City of Bothell™

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LETTER OF TRANSMITTAL

Date: May 31, 2016

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

From: Nduta Mbuthia, Capital Projects Division

Attached please find: Electronic copy of:-

1) Letter Report (5/27/2016) - QTR 1, Post-Round 2 Supplemental Injections Sampling Event Groundwater Monitoring Report for Ultra Custom Care Cleaners

- ☐ For your information/files
- ☐ For your action
- ☒ At your request
- ☐ Approved as noted
- ☐ Returned for correction
- ☐ Please return all copies
- ☐ Other:

Comments:

HWA GeoSciences Inc.

Geotechnical Engineering • Hydrogeology • Geoenvironmental Services • Inspection and Testing

May 27, 2016
HWA Project No. 2007-098

Washington State Department of Ecology
3190 160th Ave SE
Bellevue, WA 98008

Attention: Sunny Becker

Subject: **Ultra Custom Care Cleaners Site**
Ground Water Monitoring Report
First Quarter After Bioremediation Round 2

Dear Ms. Becker:

This letter describes HWA Geosciences ground water monitoring results for the Ultra Custom Care Cleaners site (the Site) for the first quarter after the second round of in-situ bioremediation was initiated in March 2016.

Introduction and Background

On January 26, 2016 a technical memorandum detailing the purpose and rationale for a second round of supplemental bioremediation injections was submitted to Ecology, and subsequently approved in February (see attached except for the second round plan). Prior to implementation of the supplemental injections, the fourth quarter of monitoring for the first round of in-situ bioremediation was reported in February of 2016.

This May 23 technical report documents the first quarter of monitoring following the second round of in-situ bioremediation completed in April 2016. The injections were implemented with minimal deviations from the approved plan. Interim action cleanup and monitoring of the Site is being performed in accordance with Agreed Order DE9704 between the City of Bothell and the Washington Department of Ecology (Ecology). As part of the approved scope of work for Interim Action No. 2 (Ultra Custom Cleaners, Interim Action Work Plan No. 2, November 7, 2014), enhanced in-situ bioremediation materials were injected into subsurface soil and ground water in four areas to stimulate biological activity and accelerate degradation of tetrachlorethene (PCE) and its degradation products trichloroethene (TCE), (cis) 1,2-dichlorethene (DCE), and vinyl chloride, (VC) at the source area and down-gradient plume. Prior and recent injection locations are shown on Figure 1.

Based on past ground water investigations and monitoring data, concentrations of PCE and its degradation products are present in ground water beneath the Site and beneath areas south of the Site under the east side of Bothell Way NE. Some of these concentrations exceed Model Toxics Control Act (MTCA)

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Method A cleanup levels. Ground water monitoring well locations and analytical results are illustrated on Figure 2.

Four quarters of post remediation (round 2) ground water monitoring are now being performed to evaluate the effectiveness of remediation efforts and to determine what additional treatment will be needed. The following paragraphs describe ground water monitoring activities, laboratory results for ground water samples, and the results of our data evaluation activities. Laboratory results are summarized in Table 1 (attached).

Ground Water Monitoring Results

Figure 2 shows ground water PCE concentrations measured during the May 2016 and previous sampling rounds.

Following is a list of analytes monitored and their significance with respect to the bioremediation efforts:

- Halogenated Volatile Organic Compounds (HVOCs) – PCE should be decreasing in treated areas. TCE, DCE, and VC typically increase (in that order) then decrease during biological treatment, as successive reductive dechlorination occurs. The complete process can take months to a year or two depending on the amount of PCE sorbed to aquifer sediments. "Stalling" at DCE or VC may occur if optimal subsurface conditions are not maintained. Zero valent iron (ZVI) was also deployed in the source area. ZVI can reduce PCE to ethene and/or ethane without the production of DCE or VC intermediates, so stoichiometric (i.e., proportional) production of DCE and/or VC is not expected.

- Dissolved oxygen (DO) / oxidation/reduction potential (ORP) – DO should be depressed (near zero) and ORP should be in the negative range for reductive dechlorination to occur. A reducing environment should be generated and maintained by the injected ZVI and electron donors (emulsified vegetable oil and sodium lactate).

- Nitrate, sulfate – Reducing conditions should eliminate nitrate, and the majority of sulfate (in that order), therefore these parameters can be used to monitor geochemical conditions in addition to other indicators.

- Total organic carbon (TOC) – TOC should be elevated (>10 ppm) where the electron donor has been injected and is set up (bound to soil) in the aquifer.

- Methane, ethane, ethene – Methane is typically present in small amounts in most reduced soils, from anaerobic decomposition of other (natural) organics. Higher methane concentrations (> 1 mg/l) are observed where donor has been added, and is an indicator that methanogenic conditions are present. Ethene is the typical end product of complete dechlorination of VC, with ethane being produced from ethene in very anaerobic environments.

- Sodium – Sodium is an indicator of the injected sodium lactate, but unlike TOC, is a 'conservative tracer', meaning it migrates at the same rate as ground water (i.e., will not bind to soil), and is a good indicator of ground water flow rate and direction.

- vcrA – This genetic test is a rough measure of the amount of inoculated microbes in ground water. It is used to assess bioremediation potential and monitor enhanced bioremediation performance by quantifying and characterizing key dechlorinating bacterial in ground water.

Below is a summary of findings, post-round 2 injections

Source area – PCE concentrations in most source area wells have decreased to below cleanup levels, including UCCMW-4, UCCMW-17, UCCMW-18, and UCCMW-19. Reductive dechlorination is generating DCE and some VC, notably in wells MW-1, UCCMW-18, UCCMW-19 and in UCCMW-20, which is 40 feet down gradient of the source injection area. These concentrations are expected to decrease as dechlorination continues. Ethene was detected in monitoring wells MW-1 (7.7 ug/l), UCCMW-19 (1.3 ug/L), UCCMW-5 (2.1 ug/L) and UCCMW-18 (240 ug/L). These concentrations indicate that destruction of VC appears to be occurring in the source area.

ORP remains negative in source area wells that are downgradient of the injection area. Nitrate remains depleted in all wells as does sulfate in most wells. TOC is still elevated or increased where measured, indicating the presence of recently injected oil in some wells, e.g., MW-1.

The overall decreasing PCE concentrations, increasing DCE and VC, the presence of ethene and ethane, high TOC, and reducing ground water conditions indicate favorable treatment progress.

Reducing conditions in wells near the injection area are still favorable, however the reducing front has not reached downgradient wells UCCMW-21 and UCCMW-5. The most recent supplemental injections upgradient of these wells should continue to migrate towards these locations over time.

First injection row – Similar to the previous round of sampling data taken before the second round of injections, PCE concentrations and redox conditions in UCCMW-25 and UCCMW-7 are essentially unchanged; however, it is still too early to tell whether injected materials have reached these downgradient wells since the current sampling results were collected only a month after the supplemental injections.

Second injection row – PCE concentrations in wells UCCMW-8 and BB-2 increased slightly from last round; with redox conditions remaining oxidative. It is still too early to tell the effectiveness of treatment from the second round of injections.

Third injection row – HVOCs in UCCMW-26 are have dropped below cleanup levels except VC. PCE increased to above cleanup levels in UCCMW-27. This likely suggest there is either a delayed response from the March treatment and/or possible seasonal changes in ground water flow or levels.

Summary & Recommendations

Overall results have been encouraging, with active treatment observed in many wells, as evidenced by decreasing PCE, increased daughter products, and anoxic/reducing conditions. Treatment has been effective in the source area, which is the most important element of the cleanup. Some downgradient areas were initially not as responsive to the first treatment, and will be evaluated after the second round of injections to see if they can be improved.

Areas where treatment was not progressing, and additional injections were conducted, include:

- Source area – the easternmost, and farthest downgradient wells UCCMW-21 and UCCMW-5, appear to have not received any treatment, and HVOC concentrations, albeit initially low, remain unchanged; however, it is still too early to determine the effectiveness of the most recent injections.
- First injection row – Both downgradient wells appear unaffected by treatment. A slight detection of DCE in UCCMW-7 may be indicative of some treatment taking place at that well location. It is still too early to tell whether injected materials have reached these downgradient wells.
- Second injection row – BB-2 and UCCMW-8 appear unaffected by treatment; however, it is still too early to determine the effectiveness of the most recent injections.
- Third injection row – Both wells UCCMW-26 and UCCMW-27 appear to be responding to treatment in the last round, but currently do not yet show signs of treatment from the most recent injections.

Injection locations from the second round of the March/April in-situ bioremediation are shown on Figure 1.

We appreciate the opportunity to provide our services to you on this project. Please feel free to call us if you have any questions or need more information.

Sincerely,
HWA GEOSCIENCES INC.

Arnie Sugar, LG, LHG
Principal Hydrogeologist

Attachments:

Excerpt from January 26 Technical Memo
Figure 1: Monitoring well and injection locations
Figure 2: PCE in ground water, last few rounds
Table 1: Analytical results for ground water samples

EXCERPT FROM JANUARY 26 TECHNICAL MEMO

Second Round Bioremediation Plan

Additional injections of electron donor (emulsified edible oil with sodium lactate) and micro zero valent iron (mZVI) are planned in the following areas. Figure 1 shows past and planned injection sites. Details of the technology and process to be used can be found in the *Ultra Custom Cleaners, Interim Action Work Plan No. 2* dated November 7, 2014.

- Source area – In order to target the area monitored by wells UCCMW-21 and UCCMW-5, injections will be completed at:
  - The five easternmost, one-inch diameter injections wells (screened 8 -13 feet bgs)
  - Ten new, direct push injections east of the easternmost injection well, at depths of 9-13 and 14-18 feet bgs (injecting in two separate lifts at each location.

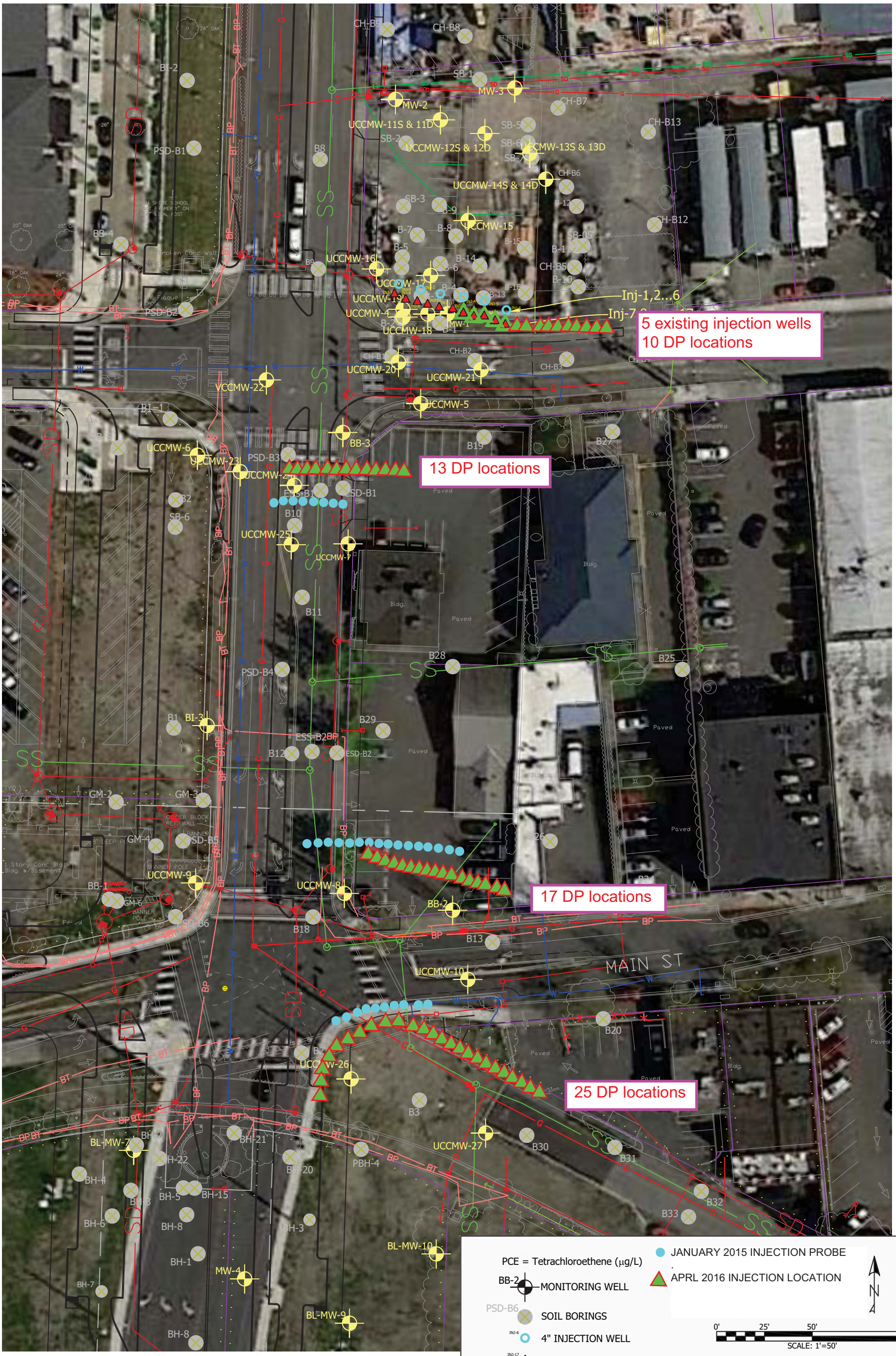
- First injection row – In order to target the area monitored by wells UCCMW-7 and UCCMW-25, a line of eight direct push injections north and upgradient of these wells will be completed, , at depths of 8-12 and 13-17 feet bgs (injecting in two separate lifts at each location.

- Second injection row – In order to target the area monitored by wells BB-2 and UCCMW-8, a line of 17 direct push injections east of and overlapping the initial line of injections will be completed, at depths of 8-12 and 13-17 feet bgs (injecting in two separate lifts at each location.

- Third injection row – In order to target the area monitored by UCCMW-26 and UCCMW-27, a line of 25 direct push injections east of and overlapping the initial line of injections will be completed, at depths of 8-12 and 13-17 feet bgs (injecting in two separate lifts at each location.

Injection protocol for each location will include the following elements:

- Mix hydrant water with granular zero-valent iron (ZVI) for approximately 24 hours to remove chlorine and create anoxic water (oxidation/reduction potential [ORP] < - 100 mV, dissolved oxygen [DO] < 0.5 mg/L) in a tank large enough for the next day's injection volume.
- Inject 100 gallons emulsified oil (5% oil:water) with micro ZVI (0.08 lbs/gallon) plus dispersant (500 ml/100lbs mZVI) in anaerobic water
- Inject bioaugmentation culture (approximately 1 liter/ 200 gallons injected at wells, and 1liter/ 150 gallons injected at direct push injection sites)
- Inject remainder of emulsified oil with micro ZVI (approximately 1,060 gallons per well, 442 gallons per DP probe)



S:\2007 PROJECTS\2007-098-22 BOTHELL CROSSROADS\CAD 2007-098\HWA 2007-098-21 T2024B.DWG <fig 1 5-20-14 (2)> Plotted: 1/3/2016 2:03 PM

BASE MAP PROVIDED BY:

HWA GeoSciences Inc.

ULTRA CUSTOM CARE CLEANERS SITE
BOTHELL, WASHINGTON

SITE PLAN

DRAWN BY	EFK
CHECK BY	AS/NN
DATE:	05.20.14
FIGURE #	1
PROJECT #	2007-098-21 T 996

UCCMW-19				
Date	PCE	TCE	DCE	VC
5/12/2014	62	10	32	<0.40
6/5/2014	260	41	<0.20	<0.20
8/19/2014	1100	33	60	<5.0
9/16/2014	400	9	11	<0.20
12/19/2014	290	12	24	<2.0
4/2/2015	120	6	5.5	<0.40
7/22/2015	1.9	0.64	24	<0.20
10/21/2015	<0.20	<0.20	37	<0.20
1/28/2016	4.2	1.2	16	<0.20
5/4/2016	<4.0	<4.0	850	13

UCCMW-16				
Date	PCE	TCE	DCE	VC
5/14/2014	<0.20	<0.20	<0.20	<0.20
6/5/2014	<0.20	<0.20	<0.20	<0.20
8/15/2014	<0.20	<0.20	<0.20	<0.20
9/18/2014	0.20	<0.20	<0.20	<0.20
12/17/2014	1.0	<0.20	<0.20	<0.20
3/24/2015	<0.20	<0.20	<0.20	<0.20
7/17/2015	<0.20	<0.20	<0.20	<0.20
2/1/2016	<0.20	<0.20	<0.20	<0.20
5/3/2016	<0.20	<0.20	<0.20	<0.20

UCCMW-17				
Date	PCE	TCE	DCE	VC
5/11/2014	<0.20	<0.20	<0.20	<0.20
6/5/2014	0.36	<0.20	<0.20	<0.20
8/15/2014	0.21	<0.20	<0.20	<0.20
9/17/2014	21	<0.20	<0.20	<0.20
12/17/2014	24	3.2	9.3	<0.20
3/24/2015	0.95	<0.20	<0.20	<0.20
7/17/2015	0.49	<0.20	0.69	<0.20
10/21/2015	0.52	<0.20	0.35	<0.20
1/28/2016	0.51	<0.20	<0.20	<0.20
5/3/2016	4.9	0.22	12	<0.20

INJ-2				
Date	PCE	TCE	DCE	VC
12/17/2014	9.3	0.29	0.53	<0.20
3/30/2015	1.5	0.27	3.1	1.1
3/24/2015	91	3.7	7	<0.40
7/17/2015	490	<0.20	16	<0.20
1/28/2016	1300	17	910	4.6
5/3/2016	50	17	1100	11

UCCMW-4				
Date	PCE	TCE	DCE	VC
3/13/2014	0.88	<0.20	<0.20	<0.20
5/12/2014	0.20	<0.20	<0.20	<0.20
6/5/2014	0.23	<0.20	<0.20	<0.20
8/19/2014	4.9	<0.20	<0.20	<0.20
9/18/2014	0.26	<0.20	<0.20	<0.20
12/17/2014	17	0.44	<0.20	<0.20
4/2/2015	6.4	<0.20	<0.20	<0.20
7/17/2015	0.48	<0.20	<0.20	<0.20
10/21/2015	0.5	<0.20	<0.20	<0.20
1/28/2016	<0.20	<0.20	<0.20	<0.20

MW-1				
Date	PCE	TCE	DCE	VC
3/13/2014	130	30	120	<1.0
5/12/2014	21	4.9	13	<0.20
6/5/2014	15	2.9	5.4	<0.20
8/19/2014	9.5	0.32	0.4	<0.20
9/17/2014	4.3	<0.20	<0.20	<0.20
12/17/2014	80	14	27	<0.40
3/24/2015	2.5	1.1	8.1	0.21
7/22/2015	2.5	1.4	130	5.4
10/21/2015	<10	<10	1600	21
1/28/2016	6.2	<4.0	760	15
5/4/2016	3.7	2.3	310	11

UCCMW-18				
Date	PCE	TCE	DCE	VC
8/19/2014	5.8	<0.20	<0.20	<0.20
9/17/2014	1.7	<0.20	<0.20	<0.20
12/17/2014	1500	55	170	<10
3/24/2015	850	9	15	<0.20
7/22/2015	1.4	0.35	22	0.60
10/20/2015	<1.0	1.2	<1.0	3.4
1/28/2016	<5.0	<5.0	1800	280
5/3/2016	<2.0	<2.0	390	240

UCCMW-20				
Date	PCE	TCE	DCE	VC
5/15/2014	43	5.9	6.8	<0.20
6/3/2014	48	6.7	6.1	<0.20
8/14/2014	48	4.2	6.6	<0.20
9/16/2014	64	7.4	9.5	<0.40
12/11/2014	160	16	32	<0.10
4/2/2015	71	7.5	9.2	<0.40
7/9/2015	31	5.8	53	0.96
10/26/2015	8.6	2.6	56	<0.40
11/29/2016	18	2.7	43	<0.20
5/5/2016	23	8.3	63	<0.20

UCCMW-21				
Date	PCE	TCE	DCE	VC
5/15/2014	13	<0.20	<0.20	<0.20
6/3/2014	16	0.34	<0.20	<0.20
8/14/2014	19	0.49	<0.20	<0.20
9/16/2014	29	1.2	0.26	<0.20
12/11/2014	28	1.0	<0.20	<0.20
4/2/2015	28	0.82	<0.20	<0.20
7/9/2015	13	<0.20	<0.20	<0.20
10/26/2015	13	<0.20	<0.20	<0.20
1/29/2016	25	0.69	0.30	<0.20
5/5/2016	24	0.48	0.25	<0.20

UCCMW-6				
Date	PCE	TCE	DCE	VC
3/13/2014	3.8	<0.20	<0.20	<0.20
5/13/2014	3.5	<0.20	<0.20	<0.20
6/6/2014	4.0	<0.20	<0.20	<0.20
8/19/2014	4.8	<0.20	<0.20	<0.20
9/16/2014	3.6	<0.20	<0.20	<0.20
12/17/2014	4.0	<0.20	<0.20	<0.20
3/30/2015	4.6	<0.20	<0.20	<0.20
7/9/2015	4.6	<0.20	<0.20	<0.20
1/27/2016	<0.20	<0.20	<0.20	<0.20

BB-3				
Date	PCE	TCE	DCE	VC
3/13/2014	0.30	<0.20	<0.20	<0.20
5/14/2014	0.21	<0.2	<0.2	<0.20
6/4/2014	<0.20	<0.20	<0.20	<0.20
8/19/2014	0.75	<0.20	<0.20	<0.20
9/19/2014	0.42	<0.20	<0.20	<0.20
12/12/2014	1.5	<0.20	<0.20	<0.20
4/2/2015	<0.20	<0.20	<0.20	<0.20
7/9/2015	<0.20	<0.20	<0.20	<0.20
1/27/2016	<0.20	<0.20	<0.20	<0.20

UCCMW-5				
Date	PCE	TCE	DCE	VC
5/14/2014	14	0.34	0.44	<0.20
6/5/2014	14	0.31	0.22	<0.20
8/19/2014	15	0.24	<0.20	<0.20
9/16/2014	13	0.27	<0.20	<0.20
12/17/2014	14	<0.20	<0.20	<0.20
4/2/2015	8.5	<0.20	<0.20	<0.20
7/17/2015	19.0	0.50	0.20	<0.20
10/21/2015	19.0	0.70	1.10	<0.20
11/27/2016	5.8	0.21	3.90	<0.20
5/4/2016	14.0	0.54	14.00	<0.20

UCCMW-23				
Date	PCE	TCE	DCE	VC
5/13/2014	2.2	<0.20	<0.20	<0.20
6/6/2014	2.1	<0.20	<0.20	<0.20
8/19/2014	2.5	<0.20	<0.20	<0.20
9/16/2014	2.5	<0.20	<0.20	<0.20
12/17/2017	4.6	<0.20	<0.20	<0.20
3/30/2015	2.9	<0.20	<0.20	<0.20
7/17/2015	3.4	<0.20	<0.20	<0.20
2/2/2016	4.1	<0.20	<0.20	<0.20

UCCMW-7				
Date	PCE	TCE	DCE	VC
5/15/2014	27	<0.20	<0.20	<0.20
6/3/2014	26	<0.20	<0.20	<0.20
8/19/2014	28	<0.20	<0.20	<0.20
9/19/2014	21	<0.20	<0.20	<0.20
12/17/2014	22	<0.20	<0.20	<0.20
4/2/2015	25	<0.20	<0.20	<0.20
7/30/2015	25	<0.20	<0.20	<0.20
2/2/2016	26	<0.20	<0.20	<0.20
5/5/2016	28	<0.20	0.35	<0.20

UCCMW-24				
Date	PCE	TCE	DCE	VC
5/15/2014	2.2	<0.20	<0.20	<0.20
6/3/2014	2.2	<0.20	<0.20	<0.20
8/14/2014	2.5	<0.20	<0.20	<0.20
9/18/2014	2.4	<0.20	<0.20	<0.20
12/11/2014	2.4	<0.20	<0.20	<0.20
4/2/2015	2.3	<0.20	<0.20	<0.20
7/9/2015	2.6	<0.20	<0.20	<0.20
1/29/2016	3.3	<0.20	<0.20	<0.20

UCCMW-25				
Date	PCE	TCE	DCE	VC
5/15/2014	6.9	<0.20	<0.20	<0.20
6/3/2014	9.3	<0.20	<0.20	<0.20
8/14/2014	9.3	<0.20	<0.20	<0.20
9/18/2014	8.3	<0.20	<0.20	<0.20
12/11/2014	7.5	<0.20	<0.20	<0.20
4/2/2015	9.4	<0.20	<0.20	<0.20
7/9/2015	6.7	<0.20	<0.20	<0.20
10/21/2015	9.6	<0.20	<0.20	<0.20
1/29/2016	10.0	<0.20	<0.20	<0.20
5/5/2016	7.8	<0.20	<0.20	<0.20

BI-3				
Date	PCE	TCE	DCE	VC
6/10/2014	4.5	0.43	1.7	0.26
9/17/2014	2.1	0.52	2.9	1.60
12/17/2014	2.5	0.35	2.4	1.50
3/30/2015				
7/9/2015	0.68	0.37	2.6	1.50
10/22/2015	0.52	<0.20	1.0	0.96
1/27/2016	<0.20	<0.20	1.0	0.83

BB-2				
Date	PCE	TCE	DCE	VC
6/10/2014	79	<0.40	<0.40	<0.40
9/17/2014	68	<0.40	<0.40	<0.40
12/12/2014	82	<0.40	<0.40	<0.40
4/2/2015	65	<0.40	<0.40	<0.40
7/22/2015	67	<0.40	<0.40	<0.40
10/22/2015	57	<0.40	<0.40	<0.40
2/2/2016	65	<0.40	<0.40	<0.40
5/5/2016	73	<0.40	<0.40	<0.40

UCCMW-9				
Date	PCE	TCE	DCE	VC
5/28/2014	1.0	<1.0	<1.0	<1.0
9/13/2014	2.5	0.23	0.21	<0.20
12/17/2014	5.7	0.22	<0.20	<0.20
3/30/2015	0.9	<0.20	<0.20	<0.20
7/9/2015	0.37	0.26	0.49	<0.20
1/27/2016	1.4	<0.20	<0.20	<0.20

UCCMW-8				
Date	PCE	TCE	DCE	VC
5/29/2014	110	<1.0	<1.0	<1.0
9/13/2014	76	0.57	<0.40	<0.40
12/12/2014	83	0.44	<0.40	<0.40
3/23/2015	49	0.38	<0.20	<0.20
7/8/2015	42	2.30	6.0	<0.20
10/21/2015	36	2.90	7.30	<0.20
1/2/2016	75	1.6	1.0	<0.20
5/5/2016	96	0.79	0.51	<0.20

UCCMW-10				
Date	PCE	TCE	DCE	VC
6/13/2014	0.90	<0.20	<0.20	<0.20
9/18/2014	0.29	<0.20	<0.20	<0.20
12/11/2014	1.3	<0.20	<0.20	<0.20
4/2/2015	<0.20	<0.20	<0.20	<0.20
7/9/2015	<0.20	<0.20	<0.20	<0.20
10/26/2015	3.0	<0.20	<0.20	<0.20
1/29/2016	0.67	<0.20	<0.20	<0.20

UCCMW-26				
Date	PCE	TCE	DCE	VC
3/23/2015	81	10	21	0.74
7/30/2025	2.2	1.5	130	3.3
10/21/2015	2	1.1	69	10
2/1/2016	0.47	0.22	0.98	0.35
5/5/2016	<0.20	0.21	8.9	4.1

UCCMW-27				
Date	PCE	TCE	DCE	VC
3/23/2015	3.8	<0.20	<0.20	<0.20
7/17/2025	19.0	<0.20	0.27	0.48
10/22/2015	6.6	0.53	0.54	<0.20
1/27/2016	0.72	<0.20	<0.20	<0.20
5/5/2016	16.0	0.49	0.22	<0.20

Inj-1,2...6
Inj-7,8.....17

PCE = Tetrachloroethene (µg/L)

BB-2 MONITORING WELL

PSD-B6 SOIL BORINGS

INJ-6 4" INJECTION WELL

INJ-17 1" INJECTION WELL

INJECTION PROBE

N

0' 25' 50' 100'

SCALE: 1"=50'

BASE MAP PROVIDED BY:

HWA GEOSCIENCES INC.

ULTRA CUSTOM CARE CLEANERS SITE BOTHELL, WASHINGTON

HVOCs in Ground Water

DRAWN BY: EFK
CHECK BY: AS
DATE: 5.20.16
FIGURE # 2
PROJECT # 2007-098-21 T 2024

S:\2007 PROJECTS\2007-098-22 BOTHELL CROSSROADS\CAD 2007-098\HWA 2007-098-21 T2024B.DWG <PCE fig 1 12-09-15 ORD> Plotted: 5/20/2016 2:19 PM

Table 1
Ultra Custom Care Cleaners Site
Ground Water Analytical Data

Sample Location	Screened Depth, (ft bgs)	Sample Date	Depth to Water (ft bgs)	pH (units)	Conductivity (mS)	Temperature (°C)	Diss. Oxygen (mg/L)	Fe^{+2} (mg/L)	Redox Potential (millivolt)	Tetrachloro-ethene (µg/L)	Trichloro-ethene (µg/L)	(cis) 1,2-Dichloro-ethene (µg/L)	Vinyl Chloride (µg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Total Organic Carbon (mg/L)	Methane (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Total Sodium (ug/L)	Dissolved Sodium (ug/L)	Vinyl Chloride Reductase (vcrA) Gene Copies/Liter	
MTCA Method A/B Cleanup Level (Table 720-1, WAC 173-340-900)										**5**	**5**	**16 (B)**	**0.2**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**				
Source Area																							
MW-1	5-15	3/13/2014	7.75	6.27	568	12.5	7.9			**130**	**30**	**120**	<1.0	**4.4**	**27**	<1.0	<0.50	<0.50	<0.50				Baseline
		5/12/2014	8.56	6.09	517	15.0	3.17	0.0	+323	**21**	**4.9**	**13**	<0.20	**6.0**	**13**	<1.0	<0.50	<0.50	<0.50				Baseline
		6/5/2014	8.77	5.94	604	15.0	4.05			**15**	**2.9**	**5.4**	<0.20										2 weeks after first injection
		8/19/2014	9.05	5.56	6.04	20.1	25.68			**9.5**	**0.32**	**0.4**	<0.20										2 weeks after second injection
		9/17/2014	9.37	5.91	504	18.5	9.14			**4.3**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/17/2014	10.14	4.85	3295	13.5	2.24			**80**	**14**	**27**	<0.40										
		3/24/2015	9.88	5.65	1511	13.51	0.00		-135.1	**2.5**	**1.1**	**8.1**	**0.21**	<0.050	**30**	**840**	**110**	**65**	**52**	**210000**			5 weeks after in situ bio injections
		7/22/2015		5.11	1489	19.43	0.00	2.0	-112.7	**2.5**	**1.4**	**130**	**5.4**	**0.16**	<50	**550**				**66000**	**57000**		
		10/21/2015	11.26	6.34	1297	15.94	0.00	1.4	-119	<10	<10	**1600**	**21**	**0.27**	<25	**320**	**7700**	<500	<0.5	**59000**	**61000**		9 months after in situ bio injections
		1/28/2016		5.97	544	13.2	4.10	2.0	-90.3	**6.2**	<4.0	**760**	**15**	<0.050	<5.0	**190**	**6000**	<22	<9.8	**60000**	**62000**		
		5/4/2016	9.78	5.77	2123	14.23	0.00	4.0	-98.1	**3.7**	**2.3**	**310**	**11**	**0.77**	<25	**2400**	**5000**	<67	**7.7**	**310000**			
UCCMW-4	35-40	3/13/2014	9.45	6.70	675	14.3	4.61			**0.88**	<0.20	<0.20	<0.20	<0.05	**8.1**	<1.0	<0.50	<0.50	<0.50				Baseline
		5/12/2014	8.30	6.83	523	15.7	0.16	0.0	+247	**0.20**	<0.20	<0.20	<0.20	<0.05	<5	<1	**1.9**	<0.5	<0.5				Baseline
		6/5/2014	8.18	6.71	589	16.0	0.20			**0.23**	<0.20	<0.20	<0.20										2 weeks after first injection
		8/19/2014	8.2	6.93	340	22.2	0.37			**4.9**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/18/2014	8.41	6.95	361	18.9	0.60			**0.26**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/17/2014	9.24	6.51	288	14.5	1.32			**17**	**0.44**	<0.20	<0.20										
		4/2/2015	9.21	7.19	248	15.0	1.24		+126.7	**6.4**	<0.20	<0.20	<0.20										6 weeks after in situ bio injections
		7/17/2015		6.48	229	17.0	0.01		-12.3	0.48	<0.20	<0.20	<0.20										
		10/21/2015	10.20	7.35	196	20.5	2.05		-29.1	**0.5**	<0.20	<0.20	<0.20										9 months after in situ bio injections
		1/28/2016		6.87	134	14.49	3.59		-25.9	<0.20	<0.20	<0.20	<0.20										
UCCMW-17	10-20	5/11/2014	8.16	6.20	351	14.6	2.03	0.0	-100	<0.20	<0.20	<0.20	<0.20	**3.1**	**11**	<1.0	**1.5**	<0.50	<0.50				Baseline
		6/5/2014	8.19	6.05	621	14.7	4.85			**0.36**	<0.20	<0.20	<0.20										2 weeks after first injection
		8/15/2014	8.45	6.10	563	17.0	28.84			**0.21**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/17/2014	8.78	6.40	645	19.1	8.64			**21**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/17/2014	9.80	6.93	376	14.8	3.25			**24**	**3.2**	**9.3**	<0.20										
		3/24/2015	9.47	5.80	271	15.1	50.0		197.5	**0.95**	<0.20	<0.20	<0.20										5 weeks after in situ bio injections
		7/17/2015		5.46	227	17.5	43.9		88.6	**0.49**	<0.20	**0.69**	<0.20										
		10/21/2015	10.82	6.77	174	19.3	38.1		63.4	**0.52**	<0.20	**0.35**	<0.20										9 months after in situ bio injections
		1/28/2016		5.75	112	15.31	5.53	0.0	104.3	**0.51**	<0.20	<0.20	<0.20	**3.2**	**17**	**1.1**	**10**	<0.50	<0.50	**9100**	**9400**		
		5/3/2016	9.35	5.80	222	20.53	7.23		125.0	**4.9**	**0.22**	**12**	<0.20										
UCCMW-18	10-20	8/19/2014	8.68	5.82	480	20.8	NA			**5.8**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/17/2014	8.99	5.93	759	19.2	6.63			**1.7**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/17/2014	9.83	6.01	372	14.1	1.02			**1500**	**55**	**170**	<10										
		3/24/2015	9.54	5.56	1252	14.8	0.00		-144.7	**850**	**9**	**15**	<0.20	<0.050	<5.0	**670**	**19**	**8.5**	**10**	**170000**		**8.00E+04**	
		7/22/2015		5.64	489	20.8	0.00	1.0	-210.1	**1.4**	**0.35**	**22**	**0.60**	**0.29**	**75**	**31**				**29000**	**28000**		
		10/20/2015	10.89	6.26	263	17.9	3.72	0.8	-106.9	<1.0	**1.2**	<1.0	**3.4**	**1.2**	**13**	**21**	**4000**	<250	<0.50			**4.00E+04**	9 months after in situ bio injections
		1/28/2016		6.10	790	13.95	3.05	1.0	-87.4	<5.0	<5.0	**1800**	**280**	**1.1**	<10	**250**	**12000**	<110	<15	**27000**	**28000**		
		5/3/2016	9.45	5.66	379	15.57	4.17	3.0	5.4	<2.0	<2.0	**390**	**240**	**2.0**	<20	**67**	**5500**	<67	**240**	**20000**			
UCCMW-19	10-20	5/12/2014	8.12	6.31	440	15.2	1.46	0.0	-166	**62**	**10**	**32**	<0.40	**3.6**	**17**	<1.0	**15**	**3.3**	**1.7**	**19000**	**18000**		Baseline
		6/5/2014	8.13	5.98	1011	16.3	5.32			**260**	**41**	<0.20	<0.20										Post injection
		8/19/2014	8.34	6.07	1072	21.6	29.85			**1100**	**33**	**60**	<5.0										2 weeks after second injection
		9/16/2014	8.60	6.14	1004	20.9	7.95			**400**	**9**	**11**	<0.20										6 weeks after second injection
		12/19/2014	9.27	6.08	334	14.0	2.07			**290**	**12**	**24**	<2.0										
		4/2/2015	9.07	5.75	459	14.5	0.00		-65.9	**120**	**6**	**5.5**	<0.40	**0.76**	**5.6**	**490**	<0.50	<0.50	**0.70**	**22000**			6 weeks after in situ bio injections
		7/22/2015		5.65	395	19.8	0.00	1.6	-185.0	**1.9**	**0.64**	**24**	<0.20	<0.050	**17**	**15**				**27000**	**25000**		
		10/21/2015	10.44	6.32	579	17.8	0.00	1.0	-98.2	<0.20	<0.20	**37**	<0.20	**0.078**	<10	**65**	**65**	<500	<0.5	**20000**	**20000**		9 months after in situ bio injections
		1/28/2016		6.16	492	12.44	4.90	1.6	-79.6	**4.2**	**1.2**	**16**	<0.20	**0.54**	<5.0	**120**	**330**	<6.2	<0.80	**36000**	**39000**		
		5/4/2016	9.11	6.21	876	14.12	0.00	2.0	-56.3	<4.0	<4.0	**850**	**13**	**0.14**	<25	**200**	**9500**	<67	**1.3**	**85000**			
UCCMW-20	8-18	5/15/2014	7.61	6.28	221	14.2	28.89	0.0	328	**43**	**5.9**	**6.8**	<0.20	**2.1**	**11**	**1.0**	<0.50	<0.50	<0.50				Baseline
		6/3/2014	7.88	6.07	380	15.3	8.04			**48**	**6.7**	**6.1**	<0.20										2 weeks after first injection
		8/14/2014	7.99	5.44	548	19.3	9.28			**48**	**4.2**	**6.6**	<0.20										2 weeks after second injection
		9/16/2014	8.31	5.56	388	20.2	9.34			**64**	**7.4**	**9.5**	<0.40										6 weeks after second injection
		12/11/2014	8.61	5.53	334	13.1	7.10			**160**	**16**	**32**	<0.10										
		4/2/2015	8.74	6.11	176	12.7	12.90		91.8	**71**	**7.5**	**9.2**	<0.40	**4.8**	**28**	**1.9**	<0.50	<0.50	<0.50	**11000**			6 weeks after in situ bio injections
		7/9/2015		5.63	767	20.1	0.00	2.8	-122.8	**31**	**5.8**	**53**	**0.96**	**0.055**	<5.0	**88**	**5.4**	**4.3**	**6.1**	**23000**	**22000**		
		10/26/2015	10.01	5.55	434	16.1	0.00	0.8	-57.6	**8.6**	**2.6**	**56**	<0.40	**0.076**	<5.0	**11**	**37**	**5.6**	<0.50	**25000**	**26000**		9 months after in situ bio injections
		1/29/2016		5.99	204	11.84	1.63	2.0	13	**18**	**2.7**	**43**	<0.20	**1.5**	**23**	**2.7**	**1.8**	<0.50	<0.50	**16000**	**15000**		
		5/5/2016	8.59	6.01	223	14.70	2.50	2.0	121	**23**	**8.3**	**63**	<0.20	**2.3**	**19**	**2.1**	**0.78**	<0.50	<0.50	**16000**			

Table 1
Ultra Custom Care Cleaners Site
Ground Water Analytical Data

Sample Location	Screened Depth, (ft bgs)	Sample Date	Depth to Water (ft bgs)	pH (units)	Conductivity (mS)	Temperature (°C)	Diss. Oxygen (mg/L)	Fe^{+2} (mg/L)	Redox Potential (millivolt)	Tetrachloro-ethene (µg/L)	Trichloro-ethene (µg/L)	(cis) 1,2-Dichloro-ethene (µg/L)	Vinyl Chloride (µg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Total Organic Carbon (mg/L)	Methane (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Total Sodium (ug/L)	Dissolved Sodium (ug/L)	Vinyl Chloride Reductase (vcrA) Gene Copies/Liter	
MTCA Method A/B Cleanup Level (Table 720-1, WAC 173-340-900)										**5**	**5**	**16 (B)**	**0.2**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**				
UCCMW-21	12-22	5/15/2014	10.38	6.81	614	14.6	15.00	0.0	-318	**13**	<0.20	<0.20	<0.20	**1.3**	**49**	**3.0**	**5.4**	**1.4**	**1.0**				Baseline
		6/3/2014	11.67	6.09	611	13.9	8.77			**16**	**0.34**	<0.20	<0.20										2 weeks after first injection
		8/14/2014	11.81	6.22	378	15.9	8.2			**19**	**0.49**	<0.20	<0.20										2 weeks after second injection
		9/16/2014	12.18	6.34	578	17.4	6.65			**29**	**1.2**	**0.26**	<0.20										6 weeks after second injection
		12/11/2014	12.66	6.03	356	14.4	6.98			**28**	**1.0**	<0.20	<0.20										
		4/2/2015	12.73	6.23	237	15.02	24.5		98.0	**28**	**0.82**	<0.20	<0.20	**3.6**	**31**	**6.1**	<0.50	<0.50	<0.50	**9700**			6 weeks after in situ bio injections
		7/9/2015		5.61	475	17.58	25.5	0.0	89.3	**13**	<0.20	<0.20	<0.20	**3.0**	**100**	**6.5**	**0.65**	<0.50	<0.50	**26000**	**25000**		
		10/26/2015	14.23	6.30	319	15.37	27.8	0.0	94.8	**13**	<0.20	<0.20	<0.20	**2.5**	**45**	**4.3**	**2.30**	<0.50	<0.50	**22000**	**21000**		9 months after in situ bio injections
		1/29/2016		5.75	146	13.59	4.95	0.0	148.9	**25**	**0.69**	**0.30**	<0.20	**2.9**	**16**	**1.9**	**9.7**	<0.50	<0.50	**13000**	**13000**		
		5/5/2016	10.91	5.57	231	15.30	4.15	0.0	138.0	**24**	**0.48**	**0.25**	<0.20	**2.9**	**26**	**3.3**	<0.50	<0.50	<0.50	**15000**			
BB-3	10-20	3/13/2014	7.94	6.11	710	12.4	9.80			**0.3**	<0.20	<0.20	<0.20	**3.5**	**20**	<1.0	<0.50	<0.50	<0.50				Baseline
		5/14/2014	8.42	6.48	567	13.7	9.01	0.0	360	**0.21**	<0.2	<0.2	<0.20	**2.6**	**18**	<1.0	<0.50	<0.50	<0.50				Baseline
		6/4/2014	7.76	6.33	569	17.5	4.38			<0.20	<0.20	<0.20	<0.20										2 weeks after first injection
		8/19/2014	10.18	6.03	318	17.6	6.71			**0.75**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/19/2014	11.39	6.74	335	18.5	3.17			**0.42**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/12/2014	5.01	6.99	263	15.5	2.40			**1.5**	<0.20	<0.20	<0.20										
		4/2/2015	6.19	6.93	320	13.93	6.93			<0.20	<0.20	<0.20	<0.20										6 weeks after in situ bio injections
		7/9/2015		6.16	350	19.50	10.95		81	<0.20	<0.20	<0.20	<0.20										
		1/27/2016		6.25	170	13.99	16.36		140.1	<0.20	<0.20	<0.20	<0.20										
UCCMW-5	10-20	5/14/2014	9.79	5.98	357	13.8	9.60	0.0	376	**14**	**0.34**	**0.44**	<0.20	**0.77**	**9.4**	**1.7**	<0.50	<0.50	<0.50				Baseline
		6/5/2014	9.94	5.98	382	14.8	5.35			**14**	**0.31**	**0.22**	<0.20										2 weeks after first injection
		8/19/2014	10.33	5.8	465	19.1	14.10			**15**	**0.24**	<0.20	<0.20										2 weeks after second injection
		9/16/2014	10.59	6.20	855	21.0	6.56			**13**	**0.27**	<0.20	<0.20										6 weeks after second injection
		12/17/2014	11.20	6.13	286	13.5	2.28			**14**	<0.20	<0.20	<0.20										
		4/2/2015	11.04	6.95	150	12.6	15.75		52.0	**8.5**	<0.20	<0.20	<0.20										6 weeks after in situ bio injections
		7/17/2015		5.40	180	18.5	16.01		62.1	**19**	0.50	0.20	<0.20										
		9/23/2015	12.39	6.13	212	17.9	4.59		49.2														Persulfate test =0
		10/21/2015	12.52	6.10	215	19.2	3.33		83.5	**19**	**0.70**	**1.10**	<0.20										9 months after in situ bio injections
		1/27/2016		6.19	82	12.07	13.65		135.8	**5.8**	**0.21**	**3.90**	<0.20										
		5/4/2016	10.90	6.07	148	14.30	3.05	0.00	23.50	**14.0**	**0.54**	**14**	<0.20	**0.18**	**12**	0.71	<0.50	<0.50	**2.1**	**20000**			
UCCMW-24	8-18	5/15/2014	4.70	6.31	486	15.0	7.50	0.0	7	**2.2**	<0.20	<0.20	<0.20	**2.6**	**18**	**1.7**	**3.9**	**1.2**	**0.71**				Baseline
		6/3/2014	3.20	6.18	556	14.9	8.75			**2.2**	<0.20	<0.20	<0.20										2 weeks after first injection
		8/14/2014	5.61	6.10	425	17.5	7.45			**2.5**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/18/2014	5.74	5.85	449	19.0	8.53			**2.4**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/11/2014	5.58	6.55	294	15.0	6.70			**2.4**	<0.20	<0.20	<0.20										
		4/2/2015	6.05	6.50	259	14.0	12.48		75.6	**2.3**	<0.20	<0.20	<0.20										6 weeks after in situ bio injections
		7/9/2015		5.93	191	19.0	4.05		39.6	**2.6**	<0.20	<0.20	<0.20										
		1/29/2016		6.13	184	13.77	5.53		81.3	**3.2**	<0.20	<0.20	<0.20										
First Injection Row																							
UCCMW-7	8-18	5/15/2014	5.95	6.23	393	14.1	7.84	0.0	352	**27**	<0.20	<0.20	<0.20	**2.2**	**28**	<1.0	<0.50	<0.50	<0.50				Baseline
		6/3/2014	6.02	6.13	513	14.3	3.98			**26**	<0.20	<0.20	<0.20										2 weeks after first injection
		8/19/2014	6.31	6.13	300	16.3	8.93			**28**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/19/2014	6.38	7.05	329	17.2	4.34			**21**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/17/2014	6.60	6.09	302	14.6	2.41			**22**	<0.20	<0.20	<0.20										
		4/2/2015	6.34	6.25	238	14.8	NA		-22.5	**25**	<0.20	<0.20	<0.20	**3.5**	**22**	**4**	<0.50	<0.50	<0.50	**10000**			6 weeks after in situ bio injections
		7/30/2015	6.16	6.12	405	17.5	NA	0.0	96.4	**25**	<0.20	<0.20	<0.20	**3.7**	**110**	**14**	<0.50	<0.50	<0.50	**10000**	**10000**		
		10/21/2015	7.39	6.20	275	18.1	22	0.0	123.2	**24**	<0.20	<0.20	<0.20	**3.1**	**65**	**7.8**	<0.50	<0.50	<0.50	**10000**	**11000**		9 months after in situ bio injections
		2/2/2016		5.93	192	15.0	11.00	0.0	144.4	**26**	<0.20	<0.20	<0.20	**3**	**67**	**7.1**	**25**	<0.50	<0.50	**12000**	**12000**		
		5/5/2016	6.75	5.87	336	15.76	15.05	0.0	97.5	**28**	<0.20	**0.35**	<0.20	**2.8**	**110**	**9.5**	<0.50	<0.50	<0.50	**15000**			
UCCMW-25	8-18	5/15/2014	4.12	6.08	424	15.3	6.40	0.0	255	**6.9**	<0.20	<0.20	<0.20	**3.9**	**24**	<1.0	<0.50	<0.50	<0.50				Baseline
		6/3/2014	5.15	6.10	636	14.7	6.29			**9.3**	<0.20	<0.20	<0.20										2 weeks after first injection
		8/14/2014	5.21	6.29	554	16.6	5.13			**9.3**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/18/2014	5.49	5.87	383	18.4	8.73			**8.3**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/11/2014	5.30	6.68	331	15.7	4.43			**7.5**	<0.20	<0.20	<0.20										
		4/2/2015	5.56	6.12	321	14.3	36.58		113	**9.4**	<0.20	<0.20	<0.20	**2.4**	**67**	**12**	<0.50	<0.50	<0.50	**15000**			6 weeks after in situ bio injections
		7/9/2025	6.51	5.54	429	17.0	34.30	0.0	100	**6.7**	<0.20	<0.20	<0.20	<0.050	**110**	**11**	<0.50	<0.50	<0.50	**14000**	**13000**		
		10/21/2015	6.80	6.50	230	17.1	8.60	0.0	76	**9.6**	<0.20	<0.20	<0.20	**1.8**	**23**	**3.7**	**0.84**	<0.50	<0.50	**28000**	**28000**		9 months after in situ bio injections
		1/29/2016		6.42	168	14.75	3.80	0.0	87.0	**10.0**	<0.20	<0.20	<0.20	**4.4**	**14**	**2.3**	**1.4**	<0.50	<0.50	**29000**	**31000**		
		5/5/2016	6.90	6.19	198	15.28	8.62	0.0	116.8	**7.8**	<0.20	<0.20	<0.20	**1.8**	**21**	**2.3**	**0.84**	<0.50	<0.50	**32000**			

Table 1
Ultra Custom Care Cleaners Site
Ground Water Analytical Data

Sample Location	Screened Depth, (ft bgs)	Sample Date	Depth to Water (ft bgs)	pH (units)	Conductivity (mS)	Temperature (°C)	Diss. Oxygen (mg/L)	Fe^{+2} (mg/L)	Redox Potential (millivolt)	Tetrachloro-ethene (µg/L)	Trichloro-ethene (µg/L)	(cis) 1,2-Dichloro-ethene (µg/L)	Vinyl Chloride (µg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Total Organic Carbon (mg/L)	Methane (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Total Sodium (ug/L)	Dissolved Sodium (ug/L)	Vinyl Chloride Reductase (vcrA) Gene Copies/Liter	
MTCA Method A/B Cleanup Level (Table 720-1, WAC 173-340-900)										**5**	**5**	**16 (B)**	**0.2**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**				
BI-3	5-10	6/10/2014	4.27	6.39	493	15.4	1.55	0.0	238	**4.5**	**0.43**	**1.7**	**0.26**	**1.3**	**10**	**1.8**	**128**	<1.2	<1.1				2 weeks after first injection
		9/17/2014	4.17	6.32	394	19.8	0.25			**2.1**	**0.52**	**2.9**	**1.6**										6 weeks after second injection
		12/17/2014	3.83	6.77	295	12.00	0.32			**2.5**	**0.35**	**2.4**	**1.5**										
		3/30/2015	4.30	6.17	204	14.03	0.00		-29.6														6 weeks after in situ bio injections
		7/9/2015		5.86	209	20.31	0.00		-118.3	**0.68**	**0.37**	**2.6**	**1.5**										
		10/22/2015	4.92	6.69	213	18.79	0.00		-59.5	**0.52**	<0.20	**1.0**	**0.96**										9 months after in situ bio injections
		1/27/2016		7.1	128	12.41	4.63		-72.6	<0.20	<0.20	**1.0**	**0.83**										
Second Injection Row																							
UCCMW-8	5-15	5/29/2014	6.07	6.52	490	13.9	1.87	0.0	283	**110**	<1.0	<1.0	<1.0	**2.3**	**18**	<1.0	<0.50	<0.50	<0.50				Baseline
		9/13/2014	6.29	6.5	289	19.1	1.00			**76**	**0.57**	<0.40	<0.40										6 weeks after second injection
		12/12/2014	5.51	6.97	257	14.6	1.30			**83**	**0.44**	<0.40	<0.40										
		3/23/2015	5.80	6.12	180	12.7	0.00		-90.1	**49**	**0.38**	<0.20	<0.20	**0.24**	**6.2**	**2.7**	**48**	<0.50	<0.50	**5400**			5 weeks after in situ bio injections
		7/8/2015		5.75	237	17.8	0.00		61.2	**42**	**2.3**	**6.0**	<0.20	**0.97**	**15**	**1.2**	<0.50	<0.50	<0.50	**14000**			14 weeks after in situ bio injections
		10/21/2015	7.00	6.41	217	18.2	0.00	0.0	84.6	**36**	**2.9**	**7.3**	<0.20	**0.71**	**16**	**1.8**	**110**	<10	<0.50	**12000**	**12000**		9 months after in situ bio injections
		2/2/2016		6.11	112	12.58	2.55	0.0	106.1	**75**	**1.6**	**1.0**	<0.20	**2.2**	**16**	**1.4**	**65**	<1.1	<0.58	**13000**	**12000**		
		5/5/2016	6.12	6.08	219	13.99	1.01	0.0	89.7	**96**	**0.79**	**0.51**	<0.20	**0.35**	**19**	**31**	**4.1**	<0.50	<0.50	**16000**			
UCCMW-9		5/28/2014	6.75	6.51	1164	16.2	0.52	0.0	276	**1.0**	<1.0	<1.0	<1.0	**1.0**	**19**	**2.0**	**16.0**	<1.0	<1.0				Baseline
		9/13/2014	6.71	6.75	611	22.8	0.46			**2.5**	**0.23**	**0.21**	<0.20										6 weeks after second injection
		12/17/2014	6.09	6.30	523	10.8	0.72			**5.7**	**0.22**	<0.20	<0.20										
		3/30/2015	6.58	6.00	366	12.8	0.12		-45.5	**0.9**	<0.20	<0.20	<0.20										6 weeks after second injection
		7/9/2015		5.95	389	20.4	0.13		-39.8	**0.37**	0.26	0.49	<0.20										
		1/27/2016		6.64	282	9.64	8.48		72.5	**1.4**	<0.20	<0.20	<0.20										
UCCMW-10	5-15	6/13/2014	6.15	5.70	736	17.0	0.60	0.0	261	**0.90**	<0.20	<0.20	<0.20	**2.0**	**24**	**9.2**	**48.6**	<1.2	<1.1				Baseline
		9/18/2014	6.02	5.75	414	21.6	0.37			**0.29**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/11/2014	5.2	5.65	469	14.0	0.49			**1.3**	<0.20	<0.20	<0.20										
		1/28/2015																					
		4/2/2015	5.56	6.34	352	12.5	0.00		-94.8	<0.20	<0.20	<0.20	<0.20										6 weeks after in situ bio injections
		7/9/2015		5.27	297	22.3	0.19		71.7	<0.20	<0.20	<0.20	<0.20			**19.0**							
		10/26/2015	7.17	6.16	182	17.8	0.00		48.9	**3.0**	<0.20	<0.20	<0.20										9 months after in situ bio injections
		1/29/2016		5.94	189	10.96	0.00		101.6	**0.67**	<0.20	<0.20	<0.20										
BB-2	9-19	6/10/2014	5.53	6.63	459	14.9	2.70	0.0	269	**79**	<0.40	<0.40	<0.40	**3.2**	**9.4**	<1.0	<0.70	<1.20	<1.10				2 weeks after first injection
		9/17/2014	5.86	6.9	306	18.6	1.85			**68**	<0.40	<0.40	<0.40										6 weeks after second injection
		12/12/2014	5.01	6.99	263	15.5	2.40			**82**	<0.40	<0.40	<0.40										
		4/2/2015	5.31	6.39	192	15.44	56.2			**65**	<0.40	<0.40	<0.40	**3.5**	**8.6**	<1.0	<0.50	<0.50	<0.50	**13000**			6 weeks after in situ bio injections
		7/22/2015		5.75	203	18.99	3.6	0.0	118.2	**67**	<0.40	<0.40	<0.40	**3.4**	**8.9**	<1.0				**14000**	**12000**		
		10/22/2015	6.92	6.51	189	17.6	2.5	0.0	69.4	**57**	<0.40	<0.40	<0.40	**3.0**	**9.4**	<1.0	**2.7**	<0.50	<0.50	**13000**	**14000**		9 months after in situ bio injections
		2/2/2016		6.21	118	14.71	5.99	0.0	90.1	**65**	<0.40	<0.40	<0.40	**3.3**	**8.8**	<1.0	**9.1**	<0.50	<0.50	**14000**	**14000**		
		5/5/2016	5.51	6.36	160	15.15	3.18	0.0	57.9	**73**	<0.40	<0.40	<0.40	**3.6**	**9.3**	<1.0	<0.50	<0.50	<0.50	**14000**			
Third Injection Row																							
EFGB-1		9/29/2014								**20**	<0.20	<0.20	<0.20										DP boring same loc as UCCMW-26
UCCMW-26	5-15	3/23/2015	5.43	5.72	574	12.3	4.73		-201.1	**81**	**10**	**21**	**0.74**	**0.14**	<5.0	**200**	**2100**	**0.86**	**0.82**	**30000**			5 weeks after in situ bio injections
		7/30/2025		5.97	377	20.0	0.00	1.6	-113.9	**2.2**	**1.5**	**130**	**3.3**	**0.054**	<5.0	**42**	**12000**	<0.50	<0.50	**18000**	**18000**		
		10/21/2015	6.97	6.18	424	18.5	0.00	1.2	-72.7	**2**	**1.1**	**69**	**10**	**0.18**	<5.0	**26**	**21000**	<1000	<5	**18000**	**19000**		9 months after in situ bio injections
		2/1/2016		6.47	1214	11.14	4.50	2.8	-127.5	**0.47**	**0.22**	**0.98**	**0.35**	**0.77**	<5.0	**61**	**11000**	<110	<14	**110000**	**95000**		
		5/5/2016	5.81	5.92	405	14.20	1.40	2.4	53.3	<0.20	**0.21**	**8.9**	**4.1**	**0.10**	<5.0	**70**	**10000**	<120	<7.9	**45000**			
EFGB-2		9/29/2014								**17**	<0.20	<0.20	<0.20										DP boring same loc as UCCMW-27
UCCMW-27	5-15	3/23/2015	5.30	7.38	923	12.4	0.23		-251.7	**3.8**	<0.20	<0.20	<0.20										5 weeks after in situ bio injections
		7/17/2025		5.73	379	21.3	0.00		36.6	**19.0**	<0.20	0.27	0.48										
		10/22/2015	7.01	6.58	540	17.8	0.00		44.5	**6.6**	**0.53**	**0.54**	<0.20										9 months after in situ bio injections
		1/27/2016		6.39	760	11.99	2.44		-32.3	**0.72**	<0.20	<0.20	<0.20										
		5/5/2016	5.65	6.41	444	13.74	1.86	2.0	156.9	**16.0**	**0.49**	**0.22**	<0.20	**0.54**	**47**	**8.5**	**730**	<8.4	<0.89	**23000**			
Other Wells																							
INJ-1	8-23	9/21/2015	9.71	5.8	220	19.37	1.65		-141.4														
INJ-2	8-23	12/17/2014								**9.3**	**0.29**	**0.53**	<0.20	**7.1**	**55**	**5.7**	**1.0**	<0.50	<0.50	**22000**			
		3/30/2015								**1.5**	**0.27**	**3.1**	**1.1**										
		3/24/2015	9.25	5.66	332	14.75	8.15		105.8	**91**	**3.7**	**7**	<0.40										5 weeks after in situ bio injections
		7/17/2015		5.16	293	18.07	35.42		89.9	**490**	<0.20	**16**	<0.20										

Table 1
Ultra Custom Care Cleaners Site
Ground Water Analytical Data

Sample Location	Screened Depth, (ft bgs)	Sample Date	Depth to Water (ft bgs)	pH (units)	Conductivity (mS)	Temperature (°C)	Diss. Oxygen (mg/L)	Fe^{+2} (mg/L)	Redox Potential (millivolt)	Tetrachloro-ethene (µg/L)	Trichloro-ethene (µg/L)	(cis) 1,2-Dichloro-ethene (µg/L)	Vinyl Chloride (µg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Total Organic Carbon (mg/L)	Methane (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Total Sodium (ug/L)	Dissolved Sodium (ug/L)	Vinyl Chloride Reductase (vcrA) Gene Copies/Liter	
MTCA Method A/B Cleanup Level (Table 720-1, WAC 173-340-900)										**5**	**5**	**16 (B)**	**0.2**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**				
		1/28/2016		5.89	276	14.02	5.49		23.3	**1300**	**17**	**910**	**4.6**										
		5/3/2016	9.16	5.92	518	17.12	0.67		-18.3	**50**	**17**	**1100**	**11**										
INJ-3	8-23	9/21/2015	10.85	6.16	369	18.91	4.29		-212.3														
INJ-4	8-23	2/2/2015	10.64	6.26	642	14.3	5.52			**2.1**	**0.28**	**0.54**	<0.20	**6.2**	**49**	**4.4**	**0.73**	<0.50	<0.50	**27000**			
INJ-5	8-23	9/23/2015	11.66	6.33	475	23.19	0.00		-210.9														Persulfate test =0
INJ-6	8-23	2/2/2015	10.46	6.53	557	15.1	6.50			**18**	**0.33**	**<0.20**	<0.20	**7.0**	**91**	**2.9**	**0.65**	<0.50	<0.50	**21000**			
INJ-7	8-13	9/21/2015	9.66	6.19	858	19.86	0.26		-96.2														
INJ-8	8-13																						
INJ-9	8-13	9/21/2015																					
		10/21/2015	10.5	5.96	756	21.24	0.00		-56.9	<0.20	<0.20	**400**	**10**										Well pumped dry, insufficient volume for field parameters
INJ-10	8-13																						
INJ-11	8-13	9/23/2015	10.85	6.27	1287	19.1	0.37		-106.9														
INJ-12	8-13																						
INJ-13	8-13	9/23/2015	11.47	6.3	445	23.23	0.00		-89.9														
INJ-14	8-13																						
INJ-15	8-13	9/23/2015	11.6	6.54	855	22.77	1.40		-82.6														
INJ-16	8-13																						
INJ-17	8-13	9/23/2015	-	-	-	-	-		-														
MW-2	3-13	5/11/2014	6.28	6.22	663	14.0	3.45	0.0	208	<0.20	<0.20	<0.20	<0.20	**8.0**	**36**	**4.9**	**20**	<0.50	<0.50				Baseline
		6/2/2014	6.32	5.91	685	15.6	3.31			**0.26**	<0.20	<0.20	<0.20										2 weeks after first injection
		8/13/2014	6.66	5.99	200	17.9	NA			<0.20	<0.20	<0.20	<0.20										2 weeks after second injection
		9/15/2014	7.02	6.34	392	20.9	2.50			**0.22**	<0.20	<0.20	<0.20										6 weeks after second injection
MW-3R	6-16	5/10/2014	6.36	6.23	1045	13.7	7.50	0.0	238	**1.7**	<0.20	<0.20	<0.20	**9.2**	**110**	**2.3**	<0.50	<0.50	<0.50				Baseline
		6/3/2014	6.53	6.13	1090	15.3	4.70			**1.6**	<0.20	<0.20	<0.20										2 weeks after first injection
		8/19/2014	6.97	6.2	492	18.9	6.49			**1.3**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/15/2014	7.32	6.25	426	19.0	2.40			**1.0**	<0.20	<0.20	<0.20										6 weeks after second injection
UCCMW-6	5-15	3/13/2014	5.30	5.75	809	10.9	0.80			**3.8**	<0.20	<0.20	<0.20	**0.39**	**17**	**1.5**	**3.8**	<0.50	<0.50				Baseline
		5/13/2014	5.50	5.96	608	13.7	0.11	0.0	363	**3.5**	<0.20	<0.20	<0.20	**1.4**	**16**	<1.0	**0.99**	<0.50	<0.50				Baseline
		6/6/2014	5.75	6.02	645	13.8	5.38			**4.0**	<0.20	<0.20	<0.20										2 weeks after first injection
		8/19/2014	5.83	5.91	426	16.5	8.11			**4.8**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/16/2014	5.96	6.33	412	16.7	2.16			**3.6**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/17/2014	6.14	6.27	395	12.4	0.89			**4.0**	<0.20	<0.20	<0.20										
		3/30/2015	6.00	5.75	282	15.1	0.00		63.6	**4.6**	<0.20	<0.20	<0.20										6 weeks after in situ bio injections
		7/9/2015		5.41	310	19.5	0.00		84.9	**4.6**	<0.20	<0.20	<0.20										
		1/27/2016		6.88	126.9	10.31	6.50		127.6	<0.20	<0.20	<0.20	<0.20										9 months after in situ bio injections
UCCMW-15	9-19	5/11/2014	8.15	6.30	475	13.4	6.28	0.0	21	**4.8**	<0.20	<0.20	<0.20	**3.6**	**42**	**1.4**	**0.93**	<0.50	<0.50				Baseline
		6/5/2014	8.22	6.12	601	14.4	5.45			**0.61**	<0.20	<0.20	<0.20										2 weeks after first injection
		8/14/2014	8.36	6.22	478	18.3	24.99			**4.2**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/15/2014	8.73	6.08	520	21.1	6.91			**2.8**	<0.20	<0.20	<0.20										6 weeks after second injection
UCCMW-16	9-19	5/14/2014	4.28	6.42	544	15.1	1.98	0.0	1	<0.20	<0.20	<0.20	<0.20	**1.7**	**16**	<1.0	**2.5**	**0.63**	<0.50				Baseline
		6/5/2014	6.73	6.27	761	15.5	5.25			<0.20	<0.20	<0.20	<0.20										2 weeks after first injection
		8/15/2014	7.13	6.43	261	18.0	6.31			<0.20	<0.20	<0.20	<0.20										2 weeks after second injection
		9/18/2014	7.24	6.26	282	18.7	3.68			**0.20**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/17/2014	8.30	7.15	237	14.0	1.87			**1.0**	<0.20	<0.20	<0.20										
		3/24/2015	7.83	5.79	205	13.8	26.76		143.5	<0.20	<0.20	<0.20	<0.20										5 weeks after in situ bio injections
		7/17/2015		5.65	205	17.6	13.30		54.6	<0.20	<0.20	<0.20	<0.20										
		9/23/2015	9.04	6.00	221	17.8	7.02		70.7														Persulfate test =0
		2/1/2016		5.68	154	13.09	3.41	0.0	79.5	<0.20	<0.20	<0.20	<0.20	**2.5**	**14**	<1.0	**2.3**	<0.50	<0.50	**12000**	**11000**		
		5/3/2016	7.46	5.36	218	16.05	1.49		182.3	<0.20	<0.20	<0.20	<0.20										
UCCMW-22	8-18	6/3/2014	6.29	6.11	472	14.4	2.69			**0.81**	<0.20	<0.20	<0.20										2 weeks after first injection
		8/15/2014	6.24	6.40	264	17.2	3.86			**0.67**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/18/2014	6.33	6.37	280	17.8	2.49			**0.89**	<0.20	<0.20	<0.20										6 weeks after second injection
UCCMW-23	8-18	5/13/2014	5.43	6.31	628	14.1	0.15	0.0	-288	**2.2**	<0.20	<0.20	<0.20	**0.38**	**10**	**1.9**	**34**	**3.9**	**2.0**				Baseline
		6/6/2014	5.57	6.17	536	13.9	6.48			**2.1**	<0.20	<0.20	<0.20										2 weeks after first injection
		8/19/2014	5.56	6.13	281	16.9	5.9			**2.5**	<0.20	<0.20	<0.20										2 weeks after second injection
		9/16/2014	5.74	6.29	291	17.5	3.89			**2.5**	<0.20	<0.20	<0.20										6 weeks after second injection
		12/17/2014	5.90	6.16	282	13.8	1.59			**4.6**	<0.20	<0.20	<0.20										
		3/30/2015	5.90	5.27	251	14.4	2.75		116.4	**2.9**	<0.20	<0.20	<0.20										5 weeks after in situ bio injections

Table 1
Ultra Custom Care Cleaners Site
Ground Water Analytical Data

Sample Location	Screened Depth, (ft bgs)	Sample Date	Depth to Water (ft bgs)	pH (units)	Conductivity (mS)	Temperature (^{o}C)	Diss. Oxygen (mg/L)	Fe^{+2} (mg/L)	Redox Potential (millivolt)	Tetrachloro-ethene (µg/L)	Trichloro-ethene (µg/L)	(cis) 1,2-Dichloro-ethene (µg/L)	Vinyl Chloride (µg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Total Organic Carbon (mg/L)	Methane (µg/L)	Ethane (µg/L)	Ethene (µg/L)	Total Sodium (ug/L)	Dissolved Sodium (ug/L)	Vinyl Chloride Reductase (vcrA) Gene Copies/Liter	
MTCA Method A/B Cleanup Level (Table 720-1, WAC 173-340-900)										**5**	**5**	**16 (B)**	**0.2**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**				
		7/17/2015		5.64	257	19.4	1.09		33.9	**3.4**	<0.20	<0.20	<0.20										
		2/2/2016		6.18	233	12.63	2.62		76	**4.1**	<0.20	<0.20	<0.20										
HZMW-16	15-25	5/28/2014	6.35	6.52	451	15.5	0.16	0.0	241	**0.32**	<0.20	**0.30**	<0.20	**1.6**	**16**	<1.0	**0.66**	<0.50	<0.50				Baseline
		9/18/2014	6.78	7.08	207	17.9	1.23			**4.2**	<0.20	<0.20	<0.20										6 weeks after second injection
QC Samples																							
Dup 1		5/11/2014								<0.20	<0.20	<0.20	<0.20	**3.1**	**10**	<1.0	**1.7**	**0.53**	<0.50				Duplicate of UCCMW-17 5/11/14
Dup 2		5/14/2014								<0.20	<0.20	<0.20	<0.20	**0.47**	**15**	<1.0	**77**	**12**	**6.5**				Duplicate of UCCMW-12D 5/14/14
Dup 01		6/3/2014								**1.7**	<0.20	<0.20	<0.20										Duplicate of MW-3R 6/3/14
Dup 6-5-14		6/6/2014								**2.1**	<0.20	<0.20	<0.20										Duplicate of UCCMW-23 6/6/14
Trip Blank		5/14/2014								<0.20	<0.20	<0.20	<0.20										
Trip Blank		5/15/2014								<0.20	<0.20	<0.20	<0.20										
Trip Blank		6/5/2014								<0.20	<0.20	<0.20	<0.20										
Trip Blank		6/6/2014								<0.20	<0.20	<0.20	<0.20										
Trip Blank		9/15/2014								<0.20	<0.20	<0.20	<0.20										
Trip Blank		9/17/2014								<0.20	<0.20	<0.20	<0.20										
Dup1		9/15/2014								**3.1**	<0.20	<0.20	<0.20										Duplicate of UCCMW-15 9/15/2014
Dup2		9/19/2014								**4.4**	<0.20	<0.20	<0.20										Duplicate of UCCMW-4 9/19/2014
Dup 1014		10/8/2014								<0.20	<0.20	<0.20	<0.20										Duplicate of UCCMW-12D 10/8/2014
Trip Blank		10/8/2014								<0.20	<0.20	<0.20	<0.20										
DUP 101714		10/17/2014								**0.41**	<0.20	<0.20	<0.20										
TB		11/3/2014								<0.20	<0.20	<0.20	<0.20										
DUP		11/3/2014								**1.2**	<0.20	<0.20	<0.20										Duplicate of UCCMW-13S 11/3/2014
TB		11/14/2014								<0.20	<0.20	<0.20	<0.20										
DUP		11/14/2014								<0.20	<0.20	<0.20	<0.20										Duplicate of UCCMW-14D 11/14/2014
DUP 112114		11/21/2014								**1.1**	<0.20	<0.20	<0.20										Duplicate of UCCMW-13S on 11/21/2014
TB		12/18/2014								<0.20	<0.20	<0.20	<0.20										
DUP1014		12/18/2014								<0.20	<0.20	<0.20	<0.20										
Dup 21215		2/12/2015								**0.70**	<0.20	<0.20	<0.20										Duplicate of UCCMW 13D on 2/12/2015
TB		3/30/2015								<0.20	<0.20	<0.20	<0.20										
DUP		3/24/2015								0.85	<0.20	<0.20	<0.20										Duplicate of UCCMW 16 on 3/24/2015
DUP 7915		3/24/2015								0.85	<0.20	<0.20	<0.20										
TB		7/17/2015								<0.20	<0.20	<0.20	<0.20										
TB		7/22/2015								<0.20	<0.20	<0.20	<0.20										
UCCDUP-102115		10/21/2015								<0.20	<0.20	**41**	<0.20										Duplicate of UCCMW-19 on 10/21/15
TB		10/21/2015								<0.20	<0.20	<0.20	<0.20										
TB		10/21/2015								<0.20	<0.20	<0.20	<0.20										
TB		10/26/2015								<0.20	<0.20	<0.20	<0.20										
DUP-0128		1/28/2016								**5.2**	<4.0	**680**	**12**										Duplicate of MW-1 on 1/28/2016
TB		1/28/2016								<0.20	<0.20	<0.20	<0.20										
DUP-0504		5/4/2016								**3.8**	**2.1**	**310**	**12**	**0.19**	**2200**	<25	**6100**	<67	**5.2**	**300000**			Duplitcate of MW-1 on 5/4/2016
TB		5/4/2016								<0.20	<0.20	<0.20	<0.20										

< – Analyte not detected at laboratory's listed reporting limit
Bold indicates analyte detected at a concentration greater than the laboratory reporting limit
Yellow highlight indicates analyte exceeds MTCA cleanup level
Blank – not analyzed or not measured at that sampling location
NA – Not applicable
1 – The MTCA Method A ground water cleanup level for gasoline range hydrocarbons is 800 µg/L if benzene is present; the cleanup level is 1000 µg/L if benzene is not detectable