A Department of Ecology Report

Shelton Laundry and Cleaners Groundwater Monitoring Results, July 2013: Data Summary Report

Abstract

Tetrachloroethene (PCE) contamination of shallow groundwater underlying Shelton Laundry and Cleaners was discovered in 1997. The source of contamination was assumed to be a 1993 solvent spill outside the dry cleaner's commercial building. Monitoring of four shallow wells in 1998 detected PCE in the local aquifer at concentrations as high as 280 ug/L in the well located nearest to the reported spill location (4W). The Washington State Model Toxics Control Act (MTCA) Method A cleanup level for PCE is 5 ug/L.

In 2002, the Washington State Department of Ecology (Ecology) began monitoring the groundwater quality at the site. From 2002 to 2005, PCE was consistently detected in well 4W over a concentration range of 10 to 25 ug/L. In an attempt to remediate the contamination, a hydrogen release compound (HRC®) was injected into the groundwater around well 4W in June 2005. Following the HRC injection, groundwater monitoring results indicated that the HRC was temporarily effective in reducing the contaminant concentrations. However, after August 2006 concentrations gradually increased, returning to their pre-HRC injection concentrations.

This report describes the water quality results for groundwater samples collected in July 2013 from three shallow wells and two deep wells. PCE was detected in well 4W at a concentration of 5.3 ug/L. Trichloroethene (TCE) and cis-1,2-dichloroethene (cis-DCE) were also detected in well 4W, at concentrations near or below the reporting limit of 1 ug/L. PCE, TCE, and cis-DCE were not detected in any of the other sampled wells.

Groundwater monitoring should continue in well 4W since PCE concentrations remain above the MTCA cleanup level of 5 ug/L.

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Contact Information

Author: Pamela B. Marti, Licensed Hydrogeologist
Environmental Assessment Program
P.O. Box 47600
Olympia, WA 98504-7600

Communications Consultant
Phone: (360) 407-6764

Washington State Department of Ecology - www.ecy.wa.gov

o	Headquarters, Olympia	(360) 407-6000
o	Northwest Regional Office, Bellevue	(425) 649-7000
o	Southwest Regional Office, Olympia	(360) 407-6300
o	Central Regional Office, Yakima	(509) 575-2490
o	Eastern Regional Office, Spokane	(509) 329-3400

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Background

Shelton Laundry and Cleaners is an active laundromat located in downtown Shelton, Washington (Figure 1). In 1997, shallow groundwater beneath the site was found to be contaminated with tetrachloroethene (PCE) (Building Analytics, 1997). The source of the contamination is assumed to be a 1993 solvent spill in the alley behind the dry cleaner's commercial building.

Environmental investigations conducted at the site between 1997 and 2000 showed that PCE contamination was present in shallow groundwater in the southeastern portion of the site beneath the alley. Groundwater samples collected from shallow (approximately 15 feet deep) monitoring wells showed PCE contamination was primarily detected in well 4W (the well located nearest to the reported spill location). Between 1997 and 2000 PCE concentrations in this well decreased from 280 ug/L to 25 ug/L (GeoEngineers, 2000).

Ecology conducted a follow-up investigation in 2002 during which four deeper wells (approximately 45 to 60 feet deep) were installed to gain a better understanding of contaminant concentrations at greater depths. PCE was not detected in any of the deep wells. Between 2002 and 2005, PCE continued to be detected in well 4W at concentrations ranging from approximately 10 to 25 ug/L.

In June 2005 an effort was made to remediate the contamination. A Hydrogen Release Compound (HRC®) was injected into the ground to stimulate biodegradation processes in the soil and groundwater to degrade the chlorinated compounds. The HRC was injected below the water table at depths of 5 to 20 feet below ground surface (bgs) at 16 locations between wells 4W and 7W (Figure 1) (Balaraju, 2005).

Results from the first year of monitoring following the HRC injection suggest that enhanced degradation was occurring. PCE and trichloroethene (TCE) concentrations decreased while cis-1,2-dichloroethene (cis-DCE) concentrations increased (Figure 2). The contaminant concentrations in well 4W were at their lowest in August 2006, 15 months following the HRC injection. After 2006, concentrations gradually increased to pre-injection levels. HRC typically has an effective longevity of about 12 to 18 months (Willett, 2004).

Ecology continues to monitor the site groundwater on a regular basis because PCE concentrations in well 4W continue to exceed Model Toxics Control Act (MTCA) Method A cleanup level of 5 ug/L. Currently the monitoring schedule is annual for 3 shallow wells and bi-annual for 2 deep wells.

The data and associated annual monitoring reports for this project are available at Ecology's Environmental Information Management (EIM) website www.ecy.wa.gov/eim/index.htm. Search Study ID, PMART001.

Results

Ecology collected groundwater samples in July 2013 from three shallow and two deep monitoring wells. All wells were sampled in accordance with Ecology's SOP EAP078 (Marti, 2011).

Samples were submitted for analysis of volatile organic compounds (VOCs) to determine PCE concentrations in the vicinity of well 4W. Analytical results are summarized in Tables 1 and 2.

A blind field duplicate was collected from well 4W in July. The relative percent difference (RPD) for the PCE and TCE duplicate results were 2% and 8% as shown in Table 1.

Table 1. Relative Percent Difference (RPD) of Duplicate Sample Results (ug/L), July 2013.

Well Sample ID	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Cis-1,2-Dichloroethene (cis-DCE)
4W	5.3	1.3	0.77 J
4W-A	5.2	1.2	0.75 J
RPD[1] (%)	2%	8%	--

MW-4A is the duplicate sample identification.
J: Analyte was positively identified. The associated numerical result is an estimate.
[1] RPD target ±15%.

The PCE and TCE duplicate data from well 4W met the data quality objectives of 15% established in the Quality Assurance Project Plan (Marti, 2002). The laboratory data quality control and quality assurance results indicate that the analytical performance was good and that the results are usable as qualified.

As shown in Table 2, PCE was detected in well 4W at a concentration of 5.3 ug/L, which slightly exceeds the MTCA cleanup level of 5 ug/L. TCE and cis-DCE were also detected in well 4W at concentrations near or below the reporting limit of 1 ug/L.

PCE, TCE, and cis-DCE were not detected in shallow wells 1W and 7W. These contaminants have not been detected in well 1W since monitoring began in 1998. PCE was last detected in well 7W in February 2006 at a concentration of 0.53 ug/L.

Volatile organics have never been detected in the deep wells since the wells were installed in July 2002.

A summary of monitoring results since 2002 is presented in Table 3.

Table 2: Summary of Analytical Results (ug/L), July 2013.

Well ID	Tetrachloroethene (PCE)	Trichloroethene (TCE)	Cis-1,2-Dichloroethene (cis-DCE)
MTCA Cleanup Level	5 ug/L	5 ug/L	70 ug/L
Shallow			
1W	1 U	1 U	1 U
4W	**5.3**	**1.3**	**0.77 J**
7W	1 U	1 U	1 U
Deep			
MW-5	1 U	1 U	1 U
MW-6	1 U	1 U	1 U

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.

Conclusions

Shallow groundwater underlying the Shelton Laundry and Cleaners site continues to be contaminated in the area of well 4W. PCE continues to be detected in this well above the MTCA cleanup level of 5 ug/L.

TCE and cis-DCE, associated with the breakdown of PCE, were also detected in well 4W but at concentrations near or below the reporting limit of 1 ug/L, which is below their respective MTCA cleanup levels of 5 ug/L and 70 ug/L.

The remaining shallow and deep wells continue to have no detectable levels of contamination.

Although enhanced contaminant degradation appeared to be occurring following the 2005 HRC injection, contaminant concentrations have returned to their pre-HRC injection levels. HRC typically has an effective longevity of about 12 to 18 months (Willett, 2004).

Recommendations

Groundwater monitoring should continue in the three shallow wells (1W, 4W, and 7W) on an annual basis since PCE concentrations in monitoring well 4W continues to exceed the MTCA Method A cleanup level of 5 ug/L.

Because contaminants have never been detected in deep wells MW-5 and MW-6, a sample frequency of every other year should continue to be sufficient.

Groundwater flow direction from the source area consistently appears to be to the south-southeast. It is recommended that either a better placed downgradient well be installed or an existing off-site well located for use in the monitoring program.

Elevated PCE concentrations (88-269 ug/Kg) were detected in shallow soil samples (4-8 feet) near well 4W in June 2005. PCE concentrations decreased to approximately 1 ug/Kg in deeper soils (12-16 feet) from the same borings. Since groundwater concentrations continue to exceed MTCA Method A cleanup levels in well 4W after the HRC injection treatment, evaluation of additional soil remediation is recommended.

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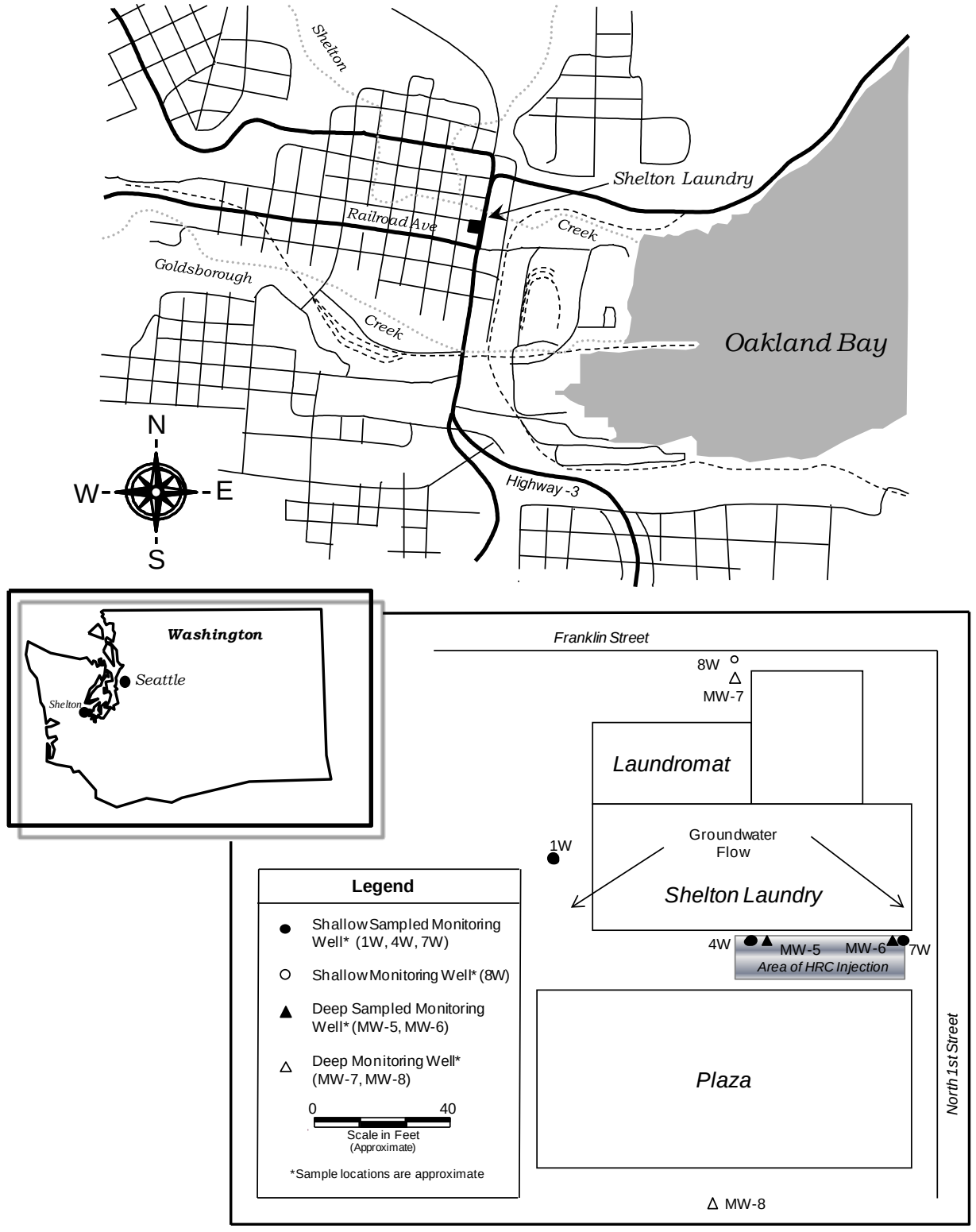

Figure 1: Shelton Laundry and Cleaners Location and Site Detail.

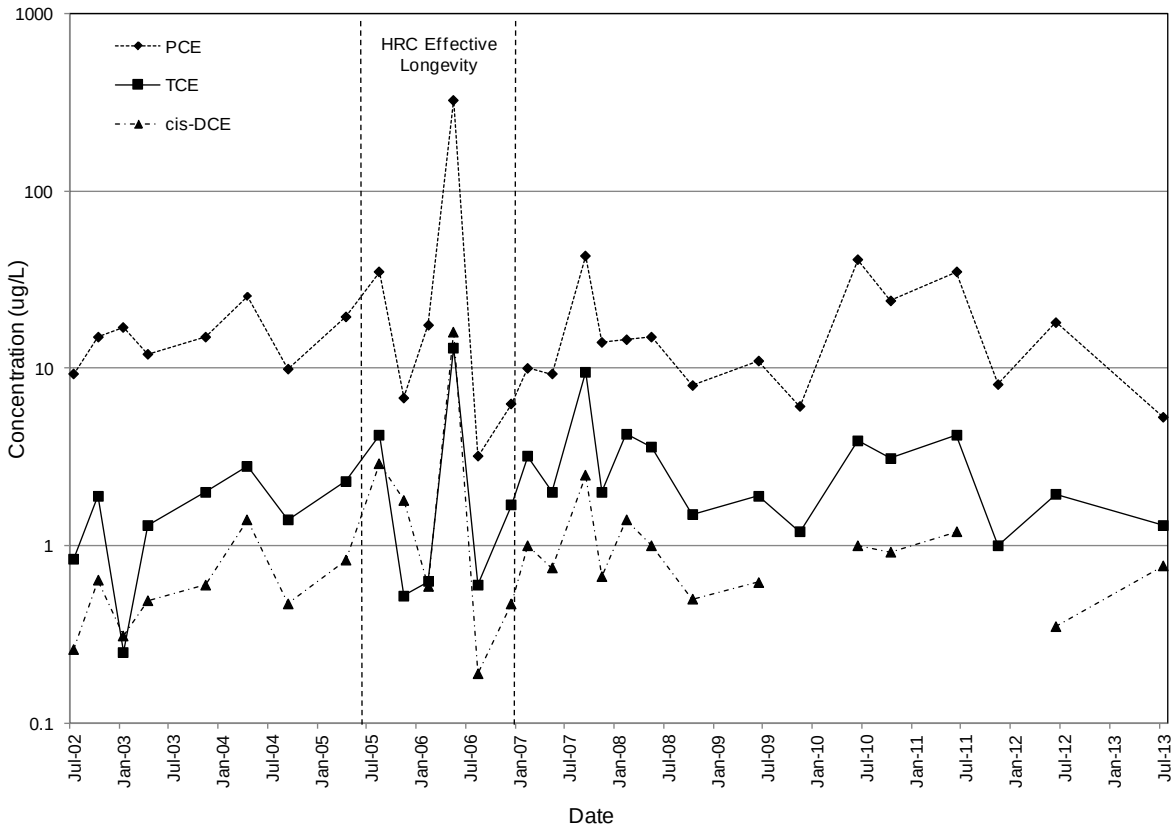

Figure 2: PCE, TCE, and cis-DCE Concentrations (ug/L – log scale) in Well 4W, July 2002 through July 2013.

Table 3: PCE, TCE, and DCE Groundwater Results (ug/L), July 2002 through July 2013.

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	8/22/06	12/1/06	2/15/07	5/14/07
1W																
PCE	1 U	1 U	1 U	1 U	--	--	--	--	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	1 U	1 U	1 U	1 U
4W																
PCE	**9.3**	**15**	**17**	**12**	**15**	**26**[a]	**9.9**	**20**[a]	**35**[a]	**6.8**	**18**[a]	**324**	**3.2 J**	**6.3**	**10**	**9.3**
TCE	**0.84 J**	**1.9 J**	**0.25 J**	**1.3**	**2**	**2.8**[a]	**1.4**	**2.3**	**4.2**[a]	**0.52 J**	**0.63 J**	**13**	**0.60 J**	**1.7**	**3.2**	**2**
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**[a]	**1.8**	**0.59 J**	**16**	**0.19 J**	**0.47 J**	**1**	**0.75 J**
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	1 U	1 U	1 U	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	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	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	1 UJ	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	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	1 UJ	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	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	--	--	--	--	--	--	--	--	--	--	--	--

Bold = Analyte was detected.

U - Analyte was not detected at or above the reported value.
UJ - Analyte was not detected at or above the reported estimated result.
J - Analyte was positively identified. The associated numerical result is an estimate.
[a] Average concentration of duplicate samples.

Table 2 (continued): PCE, TCE, and DCE Groundwater Results (ug/L), July 2002 through July 2013.

Well ID	Ecology															
	9/7/07	11/30/07	2/19/08	5/14/08	10/20/09	6/12/09	11/20/09	6/10/10	10/15/10	6/10/11	11/8/11	6/12/12	7/17/13			
1W																
PCE	2 U	2 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U			
TCE	2 U	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																
PCE	**43**	**14**	**15 J**[a]	**15 J**	**8**	**11**	**6.1 J**[a]	**41 J**[a]	**24**	**35 J**	**8.1 J**[a]	**18.1 J**[a]	**5.3**			
TCE	**9.5**	**2**	**4.3 J**[a]	**3.6**	**1.5**	**1.9**	**1.2**	**3.9 J**[a]	**3.1**	**4.2 J**	**1.0 J**	**1.95 J**[a]	**1.3**			
DCE	**2.5**	**0.67 J**	**1.4 J**	**1**	**0.5 J**	**0.62 J**	1 U	**1**	**0.92 J**	**1.2**	1 U	**0.35 J**	**0.77 J**			
7W																
PCE	2 U	2 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U			
TCE	2 U	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	--	--	--	--	--	--	--	--	--	--	--	--	--			
TCE	--	--	--	--	--	--	--	--	--	--	--	--	--			
MW-5																
PCE	2 U	2 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	--	1 U			
TCE	2 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																
PCE	2 U	2 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	--	1 U			
TCE	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	--	1 U			
MW-7																
PCE	--	--	--	--	--	--	--	--	--	--	--	--	--			
TCE	--	--	--	--	--	--	--	--	--	--	--	--	--			
MW-8																
PCE	--	--	--	--	--	--	--	--	--	--	--	--	--			
TCE	--	--	--	--	--	--	--	--	--	--	--	--	--			

Bold = Analyte was detected.

U - Analyte was not detected at or above the reported value.

J - Analyte was positively identified. The associated numerical result is an estimate.

[a] Average concentration of duplicate samples.