



# City of Bothell™

## Public Works Department

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Bothell, WA 98011

## LETTER OF TRANSMITTAL

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**Date:** December 2, 2017

**Company:** Department of Ecology  
**Attn:** Sunny Becker NWRO Toxics  
**Address:** Cleanup Program 3190 - 160th SE  
Bellevue, WA 98008

**From:** Nduta Mbutia, Project Engineer, Capital Projects Division

### Attached please find: Electronic copy of:-

1) Letter Report (12/2/2017) - YR 4, QTR 3 Groundwater Monitoring Report for Riverside Site

- |   |   |
|---|---|
| <input type="checkbox"/> For your information/files | <input type="checkbox"/> For your action          |
| <input checked="" type="checkbox"/> At your request | <input type="checkbox"/> Approved as noted        |
| <input type="checkbox"/> Returned for correction    | <input type="checkbox"/> Please return all copies |
| <input type="checkbox"/> Other:                     |   |

**Comments:** N/A



December 2, 2017

HWA Project No. 2007 098- 2012

Ms. Sunny Becker  
Washington Department of Ecology  
Toxics Cleanup Program, Northwest Regional Office  
3190 - 160th SE Bellevue, WA 98008

Subject: **GROUND WATER MONITORING RESULTS  
YEAR 4, QUARTER 3 – OCTOBER 2017  
Riverside HVOC Site  
Bothell, Washington**

Dear Ms. Becker:

This report describes quarterly ground water monitoring results at the Riverside HVOC Site, hereafter referred to as “the Site”, located in downtown Bothell, Washington.

Ground water remediation is being performed as an interim action, in response to tetrachloroethene (PCE) and its degradation products in shallow ground water at concentrations exceeding Model Toxics Control Act (MTCA) Method A cleanup levels. The interim action is being performed in accordance with the Interim Action Work Plan (IAWP) dated January 7, 2013 and per the scope of work set forth in Amendment 2 to Agreed Order DE 6295, dated April 19, 2013, between the City of Bothell (City) and the Washington State Department of Ecology (Ecology). Remediation is being performed via pump-and-treat methods, which includes ground water extraction and discharge to the sanitary sewer via King County Industrial Waste Discharge permit 4268-01. The remediation system currently includes six active extraction wells (EW-1 through EW-6) and 11 monitoring wells (RMW-4 through RMW-13 and BC-3).

Based on discussions with Ecology on October 16, 2017, if, at the end of the fourth year of monitoring (i.e., the next quarterly report) sampling results from the six extraction wells indicate that the interim action is reducing concentrations in ground water, discussions on whether to convert the current interim action into a final cleanup action (dCAP) could potentially commence. The draft Riverside site RI report for both Riverside sites (HVOC & TPH) was issued for public comment from October 20 through November 20. Upon Ecology’s acceptance of the draft RI report as Final, the submittal of a dCAP for the HVOC site would be the next step in the process.

Figure 1 shows a site plan with well locations. Ground water monitoring and remediation activities are described below.

## **GROUND WATER REMEDIATION ACTIVITIES**

The ground water extraction and treatment system began operation in December 2013, (with four original extraction wells) and is still operating. Extraction wells EW-5 and EW-6 were installed in June 2016, with Ecology's input and approval. Ground water extraction from the remediation system is measured via a totalizing flow meter placed in the effluent pipe that discharges to the King County sanitary sewer.

Quarterly discharge reports are submitted to King County Industrial Waste Division using standard forms provided by King County. The quarterly discharge report for this quarter is attached for reference (Appendix A). Effluent samples were collected from all extraction wells except EW-4 during the last round of sampling. In addition, each quarter of sampling has included collection of a sample from the combined discharge effluent from the remediation system. Sampling dates for extraction wells are shown in Table 1.

## **COMPLIANCE GROUND WATER MONITORING**

This section describes performance monitoring of ground water performed during the interim action.

- First year (2014) ground water monitoring events were performed in April, June, September and December 2014.
- Second year (2015) ground water monitoring events were performed in March, June, September, and December 2015.
- Third year (2016) ground water monitoring events were performed in March, June, September, and December 2016/early January 2017.
- Fourth year (2017) ground water monitoring events were performed in April, June, and October, with one subsequent round remaining and tentatively scheduled for late December 2017/early January 2018.

All monitoring events have included sampling some wells on a quarterly basis and some wells on a semi-annual basis in accordance with the IAWP (see Table 1).

Performance monitoring is performed to confirm that the interim action has attained cleanup standards. Performance monitoring includes collection of ground water samples from the extraction wells and selected monitoring wells, as described in Table 1 (excerpted from the IAWP).

Performance monitoring samples are analyzed for halogenated volatile organic compounds (HVOCs) and field parameters (temperature, dissolved oxygen, oxygen reduction potential, specific conductivity, and pH).

## **GROUND WATER ANALYTICAL RESULTS**

Analytical results for ground water samples are summarized in Table 2. Figures 2, 3, and 4 show graphs of HVOCs over time as follows:

- Figure 2 - Monitoring wells, PCE vs time
- Figure 3 - Extraction wells, PCE vs time
- Figure 4 - RMW-7 HVOCs vs. time

Sampling events in September 2009 and May 2013 provide ground water chemistry data from when the wells were installed, and base-line ground water chemistry data prior to initial operation of the ground water treatment system. Review of analytical results for monitoring well samples provides the following observations:

- HVOC concentrations in the monitoring wells, including RMW-7 at the point of compliance near the river, had decreased from 2009 to 2013, before the treatment system was installed.
- After the treatment system was started in December 2013, all HVOC concentrations in compliance monitoring well RMW-7 have changed seasonally, but generally show decreasing concentrations (i.e., the seasonal high concentrations have generally decreased over time). Results from this most recent quarter show an increase in both (cis) 1,2-DCE and VC, likely due to seasonal changes, with generally higher concentrations in the fall and winter.

Review of analytical results for extraction well samples provides the following observations and trends:

- HVOC concentrations in the four original extraction wells after the treatment system was started have changed seasonally, but have generally remain within the same range.
- Extraction wells EW-1, EW-2, and EW-3 continue to show PCE and/or TCE exceedances in the MTCA Method A cleanup levels. EW-3 has generally exhibited concentrations of VC, and sometimes (cis) 1,2-DCE, that exceed the MTCA Method A cleanup levels.
- PCE has shown increasing concentrations in EW-3 since September 2016; however, this is the first quarter since then that has seen a significant drop in PCE concentration, likely in response to changed ground water flow patterns post EW-5 and EW-6 installation. The remediation system's flow rates for each extraction well continues to be adjusted on a quarterly basis to either increase or decrease flow rates based on HVOC concentrations. In EW-3's case, we have increased the flow rate in response to the increasing PCE concentrations.
- EW-4 recently stopped pumping prior to this sampling event, but the well pump is scheduled to be serviced this month. Out of the four original extraction wells, well EW-4 has shown the lowest HVOC concentrations, with PCE concentrations

ranging from below MTCA cleanup levels to non-detect in the seven previous rounds of sampling.

- PCE, TCE and VC concentrations in EW-5 were above the MTCA Method A cleanup level in the past three sampling events while DCE was below the cleanup levels. During the last sampling event, VC was above the cleanup levels while PCE and the other degradation products were below cleanup levels or non-detect in EW-5.
- PCE, TCE, DCE, and VC concentrations in EW-6 were all above the MTCA cleanup levels for the first time since monitoring of this well commenced in January 2017. As mentioned above, this is likely due to seasonal fluctuations as the HVOC concentrations often show an increase during the third quarter monitoring events.

## **GROUND WATER TREATMENT SYSTEM PERFORMANCE DATA**

Treatment system performance data is collected on at least a monthly basis. Total discharge to-date is around 11M gallons based on totalizer readings at the discharge outlet to the sanitary sewer. Average flows have been around 10,000 to 15,000 gallons per day.

## **CONCLUSIONS AND RECOMMENDATIONS**

Analytical results of the quarterly monitoring indicate all extraction wells have been and continue to recover HVOC-impacted ground water. Analytical results indicate generally decreasing trends, with seasonal fluctuations in HVOC concentrations in compliance monitoring well RMW-7. This suggests some shrinking of the plume, although the generally similar concentrations in the other wells suggest a steady state condition, where HVOCs from upgradient areas may be replacing ground water pumped from the system.

The new extraction wells (EW-5 and EW-6) show an increase in HVOC concentrations from the previous quarter, with HVOC impacts in both wells. However, this increase is likely due to seasonal fluctuations and these wells appear also to be successful in capturing HVOC-impacted ground water prior to that water discharging to the river.

In summary, the analytical results from the ground water monitoring and extraction wells show that the extraction system is acting as a barrier and capturing HVOC-impacted ground water that might otherwise be discharging into the river, as intended. We recommend continued operation of the treatment system. Other than general maintenance, no augmentation or modifications of the system appear warranted other than what is needed as part of normal operation and maintenance.

December 2, 2017  
HWA Project No. 2007 098- 2012



We appreciate the opportunity to provide our services to you on this project. Please feel free to contact me if you have any questions or need additional information.

Sincerely,  
HWA GEOSCIENCES INC.

Handwritten signature of Austin York in black ink.

Austin York  
Geologist

Handwritten signature of Arnie Sugar in purple ink.

Arnie Sugar, LC, LHG  
Principal Hydrogeologist

Attachments:

- Table 1, Performance Monitoring per the IAWP
- Table 2, Ground water analytical results, including new wells
- Figure 1, Site plan
- Figure 2, Monitoring wells, PCE vs time
- Figure 3, Extraction wells, PCE vs time
- Figure 4, MW-7 HVOCs vs. time
- Figure 5: HVOCs in Ground water
- Appendix A: King County Industrial Waste Report

**Table 1**  
**Performance Monitoring**  
**Bothell Riverside Site**

<b>Sample Type</b>	<b>Sampling Location</b>	<b>Sampling Frequency / Rationale</b>
Preliminary Point of Compliance	Extraction well 1 Extraction well 2 Extraction well 3 Extraction well 4 Extraction well 5 (added 12/16) Extraction well 6 (added 12/16) RMW-7	Quarterly for one year, then modify based on results and consultation with Ecology (e.g. move to semi-annual if concentrations stabilize)
Combined discharge	Combined discharge at sewer manhole or manifold	As required by KCIWD permit
Nearby wells	BC-3 RMW-4 RMW-5 RMW-6 RMW-8 RMW-9 RMW-10 RMW-12 (added 12/16) RMW-13 (added 12/16)	Semi-annual for one year, then modify based on results and consultation with Ecology to check for water quality impacts due to pumping

**Table 2  
Bothell Riverside Site  
Ground Water Analytical Results**

Monitoring Well Identification	Screened Interval (ft bgs)	Date Sampled	FIELD PARAMETERS							HVOCs					NOTES
			Depth to Water (ft below MP)	pH (units)	Conductivity (µS)	Temp (°C)	Dissolved Oxygen (mg/L)	Oxygen Reduction Potential (ORP)	Settable Solids (mg/L)	Tetrachloro-ethene (µg/L)	Trichloro-ethene (µg/L)	(cis) 1,2-Dichloro-ethene (µg/L)	(trans) 1,2-Dichloro-ethene (µg/L)	Vinyl chloride (µg/L)	
			<b>Cleanup Levels*</b>							<b>0.69</b>	<b>2.5</b>	<b>16 (B)</b>	<b>100 (B)</b>	<b>0.2</b>	
			<b>KCIWD Limits</b>							<b>7.00</b>	<b>240</b>	<b>500</b>	<b>Total &lt;2000</b>	<b>12</b>	
RMW-4	15-25	6/24/14													Wellhead buried under new landscaping
		12/19/14	12.2	6.59	1183	14.6	1.70			<b>0.79</b>	<b>0.33</b>	<0.20	<0.20	<0.20	
		6/23/15	13.09	5.76	987	17.67	0.00	-125.70		<b>0.52</b>	<b>0.72</b>	<0.20	<0.20	<0.20	
		12/8/15	11.95	5.99	510	14.9	0.00	-69.90		<b>2.2</b>	<b>0.56</b>	<0.20	<0.20	<0.2	
		6/29/16	12.22	5.17	400	15.31	4.22	91.50		<b>3.6</b>	<b>0.46</b>	<0.20	<0.20	<0.20	
		12/21/16	11.48	6.2	293.5	14.5	0.43	0.00		<b>4.3</b>	<b>0.51</b>	<0.20	<0.20	<0.20	
RMW-5	12-22	6/28/17	11.48	6.41	225	14.65	1.57	65.3		<b>3.9</b>	<b>0.49</b>	<0.20	<0.20	<0.20	
		5/24/13	11.51	6.70	932	13.9	1.00			<b>1.7</b>	<0.2	<0.2		<0.20	
		6/24/14	14.51	6.48	740	14.5	0.15			<b>1.4</b>	<b>0.40</b>	<0.20	<0.20	<0.20	
		12/19/14	13.61	6.28	1226	13.3	0.55			<b>1.3</b>	<b>0.32</b>	<b>0.22</b>	<0.20	<0.20	
		6/23/15	14.26	6.28	953	16.1	0.00	-127.10		<b>0.66</b>	<b>0.36</b>	<0.20	<0.20	<0.20	
		12/8/15	13.29	5.83	318	14.54	18.61	-90.40		<b>1.6</b>	<0.20	<0.20	<0.20	<0.2	
		6/29/16	13.41	6.18	356	14.43	1.71	-2.00		<b>1.1</b>	<b>0.31</b>	<0.20	<0.20	<0.20	
RMW-6	15-25	12/22/16	13.01	6.48	483.9	13.7	0.27	-106.2		<b>1.0</b>	<0.20	<b>0.23</b>	<0.20	<0.20	
		6/29/17	13.26	6.65	0.438	13.85	0.46	-89.3		<b>2.0</b>	<0.20	<0.20	<0.20	<0.20	
		9/14/09								<0.2	<b>0.27</b>	<b>3.6</b>		<b>5.3</b>	
		5/24/13	10.42	6.68	467	14.3	1.40			<0.2	<0.2	<b>2.7</b>		<b>3.4</b>	
		6/24/14	14.79	6.47	407	14.2	0.13			<b>0.34</b>	<b>0.60</b>	<b>0.42</b>	<0.20	<0.20	
		12/19/14	13.31	6.09	294	14.3	0.82			<b>0.47</b>	<0.20	<0.20	<0.20	<0.20	
		6/23/15	13.65	6.12	283	15.2	0.00	8.00		<0.20	<b>1.4</b>	<b>0.88</b>	<0.20	<0.20	
		12/8/15	12.46	6.00	232	14.99	0.00	-40.10		<0.2	<b>2.7</b>	<b>1.0</b>	<0.20	<0.20	
RMW-7	15-25	6/29/16	13.14	6.39	194	15.34	1.64	35.50		<0.20	<b>2.5</b>	<b>1.3</b>	<0.20	<0.20	
		12/21/16	12.21	6.47	179.8	14.8	0.57	88.20		<0.20	<b>0.39</b>	<b>0.5</b>	<0.20	<0.20	
		6/28/17	12.68	6.60	171	14.21	1.11	140.50		<0.20	<b>0.41</b>	<b>0.3</b>	<0.20	<0.20	
		9/14/09								<b>50</b>	<b>120</b>	<b>190</b>		<b>22</b>	
		5/24/13	16.31	6.80	447	16.2	0.30			<b>9</b>	<b>33</b>	<b>65</b>		<b>9.3</b>	
		4/4/14	16.65	6.50	1969	12.9	0.55			<b>0.75</b>	<b>3.8</b>	<b>35</b>	<b>0.54</b>	<b>8.3</b>	
		6/25/14	16.55	6.48	865	15.2	0.03			<b>5.2</b>	<b>24</b>	<b>80</b>	<b>1.1</b>	<b>9.9</b>	
		9/22/14	17.54	6.96	386	18.2	5.25			<1.0	<b>3.2</b>	<b>170</b>	<b>1.6</b>	<b>47</b>	
		12/19/14	17.49	6.06	683	15.4	0.73			<b>2.9</b>	<b>8.9</b>	<b>150</b>	<b>1.4</b>	<b>34</b>	
		3/18/15	16.66	6.35	1127	14.9	1.87			<0.40	<b>1.5</b>	<b>57</b>	<b>0.64</b>	<b>20</b>	
		6/23/15	17.41	5.97	508	17.96	0	-70.3		<0.40	<b>3.1</b>	<b>95</b>	<b>1.2</b>	<b>9.6</b>	
		9/11/15	18.50	6.22	464	21.54	3.23			<b>4.2</b>	<b>23</b>	<b>110</b>	<b>1.4</b>	<b>14</b>	
		12/8/15	15.97	5.96	274	15.92	0.00	-12.3		<b>3.5</b>	<b>8.7</b>	<b>85</b>	<b>0.87</b>	<b>9.0</b>	
		3/31/16	16.94	6.40	403	14.63	2	38.9		<b>1.5</b>	<b>6.8</b>	<b>84</b>	<b>0.91</b>	<b>35</b>	
6/29/16	17.11	6.28	297	16.57	1.2	30.3		<b>2.3</b>	<b>14</b>	<b>65</b>	<b>0.68</b>	<b>12</b>			
9/30/16	18.28	6.12	419	16.81	0.69	31.3		<b>2.4</b>	<b>7.8</b>	<b>89</b>	<1.0	<b>13</b>			
12/22/16	15.89	6.34	368.4	15.8	0.19	-34.1		<b>1.1</b>	<b>4.1</b>	<b>88</b>	<b>0.93</b>	<b>24</b>			
4/5/17	16.43	6.26	318.9	13	0.3	19.5		<b>1.2</b>	<b>2.4</b>	<b>12</b>	<0.20	<b>0.86</b>			
6/28/17	16.65	6.50	283	15.49	0.78	5.9		<b>1.3</b>	<b>1.9</b>	<b>33</b>	<b>0.5</b>	<b>1.9</b>			
10/10/17	18.26	6.33	438	17.38	3.18	176.6		<b>1.0</b>	<b>2.3</b>	<b>47</b>	<b>0.67</b>	<b>25</b>			



RMW-8	20-30	9/15/09								<b>0.46</b>	<b>2.6</b>	<b>1.3</b>		<0.2		
		5/24/13	18.81	6.42	494	16.4	0.10				<b>0.5</b>	<b>0.85</b>	<b>0.44</b>		<0.2	
		6/25/14	19.62	6.27	650	15.7	0.20				<0.20	<0.20	<0.20	<0.20	<0.20	
		12/19/14	20.63	6.18	431	14.5	0.84				<b>0.7</b>	<0.20	<0.20	<0.20	<0.20	
		6/23/15	20.87	5.74	333	26.9	0.27	-61.20			<0.20	<0.20	<0.20	<0.20	<0.20	
		12/8/15	19.42	5.83	344	15.15	1.51	44.30			<0.2	<b>0.39</b>	<b>0.47</b>	<0.20	<0.2	
		6/29/16	20.5	6.27	216	17.47	2.05	32.00			<0.20	<0.20	<0.20	<0.20	<0.20	
		12/22/16	20.58	6.13	297.3	14.6	0.31	32.80			<b>0.31</b>	<b>0.66</b>	<b>0.37</b>	<0.20	<0.20	
6/28/17	19.73	6.21	213	16.03	0.84	120.90			<0.20	<0.20	<0.20	<0.20	<0.20			
RMW-9	20-30	9/15/09								<0.20	<0.20	<0.20		<0.20		
		5/24/13	13.65	6.38	247	15.7	4.00				<0.20	<0.20	<0.20		<0.20	
RMW-9R	20-30	6/24/14												<0.20	Well abandoned during SR 522 construction	
		12/19/14	15.31	6.16	182	15.7	2.92				<b>0.79</b>	<0.20	<0.20	<0.20	<0.20	
		6/23/15	4.00	5.93	139	18.7	4.20	70.40			<0.20	<0.20	<0.20	<0.20	<0.20	
		12/8/15	15.92	5.75	163	15.61	3.29	94.30			<0.2	<0.2	<0.2	<0.20	<0.2	
		6/29/16	15.31	6.53	132	15.91	11.2	94.90			<0.20	<0.20	<0.20	<0.20	<0.20	
		12/22/16	14.78	6.19	151	16	7.68	85.30			<0.20	<0.20	<0.20	<0.20	<0.20	
6/29/17	13.55	6.06	0.103	16.75	7.95	122.10			<0.20	<0.20	<0.20	<0.20	<0.20			
RMW-10	32-42	5/24/13	11.85	6.52	247	13.3	6.60				<0.20	<0.20	<0.20		<0.20	
		6/24/14	15.00	6.19	361	15.4	1.08				<0.20	<0.20	<0.20	<0.20	<0.20	
		12/19/14	14.80	6.08	284	15.0	2.03				<b>0.69</b>	<0.20	<0.20	<0.20	<0.20	
		6/23/15	20.40	6.43	233	17.3	7.28	37.00			<0.20	<0.20	<0.20	<0.20	<0.20	
		12/8/15	19.69	5.94	134	14.69	5.41	50.00			<0.2	<0.2	<0.2	<0.20	<0.2	
		6/29/16	13.6	6.68	166	15.83	8.35	29.20			<0.20	<0.20	<0.20	<0.20	<0.20	
		12/21/16	13.63	6.31	152.4	14.3	3.25	133.8			<0.20	<0.20	<0.20	<0.20	<0.20	
6/28/17	14.05	6.6	207	15.4	2.83	112.6			<0.20	<0.20	<0.20	<0.20	<0.20			
RMW-12	15-25	7/25/16	16.25	6.3	0.442	17.68	1.53	21.7			<b>120</b>	<b>19</b>	<b>14</b>	<1.0	<1.0	
		12/21/16	13.1	5.9	305	15	0.25	103.3			<b>61</b>	<b>14</b>	<b>21</b>	<b>0.34</b>	<b>1.6</b>	
		6/28/17	13.1	6.09	368	14.54	1.87	144.8			<b>130</b>	<b>27</b>	<b>29</b>	<1.0	<1.0	
RMW-13	15-25	7/25/16	14.95	5.19	0.333	17.4	2.5	183.5			<0.20	<0.20	<b>1.8</b>	<0.20	<b>0.24</b>	
		12/22/16	16.61	6.36	351.4	16.0	0.16	-8.2			<0.20	<0.20	<b>1.2</b>	<0.20	<0.20	
		6/28/17	15.23	6.42	448.0	14.7	0.71	25.3			<0.20	<0.20	<b>0.5</b>	<0.20	<0.20	
BC-3	15-25	9/5/08									<b>110</b>	<b>120</b>	<b>46</b>		<1	
		5/24/13	12.95	6.55	342	15.1	4.00				<b>25</b>	<b>11</b>	<b>4</b>		<0.20	
		6/24/14	14.41	6.06	426	14.8	2.40				<b>11</b>	<b>4.0</b>	<b>0.75</b>	<0.20	<0.20	
		12/19/14	15.61	6.07	298	14.8	1.82				<b>7.7</b>	<b>2.1</b>	<b>0.44</b>	<0.20	<0.20	
		6/23/15	18.30	5.68	161	21.2	364.00	123.40			<b>3.8</b>	<b>0.9</b>	<0.20	<0.20	<0.20	
		12/8/15	15.3	5.59	248	15.17	6.05	120.80			<b>5.3</b>	<b>1.3</b>	<b>0.29</b>	<0.20	<0.20	
		6/29/16	16.95	5.9	167	15.84	6.97	52.20			<b>3.7</b>	<b>0.93</b>	<0.20	<0.20	<0.20	
		12/21/16	14.25	5.9	245.6	14.6	1.48	175.8			<b>5.9</b>	<b>1.5</b>	<b>0.57</b>	<0.20	<0.20	
6/28/17	16.43	6.04	265	14.86	3.67	147.6			<b>6.8</b>	<b>1.9</b>	<b>0.8</b>	<0.20	<0.20			
EW-1	12.5-32.5	4/4/14	27.90								<b>17</b>	<b>3</b>	<b>1.2</b>		<0.20	
		6/25/14	14.78	6.61	0.10	18.3	5.68				<b>27</b>	<b>8.1</b>	<b>6.5</b>	<0.20	<0.20	
		9/22/14														Pump not working
		12/19/14		6.42	107	17.3	4.99				<b>21</b>	<b>2.6</b>	<b>0.82</b>	<0.20	<0.20	
		3/18/15		7.01	167	15.9	3.65				<b>2.8</b>	<b>0.27</b>	<0.20	<0.20	<0.20	
		6/23/15									<b>22</b>	<b>2</b>	<b>0.95</b>	<0.20	<0.20	
		9/11/15	15.86	6.01	160	19.54	2.99	-49.88			<b>41</b>	<b>2.2</b>	<b>0.79</b>	<0.20	<0.20	
		12/8/15														Pump not working
		3/31/16		6.27	227	15.94	6.55	80.2			<b>22</b>	<b>2.8</b>	<b>2.5</b>	<0.20	<0.20	
		6/29/16		6.37	192	16.7	8.1	47.5			<b>24</b>	<b>4.2</b>	<b>4.5</b>	<0.20	<0.20	
		9/30/16		5.63	193	14.21	4.1	90.1			<b>20</b>	<b>2.0</b>	<b>2.3</b>	<0.20	<0.20	
		1/5/17		6.64	315	12.05	4.6	47.3			<b>1.1</b>	<0.20	<0.20	<0.20	<0.20	
		4/5/17		5.89	368.2	15.9	2.34	136			<b>13</b>	<b>1.2</b>	<b>0.85</b>	<0.20	<0.20	
6/29/17		6.44	192	18.11	3.17	128.3			<b>8.9</b>	<b>0.77</b>	<b>0.7</b>	<0.20	<0.20			
10/10/17		6.49	226	15.28	7.34	298.8			<b>15</b>	<b>0.81</b>	<b>0.5</b>	<0.20	<0.20			

EW-2	15-35	4/4/14	23.70							13	2.8	1.5		<0.20	
		6/25/14	17.10	6.58	143	16.5	2.21			28	3.8	1.5	<0.20	<0.20	
		9/22/14								66	16	12	<0.40	<0.40	
		12/19/14		7.01	204	15.8	2.31			44	12	12	<0.40	<0.40	
		3/18/15		6.87	251	15.0	2.16			22	6.5	4.3	<0.20	<0.20	
		6/23/15								8.6	2.4	1.8	<0.20	<0.20	
		9/11/15	19.89	6.11	235	19.9	2.84	-56.8		6.5	0.62	<0.20	<0.20	<0.20	
		12/8/15		5.92	201	15.12	2.43	595.1		16	2.6	2.4	<0.20	<0.20	
		3/31/16		5.75	218	15.21	8.58	129.9		16	4.0	3.7	<0.20	<0.20	
		6/29/16		6.46	185	15.75	6.85	48.3		17	4.1	3.2	<0.20	<0.20	
		9/30/16		5.94	191	14.24	3.97	73.9		21	6.2	5.6	<0.20	<0.20	
		1/5/17		6.67	192	12.08	3.8	31.3		24	3.6	1.7	<0.20	<0.20	
		4/5/17		6.38	258.7	16.2	5.08	123.4		11	3.2	2.2	<0.20	<0.20	
6/29/17		6.51	185	19.5	2.5	125.6		16	4.8	3.6	<0.20	<0.20			
10/10/17		6.73	215	16.35	6.2	300.9		3.0	0.45	0.23	<0.20	<0.20			
EW-3	14-34	4/4/14	23.80							49	14	7.2		0.61	
		6/25/14	19.00	6.58	182	16.4	6.34			41	14	12	<0.40	<0.40	
		9/22/14								190	59	33	<1.0	1.10	
		12/19/14		6.82	275	15.9	6.02			21	6.4	6	<0.20	<0.20	
		3/18/15		6.78	322	15.4	5.47			140	46	29	<1.0	<1.0	
		6/23/15								87	24	9			
		9/11/15	20.86	6.56	354	19.89	2.53	-65.78		81	28	14	<0.40	<0.40	
		12/8/15		5.82	247	16.59	2.36	160		33	11	7.8	<0.20	0.38	
		3/31/16		6.20	358	19.57	2.28	87.5		72	21	16	<0.20	0.64	
		6/29/16		6.28	304	19.37	6.51	45.9		79	24	14	<0.40	0.43	
		9/30/16		5.84	386	18.59	1.11	51.7		50	18	10	<0.20	0.63	
		1/5/17		6.37	319	13.32	2.6	27.5		95	30	20	<0.40	0.46	
		4/5/17		5.99	434.8	18.7	1.21	105.6		150	57	30	<1.0	1.3	
6/29/17		6.27	330	26.59	2.65	133		270	79	59	<1.0	1.4			
10/10/17		6.38	305	18.4	6.17	221.5		69	25	16	<0.40	0.41			
EW-4	11-31	4/4/14	12.50												Pump not working
		6/25/14	17.30	6.46	0.22	16.0	1.73			1.7	1.8	1.1	<0.20	0.38	
		9/22/14								45	10	7.4	<0.20	0.87	
		12/19/14		6.68	105	16.6	1.99			1.2	1.6	1.1	<0.20	0.27	
		3/18/15								15	4.8	3.2	<0.20	<0.20	
		6/23/15								0.85	2.8	1.7	<0.20	0.37	
		9/11/15	18.84	6.23	125	19.22	2.55	-65.32		1.8	2.1	0.92	<0.20	0.28	
		12/8/15		5.84	424	22.04	0	214		<0.20	1.6	2.9	<0.20	0.85	
		3/31/16		6.61	354	15.91	1.47	2.0		<0.20	2.5	2.0	<0.20	0.31	
		6/29/16		6.54	344	19.19	6.99	33.0		<0.20	1.2	3.5	<0.20	0.61	
		9/30/16		8.14	373	17.05	0.95	12.0		<0.20	0.88	4.0	<0.20	0.75	
		1/5/17		6.67	325	12.21	1.8	-67.9		0.33	3.2	1.8	<0.20	0.29	
		4/5/17		6.37	409.2	15.9	0.82	-12.2		0.2	3	1.7	<0.20	0.25	
6/29/17		6.73	343	19.88	1.12	-47.6		<0.20	0.9	2.6	<0.20	0.24			
EW-5	15-35	1/5/17		6.61	270	12.71	1.29	-45.1		5.0	4.0	9.4	<0.20	2.5	
		4/5/17		6.27	511.9	14.8	1.22	23.9		6.9	5.2	15.0	0.28	3.8	
		6/29/17		6.58	239	18.98	4.41	66.7		8.6	3.8	10	<0.20	0.49	
		10/10/17		6.58	350	18.81	2.65	262.6		0.36	0.94	8.6	<0.20	1.8	
EW-6	15-35	1/5/17		6.62	166	4.13	5.65	-17.8		2.4	0.54	<0.20	<0.20	<0.20	
		4/5/17		6.2	252.7	15.2	2.47	60.2		2.1	0.94	1.2	<0.20	<0.20	
		6/29/17		6.67	280	20.23	4.05	29.5		0.56	0.63	2.0	<0.20	0.31	
		10/10/17		6.56	274	17.42	2.68	289.3		20	7.2	18	0.2	0.46	

DISCH	NA	4/4/14	NA	6.48	443	15.3				<b>25</b>	<b>6.3</b>	<b>3</b>	<0.20	<0.20	
		6/25/14	NA	6.40	200	16.4	1.43		0.0	<b>30</b>	<b>8.4</b>	<b>5.9</b>	<0.20	<b>0.38</b>	
		9/22/14	NA						0.2	<b>79</b>	<b>18</b>	<b>13</b>	<0.40	<0.40	
		12/18/14	NA							<b>11</b>	<b>2.7</b>	<b>2.5</b>	<0.20	<0.20	
		3/18/15	NA	6.54	230	15.1	1.89		0.1	<b>25</b>	<b>7.4</b>	<b>4.7</b>	<0.20	<0.20	
		6/23/15	NA							<b>11</b>	<b>2.3</b>	<b>1.5</b>	<0.20	<0.20	
		9/11/15	NA	6.23	245	20.55	2.68	-65.3	0	<b>7.9</b>	<b>1.5</b>	<b>0.77</b>	<0.20	<0.20	
		12/8/15	NA	6.15	267	17.2	3.9	18		<b>68</b>	<b>21</b>	<b>15</b>	<b>0.23</b>	<b>0.91</b>	
		3/31/16	NA	6.57	261	16.26	6.78	50.6		<b>21</b>	<b>5.5</b>	<b>4.4</b>	<0.20	<0.20	
		6/29/16	NA	6.71	214	16.83	6.14	13.7		<b>24</b>	<b>5.7</b>	<b>4.6</b>	<0.20	<0.20	
		9/30/16	NA	6.39	219	14.52	2.9	20.6		<b>16</b>	<b>4.4</b>	<b>3.6</b>	<0.20	<b>0.22</b>	
		1/5/17								<b>27</b>	<b>8.6</b>	<b>5.3</b>	<0.20	<b>0.23</b>	
		4/5/17								<b>5.4</b>	<b>2.3</b>	<b>2.4</b>	<0.20	<b>0.32</b>	
		6/29/17		6.49	235	19.32	2.9	57.6		<b>15</b>	<b>4.6</b>	<b>6.5</b>	<0.20	<b>0.3</b>	
10/10/17		6.52	260	16.75	2.25	302.6		<b>11</b>	<b>3.3</b>	<b>6.8</b>	<0.20	<b>0.21</b>			
QC Samples		FIELD PARAMETERS							HVOCs					NOTES	
DUP 6/25/14	6/25/14								<b>28</b>	<b>8.4</b>	<b>6.4</b>	<0.20	<b>0.37</b>	Duplicate of DISCH 6/25/14	
DUP 12/19/14	12/19/14								<b>0.92</b>	<0.20	<0.20	<0.20	<0.20	Duplicate of RMW-8 12/19/2014	
Trip Blank	6/25/14								<0.20	<0.20	<0.20	<0.20	<0.20		
DUP 9/22/14	9/22/14								<b>66</b>	<b>16</b>	<0.40	<0.40	<0.40	Duplicate of EX2 9/22/2014	
Trip Blank	3/18/15								<0.20	<0.20	<0.20	<0.20	<0.20		
DUP	3/18/15								<0.40	<b>1.0</b>	<b>54</b>	<b>0.65</b>	<b>19</b>	Duplicate of RMW-7 3/18/2015	
Trip Blank	9/11/15								<0.20	<0.20	<0.20	<0.20	<0.20		
DUP	9/11/15								<b>23</b>	1.7	<b>0.62</b>	<0.20	<0.20		
Trip Blank	12/8/15								<0.2	<0.2	<0.2	<0.20	<0.2		
DUP	12/8/15								<b>2.8</b>	<b>0.6</b>	<0.2	<0.2	<0.2	Duplicate of RMW-4 12/8/15	
Trip Blank	12/22/16								<0.20	<0.20	<0.20	<0.20	<0.20		
DUP	12/22/16								<0.20	<0.20	<b>1.2</b>	<0.20	<0.20		
Trip Blank	6/28/17								<0.20	<0.20	<0.20	<0.20	<0.20		
DUP	6/28/17								<b>1.2</b>	<b>2</b>	<b>35</b>	<b>0.53</b>	<b>1.8</b>	Duplicate of RMW-7 6/28/17	
Trip Blank	10/10/17								<0.20	<0.20	<0.20	<0.20	<0.20		
DUP	10/10/17								<b>2.6</b>	<b>0.37</b>	<b>0.22</b>	<0.20	<0.20	Duplicate of EW-2 10/10/17	

**Bold** indicates analyte detected at a concentration greater than the laboratory reporting limit

**Yellow highlight** indicates analyte exceeds MTCA cleanup level

\*Cleanup Levels:

Tetrachloroethene: Surface Water Applicable or Relevant and Appropriate Requirements (ARARs)- Human Health - Fresh Water - Clean Water Act § 304

Trichloroethene: Surface Water ARARs- Human Health - Fresh Water - Clean Water Act § 304

1,1- Dichloroethene:

(cis) 1,2- Dichloroethene: Ground Water, Method B, Non-carcinogen, Standard Formula Value

(trans) 1,2- Dichloroethene: Ground Water ARAR - State Primary Maximum Contaminant Level

Vinyl chloride: Practical Quantitation Limits / Reporting Limits Achievable by Local Accredited Labs

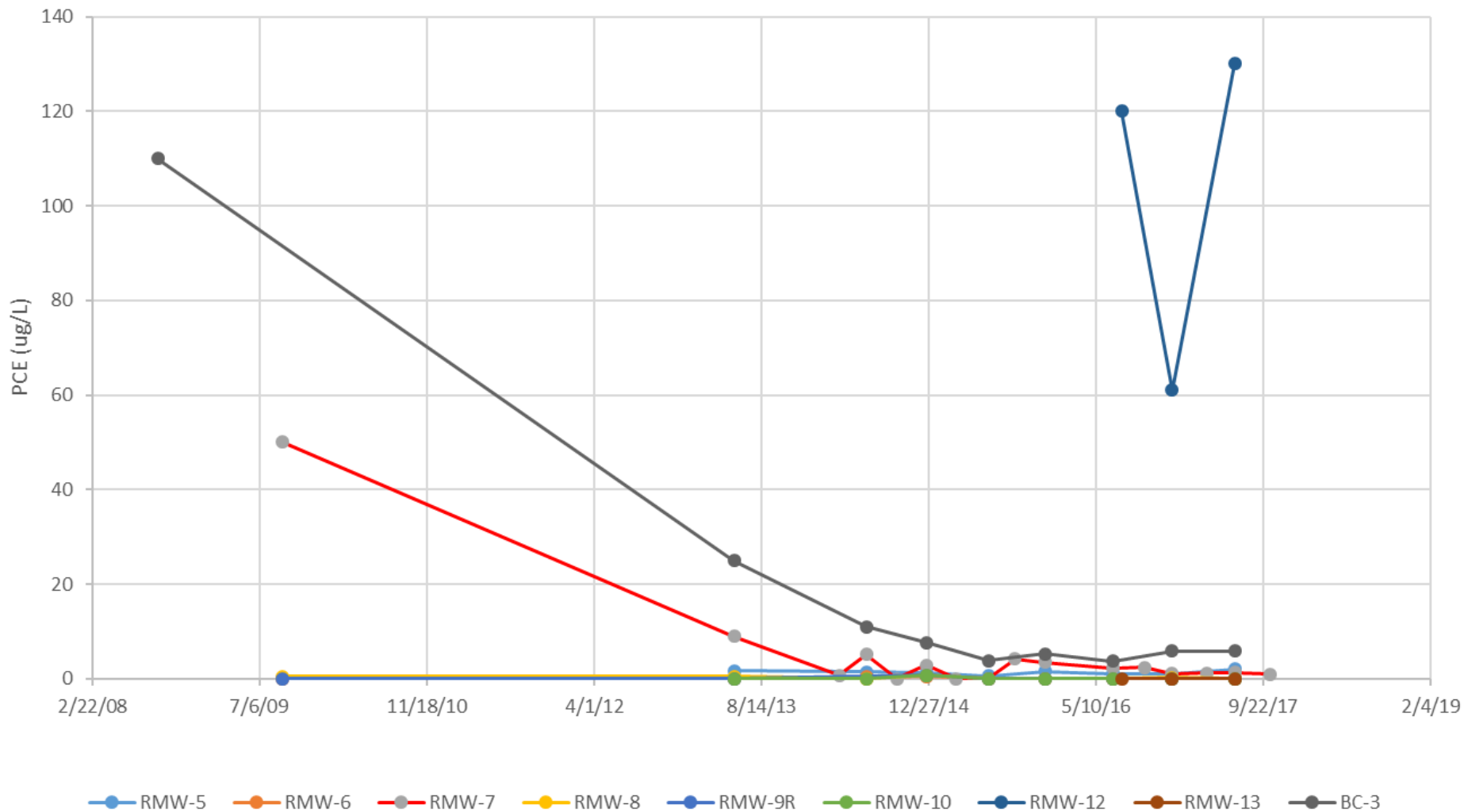
KCIWD = King County Industrial Waste Discharge limit

Blank – Not analyzed

NA – Not applicable



### RIVERSIDE MONITORING WELLS PCE (ug/L)



HWA GEOSCIENCES INC.

MONITORING WELLS PCE (UG/L)

BOTHELL RIVERSIDE HVOC SITE  
BOTHELL, WASHINGTON

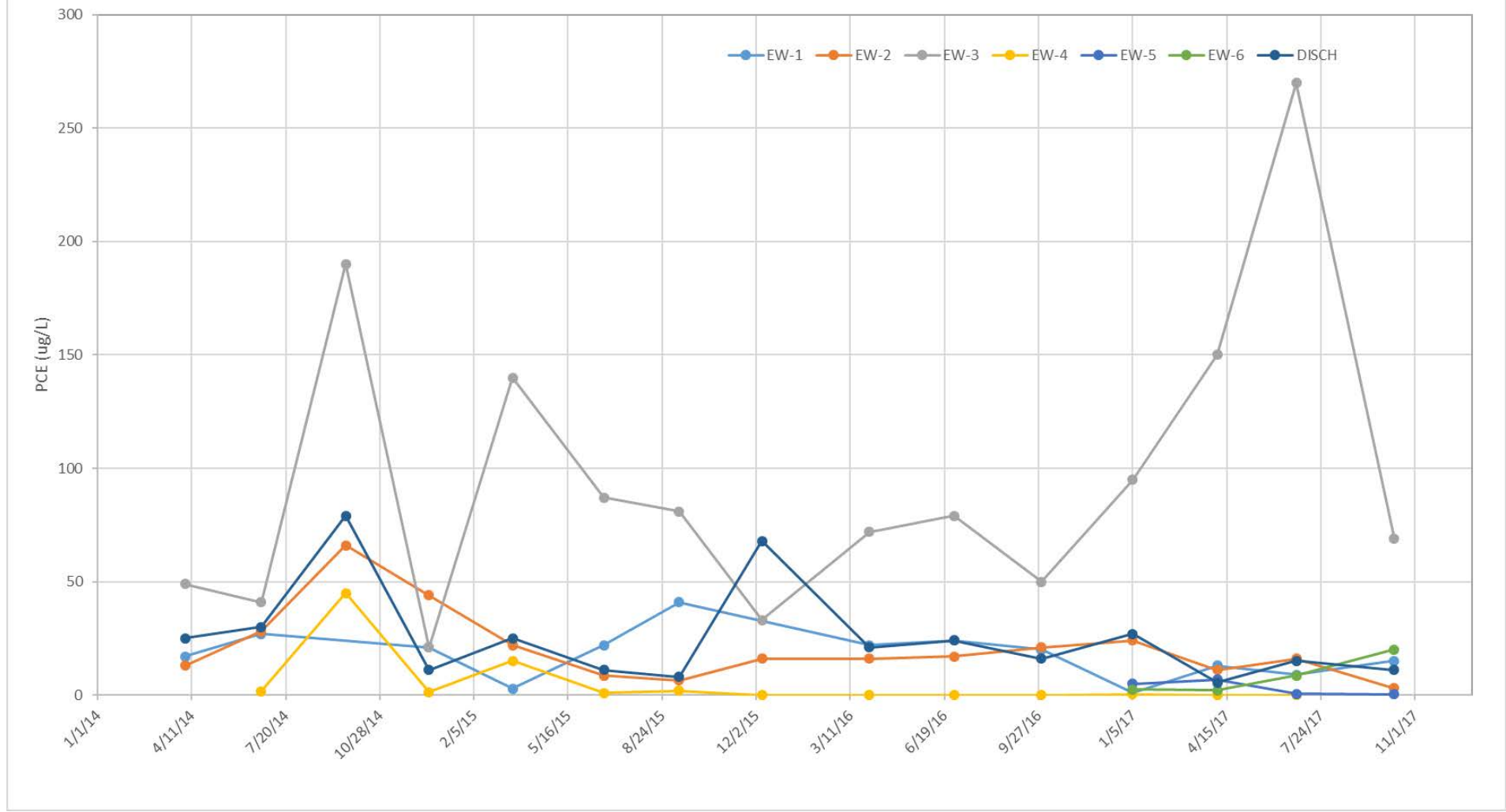
FIGURE NO.

2

PROJECT NO

2007-098

RIVERSIDE EXTRACTION WELLS PCE (ug/L)



HWA GEOSCIENCES INC.

EXTRACTION WELLS PCE (UG/L)

BOTHELL RIVERSIDE HVOC SITE  
BOTHELL, WASHINGTON

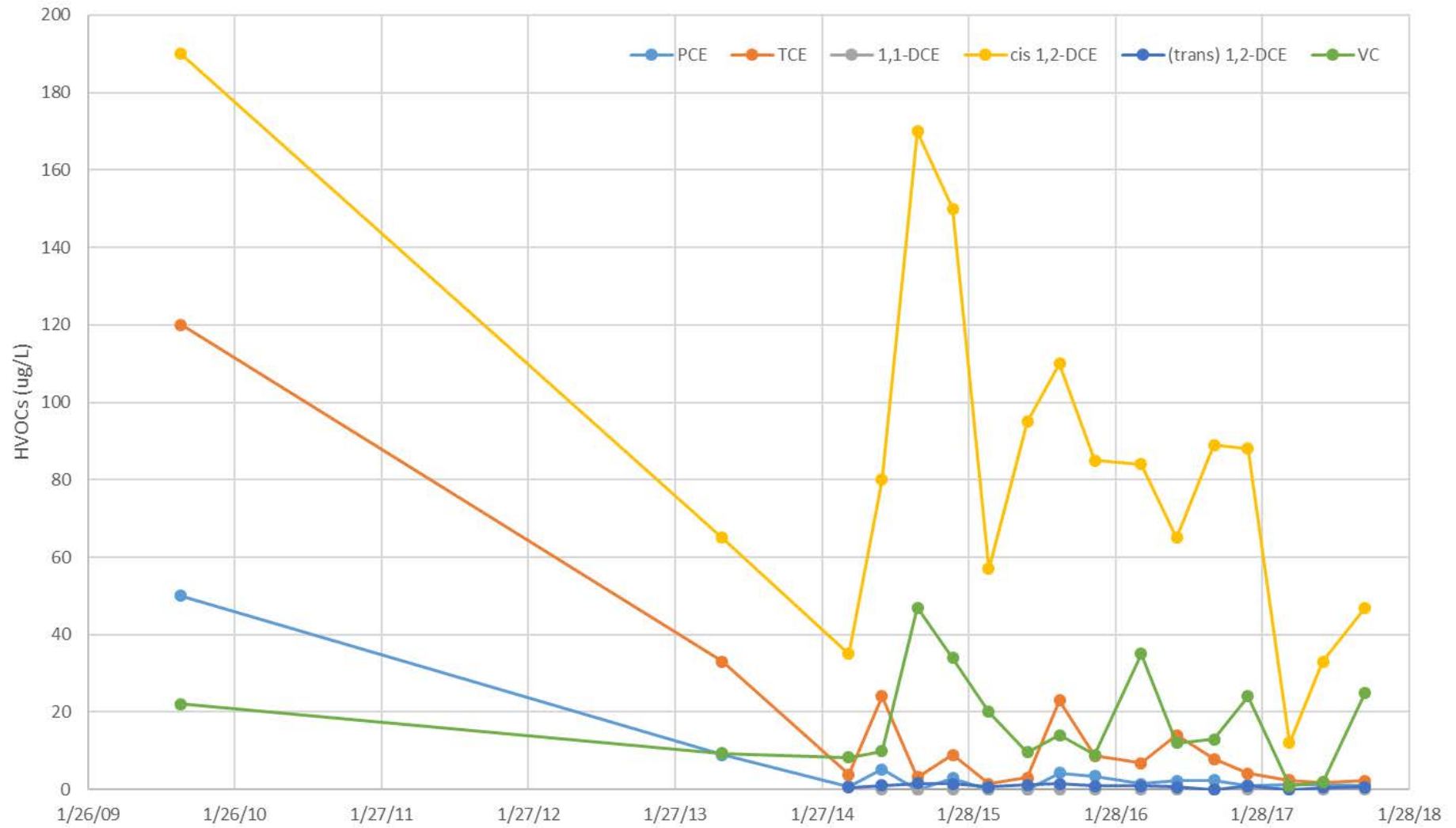
FIGURE NO.

3

PROJECT NO

2007-098

RMW-7 HVOCs/Time



HWA GEOSCIENCES INC.

RMW-7 HVOCs (UG/L)

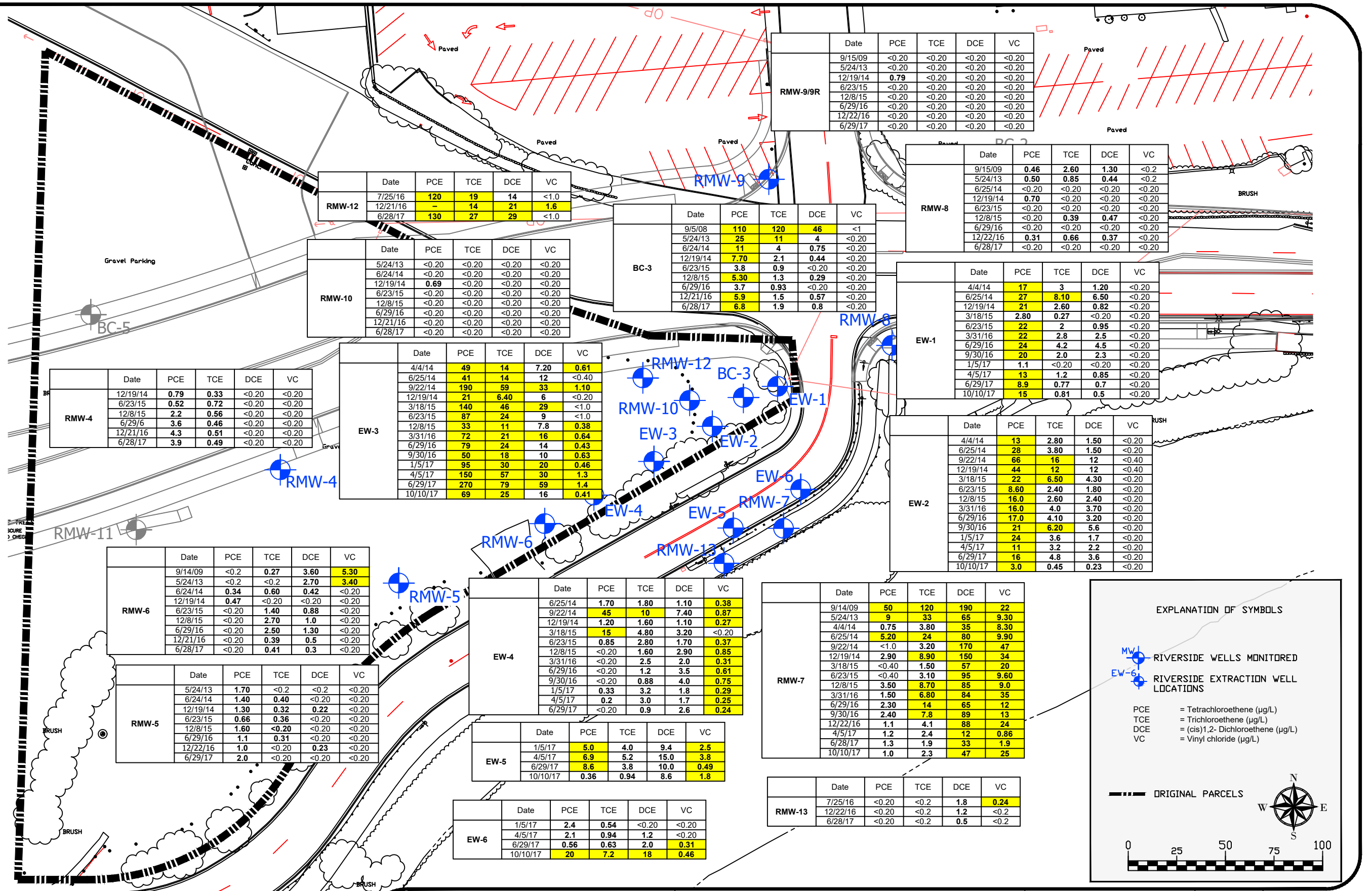
BOTHELL RIVERSIDE HVOC SITE  
BOTHELL, WASHINGTON

FIGURE NO.

4

PROJECT NO

2007-098



HWA GEOSCIENCES INC.

BOTHELL RIVERSIDE HVOC SITE  
 BOTHELL WASHINGTON

HVOCs MONITORING  
 GROUND WATER

DRAWN BY EFK

CHECK BY NK

11.07.16

FIGURE NO.

5

PROJECT NO.

2007-098 T2012



**APPENDIX A**

**YEAR 2017 QUARTERLY KING COUNTY INDUSTRIAL WASTE  
REPORTS**



# Industrial Waste Quarterly Self-Monitoring Report

King County

Send to: King County Industrial Waste  
130 Nickerson Street, Suite 200  
Seattle, WA 98109-1658  
Phone 206-263-3000 / FAX 206-263-3001  
Email: info.KCIW@kingcounty.gov

Company Name: Bothell, City of - Riverside Groundwater Remediation Site

This form is available at [www.kingcounty.gov/industrialwaste](http://www.kingcounty.gov/industrialwaste).

Please specify year: **2017**

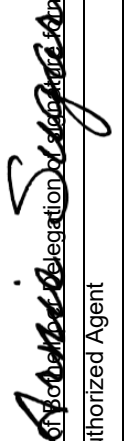
**QUARTER 1**

Sample Site No.: IW1175A

Permit/DA No.: 4268-01

Month	Sample Date	Sample Type C (Composite) G (Grab) BC (Batch)	1,2-Dichloro-ethylene (Total cis & trans) (µg/l)	Tetrachloro-ethylene (PCE) (µg/l)	Trichloro-ethylene (TCE) (µg/l)	Vinyl Chloride (µg/l)	1,1-Dichloro-ethane (µg/l)	Settleable Solids (ml/L)	Discharge Volume on sample day (gallons)	Total Monthly Flow (gallons)
January										
	Total volume discharged for January									592,380
February										
	Total volume discharged for February									209,187
March										
	3/31/16	G	2.4	5.4	2.3	0.32	<0.20	0	14,390	
	Total volume discharged for March									449,360

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further certify that all data requiring a laboratory analysis were analyzed by a Washington State Department of Ecology accredited laboratory for each parameter tested

Arnie Sugar, Designated rep. for City of Bothell  
  
 Signature of Principal Executive or Authorized Agent  
 Date 4 / 14 / 17

**Due date:** First quarter report is due by **April 15** each year.



# Industrial Waste Quarterly Self-Monitoring Report

King County

Send to: King County Industrial Waste  
130 Nickerson Street, Suite 200  
Seattle, WA 98109-1658  
Phone 206-263-3000 / FAX 206-263-3001  
Email: [info.KCIW@kingcounty.gov](mailto:info.KCIW@kingcounty.gov)

Company Name: Bothell, City of - Riverside Groundwater Remediation Site

This form is available at [www.kingcounty.gov/industrialwaste](http://www.kingcounty.gov/industrialwaste).

Please specify year: 2017

**QUARTER 2**

Sample Site No.: IW1175A

Permit/DA No.: 4268-01

Month	Sample Date	Sample Type C (Composite) G (Grab) BC (Batch)	1,2-Dichloro-ethylene (Total cis & trans) (µg/l)	Tetrachloro-ethylene (PCE) (µg/l)	Trichloro-ethylene (TCE) (µg/l)	Vinyl Chloride (µg/l)	1,1-Dichloro-ethane (µg/l)	Settleable Solids (ml/L)	Discharge Volume on sample day (gallons)	Total Monthly Flow (gallons)
April										
	Total volume discharged for April									336,911
May										
	Total volume discharged for May									395,307
June										
	6/29/17	G	6.5	15	4.6	0.30	<0.20	0	13,900	
	Total volume discharged for June									376,885

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further certify that all data requiring a laboratory analysis were analyzed by a Washington State Department of Ecology accredited laboratory for each parameter tested.

  
Arnie Sugar, Designated rep. for City of Bothell per Delegation of Signature Form dated 6/22/13  
Signature of Principal Executive or Authorized Agent

Date 7/13/17

**Due date: Second quarter report is due by July 15 each year.**



King County

# Industrial Waste Quarterly Self-Monitoring Report

Send to: King County Industrial Waste  
130 Nickerson Street, Suite 200  
Seattle, WA 98109-1658  
Phone 206-263-3000 / FAX 206-263-3001  
Email: [info.KCIW@kingcounty.gov](mailto:info.KCIW@kingcounty.gov)

Company Name: Bothell, City of - Riverside Groundwater Remediation Site

This form is available at [www.kingcounty.gov/industrialwaste](http://www.kingcounty.gov/industrialwaste).

Please specify year: **2017**

**QUARTER 3**

Sample Site No.: IW1175A

Permit/DA No.: 4268-01

Month	Sample Date	Sample Type C (Composite) G (Grab) BC (Batch)	1,2-Dichloro-ethylene (Total cis & trans) (µg/l)	Tetrachloro-ethylene (PCE) (µg/l)	Trichloro-ethylene (TCE) (µg/l)	Vinyl Chloride (µg/l)	1,1-Dichloro-ethane (µg/l)	Settleable Solids (ml/L)	Discharge Volume on sample day (gallons)	Total Monthly Flow (gallons)
July										
	Total volume discharged for July									474,873
August										
	Total volume discharged for August									334,902
September	10/10/16	G	6.8	11	3.3	0.21	<0.20	0	9,337	
	Total volume discharged for September									280,115

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further certify that all data requiring a laboratory analysis were analyzed by a Washington State Department of Ecology accredited laboratory for each parameter tested

Arnie Sugar, Designated rep. for City of Bothell per Delegation of signature form dated 8/22/13

Signature of Principal Executive or Authorized Agent

Date 10/15/17

**Due date: Third quarter report is due by October 15 each year.**