)		Specific Conductance (umhos/cm)	
		Range	Difference	Range	Difference	Range	Mean	Range	Mean
Shallow									
1W	14.56	3.27 - 5.13	1.86	9.7 - 13.4	3.7	6.6 - 7.2	6.9	149 - 222	202
4W	13.77	3.14 - 5.03	1.89	9.7 - 14.8	5.1	6.2 - 6.8	6.6	238 - 283	252
7W	14.83	2.79 - 4.63	1.84	10.1 - 12.4	2.3	5.6 - 7.1	6.5	125 – 223	198
Deep									
MW-5	45.5	2.98 - 5.01	2.03	10.6 - 13.4	2.8	6.8 - 7.1	7.0	214 – 221	218
MW-6	45.3	2.77 - 4.61	1.84	10.6 - 11.7	1.1	6.6 - 7.2	7.0	151 - 226	206

[1] Measured from top of PVC casing.

Completion depths for the five monitoring wells ranged from 13.77 to 45.5 feet with depth-to-water ranging from 2.77 to 5.13 feet below the measuring point. Water levels fluctuated approximately two feet during the monitoring period. Hydrographs showing water-level elevations for each well from May 2002 to May 2006 are in Figure 3. Data for the hydrographs are presented in Appendix B. The hydrographs show that, overall, the seasonal fluctuation is small throughout the year (less than one foot), and the groundwater gradient is fairly flat. Water level elevations in February 2006 were higher than in previous years which is probably the result of the long period of rainfall prior to that sampling event.

A typical groundwater flow pattern for the site is shown in Figure 4. This figure is based on water levels measured on May 2006. The location of the water-table contours was determined using a kriging algorithm in the Surfer software program. The groundwater flow direction is approximately perpendicular to the contours. The overall flow direction appears to be southward, which corresponds to the regional flow direction with flow toward the southwest and southeast.

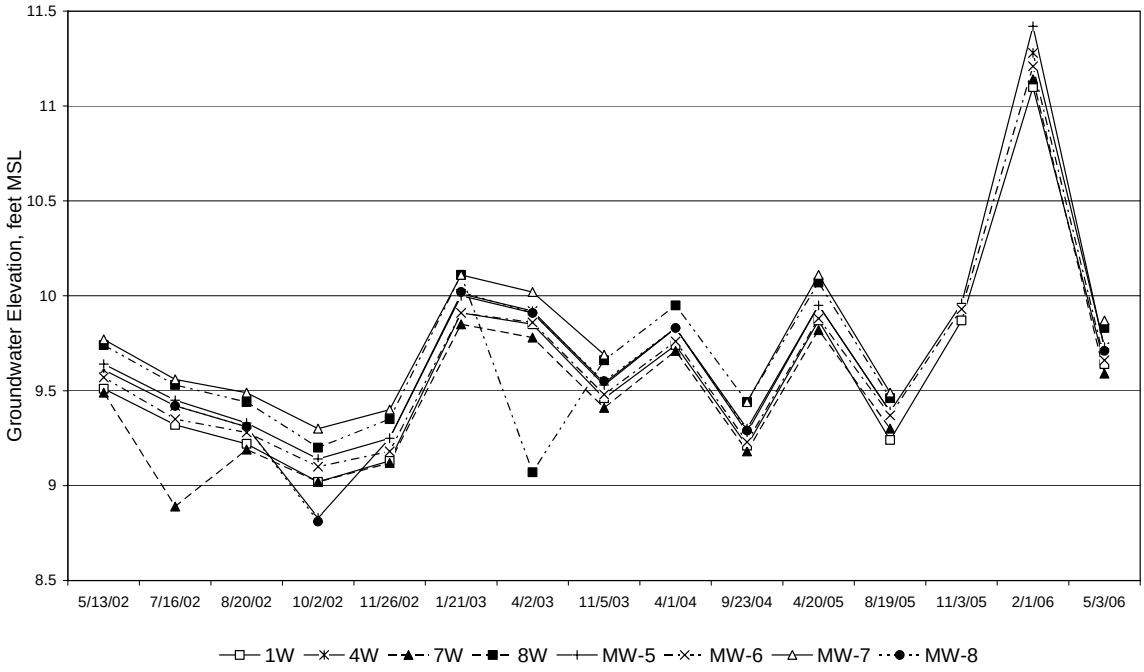

Figure 3: Shelton Laundry and Cleaners - Hydrographs, May 2002 to May 2006

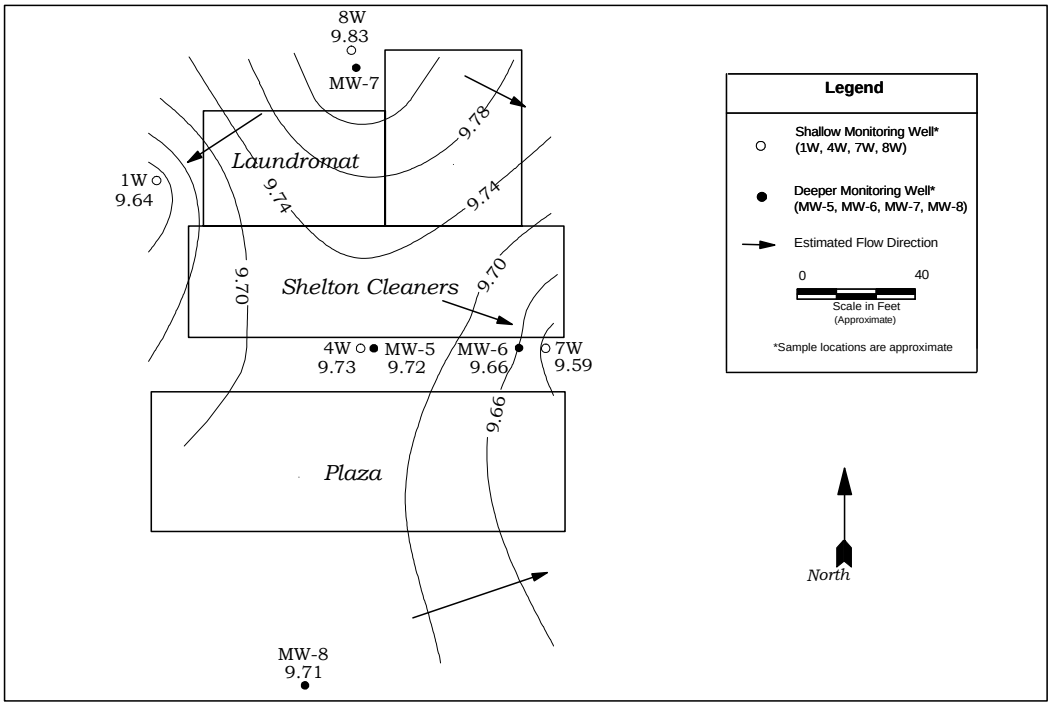

Figure 4: Shelton Laundry and Cleaners - Water Table Elevation, May 2006

Field parameters were within expected ranges for the sampled monitoring wells. Groundwater temperatures measured in the flow cell, which is subject to heating, ranged from 9.7ºC to 14.8ºC, with a fluctuation of 1.1 to 5.1°C. The lowest groundwater temperatures were measured in February and the highest in August. The higher temperatures in August are partly caused by the combination of purging at a low flow rate through a flow cell. The pH of groundwater had an average range of 6.5 to 7.0. The specific conductivity measurements had a mean range of 198 to 252 umhos/cm.

Analytical Results

Analytical results for volatile organics are summarized in Table 4. For comparison, a summary of historical data for this project is presented in Appendix C.

Table 4. Summary of Analytical Results (µg/L) for August 2005 through May 2006

Well ID	Tetrachloroethylene (PCE)				Trichloroethylene (TCE)				Cis-1,2-Dichloroethylene (DCE)			
	8/05	11/05	2/06	5/06	8/05	11/05	2/06	5/06	8/05	11/05	2/06	5/06
Shallow												
1W	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4W	**35* J**	**6.8**	**18* J**	**324**	**4.2* J**	**0.52 J**	**0.63 J**	**13**	**2.9* J**	**1.8**	**0.59 J**	**16**
7W	**0.38 J**	1 U	**0.53 J**	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Deep												
MW-5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
MW-6	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

* – Average concentration of duplicate samples.
U – Analyte was not detected at or above the reported value.
J – Analyte was positively identified. The associated numerical result is an estimate.
Bold – Analyte was detected.

PCE, trichloroethylene (TCE), and cis-1,2-dichloroethylene (DCE) were detected in well 4W during all four rounds of sampling. PCE concentrations in this well ranged from a low of 6.8 µg/L in November 2005 to a high of 324 µg/L in May 2006. TCE and DCE concentrations also increased in well 4W over the monitoring period. TCE and DCE concentrations ranged from below the practical quantitation limit of 1 µg/L and increased to 13 µg/L and 16 µg/L, respectively, in May 2006. Trans-1,2-dichloroethene was also detected in well 4W at an estimated concentration of 0.25 µg/L in May.

PCE was detected in well 7W at concentrations below the quantitation limit in August 2005 and February 2006. Low concentrations of PCE have been detected in this well in the past.

PCE, TCE, and DCE have not been detected in the deep wells since they were installed in July 2002.

Since the injection of the HRC in June 2005, PCE concentrations in well 4W have increased from an average of 15 ppb prior to its injection to 324 µg/L in May 2006 as shown in Figure 5. Hansen et al. (2000) have noted that there can be a temporary increase in aqueous contaminant concentrations in the treatment area as biosurfactants, produced by stimulating microbial growth in the subsurface, solubilize volatile organics that are absorbed to the aquifer media.

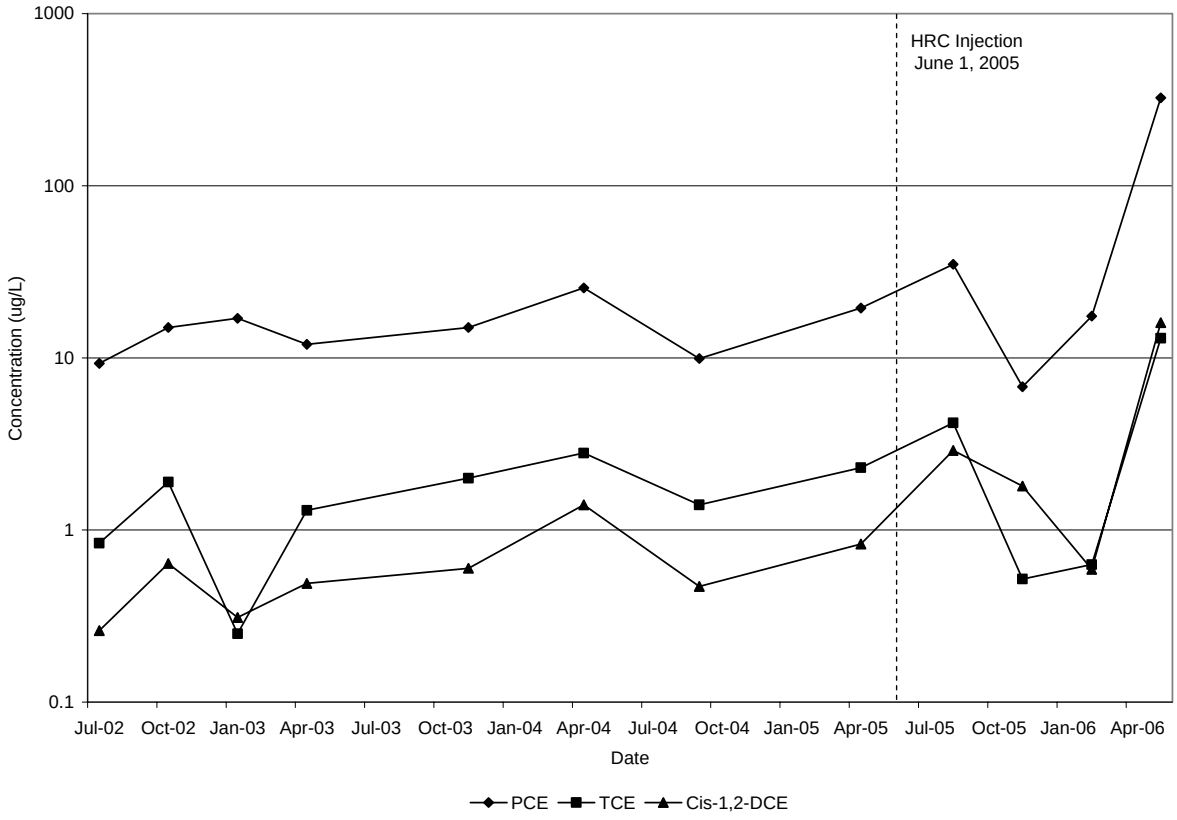

Figure 5: PCE, TCE, and DCE Concentrations (µg/L) in Well 4W, July 2002 through May 2006

2-Butanone, also known as methyl ethyl ketone (MEK), was detected in wells 4W and 7W. MEK concentrations in well 4W ranged from a high of 222 µg/L in August 2005 to a low of 2 µg/L in May 2006. MEK was detected in well 7W in August and November 2005 at concentrations of 9.8 µg/L and 3.8 µg/L, respectively. MEK had not been detected at this site prior to the HRC injection.

Based on information provided by the HRC manufacturer, MEK can be produced by soil bacteria through fermentation of a wide range of organic carbon compounds, either native to the site or introduced during engineered bioremediation. The production of MEK at other HRC sites has not appeared to be significant or long-lasting. (Biondolillo, 2006.)

Conclusions

PCE concentrations in well 4W have increased since the injection of a hydrogen release compound (HRC) for remedial treatment in June 2005. PCE concentrations in this well ranged from a low of 6.8 µg/L in November 2005 to a high of 324 µg/L in May 2006. TCE and DCE concentrations also increased in well 4W to 13 µg/L and 16 µg/L, respectively. TCE and DCE are typically associated with the breakdown of PCE.

PCE concentrations detected in well 4W continue to exceed the Model Toxic Control Act (MTCA) Method A cleanup standard of 5.0 µg/L. TCE concentrations detected in well 4W in May 2006 also exceeded the MTCA cleanup level of 5.0 µg/L. DCE concentrations were well below the cleanup standard of 70 µg/L.

Results of this study indicate that the Shelton Laundry and Cleaners site continues to be contaminated in the area of well 4W. Because the PCE concentrations in the treatment area were low at the time of the HRC injection, approximately 15 ppb, Hansen et al. (2000) have noted that the microbial growth and conditioning needed to reduce contaminant concentrations may take longer. Increases in contaminant concentrations, which have occurred in well 4W, have also been observed at other HRC treatment sites as biosurfactants solubilize the volatile organics that are absorbed to the aquifer media. These increases are typically temporary. If the increased concentrations persist at this site, a second HRC application may be necessary.

Recommendation

Groundwater monitoring should continue on a quarterly basis for a minimum of another year to determine if the HRC remediation has been effective.

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Appendix A. Field Parameters

Table A-1. Field Parameter Results for August & November 2005 and February & May 2006

Well ID	Date	Total Depth (feet)[1]	Depth to Water (feet)[2]	Temperature (°C)	pH (standard units)	Specific Conductance (umhos/cm)	Purge Volume (gallons)
1W	8/19/05	14.56	5.13	13.4	7.2	217	3
1W	11/3/05		4.50	11.1	6.9	149	5.5
1W	2/1/06		3.27	9.7	6.9	222	4
1W	5/3/06		4.73	11.1	6.6	221	4
4W	8/19/05	13.77	5.03	14.8	6.7	283	3.5
4W	11/3/05		--	12.4	6.7	263	4
4W	2/1/06		3.14	9.7	6.2	238	4.5
4W	5/3/06		4.69	11.2	6.8	222	4.5
7W	8/19/05	14.83	4.63	12.4	7.1	221	5
7W	11/3/05		--	11.4	5.6	125	5
7W	2/1/06		2.79	10.1	6.8	223	4
7W	5/3/06		4.34	10.5	6.6	221	4
MW-5	8/19/05	45.50	5.01	13.4	7.1	217	6
MW-5	11/3/05		4.44	12.4	6.9	219	9
MW-5	2/1/06		2.98	10.6	6.8	214	10.5
MW-5	5/3/06		4.68	11.5	7.0	221	7
MW-6	8/19/05	45.30	4.61	11.7	7.1	220	14
MW-6	11/3/05		4.05	11.4	7.2	225	11
MW-6	2/1/06		2.77	10.6	6.6	151	14
MW-6	5/3/06		4.32	11.6	7.0	226	10

[1] Measured from top of PVC casing.
-- Not measured

Appendix B. Hydrograph Data

Table B-1. Groundwater Elevations (feet above mean sea level), May 2002 through May 2006

Well ID:	1W	4W	7W	8W	MW-5	MW-6	MW-7	MW-8
5/13/02	9.51	9.61	9.49	9.74	9.64	9.57	9.77	--
7/16/02	9.32	9.42	8.89	9.53	9.45	9.35	9.56	9.42
8/20/02	9.22	9.31	9.19	9.44	9.33	9.28	9.49	9.31
10/2/02	9.02	8.83	9.02	9.2	9.14	9.1	9.3	8.81
11/26/02	9.13	9.25	9.12	9.35	9.25	9.18	9.5	--
1/21/03	9.91	10.01	9.85	10.11	10	9.91	10.11	10.02
4/2/03	9.85	9.92	9.78	9.07	9.91	9.86	10.02	9.91
11/5/03	9.46	9.54	9.41	9.66	9.53	9.48	9.69	9.55
4/1/04	9.74	9.83	9.71	9.95	9.83	9.76	--	9.83
9/23/04	9.21	9.3	9.18	9.44	9.28	9.23	9.44	9.29
4/20/05	9.87	9.95	9.82	10.07	9.95	9.88	10.11	--
8/19/05	9.24	9.39	9.30	9.46	9.39	9.37	9.49	--
11/3/05	9.87	--	--	--	9.96	9.93	--	--
2/1/06	11.1	11.28	11.14	--	11.42	11.21	--	--
5/3/06	9.64	9.73	9.59	9.83	9.72	9.66	9.87	9.71

Depth-to-water measured from top of PVC casing.
-- Not measured

Appendix C. Historical Data

Table C-1. PCE, TCE, and DCE Results (µg/L), May 1997 through May 2006

Well ID	Building Analytics	AA Enviro Assessment	GeoEngineers			
	5/21/97	3/3/98	7/24/98	11/18/98	7/12/99	9/6/00
1W						
PCE	--	--	<1.0	<1.0	<1.0	NS
TCE	--	--	<1.0	<1.0	<1.0	NS
4W						
PCE	**130**[1]	**1510**[2]	**280**	**130**	**39**	**25**
TCE	NR	NR	**4.7**	<1.0	<1.0	<1.0
DCE	NR	NR	**33**	<1.0	<1.0	<1.0
7W						
PCE	--	--	**4.3**	**3**	<1.0	**1.2**
TCE	--	--	<1.0	<1.0	<1.0	<1.0
DCE	--	--	**6.4**	<1.0	<1.0	<1.0
8W						
PCE	--	--	<1.0	<1.0	<1.0	NS
TCE	--	--	<1.0	<1.0	<1.0	NS

PCE = tetrachloroethylene
TCE = trichloroethylene
DCE = cis-1,2-dichloroethylene

NS = not sampled
NR = not reported

<1.0 = Analyte was not detected at a concentration above the value shown.

[1] = Concentration reported by Building Analytics is from an approximate location of well 4W.
[2] = Concentration reported by AA Enviro Assessment is from an approximate location of well 4W.

Bold = Analyte was detected.

Table C-1 (continued). PCE, TCE, and DCE Results (µg/L), May 1997 through May 2006

Well ID	Ecology											
	7/17/02	10/3/02	1/22/03	4/3/03	11/5/03	4/1/04	9/23/04	4/20/05	8/19/05	11/3/05	2/1/06	5/3/06
1W												
PCE	1 U	1 U	1 U	1 U	--	--	--	--	1 U	1 U	1 U	1 U
TCE	1 U	2 U	1 U	1 U	--	--	--	--	1 U	1 U	1 U	1 U
4W												
PCE	**9.3**	**15**	**17**	**12**	**15**	**26***	**9.9**	**20***	**35***	**6.8**	**18***	**324**
TCE	**0.84 J**	**1.9 J**	**0.25 J**	**1.3**	**2**	**2.8***	**1.4**	**2.3**	**4.2***	**0.52 J**	**0.63 J**	**13**
DCE	**0.26 J**	**0.64 J**	**0.31 J**	**0.49 J**	**0.60 J**	**1.4**	**0.47 J**	**0.83 J**	**2.9***	**1.8**	**0.59 J**	**16**
7W												
PCE	1 U	**0.19 J**	1 U	1 U	1 U	**1.7**	**0.47 J**	**0.15 J**	**0.38 J**	1 U	**0.53 J**	1 U
TCE	1 U	2 U	1 U	1 U	1 U	1 U	**0.26 J**	1 U	1 U	1 U	1 U	1 U
DCE	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
8W												
PCE	1 U	1 U	1 U	1 U	--	--	--	--	--	--	--	--
TCE	1 U	2 U	1 U	1 U	--	--	--	--	--	--	--	--
MW-5												
PCE	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U
TCE	1 U	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
MW-6												
PCE	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U
TCE	1 U	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
MW-7												
PCE	1 U	1 U	1 U	1 U	--	--	--	--	--	--	--	--
TCE	1 U	2 U	1 U	1 U	--	--	--	--	--	--	--	--
MW-8												
PCE	1 U	1 U	1 U	1 U	--	--	--	--	--	--	--	--
TCE	1 U	2 U	1 U	1 U	--	--	--	--	--	--	--	--

PCE = tetrachloroethylene
TCE = trichloroethylene
DCE = cis-1,2-dichloroethylene

U = Analyte was not detected at or above the reported value.
J = Analyte was positively identified. The associated numerical result is an estimate.
UJ = Analyte was not detected at or above the reported estimated result.

* = Average concentration of duplicate samples.
Bold = Analyte was detected.