

Groundwater Sampling Summary

Event 3, Second Quarter 2017

Supplemental Groundwater Sampling and Data Evaluation
Northwest Pipe Company, Portland, Oregon ECSI #138

Prepared for

Northwest Pipe Company

June 14, 2017



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Table 1

Groundwater Quality Field Parameters, Events 1 through 3
 Supplemental Groundwater Investigation
 Northwest Pipe Company Portland Plant

Well	Date Sampled	Temperature (°C)	pH	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	Turbidity (NTU)
<i>Northwest Pipe Company Wells</i>							
MW-01	10/26/2016	15.9	6.42	352	0.26	6	6.8
	2/2/2017	16.0	6.64	385	0.01	-36	3.1
	5/1/2017	15.5	6.56	423	0.12	36	3.0
MW-02	10/26/2016	16.8	6.90	197	0.24	-138	0.7
	2/1/2017	15.4	6.97	202	0.09	-136	8.2
	4/27/2017	15.0	7.11	240	0.20	-142	8.1
MW-03	10/26/2016	16.4	6.61	281	0.32	-88	2.6
	2/2/2017	15.9	6.76	321	0.26	-68	3.2
	5/1/2017	15.5	6.56	334	0.07	-43	3.5
MW-04	10/26/2016	14.8	6.34	323	0.28	-59	4.1
	2/1/2017	14.3	6.39	440	0.32	-45	1.3
	4/27/2017	13.0	6.60	337	0.22	-59	5.0
MW-05	10/26/2016	15.5	6.50	375	0.17	-52	1.2
	2/2/2017	15.7	6.59	426	0.33	77	1.8
	5/1/2017	15.4	6.60	360	0.11	-40	0.5
MW-06	10/26/2016	15.9	6.47	266	0.15	-76	2.7
	2/2/2017	15.5	6.54	299	0.20	-47	2.8
	5/1/2017	15.7	6.35	310	0.13	20	4.4
<i>Port of Portland Wells</i>							
T4S1MW-03S	10/25/2016	14.2	6.42	245	0.86	72	0.5
	2/1/2017	14.3	6.65	111	5.19	145	0.8
	4/26/2017	13.2	6.62	87	8.96	167	1.6
T4S1MW-09	10/25/2016	14.9	6.51	278	3.27	-53	1.6
	2/1/2017	14.9	6.67	234	2.87	-41	0.9
	4/26/2017	14.3	6.51	200	0.98	-20	4.2
T4S1MW-22	10/25/2016	15.7	6.35	217	0.33	97	4.0
	2/1/2017	14.4	6.40	255	0.30	132	1.2
	4/27/2017	15.0	6.36	232	1.20	169	1.4
T4S1MW-23	10/25/2016	15.1	6.49	165	0.90	39	1.2
	2/1/2017	14.2	6.54	177	1.31	51	1.4
	4/27/2017	14.9	6.53	161	1.12	92	1.9

Notes:

°C = degrees celcius

mg/L = milligrams per liter

mV = millivolts

uS/cm = microsiemens per centimeter

NTU = Nephelometric Turbidity Units

Table 2

Groundwater Quality Field Parameters, Natural Attenuation Parameters, Events 1 through 3
 Supplemental Groundwater Investigation
 Northwest Pipe Company Portland Plant

Sample ID	Sample Date	Natural Attenuation Parameters (mg/L)						
		Chloride	Nitrate-N	Sulfate	TOC	Iron, dissolved	Carbon Dioxide	Methane
<i>Northwest Pipe Company Wells</i>								
MW-01	10/26/2016	2.46	0.37 J	10.1	1.00	1.59	81.0	1.25
	2/1/2017	3.69	0.061	4.71	0.84	3.01	68.2	1.74
	5/1/2017	4.00	0.029	3.57	1.34	1.53	82.6	3.12
MW-02	10/26/2016	1.98	0.023 J	4.15	1.48	5.45	29.6	3.68
	2/1/2017	2.50	0.39	8.09	1.23	5.39	17.6	3.30
	4/27/2017	2.47	0.31	5.37	1.6	1.34	15.6	3.42
MW-03	10/26/2016	3.61	0.018 J	10.2	1.27	6.14	53.6	1.48
	2/1/2017	3.92	0.018	10.4	0.93	4.46	44.1	0.734
	5/1/2017	5.47	0.0028 U	12.1	1.27	3.32	53.9	0.748
MW-04	10/26/2016	3.00	0.043 J	5.7	1.21	12.9	104	1.46
	2/1/2017	4.90	0.0028 U	4.42	1.09	9.75	98.4	1.86
	4/27/2017	4.52	0.011	2.35	1.4	9.83	82	1.21
MW-05	10/26/2016	5.36	0.34 J	20.5	1.67	4.46	75.1	1.16
	2/1/2017	7.03	0.57	29.7	1.5	0.0137 U	74.9	0.887
	5/1/2017	4.87	0.0028 U	11.9	1.33	4.17	50.5	2.31
MW-06	10/26/2016	5.07	0.016 J	5.17	1.25	7.29	57.1	2.28
	2/1/2017	6.12	0.0028 U	9.27	1.15	6.1	60.5	0.623
	5/1/2017	6.2	0.0028 U	13.9	1.27	3.53	81.8	0.206
MW-06	10/26/2016	5.05	0.017 J	5.36	1.15	7.4	59.5	2.04
<i>Duplicate</i>	2/1/2017	5.95	0.003 J	9.09	1.12	6.09	62.3	0.666
	5/1/2017	6.21	0.0028 U	14	1.4	3.6	82.3	0.265

Table 2

Groundwater Quality Field Parameters, Natural Attenuation Parameters, Events 1 through 3
 Supplemental Groundwater Investigation
 Northwest Pipe Company Portland Plant

Sample ID	Sample Date	Natural Attenuation Parameters (mg/L)						
		Chloride	Nitrate-N	Sulfate	TOC	Iron, dissolved	Carbon Dioxide	Methane
<i>Port of Portland Wells</i>								
T4S1MW-03S	10/25/2016	5.1 J	5.19 J	24.7 J	0.85 J	0.0304 J	26.2 J	0.0291 J
	2/1/2017	0.86	1.23	4.54	0.39 J	0.01 U	13.9	0.0101 J
	4/26/2017	0.71	0.44	2.56	0.5	0.01 U	9.6	0.00515 U
T4S1MW-09	10/25/2016	2.76 J	1.23 J	5.97 J	1.09 J	7.62	49.1 J	2.64 J
	2/1/2017	1.70	2.94	5.66	0.61	4.41	29	1.22
	4/26/2017	1.65	1.87	5.95	0.7	2	27.3	0.0225 J
T4S1MW-22	10/25/2016	2.8 J	0.095 J	5.49 J	1.19 J	0.01 U	48.4 J	0.0159 J
	2/1/2017	4.56	0.039	8.90	1.09	0.01 U	84.5	0.0334
	4/27/2017	3.38	0.92	10.00	1.18	0.01 U	49.1	0.00605 U
T4S1MW-23	10/25/2016	3.92 J	0.27 J	7.67 J	0.65 J	0.221	52.9 J	0.00507 J
	2/1/2017	4.24	0.58	8.74	0.68	0.185	26.9	0.0379
	4/27/2017	3.36	0.42	7.76	0.78	0.0545 J	20.4	0.00712 J

Notes:

mg/L = milligrams per Liter

TOC = Total Organic Carbon

Qualifiers

U - the analyte was analyzed for but was not detected above the detection limit.

J - the analyte was detected, but the associated numerical value is considered an estimated quantity.

Table 3

Groundwater Quality Field Parameters, Volatile Organic Compounds, Events 1 through 3
 Supplemental Groundwater Investigation
 Northwest Pipe Company Portland Plant

		Volatile Organic Compounds (µg/L)			
		PCE	TCE	cis-1,2-DCE	VC
<i>Cleanup Levels or Targets identified in the January 2017 ROD (µg/L) ¹</i>		<i>0.24</i>	<i>0.6</i>	<i>9.9</i>	<i>0.022</i>
Northwest Pipe Company Wells					
MW-01	10/26/2016	158	22.8	113	16.7
	2/1/2017	71.1	14.9	107	29.9
	5/1/2017	61.7	13	220	51.6
MW-02	10/26/2016	0.0598	0.15 U	0.15 U	0.0652
	2/1/2017	0.169	0.15 U	0.20 J	0.037
	4/27/2017	0.224	0.15 U	0.21 J	0.0115 J
MW-03	10/26/2016	630	221	428	22.8
	2/1/2017	483	178	502	20.8
	5/1/2017	657	283	847	26.1
MW-04	10/26/2016	28.2	38.4	111	4.45
	2/1/2017	12.4	20.3	119	9.73
	4/27/2017	14.4	29.7	116	16.6
MW-05	10/26/2016	3,510	195	1,160	40.4
	2/1/2017	4,150	208	1,240	39.5
	5/1/2017	949	92	634	70.7
MW-06	10/26/2016	287	60.4	1,160	170
	2/1/2017	805	147	1,590	51
	5/1/2017	1,280	225	1,530	21.9
MW-06	10/26/2016	299	70.9	1,130	177
<i>Duplicate</i>	2/1/2017	760	145	1,600	53.9
	5/1/2017	1,280	228	1,550	20.7

Table 3

Groundwater Quality Field Parameters, Volatile Organic Compounds, Events 1 through 3
 Supplemental Groundwater Investigation
 Northwest Pipe Company Portland Plant

		Volatile Organic Compounds (µg/L)			
		PCE	TCE	cis-1,2-DCE	VC
Cleanup Levels or Targets identified in the January 2017 ROD (µg/L) ¹		0.24	0.6	9.9	0.022
Port of Portland Wells					
T4S1MW-03S	10/25/2016	0.112 J	0.15 UJ	0.15 UJ	0.008 UJ
	2/1/2017	0.23	0.15 U	0.15 U	0.008 U
	4/26/2017	0.117	0.15 U	0.15 U	0.008 U
T4S1MW-09	10/25/2016	0.0191 J	0.15 UJ	0.15 UJ	0.0197 J
	2/1/2017	0.0177 J	0.15 U	0.15 U	0.0113 J
	4/26/2017	0.005 U	0.15 U	0.15 U	0.008 U
T4S1MW-22	10/25/2016	1.46 J	4.6 J	2.77 J	0.0499 J
	2/1/2017	1.28	4.29	5.36	0.106
	4/27/2017	1.43	3.56	2.11	0.022
T4S1MW-23	10/25/2016	1.59 J	0.15 UJ	0.7 J	0.008 UJ
	2/1/2017	0.937	0.41 J	0.65	0.0188 J
	4/27/2017	1.07	0.39 J	0.42 J	0.008 U

Notes:

µg/L = micrograms per Liter

Results shown in **bold** denote detected concentrations.

Shaded values exceed identified Cleanup Levels or Targets.

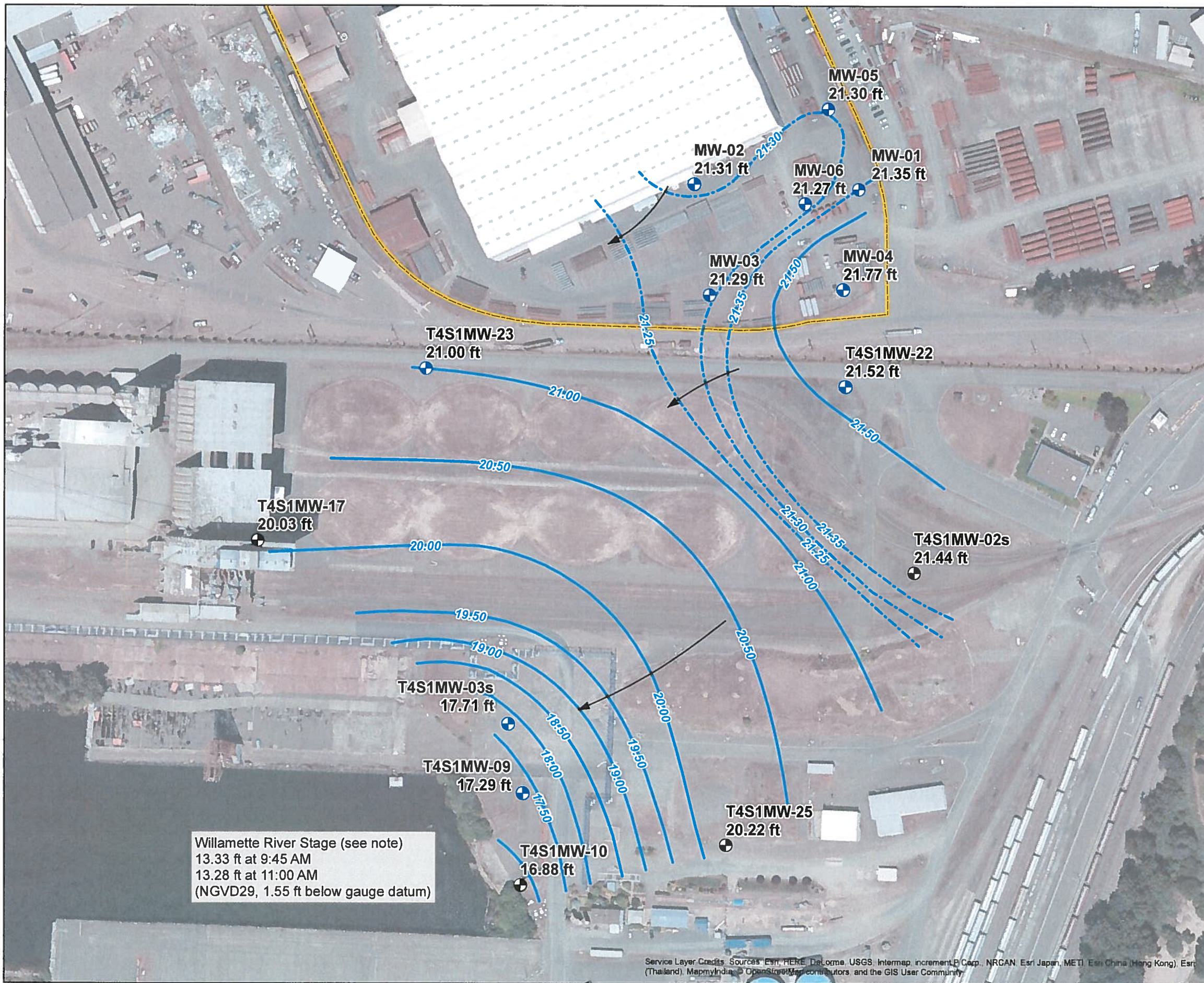
¹Cleanup Levels and Targets are selected from Table 17 of the Portland Harbor Record of Decision (U.S. Environmental Protection Agency Region 10, 2017). Values were selected from remedial action objectives (RAOs 4 and 8) associated with migration of contaminated groundwater.

Qualifiers

U - the analyte was analyzed for but was not detected above the detection limit.

J - the analyte was detected, but the associated numerical value is considered an estimated quantity.

UJ - the analyte was not detected above the detection limit. However, the detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.



- LEGEND**
- Groundwater Elevation Contour (0.5 ft contour interval, ft NGVD29)
 - Groundwater Elevation Contour (0.05 ft contour interval, to show detail in the NW Pipe Southeast Area, ft NGVD29)
 - Groundwater Flow Direction
- Investigation Wells**
- Groundwater Quality Monitoring
 - Water Level Only
 - Northwest Pipe Facility Boundary

Note: Groundwater levels measured between 9:48 AM and 10:51 AM on April 26, 2017. During this period, the Willamette River stage decreased by 0.05 foot, as measured at the Broadway Bridge river gauge (USGS 14211720).

FIGURE 1
Groundwater Elevation Contour Map
April 26, 2017
 Supplemental Groundwater Sampling and Data Evaluation
 Northwest Pipe Company, Portland, Oregon

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



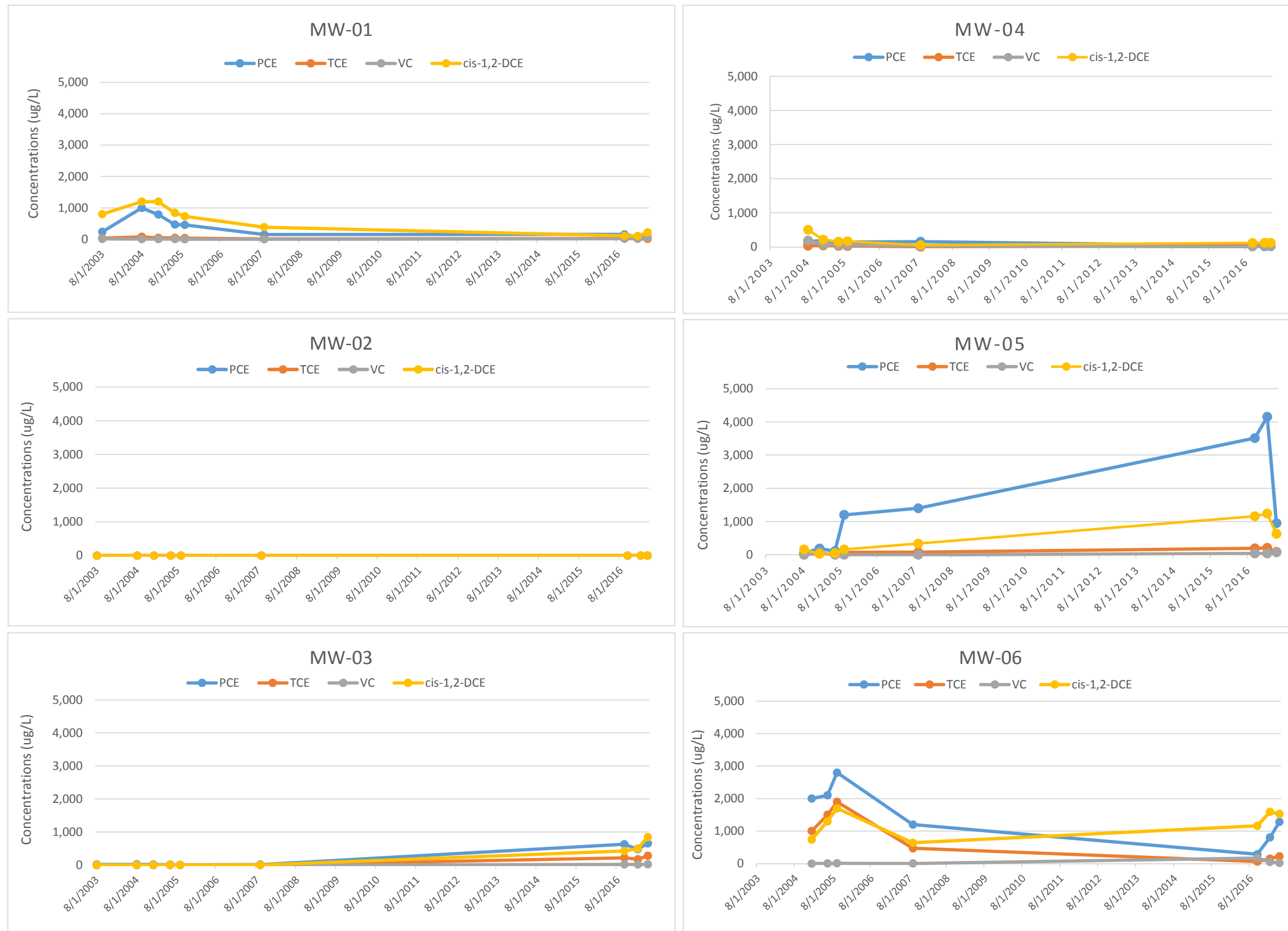


Figure 2
CVOC Trend Plots (2003 - 2017)
 Supplemental Groundwater Investigation
 Northwest Pipe Company Portland Plant

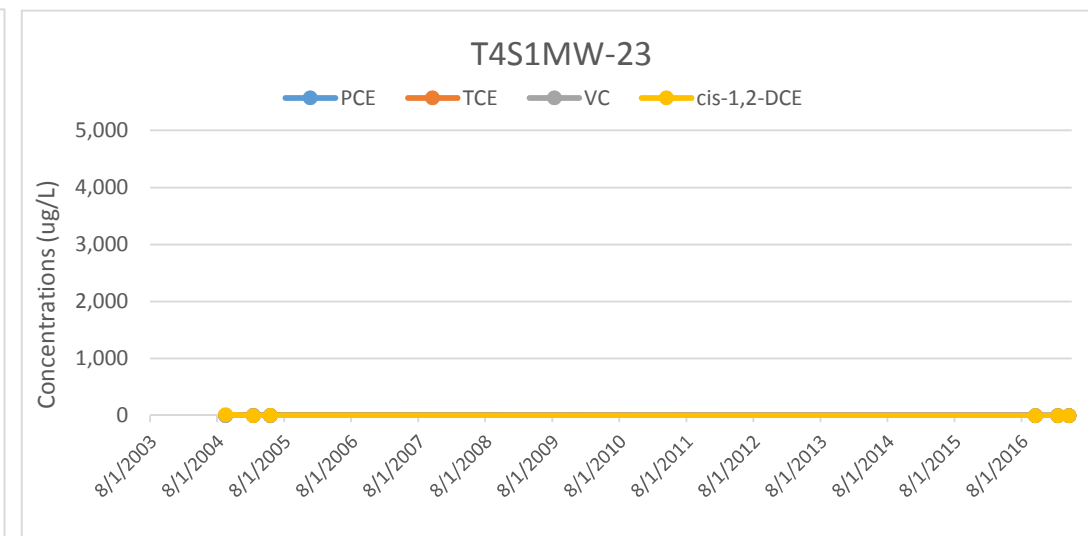
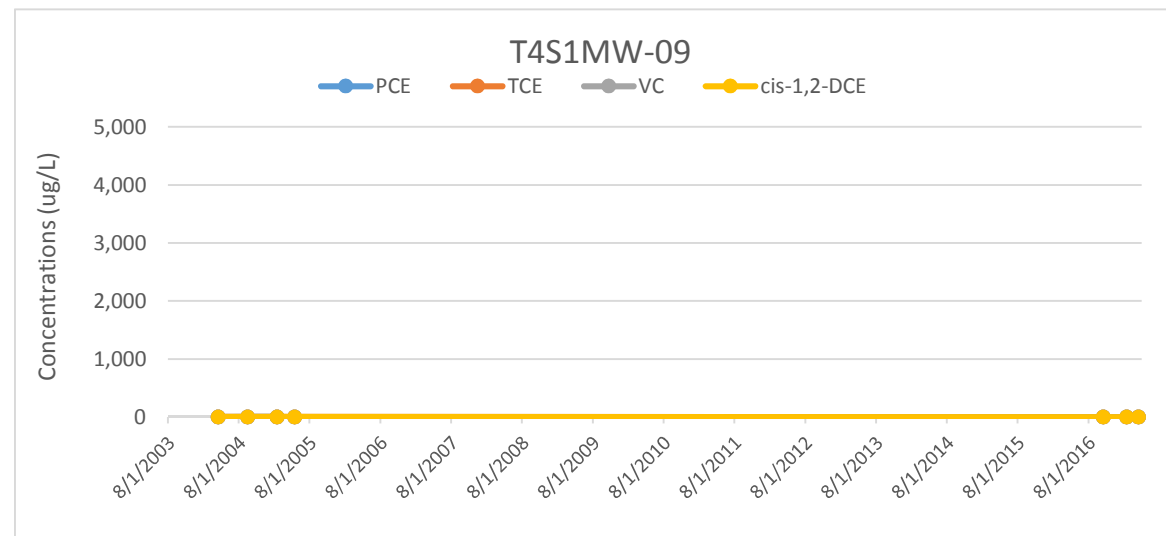
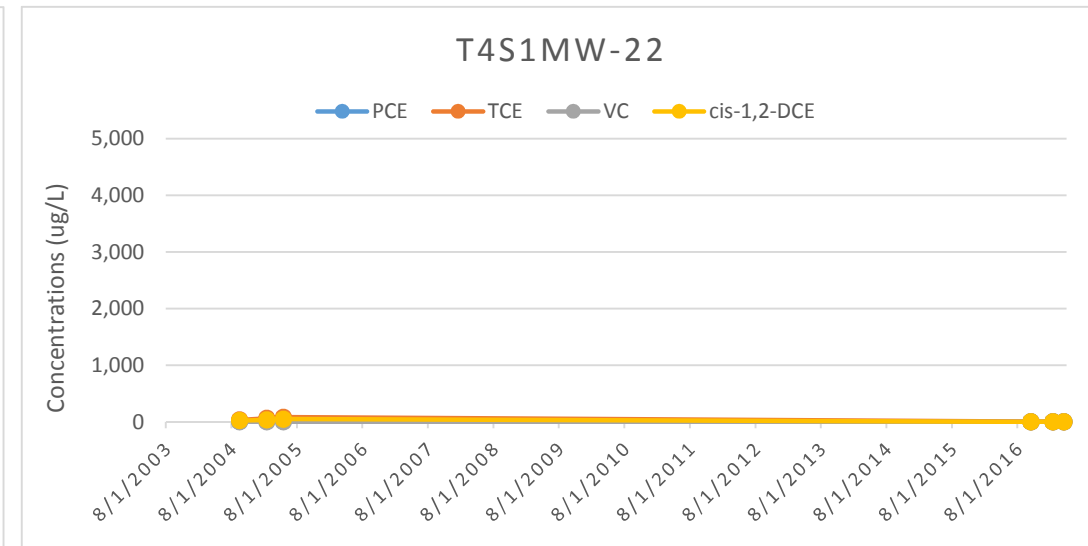
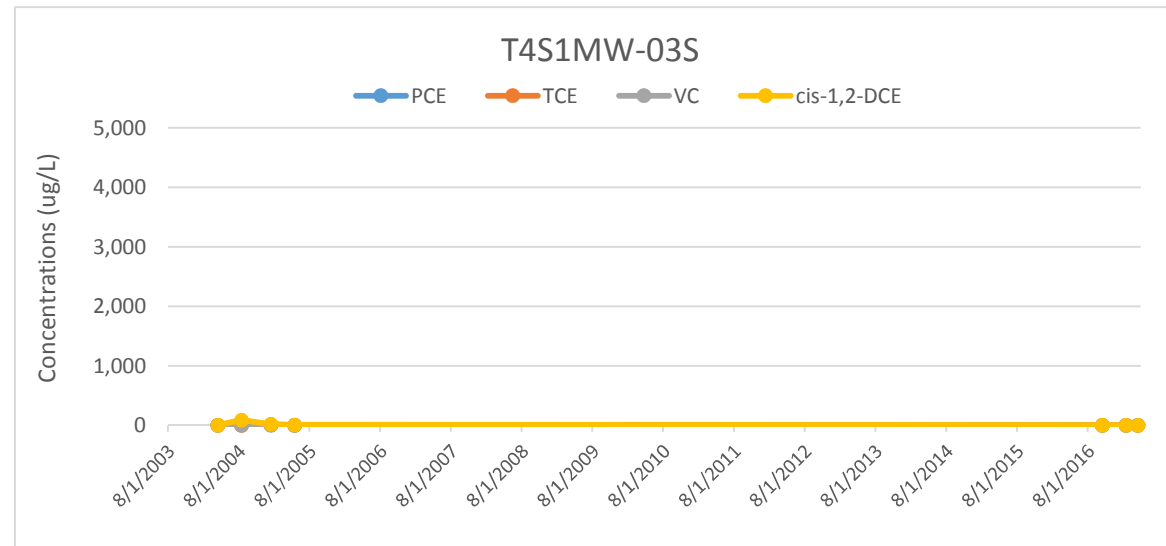


Figure 2
CVOC Trend Plots (2003 - 2017)
 Supplemental Groundwater Investigation
 Northwest Pipe Company Portland Plant

Attachment A
Field Sampling Sheets and Notes

CH2M WELL SAMPLING FIELD LOG

Date: 5/1/12

Project #: 682722.GW.05

Well I.D.: MW-01

Field Team: S. Baffow, B. Ostapko

Total Depth (ft) 24.57 (-) DTW (ft) 9.73 (X0.17 gal/ft) = Well Casing Volume (gal.) = 2.52

Field Conditions: 44°F, cloudy

Decontamination: Alconox wash, DI wash

PURGE INFORMATION *section*

Purge Method: Transient peristaltic pump with | | new or dedicated ~~polyethylene~~ tubing
 Purge Method: Dedicated submersible pump with | | new or | | dedicated polyethylene tubing
 Purge Method: Dedicated Hydrostar pump with | | new or | | dedicated polyethylene tubing

Pump Suction Depth (ft): ~20' Purge water disposal: Drum

Comments/Exceptions to SAP: ~4' of tubing out of well to get 20' suction depth
 PSD @ WELL HEAD = 0.0 ppm

	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
Target Stabilization Criteria	-	+/- 3%	-	+/- 0.1	+/- 10	+/- 0.3	+/- 10 if > 10 NTU	0.03 - 0.08	-	
Time										
09:58	initial	351.3	15.2	6.43	228.8	0.50	12.7		9.73	
09:28	2.6	343.3	15.2	6.54	136.0	0.65	9.50		9.73	CLEAR, COLORLESS
09:33	3.0	418.6 SPL	15.7	6.53	122.5	0.40	3.15		9.73	CLEAR, COLORLESS
9:38	3.4	419.1	15.5	6.53	113.8	0.33	2.72		9.73	CLEAR, COLORLESS
9:43	3.8	417.7	15.4	6.56	92.5	0.28	1.79		9.73	CLEAR, COLORLESS
9:48	4.1	418.6	15.4	6.58	85.5	0.15	2.71		9.73	CLEAR, COLORLESS
9:53	4.3	421.8	15.4	6.58	71.8	0.15	1.57		9.73	CLEAR, COLORLESS
9:58	4.6	420.0	15.5	6.57	63.8	0.14	2.96		9.73	CLEAR, COLORLESS
10:03	4.8	421.0	15.6	6.58	52.7	0.28	4.23		9.73	CLEAR, COLORLESS
10:08	5.2	421.7	15.6	6.59	41.9	0.14	1.62		9.73	CLEAR, COLORLESS
10:13	5.5	421.3	15.5	6.58	40.9	0.12	1.91		9.73	CLEAR, COLORLESS
10:18	5.8	423.3	15.5	6.56	35.5	0.12	2.97		9.73	CLEAR, COLORLESS
10:20	Start Sampling									
:	End Sampling									

* VC = Very cloudy CI = Cloudy SC = Slightly Cloudy VSC = Very Slightly Cloudy AC = Almost Clear C = Clear CC = Crystal Clear

Laboratory Analytical Program - Quarterly Sampling
Groundwater Sampling
Project #: 682722.GW.05

DATE: 05/01/17 Time: 10 : 20 Well ID: MW-01

Sample I.D.	Number of Sample Containers (Circled)			Volume	Type	Pres.	Shipping Date	Analytical Method
	Equip-ment	Dupli-cate	Parent Sample					
Organic Constituents								
TCE, cis 1,2-DCE	3	3	3	40 mL	Glass	HCl	5/1/17	EPA 8260C, no headspace
PCE, VC	3	3	3	40 mL	Glass	HCl	↓	EPA 8260SIM, no headspace
Metals <u>0.45 µm field filtered</u>								
Dissolved Ferrous Iron	1	1	1	250 mL	Poly	HNO3		E200.7
Natural Attenuation Monitoring Constituents								
Nitrate, Sulfate, Chloride	1	1	1	250 mL	Poly	None		Nitrate (E353.2), Sulfate & Chloride (E300.0)
TOC	1	1	1	250 mL	Poly	H2S04		SM5310
Methane and Carbon Dioxide	3	3	3	40 mL	Glass	None	↓	RSK 175, no headspace
Duplicate ID Time:								
Comments:								

CH2M HILL WELL SAMPLING FIELD LOG

Project #: 682722.GW.RP⁰⁵

Date: 4/27/17

Well I.D.: MW-02

Field Team: J. Ulrich/PDX + S. Bartow/PDX

Total Depth (ft) 21.00 (-) DTW (ft) 6.68 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 2.43

Field Conditions: Overcast, 50°F

Decontamination: Alconox wash, DI wash

PURGE INFORMATION TEFLON LINED

✓	Purge Method:	Transient peristaltic pump with new or dedicated polyethylene tubing
	Purge Method:	Dedicated submersible pump with new or dedicated polyethylene tubing
	Purge Method:	Dedicated Hydrostar pump with new or dedicated polyethylene tubing

Pump Suction Depth (ft): ~ 15' BTDC

Purge water disposal: DRUM

Comments/Exceptions to SAP: —

+/- 3% +/- 0.1 +/- 10 +/- 0.3 +/- 10 (if > 10 NTU)

Time	Purge Volume (gallons)	Specific Conduct. (uS/cm)	Temp. (oC)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU's)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
09:06	0.02 initial	256.1	14.9	6.78	-101.9	0.33 0.6	15.6	0.1	6.68	Slight sulfur odor clear, odorless (up)
09:34	2.5	237.9	15.1	7.07	-111.3	1.08	3.42	0.08	6.95	"
09:39	3	236.4	15.1	7.17	-110.9	0.27	7.20	0.1	6.95	"
09:44	3.4	239.9	15.1	7.14	-134.3	0.22	5.42	0.08	6.95	"
09:49	3.9	239.1	15.1	7.13	-139.7	0.21	9.02	0.1 0.08	6.96	"
09:54	4.3	239.7	15.0	7.11	-142.3	0.20	8.12	0.08	6.95	"
:										
:										
:										
:										
16:00	Start Sampling									
18:20	End Sampling									

* VC = Very cloudy CI = Cloudy SC = Slightly Cloudy VSC = Very Slightly Cloudy AC = Almost Clear C = Clear CC = Crystal Clear

**Laboratory Analytical
Groundwater Monitoring
Project #: 682722.GW.RP**

DATE: 4/27/17 Time: 10 : 00

Well ID: MW-02

Sample I.D.	Number of Sample Containers (Circled)			Volume	Type	Pres.	Analytical Method
	Equip- ment	Dupli- cate	Parent Sample				

Organic Constituent Wells

	3	3	3	40 mL	Glass	HCl	TCE, cis-1,2-DCE (EPA 8260C)
	3	3	3	40 mL	Glass	HCl	PCE, VC (EPA 8260SIM)

Metals

Field Filtered using 0.45 micron filter

	1	1	1	250 mL	Poly	HNO3	Dissolved Ferrous Iron (E200.7)
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Natural Attenuation Monitoring Constituents

	1	1	1	250 mL	Poly	None	Nitrate (E353.2), Sulfate (E300.0), & Chloride (E300.0)
	1	1	1	250 mL	Poly	H2SO4	Total Organic Carbon (SM5310)
	3	3	3	40 mL	Glass	None	Methane and Carbon Dioxide (RSK 175)

Duplicate ID

Time:

Comments:

CH2M WELL SAMPLING FIELD LOG

Date: 05/01/17

Project #: 682722.GW.05

Well I.D.: MW-03

Field Team: SB + BPO

Total Depth (ft) 25.10 (-) DTW (ft) 8.14 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 2.88

Field Conditions: 50°F Cloudy

Decontamination: Alconox wash, DI wash

PURGE INFORMATION

X	Purge Method:	Transient peristaltic pump with		new or	X	dedicated polyethylene tubing	TEFLON
	Purge Method:	Dedicated submersible pump with		new or		dedicated polyethylene tubing	
	Purge Method:	Dedicated Hydrostar pump with		new or		dedicated polyethylene tubing	

Pump Suction Depth (ft): ~20' Purge water disposal:

Comments/Exceptions to SAP: ~ 4' OF RUBBER OUT OF WELL FOR 20' SULTON
WELL HEAD PPD = 0.0 ppm

Target Stabilization Criteria Time	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
	-	+/- 3%	-	+/- 0.1	+/- 10	+/- 0.3	+/- 10 if > 10 NTU	0.03 - 0.08	-	
12:33	PUMP ON									
12:36	0.3	330.4	15.6	6.60	21.3	0.47	117		8.52	CLOUDY, ORANGE TAN
13:04	2.9	332.3	15.5	6.54	1.3	0.37	22.9		8.34	VSC, CLOUDINESS
13:10	3.4	333.1	15.3	6.53	0.7	0.22	19.7		8.32	AC, CLOUDINESS
13:15	3.8	329.9	15.5	6.56	5.5	0.20	17.8	0.08	8.47	AC, CLOUDINESS
13:21	4.3	334.7	15.5	6.57	-19.1	0.09	20.5	0.1	8.43	AC, CLOUDINESS
13:26	4.7	333.2	15.5	6.57	-23.6	0.08	9.61	0.08	8.44	C, CLOUDINESS
13:31	5.2	333.2	15.5	6.57	-32.6	0.07	8.24	0.1	8.44	C, CLOUDINESS
13:36	5.75	333.3	15.5	6.57	-37.2	0.17	4.81	0.1	8.41	CLEAR, CLOUDINESS
13:41	6.5	334.1	15.5	6.58	-45.0	0.08	3.95		8.43	CLEAR, CLOUDINESS
13:46	7.0	333.5	15.5	6.56	-42.7	0.07	3.95		8.43	CLEAR, CLOUDINESS
13:46	6.0						3.46			
13:50	Start Sampling									
:	End Sampling									

* VC = Very cloudy CI = Cloudy SC = Slightly Cloudy VSC = Very Slightly Cloudy AC = Almost Clear C = Clear CC = Crystal Clear

Laboratory Analytical Program - Quarterly Sampling
Groundwater Sampling
Project #: 682722.GW.05

DATE: 05/01/17

Time: 13:50

Well ID: MW-03

Sample I.D.	Number of Sample Containers (Circled)			Volume	Type	Pres.	Shipping Date	Analytical Method
	Equip-ment	Dupli-licate	Parent Sample					
Organic Constituents								
TCE, cis 1,2-DCE	3	3	(3)	40 mL	Glass	HCl		EPA 8260C, no headspace
PCE, VC	3	3	(3)	40 mL	Glass	HCl		EPA 8260SIM, no headspace
Metals <u>0.45 µm field filtered</u>								
Dissolved Ferrous Iron	1	1	(1)	250 mL	Poly	HNO3		E200.7
Natural Attenuation Monitoring Constituents								
Nitrate, Sulfate, Chloride	1	1	(1)	250 mL	Poly	None		Nitrate (E353.2), Sulfate & Chloride (E300.0)
TOC	1	1	(1)	250 mL	Poly	H2S04		SM5310
Methane and Carbon Dioxide	3	3	(3)	40 mL	Glass	None		RSK 175, no headspace
Duplicate ID				Time:				
Comments:								

CH2M WELL SAMPLING FIELD LOG

Date: 4/27/17

Project #: 682722.GW.05

Well I.D.: MW-04

Field Team: J. Ulrich / PDX + S. Bartow / PDX

Total Depth (ft) 27.39 (-) DTW (ft) 9.04 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 3.12

Field Conditions: Partly cloudy, 51°F, light wind

Decontamination: Alconox wash, DI wash

PURGE INFORMATION TEFLON LINED

✓	Purge Method:	Transient peristaltic pump with new or dedicated polyethylene tubing
	Purge Method:	Dedicated submersible pump with new or dedicated polyethylene tubing
	Purge Method:	Dedicated Hydrostar pump with new or dedicated polyethylene tubing

Pump Suction Depth (ft): ~ 21 ft BTDC

Purge water disposal: DRUM

Comments/Exceptions to SAP: -

	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
Target Stabilization Criteria	-	+/- 3%	-	+/- 0.1	+/- 10	+/- 0.3	+/- 10 if > 10 NTU	0.03 - 0.08	-	
Time										
10:37	initial	329.1	13.4	6.51	88.2	3.71	16.8	~0.1	9.04	clear, odorless turn pump down
10:15	3.2	334.6	14.0	6.59	-58.2	0.42	5.95	0.08	9.09	"
11:20	3.6	337.1	13.9	6.60	-58.7	0.31	5.88	0.08	9.08	"
11:25	3.9	337.1	13	6.60	-58.9	0.22	5.02	0.08	9.08	"
11:40										
:										
:										
:										
:										
11:30	Start Sampling									
11:40	End Sampling									

* VC = Very cloudy CI = Cloudy SC = Slightly Cloudy VSC = very Slightly Cloudy AC = Almost Clear C = Clear CC = Crystal Clear

Laboratory Analytical Program - Quarterly Sampling
Groundwater Sampling
Project #: 682722.GW.05

DATE: 4/27/17

Time: 11 : 30

Well ID: MW-04

Sample I.D.	Number of Sample Containers (Circled)			Volume	Type	Pres.	Shipping Date	Analytical Method
	Equip-ment	Dupli-cate	Parent Sample					
Organic Constituents								
TCE, cis 1,2-DCE	3	3	(3)	40 mL	Glass	HCl	4/27/17	EPA 8260C, no headspace
PCE, VC	3	3	(3)	40 mL	Glass	HCl	"	EPA 8260SIM, no headspace
Metals <u>0.45 µm field filtered</u>								
Dissolved Ferrous Iron	1	1	(1)	250 mL	Poly	HNO3	"	E200.7
Natural Attenuation Monitoring Constituents								
Nitrate, Sulfate, Chloride	1	1	(1)	250 mL	Poly	None	"	Nitrate (E353.2), Sulfate & Chloride (E300.0)
TOC	1	1	(1)	250 mL	Poly	H2SO4	"	SM5310
Methane and Carbon Dioxide	3	3	(3)	40 mL	Glass	None	"	RSK 175, no headspace
Duplicate ID	-			Time:	-			
Comments:	-							

CH2M WELL SAMPLING FIELD LOG

Date: 5/1/17

Project #: **682722.GW.05**

Well I.D.: MW-05

Field Team: SS + BPO

Total Depth (ft) 27.84 (-) DTW (ft) 9.51 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 3.11

Field Conditions: 51° F Cloudy

Decontamination: Alconox wash, DI wash

PURGE INFORMATION teflon

Purge Method: Transient peristaltic pump with | | new or dedicated polyethylene tubing

Purge Method: Dedicated submersible pump with | | new or | | dedicated polyethylene tubing

Purge Method: Dedicated Hydrostar pump with | | new or | | dedicated polyethylene tubing

Pump Suction Depth (ft): ~22' Purge water disposal: Drum

Comments/Exceptions to SAP: - 2 ft tubing out of well for 22' suction

	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
Target Stabilization Criteria	-	+/- 3%	-	+/- 0.1	+/- 10	+/- 0.3	+/- 10 if > 10 NTU	0.03 - 0.08	-	
Time										
14:22	initial	315.1	15.3	6.55	94.0	1.25	1.74		9.51	AC, colorless
14:58	3.1	353.1	15.4	6.57	-22.2	0.30	0.73		9.50	C, colorless
15:03	3.6	357.5	15.3	6.61	-31.2	0.15	1.78		9.50	" "
15:08	4.0	358.9	15.4	6.57	-35.7	0.11	0.93		9.50	" "
15:13	4.5	359.7	15.4	6.60	-39.9	0.11	0.49		9.50	" "
:										
:										
:										
:										
:										
15:20	Start Sampling									
:	End Sampling									

VC = Very cloudy CI = Cloudy SC = Slightly Cloudy VSC = Very Slightly Cloudy AC = Almost Clear C = Clear CC = Crystal Clear

Laboratory Analytical Program - Quarterly Sampling
Groundwater Sampling
Project #: 682722.GW.05

DATE: 05/01/17 Time: 15:20 Well ID: MW-05

Sample I.D.	Number of Sample Containers (Circled)			Volume	Type	Pres.	Shipping Date	Analytical Method
	Equip-ment	Dupli-cate	Parent Sample					
Organic Constituents								
TCE, cis 1,2-DCE	3	3	3	40 mL	Glass	HCl		EPA 8260C, no headspace
PCE, VC	3	3	3	40 mL	Glass	HCl		EPA 8260SIM, no headspace
Metals <u>0.45 µm field filtered</u>								
Dissolved Ferrous Iron	1	1	1	250 mL	Poly	HNO3		E200.7
Natural Attenuation Monitoring Constituents								
Nitrate, Sulfate, Chloride	1	1	1	250 mL	Poly	None		Nitrate (E353.2), Sulfate & Chloride (E300.0)
TOC	1	1	1	250 mL	Poly	H2SO4		SM5310
Methane and Carbon Dioxide	3	3	3	40 mL	Glass	None		RSK 175, no headspace
Duplicate ID _____ Time: _____								
Comments:								

CH2M WELL SAMPLING FIELD LOG

Date: 05/01/17
Well I.D.: MW-06

Project #: 682722.GW.05

Field Team: SB + BPO

Total Depth (ft) 29.03 (-) DTW (ft) 8.86 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 3.7

Field Conditions: 45°F, LL0.05

Decontamination: Alconox wash, DI wash

PURGE INFORMATION

TEFLON

<input checked="" type="checkbox"/>	Purge Method:	Transient peristaltic pump with new or <input checked="" type="checkbox"/> dedicated polyethylene tubing
	Purge Method:	Dedicated submersible pump with new or dedicated polyethylene tubing
	Purge Method:	Dedicated Hydrostar pump with new or dedicated polyethylene tubing

Pump Suction Depth (ft): ~ 23' Purge water disposal:

Comments/Exceptions to SAP: 1-2' OF TUBING OUT OF WELL TO GET 23' SUCTION

	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
Target Stabilization Criteria	-	+/- 3%	-	+/- 0.1	+/- 10	+/- 0.3	+/- 10 if > 10 NTU	0.03 - 0.08	-	
Time										
10:55	- Pump ON									
10:58	0.2	315.1	15.7	6.45	16.8	0.75	33.1	0.07	8.96	SMALL, PPD FLECKS CLOUDINESS
11:30	3.4	310.7	15.8	6.39	15.8	0.48	6.32	0.1	8.89	CLEAR, CLOUDINESS
11:35	3.9	311.3	15.8	6.36	12.2	0.22	7.22	0.1	8.89	CLEAR, CLOUDINESS
11:40	4.2	309.9	15.7	6.34	14.5	0.14	3.79	0.06	8.89	CLEAR, CLOUDINESS
11:45	4.5	310.1	15.7	6.35	19.8	0.13	4.37		8.89	CLEAR, CLOUDINESS
:										
:										
:										
:										
11:50	Start Sampling									
:	End Sampling									

* VC = Very cloudy CI = Cloudy SC = Slightly Cloudy VSC = Very Slightly Cloudy AC = Almost Clear C = Clear CC = Crystal Clear

Laboratory Analytical Program - Quarterly Sampling
Groundwater Sampling
Project #: 682722.GW.05

DATE: 05/01/17 Time: 11:50 Well ID: MW-06

Sample I.D.	Number of Sample Containers (Circled)			Volume	Type	Pres.	Shipping Date	Analytical Method
	Equip-ment	Dupli-cate	Parent Sample					
Organic Constituents								
TCE, cis 1,2-DCE	3	3	3	40 mL	Glass	HCl	05/01/17	EPA 8260C, no headspace
PCE, VC	3	3	3	40 mL	Glass	HCl		EPA 8260SIM, no headspace
Metals <u>0.45 µm field filtered</u>								
Dissolved Ferrous Iron	1	1	1	250 mL	Poly	HNO3		E200.7
Natural Attenuation Monitoring Constituents								
Nitrate, Sulfate, Chloride	1	1	1	250 mL	Poly	None		Nitrate (E353.2), Sulfate & Chloride (E300.0)
TOC	1	1	1	250 mL	Poly	H2SO4		SM5310
Methane and Carbon Dioxide	3	3	3	40 mL	Glass	None		RSK 175, no headspace
Duplicate ID	Time:							
Comments:	DUPLICATE MW-100-050117-0							

CH2M WELL SAMPLING FIELD LOG

Date: 4/26/17

Project #: 682722.GW.05

Well I.D.: T4S1MW-09

Field Team: Jennifer Ulrich / PDX & Brad Ostapkowicz / PDX

Total Depth (ft) 31.5 (-) DTW (ft) 16.44 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 2.56

Field Conditions: partly cloudy, 53°F

Decontamination: Alconox wash, DI wash

PURGE INFORMATION

TEFLON LINED

Purge Method: Transient peristaltic pump with | | new or | | dedicated polyethylene tubing

Purge Method: Dedicated submersible pump with | | new or | | dedicated polyethylene tubing

Purge Method: Dedicated Hydrostar pump with | | new or | | dedicated polyethylene tubing

Pump Suction Depth (ft): ~ 25' BTOC

Purge water disposal: DRUM

Comments/Exceptions to SAP: -

	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
Target Stabilization Criteria	-	+/- 3%	-	+/- 0.1	+/- 10	+/- 0.3	+/- 10 if > 10 NTU	0.03 - 0.08	-	
Time										
12:17	initial	212.2	13.9	6.26	-13.5	0.70	14.6	0.1	16.44	clear, odorless
12:48	2.6	198.9	14.3	6.46	-23.9	1.15	6.21	0.06	16.45	"
12:53	2.9	200.1	14.4	6.48	-29.9	0.99	4.64	0.06	16.45	"
12:58	3.2	200.2	14.3	6.51	-20.4	0.98	4.22	0.06	16.45	"
:										
:										
:										
:										
:										
13:00	Start Sampling									
13:35	End Sampling									

* VC = Very cloudy CI = Cloudy SC = Slightly Cloudy VSC = Very Slightly Cloudy AC = Almost Clear C = Clear CC = Crystal Clear

Laboratory Analytical Program - Quarterly Sampling
Groundwater Sampling
Project #: 682722.GW.05

DATE: 4/26/17

Time: 13 :00

Well ID: T4S1MW-09

Sample I.D.	Number of Sample Containers (Circled)			Volume	Type	Pres.	Shipping Date	Analytical Method
	Equip-ment	Dupli-cate	Parent Sample					
Organic Constituents								
TCE, cis 1,2-DCE	3	3	3	40 mL	Glass	HCl	4/26/17	EPA 8260C, no headspace
PCE, VC	3	3	3	40 mL	Glass	HCl	"	EPA 8260SIM, no headspace
Metals <u>0.45 µm field filtered</u>								
Dissolved Ferrous Iron	1	1	1	250 mL	Poly	HNO3	"	E200.7
Natural Attenuation Monitoring Constituents								
Nitrate, Sulfate, Chloride	1	1	1	250 mL	Poly	None	"	Nitrate (E353.2), Sulfate & Chloride (E300.0)
TOC	1	1	1	250 mL	Poly	H2SO4	"	SM5310
Methane and Carbon Dioxide	3	3	3	40 mL	Glass	None	"	RSK 175, no headspace
Duplicate ID	Time:							
Comments:	-							

CH2M HILL WELL SAMPLING FIELD LOG

Date: 4/26/17

Project #: 682722.GW.RP05

Well I.D.: T4S1MW-03 S

Field Team: J. Ulrich / PDX + B. Ostapkowicz / PDX

Total Depth (ft) 30 (-) DTW (ft) 15.61 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 2.45

Field Conditions: Partly cloudy

Decontamination: Alconox wash, DI wash

PURGE INFORMATION TEFLON LINED

<input checked="" type="checkbox"/>	Purge Method:	Transient peristaltic pump with new or <u>dedicated polyethylene tubing</u>
	Purge Method:	Dedicated submersible pump with new or dedicated polyethylene tubing
	Purge Method:	Dedicated Hydrostar pump with new or dedicated polyethylene tubing

Pump Suction Depth (ft): ~25 ft BTDC

Purge water disposal: DRUM

Comments/Exceptions to SAP: -

+/- 39.4 uS/cm

+/- 0.3 mg/L

Time	Purge Volume (gallons)	Specific Conduct. (uS/cm)	Temp. (oC)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU's)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
13:59	initial	-	-	-	-	-	-	-	15.61	Allow line to clear prior to clear/odorless connect.
14:04	0.14	90.4	13.4	6.79	126.0	9.67	8.3	0.1	15.73	"
14:28	2.5	86.9	13.1	6.57	151.2	9.15	3.32	0.1	15.79	"
14:33	3.8	86.1	13.2	6.52	157.9	8.91	2.19	0.14	15.79	turned down pump
14:38	3.5	88.0	13.1	6.60	165.3	9.07	2.12	0.06	15.75	"
14:43	4.0	86.6	13.2	6.62	146.8	8.96	1.55	0.1	15.74	"
:										
:										
:										
:										
14:45	Start Sampling									
15:20	End Sampling									

* VC = Very cloudy CI = Cloudy SC = Slightly Cloudy VSC = Very Slightly Cloudy AC = Almost Clear C = Clear CC = Crystal Clear

**Laboratory Analytical
Groundwater Monitoring
Project #: 682722.GW.RP^{of}**

DATE: 4/26/17

Time: 14:45

Well ID: T4S1MW-03S

Sample I.D.	Number of Sample Containers (Circled)			Volume	Type	Pres.	Analytical Method
	Equip-ment	Dupli-cate	Parent Sample				

Organic Constituent Wells

	3	3	3	40 mL	Glass	HCl	TCE, cis-1,2-DCE (EPA 8260C)
	3	3	3	40 mL	Glass	HCl	PCE, VC (EPA 8260SIM)

Metals

Field Filtered using 0.45 micron filter

	1	1	1	250 mL	Poly	HNO3	Dissolved Ferrous Iron (E200.7)
--	---	---	---	--------	------	------	---------------------------------

Natural Attenuation Monitoring Constituents

	1	1	1	250 mL	Poly	None	Nitrate (E353.2), Sulfate (E300.0), & Chloride (E300.0)
	1	1	1	250 mL	Poly	H2SO4	Total Organic Carbon (SM5310)
	3	3	3	40 mL	Glass	None	Methane and Carbon Dioxide (RSK 175)

Duplicate ID _____ Time: _____

Comments: _____

CH2M WELL SAMPLING FIELD LOG

Date: 4/27/17

Project #: 682722.GW.05

Well I.D.: T4S/MW-22

Field Team: J. Ulrich / PDX + S. Bartow / PDX

Total Depth (ft) 23 (-) DTW (ft) 11.81 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 1.9

Field Conditions: Partly cloudy, 54°F

Decontamination: Alconox wash, DI wash

PURGE INFORMATION

TEFLON LINED

✓ Purge Method: Transient peristaltic pump with | | new or | (dedicated polyethylene tubing)
 Purge Method: Dedicated submersible pump with | | new or | | dedicated polyethylene tubing
 Purge Method: Dedicated Hydrostar pump with | | new or | | dedicated polyethylene tubing

Pump Suction Depth (ft): ~19' BTDC

Purge water disposal: DRUM

Comments/Exceptions to SAP: -

	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
Target Stabilization Criteria Time	-	+/- 3%	-	+/- 0.1	+/- 10	+/- 0.3	+/- 10 if > 10 NTU	0.03 - 0.08	-	
13:58	initial	236.3	15.3	6.55	149.6	3.08	13.2	0.07	11.81	clear, odorless
14:26	2	228.1	15.1	6.30	174.2	1.24	2.15	0.07	11.80	"
14:31	2.3	230.2	15.1	6.36	173.6	1.07	1.53	0.06	11.80	"
14:36	2.6	232.2	15.0	6.36	148.9	1.20	1.39	0.06	11.80	"
:										
:										
:										
:										
:										
14:40	Start Sampling									
15:03	End Sampling									

* VC = Very cloudy Ci = Cloudy SC = Slightly Cloudy VSC = Very Slightly Cloudy AC = Almost Clear C = Clear CC = Crystal Clear

Laboratory Analytical Program - Quarterly Sampling
Groundwater Sampling
Project #: 682722.GW.05

DATE: 4/27/17

Time: 14 : 40

Well ID: T451MW-22

Sample I.D.	Number of Sample Containers (Circled)			Volume	Type	Pres.	Shipping Date	Analytical Method
	Equip-ment	Dupli-cate	Parent Sample					
Organic Constituents								
TCE, cis 1,2-DCE	3	3	3	40 mL	Glass	HCl	4/27/17	EPA 8260C, no headspace
PCE, VC	3	3	3	40 mL	Glass	HCl	"	EPA 8260SIM, no headspace
Metals <u>0.45 µm field filtered</u>								
Dissolved Ferrous Iron	1	1	1	250 mL	Poly	HNO3	"	E200.7
Natural Attenuation Monitoring Constituents								
Nitrate, Sulfate, Chloride	1	1	1	250 mL	Poly	None	"	Nitrate (E353.2), Sulfate & Chloride (E300.0)
TOC	1	1	1	250 mL	Poly	H2SO4	"	SM5310
Methane and Carbon Dioxide	3	3	3	40 mL	Glass	None	"	RSK 175, no headspace
Duplicate ID	Time:							
Comments:								

CH2M WELL SAMPLING FIELD LOG

Date: 4/27/17

Project #: 682722.GW.05

Well I.D.: T4SIMW-23

Field Team: J. Ulrich / PDX + S. Bartow / PDX

Total Depth (ft) 25 (-) DTW (ft) 10.46 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 2.47

Field Conditions: Partly cloudy, 54°F

Decontamination: Alconox wash, DI wash

PURGE INFORMATION TEFLON LINED

✓ Purge Method: Transient peristaltic pump with | | new or | | dedicated polyethylene tubing

Purge Method: Dedicated submersible pump with | | new or | | dedicated polyethylene tubing

Purge Method: Dedicated Hydrostar pump with | | new or | | dedicated polyethylene tubing

Pump Suction Depth (ft): ~ 20 ft BTDC

Purge water disposal: DRUM

Comments/Exceptions to SAP:

	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
Target Stabilization Criteria	-	+/- 3%	-	+/- 0.1	+/- 10	+/- 0.3	+/- 10 if > 10 NTU	0.03 - 0.08	-	
Time										
12:23	initial	191.1	15.0	6.76	112.6	3.30	8.77	0.07	10.46	clear, odorless
12:56	2.5	162.9	15.0	6.53	94.3	2.31	4.90	0.09	10.48	"
13:01	2.9	160.4	14.9	6.55	90.2	1.24	2.65	0.08	10.48	"
13:06	3.6	160.7	14.9	6.54	91.6	1.15	1.94	0.14	10.48	"
13:11	3.8 4.0	161.2	14.9	6.53	91.6	1.12	1.87	0.08	10.48	TURN DOWN PUMP
:										
:										
:										
:										
:										
13:15	Start Sampling									
13:40	End Sampling									

* VC = Very cloudy CI = Cloudy SC = Slightly Cloudy VSC = Very Slightly Cloudy AC = Almost Clear C = Clear CC = Crystal Clear

Laboratory Analytical Program - Quarterly Sampling
Groundwater Sampling
Project #: 682722.GW.05

DATE: 4/27/17

Time: 13:15

Well ID: T4SIMW-23

Sample I.D.	Number of Sample Containers (Circled)			Volume	Type	Pres.	Shipping Date	Analytical Method
	Equip-ment	Dupli-licate	Parent Sample					
Organic Constituents								
TCE, cis 1,2-DCE	3	3	(3)	40 mL	Glass	HCl	4/27/17	EPA 8260C, no headspace
PCE, VC	3	3	(3)	40 mL	Glass	HCl	"	EPA 8260SIM, no headspace
Metals <u>0.45 µm field filtered</u>								
Dissolved Ferrous Iron	1	1	(1)	250 mL	Poly	HNO3	"	E200.7
Natural Attenuation Monitoring Constituents								
Nitrate, Sulfate, Chloride	1	1	(1)	250 mL	Poly	None	"	Nitrate (E353.2), Sulfate & Chloride (E300.0)
TOC	1	1	(1)	250 mL	Poly	H2SO4	"	SM5310
Methane and Carbon Dioxide	3	3	(3)	40 mL	Glass	None	"	RSK 175, no headspace
Duplicate ID: — Time: —								
Comments: —								