

Groundwater Sampling Summary Event 2, First Quarter 2017

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

Prepared for

Northwest Pipe Company

May 18, 2017 (Revised)



2020 SW Fourth Avenue Suite 300
Portland, Oregon 97201

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Table 1

Groundwater Quality Field Parameters, Second Quarter, February 1 and 2, 2017

*Supplemental Groundwater Investigation**Northwest Pipe Company Portland Plant*

Well	Date Sampled	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	Conductivity (µS/cm)	Turbidity (NTU)
Northwest Pipe Company Wells							
MW-01	2/2/2017	16.0	6.64	0.01	-36	385	3.1
MW-02	2/1/2017	15.4	6.97	0.09	-136	202	8.2
MW-03	2/2/2017	15.9	6.76	0.26	-68	321	3.2
MW-04	2/1/2017	14.3	6.39	0.32	-45	440	1.3
MW-05	2/2/2017	15.7	6.59	0.33	77	426	1.8
MW-06	2/2/2017	15.5	6.54	0.20	-47	299	2.8
Port of Portland Wells							
T4S1MW-09	2/1/2017	14.9	6.67	2.87	-41	234	0.9
T4S1MW-03s	2/1/2017	14.3	6.65	5.19	145	111	0.8
T4S1MW-22	2/1/2017	14.4	6.40	0.30	132	255	1.2
T4S1MW-23	2/1/2017	14.2	6.54	1.31	51	177	1.4

°C = degrees celcius

mg/L = milligrams per liter

mV = millivolts

uS/cm = microsiemens per centimeter

NTU = Nephelometric Turbidity Units

Table 2

Groundwater Quality Analytical Results, Events 1 and 2
 Supplemental Groundwater Investigation
 Northwest Pipe Company Portland Plant

Sample ID Sample Date	Cleanup Levels or Targets identified in the January 2017 ROD (µg/L) ¹	MW01		MW02		MW03		MW04		MW05	
		10/26/2016	2/1/2017	10/26/2016	2/1/2017	10/26/2016	2/1/2017	10/26/2016	2/1/2017	10/26/2016	2/1/2017
Natural Attenuation Parameters (mg/L)											
Chloride	--	2.46	3.69	1.98	2.50	3.61	3.92	3.00	4.90	5.36	7.03
Nitrate-N	--	0.37 J	0.061	0.023 J	0.39	0.018 J	0.018	0.043 J	0.0028 U	0.34 J	0.57
Sulfate	--	10.1	4.71	4.15	8.09	10.2	10.4	5.7	4.42	20.5	29.7
Total Organic Carbon	--	1.00	0.84	1.48	1.23	1.27	0.93	1.21	1.09	1.67	1.5
Iron, dissolved	--	1.59	3.01	5.45	5.39	6.14	4.46	12.9	9.75	4.46	0.0137 U
Carbon dioxide	--	81.0	68.2	29.6	17.6	53.6	44.1	104	98.4	75.1	74.9
Methane	--	1.25	1.74	3.68	3.30	1.48	0.734	1.46	1.86	1.16	0.887
Volatile Organic Compounds (µg/L)											
Tetrachloroethene (PCE)	0.24	158	71.1	0.0598	0.169	630	483	28.2	12.4	3,510	4,150
Trichloroethene (TCE)	0.6	22.8	14.9	0.15 U	0.15 U	221	178	38.4	20.3	195	208
cis-1,2-Dichloroethene	9.9	113	107	0.15 U	0.20 J	428	502	111	119	1,160	1,240
Vinyl Chloride	0.022	16.7	29.9	0.0652	0.037	22.8	20.8	4.45	9.73	40.4	39.5

Notes:

mg/L = milligrams per Liter

µg/L = micrograms per Liter

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

Shaded values exceed identified PRGs.

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.

Table 2

Groundwater Quality Analytical Results, Events 1 and 2
 Supplemental Groundwater Investigation
 Northwest Pipe Company Portland Plant

Sample ID Sample Date	Cleanup Levels or Targets identified in the January 2017 ROD (µg/L) ¹	MW06		MW06 - DUP		T4S1MW03S		T4S1MW09		T4S1MW22		T4S1MW23	
		10/26/2016	2/1/2017	10/26/2016	2/1/2017	10/25/2016	2/1/2017	10/25/2016	2/1/2017	10/25/2016	2/1/2017	10/25/2016	2/1/2017
Natural Attenuation Parameters (mg/L)													
Chloride	--	5.07	6.12	5.05	5.95	5.1 J	0.86	2.76 J	1.70	2.8 J	4.56	3.92 J	4.24
Nitrate-N	--	0.016 J	0.0028 U	0.017 J	0.003 J	5.19 J	1.23	1.23 J	2.94	0.095 J	0.039	0.27 J	0.58
Sulfate	--	5.17	9.27	5.36	9.09	24.7 J	4.54	5.97 J	5.66	5.49 J	8.90	7.67 J	8.74
Total Organic Carbon	--	1.25	1.15	1.15	1.12	0.85 J	0.39 J	1.09 J	0.61	1.19 J	1.09	0.65 J	0.68
Iron, dissolved	--	7.29	6.1	7.4	6.09	0.0304 J	0.01 U	7.62	4.41	0.01 U	0.01 U	0.221	0.185
Carbon dioxide	--	57.1	60.5	59.5	62.3	26.2 J	13.9	49.1 J	29	48.4 J	84.5	52.9 J	26.9
Methane	--	2.28	0.623	2.04	0.666	0.0291 J	0.0101 J	2.64 J	1.22	0.0159 J	0.0334	0.00507 J	0.0379
Volatile Organic Compounds (µg/L)													
Tetrachloroethene (PCE)	0.24	287	805	299	760	0.112 J	0.23	0.0191 J	0.0177 J	1.46 J	1.28	1.59 J	0.937
Trichloroethene (TCE)	0.6	60.4	147	70.9	145	0.15 UJ	0.15 U	0.15 UJ	0.15 U	4.6 J	4.29	0.15 UJ	0.41 J
cis-1,2-Dichloroethene	9.9	1,160	1,590	1,130	1,600	0.15 UJ	0.15 U	0.15 UJ	0.15 U	2.77 J	5.36	0.7 J	0.65
Vinyl Chloride	0.022	170	51	177	53.9	0.008 UJ	0.008 U	0.0197 J	0.0113 J	0.0499 J	0.106	0.008 UJ	0.0188 J

Notes:

mg/L = milligrams per Liter

µg/L = micrograms per Liter

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

Shaded values exceed identified PRGs.

¹Cleanup Levels and Targets are selected from Table 17 of the Portland Harbor Record of Decision (U.S. Environmental Protection Agency Region 10, 2017).

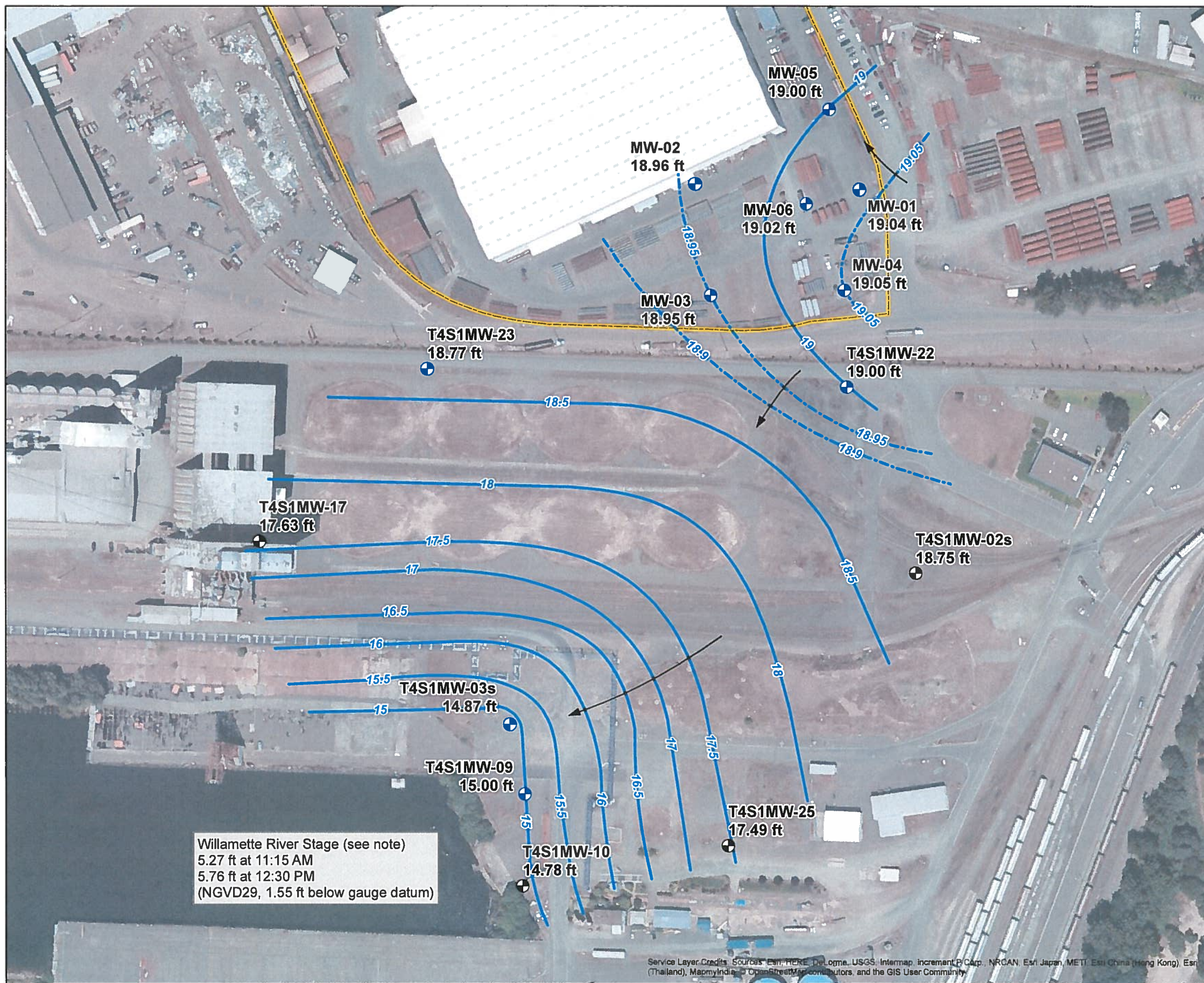
Values were selected from remedial action objectives (RAOs 4 and 8) associated with migration of contaminated groundwater.

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.



Willamette River Stage (see note)
 5.27 ft at 11:15 AM
 5.76 ft at 12:30 PM
 (NGVD29, 1.55 ft below gauge datum)

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



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

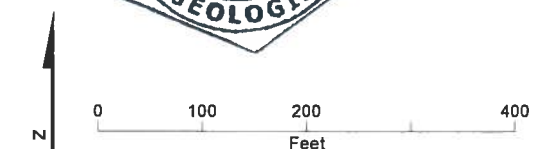
Investigation Wells

- Groundwater Quality Monitoring
- Water Level Only
- Northwest Pipe Facility Boundary

Note: Groundwater levels measured between 11:23 AM and 12:35 PM on January 10, 2017. During this period, the Willamette River stage increased by 0.49 foot, as measured at the Broadway Bridge river gauge (USGS 14211720).



Expires 1/1/2018

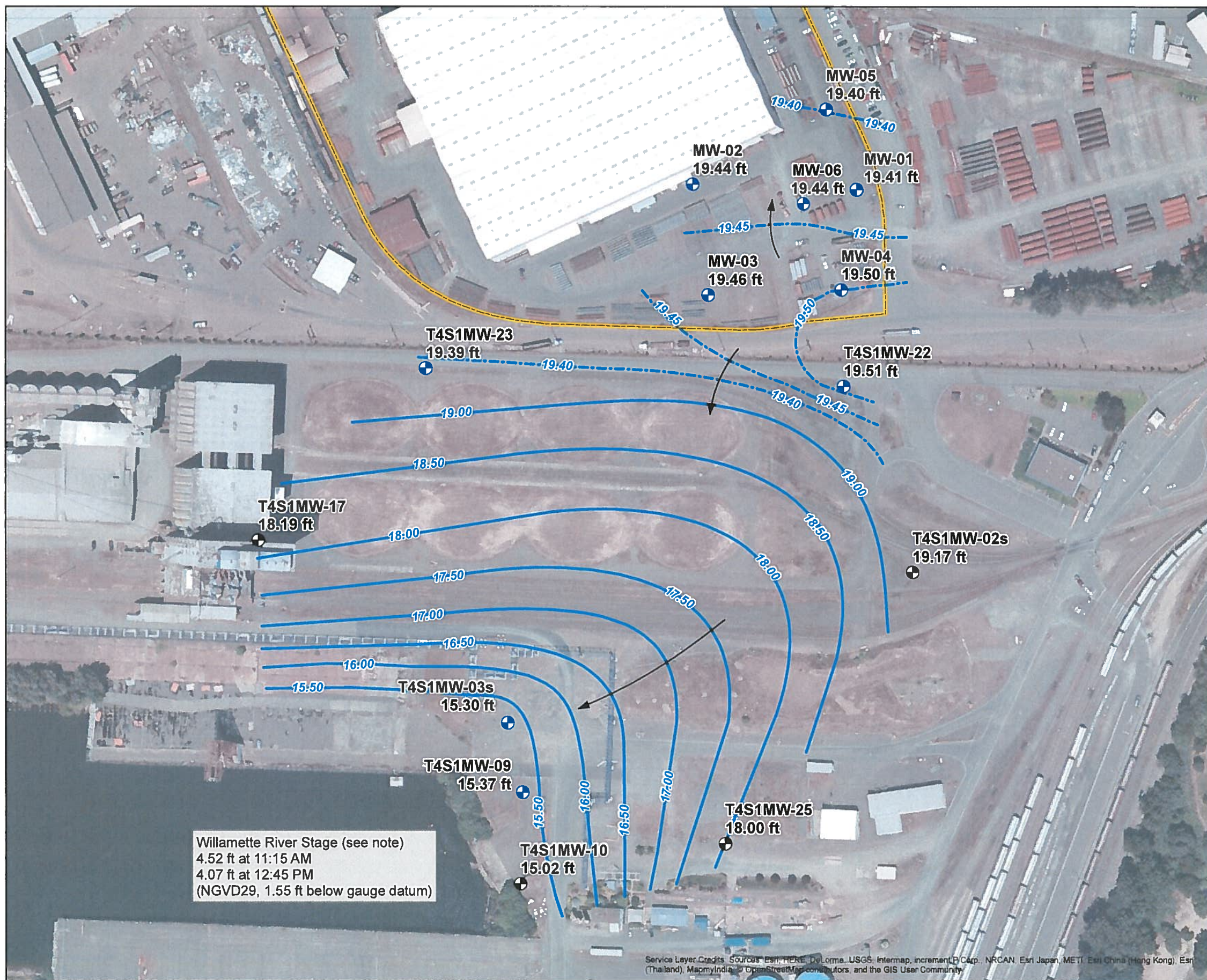


This map is an interpretation of a single set of measurements. It has been stamped by a registered professional geologist as required by DEQ; however it is subject to change if subsequent measurements indicate an alternate depiction of groundwater flow conditions is more appropriate than that depicted herein. This map does not represent a comprehensive picture of groundwater flow and direction over time, nor standing alone, does it define a CSM for this site.

FIGURE 1
Groundwater Elevation Contour Map
January 10, 2017

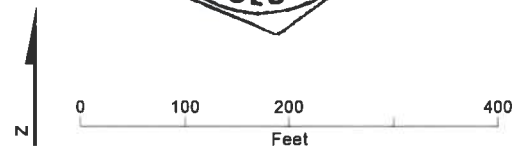
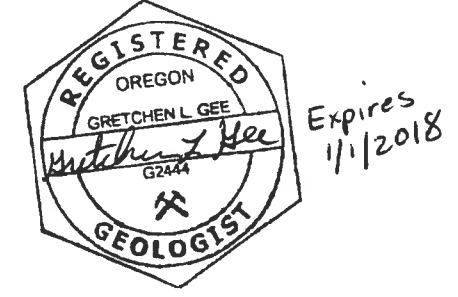
Supplemental Groundwater Sampling and Data Evaluation
 Northwest Pipe Company, Portland, Oregon





- 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 11:20 AM and 12:40 PM on January 30, 2017. During this period, the Willamette River stage decreased by 0.45 foot, as measured at the Broadway Bridge river gauge (USGS 14211720).



This map is an interpretation of a single set of measurements. It has been stamped by a registered professional geologist as required by DEQ; however it is subject to change if subsequent measurements indicate an alternate depiction of groundwater flow conditions is more appropriate than that depicted herein. This map does not represent a comprehensive picture of groundwater flow and direction over time, nor standing alone, does it define a CSM for this site.

FIGURE 2
Groundwater Elevation Contour Map
January 30, 2017
 Supplemental Groundwater Sampling and Data Evaluation
 Northwest Pipe Company, Portland, Oregon



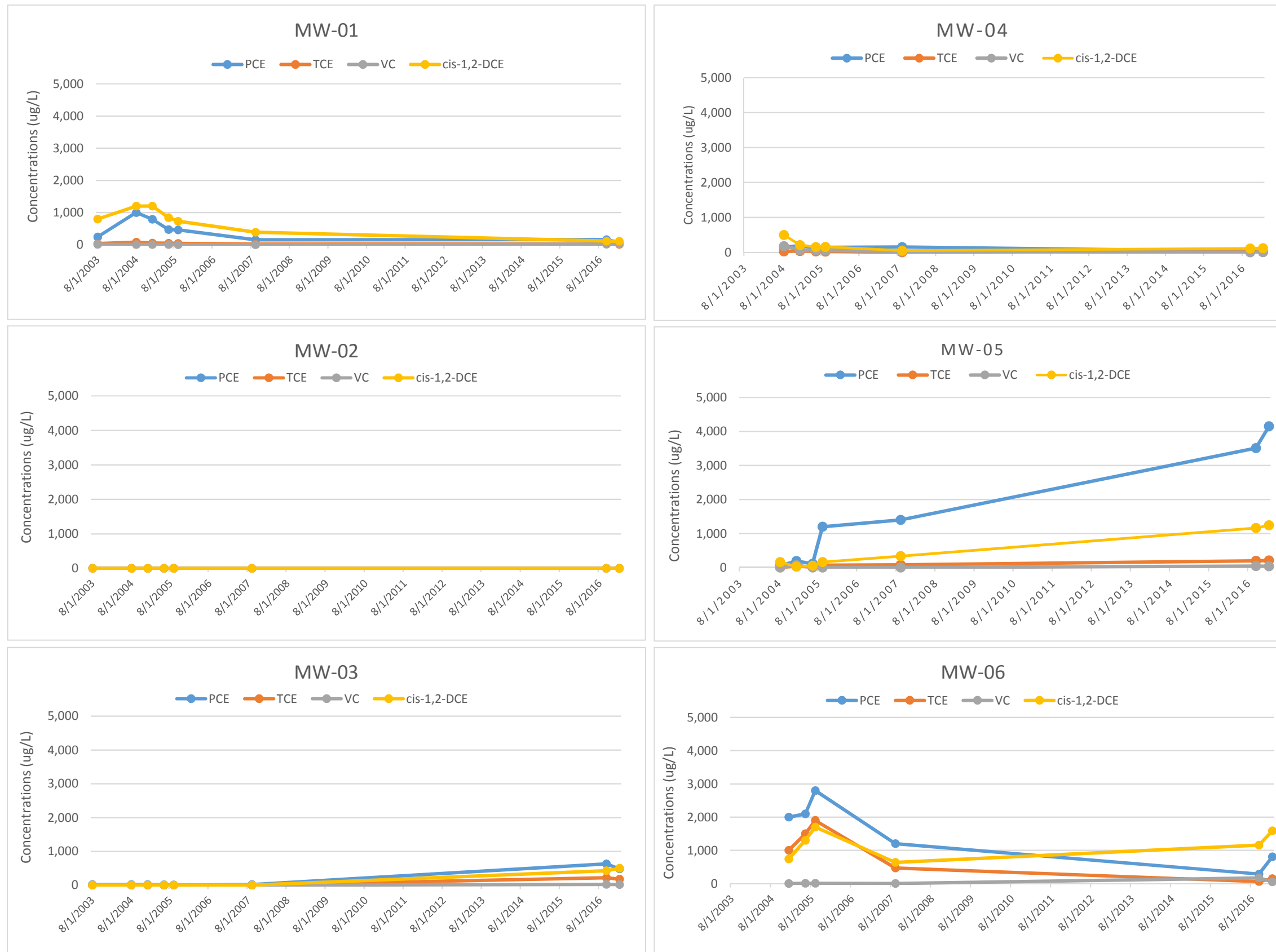


Figure 3
CVOC Trend Plots (2003 - 2017)
 Supplemental Groundwater Investigation
 Northwest Pipe Company Portland Plant

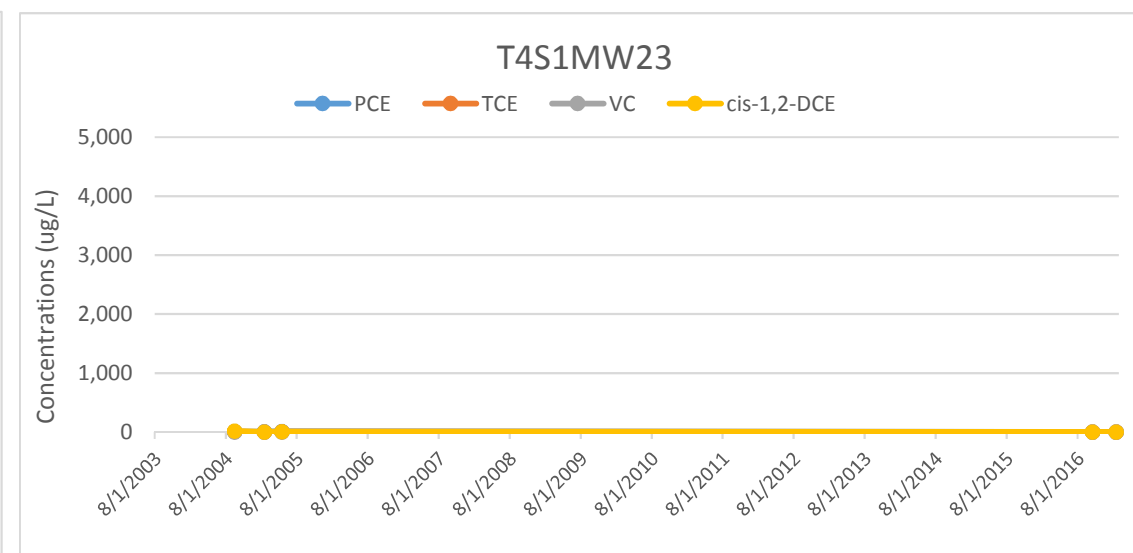
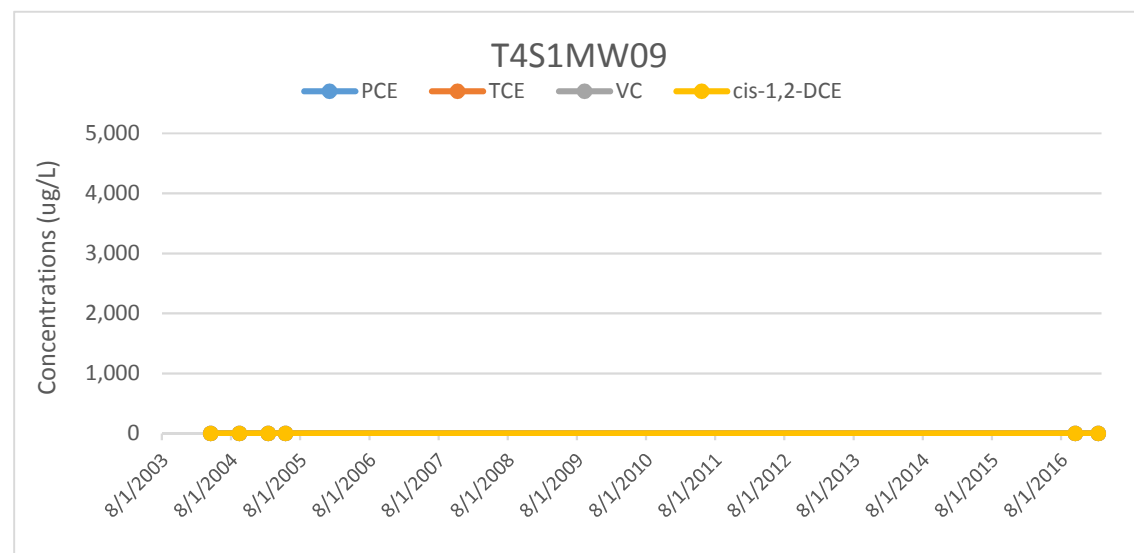
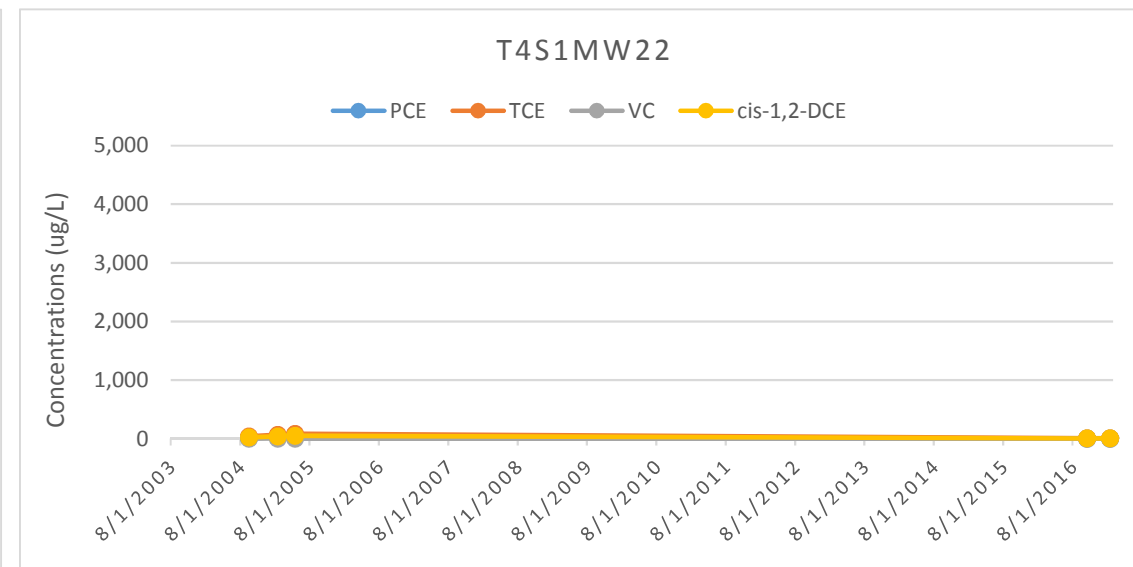
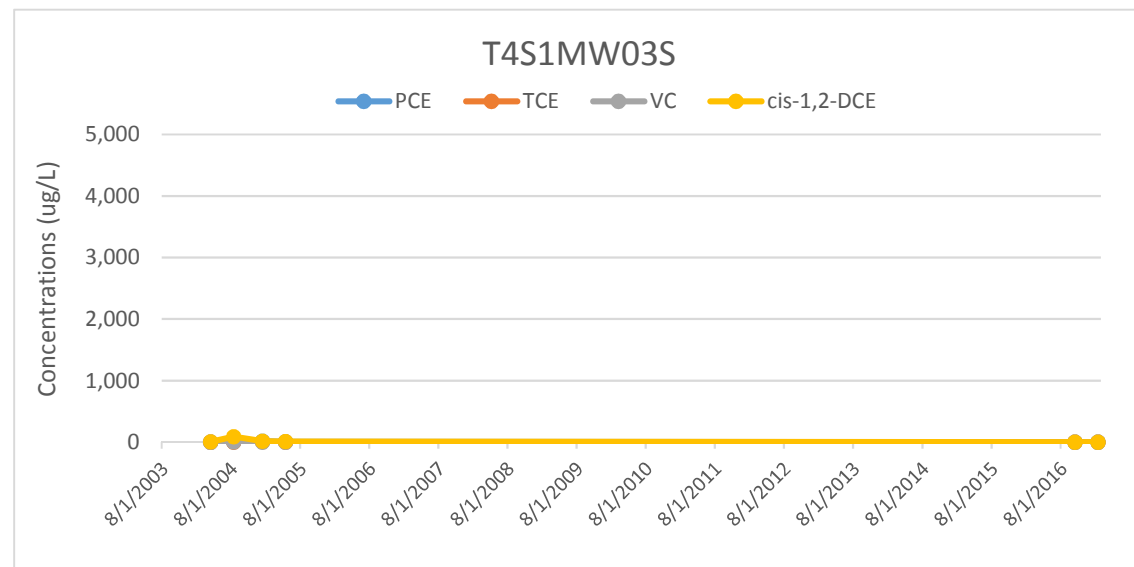


Figure 3
CVOC Trend Plots (2003 - 2017)
 Supplemental Groundwater Investigation
 Northwest Pipe Company Portland Plant

Attachment A
Field Sampling Sheets and Notes

CH2M HILL WELL SAMPLING FIELD LOG

Date: 02/02/17

Project #: 682722.GW.RP⁰⁵

Well I.D.: MW-01

Field Team: BPO + SB

Total Depth (ft) 24.57 (-) DTW (ft) 11.22 (X 0.07 gal/ft) = Well Casing Volume (gal.) = 2.27

Field Conditions: 35°F, P. CLOUDY

Decontamination: Alconox wash, DI wash

PURGE INFORMATION

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

Time	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU's)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
9:06	PUMP	ms/cm ON								
9:08	0.2	0.382	15.6	6.68	243.7	0.90	6.89	0.1	11.22	clear/colorless
9:30	2.3	0.387	15.6	6.64	0.3	0.17	4.99	0.09	11.23	" "
9:35	3.2	0.389	15.8	6.64	-19.0	0.15	4.8	0.18	11.22	" "
9:40	3.5	0.389	15.6	6.65	-29.9	0.14	6.83		11.22	" "
9:45	3.9	0.386	15.8	6.66	-34.4	0.12	4.22	0.08	11.22	" "
9:50	4.4	0.385	16.0	6.64	-35.5	0.12	3.08	0.1	11.22	" "
:										
:										
:										
9:55	Start Sampling									
:	End Sampling									

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

+/- 3% +/- 0.1 +/- 10 +/- 0.3 +/- 10%

NOTES: ONLY 1 BOLT.
GET NEW GASKET

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

DATE: 02/02/17

Time: 09:55

Well ID: MW-01

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	H2S04	Total Organic Carbon (SM5310)
	3	3	3	40 mL	Glass	None	Methane and Carbon Dioxide (RSK 175)

Duplicate ID

Time:

Comments:

CH2M HILL WELL SAMPLING FIELD LOG

Project #: 682722.GW.RP⁰⁵

Date: 02/01/17

Well I.D.: MW-02

Field Team: BRB + SB

Total Depth (ft) 21.02 (-) DTW (ft) 8.22 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 2.18

Field Conditions: 35°F, P. CLOUDY

Decontamination: Alconox wash, DI wash

PURGE INFORMATION

Purge Method: Transient peristaltic pump with | | new or 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): ~15' Purge water disposal: DRUM

Comments/Exceptions to SAP: ~~1' OF~~ 2' OF TUBING OUT OF WELL

Time	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU's)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
12:23	PUMP	ms/cm ON								
12:26	0.2	0.190	15.4	6.91	17.4	0.70	68.2		8.63	SLIGHTLY CLOUDY/ LIGHT YELLOW TINT
12:43	2.2	0.200	15.7	6.93	-114.9	0.12	32.3		8.65	SMALL SPECS/ LIGHT YELLOW TINT
12:49	2.9	0.196	15.5	6.94	-116.9	0.11	17.0	0.1	8.60	SMALL WHITE SPECS/ COLORLESS
12:54	3.4	0.197	15.6	6.94	-119.0	0.10	12.4	0.1	8.60	SMALL WHITE SPECS/ COLORLESS
12:59	3.9	0.200	15.7	6.96	-128.8	0.10	8.97	0.1	8.60	SMALL WHITE SPECS/ COLORLESS
13:04	4.4	0.202	15.4	6.99	-130.6	0.11	9.57	0.1	8.54	SMALL WHITE SPECS/ COLORLESS
13:10	4.9	0.203	15.5	6.96	-135.0	0.09	10.8	0.1	8.54	CLEAR / COLORLESS
13:15	5.4	0.202	15.4	6.97	-135.6	0.09	8.17	0.1	8.54	CLEAR / COLORLESS
:										
13:20	Start Sampling									
:	End Sampling									

PUMP SPECS
75%

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.RP⁰⁵**

DATE: 02/01/17

Time: 13 : 20

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							
<u>Field Filtered using 0.45 micron filter</u>							
	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 HILL WELL SAMPLING FIELD LOG

Date: 02/02/17

Project #: 682722.GW.RP⁰¹

Well I.D.: MW-03

Field Team: BAO + SB

Total Depth (ft) 25.10 (-) DTW (ft) 9.72 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 2.6

Field Conditions: 35°F, SUNNY

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
<input type="checkbox"/>	Purge Method:	Dedicated submersible pump with new or dedicated polyethylene tubing
<input type="checkbox"/>	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 FOR 20' SUCTION

12:46 WENTHEAD PFD = 1.7 ppm 0.0 BZ

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
12:22	PUMP	ON								
12:24	0.2	0.338	15.9	6.85	-80.7	0.98	41.2	0.1	10.02	VSC, COLORLESS
12:46	2.8	0.326	15.9	6.76	-64.4	0.19	9.11	0.12	9.83	CLEAR, COLORLESS
12:51	3.2	0.326	15.4	6.75	-66.1	0.26	4.20	0.08	9.84	CLEAR, COLORLESS
12:56	3.5	0.321	15.9	6.76	-67.9	0.26	3.15	0.06	9.97	CLEAR, COLORLESS
:										
:										
:										
:										
:										
13:00	Start Sampling									
:	End Sampling									

* VC = Very cloudy Cl = 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: 02/02/17 Time: 13:00 Well ID: MW-03

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 HILL WELL SAMPLING FIELD LOG

Date: 02/01/17

Project #: 682722.GW.RP⁰⁵

Well I.D.: MW-04

Field Team: BPO + SB

Total Depth (ft) 27.39 (-) DTW (ft) 10.61 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 2.8

Field Conditions: 35° cloudy

Decontamination: Alconox wash, DI wash

PURGE INFORMATION

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

Pump Suction Depth (ft): ~ 21'

Purge water disposal:

Comments/Exceptions to SAP: 4' OF TUBING OUT OF WELL FOR 21' SUCTION DEPTH

Time	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU's)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
13:52	Pump	ms/cm ON								
13:54	0.2	0.309 (COND.)	14.5	6.38	-1.1	0.81	8.87		10.65	CLEAR/COLORLESS
14:24	2.9	0.438	13.8	6.43	-41.2	0.57 0.78	6.11	0.1	10.64	CLEAR/COLORLESS
14:30	3.2	0.436	13.8	6.43	-42.9	0.94	2.85	<0.1	10.64	- PUMP SLOWED DOWN, BATTERY LOW. USE NEW BATTERY = CLEAR/COLORLESS
14:35	3.6	0.429	13.8	6.41	-39.2	0.46	1.93	<0.1	10.65	- CLEAR/COLORLESS
14:40	3.9	0.434	14.3	6.41	-43.5	0.35	1.83	<0.1	10.65	- CLEAR/COLORLESS
14:45	4.4	0.440	14.3	6.39	-44.8	0.32	1.32	0.1	10.65	CLEAR/COLORLESS
:										
:										
:										
14:50	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
Groundwater Monitoring
Project #: 682722.GW.RP⁰⁵**

DATE: 02/01/17 Time: 11 : 50

Well ID: MW-04

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 HILL WELL SAMPLING FIELD LOG

Date: 02/02/17
Well I.D.: MW-05

Project #: 682722.GW.RP⁰¹

Field Team: BPO & SB

Total Depth (ft) 27.84 (-) DTW (ft) 10.94 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 2.9

Field Conditions: 40°F CLOUDY

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
<input type="checkbox"/>	Purge Method:	Dedicated submersible pump with new or dedicated polyethylene tubing
<input type="checkbox"/>	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' OF TUBING OUT OF WELL FOR 22' SUCTION
1340 WEL HEAD PIP = ~~6.6~~^{8.0} ppm, 0.0 ppm BZ

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
13:40	PUMP	ms/cm on								
13:43	0.3	0.435	15.8	6.59	58.2	1.06	6.33	0.1	10.94	CLEAR, COLORLESS
14:10	2.9	0.429	15.7	6.59	69.5	0.37	3.66	0.1	10.94	CLEAR, COLORLESS
14:15	3.25	0.430	15.7	6.58	70.5	0.36	2.67	0.1	10.95	CLEAR, COLORLESS
14:20	3.75	0.426	15.7	6.59	77.0	0.33	1.76	0.1	10.95	CLEAR, COLORLESS
:										
:										
:										
:										
:										
14:25	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
Groundwater Monitoring
Project #: 682722.GW.RP⁰⁵**

DATE: 02/02/17 Time: 14:25

Well ID: MW-05

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 HILL WELL SAMPLING FIELD LOG

Date: 02/02/17
Well I.D.: MW-06

Project #: 682722.GW.RP¹⁰⁵

Field Team: BLO + SB

Total Depth (ft) 29.03 (-) DTW (ft) 10.37 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 3.17

Field Conditions: 35°F, P. 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): ~23' Purge water disposal: DRUM

Comments/Exceptions to SAP: 1-2' OF NBSM OUT OF WELL TO GET 23' SOLUTION
0.2 ppm @ WELLHEAD

Time	Purge Volume (gallons)	Specific Conduct. (US/cm) m)/cm	Temp. (oC)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU's)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
10:42										
10:44	0.1	0.288	16.0	6.59	-19.1	0.89	5.62		10.41	CLEAR, COLORLESS
11:07	3.25	0.297	16.1	6.56	-44.6	0.15	2.47		10.40	CLEAR, COLORLESS
11:12	3.8	0.297	15.7	6.55	-49.3	0.13	2.23		10.39	CLEAR, COLORLESS
11:17	4.1	0.305	14.3	6.54	-39.4	0.19	2.78		10.38	CLEAR, COLORLESS
11:22	4.3	0.299	15.5	6.54	-47.1	0.20	2.79		10.39	CLEAR, COLORLESS
:										
:										
:										
:										
11:25	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
Groundwater Monitoring
Project #: 682722.GW.RP⁰⁵**

DATE: 02/02/17 Time: 11 : 25

Well ID: Mw-06

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	H2S04	Total Organic Carbon (SM5310)
	3	3	3	40 mL	Glass	None	Methane and Carbon Dioxide (RSK 175)

Duplicate ID

Time:

Comments:

Duplicate

CH2M HILL WELL SAMPLING FIELD LOG

Date: 02/01/17
Well I.D.: 143/MW-055

Project #: 682722.GW.RP⁰⁵

Field Team: BPO + SB
Total Depth (ft) 30 (-) DTW (ft) 17.69 (X) gal/ft = Well Casing Volume (gal.) = 2.1

Field Conditions: 30°F, P. CLOUDY
Decontamination: Alconox wash, DI wash

PURGE INFORMATION

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' Purge water disposal: DRUM

Comments/Exceptions to SAP: tubing ~ 3' from well to pump
5 to 4'

Time	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU's)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
10:51	PUMP	ON								
10:53	0.2	0.114	13.7	6.98	82.0	4.11	2.27	0.1	17.83	CLAR / COLORLESS
11:24	2.2	0.111	14.5	6.65	140.8	5.38	1.59	0.1	17.85	CLAR / COLORLESS
11:29	2.8	0.111	14.3	6.66	143.4	5.33	0.86	0.11	17.81	CLAR / COLORLESS
11:34	3.3	0.111	14.3	6.65	145.3	5.19	0.76	0.1	17.82	
:										
:										
:										
:										
:										
11:40	Start Sampling									
:	End Sampling									

VC = Very cloudy CI = Cloudy SC = Slightly Cloudy VSC = Very Slightly Cloudy AC = Almost Clear C = Clear CC = Crystal Clear
+/- 3% +/- 0.1 +/- 10 +/- 0.3 +/- 10%

**Laboratory Analytical
Groundwater Monitoring
Project #: 682722.GW.RP⁰⁵**

DATE: 02/01/17 Time: 11:40

Well ID: TY51MW-03s

Sample I.D.	Number of Sample Containers (Circled)			Volume	Type	Pres.	Analytical Method
	Equip-ment	Dupli-ate	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							
<u>Field Filtered using 0.45 micron filter</u>							
	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 HILL WELL SAMPLING FIELD LOG

Date: 02/01/17

Project #: 682722.GW.RP⁰⁵

Well I.D.: 7451 MW - 09

Field Team: DPO + SB

Total Depth (ft) 31.5 (-) DTW (ft) 18.15 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 2.27

Field Conditions: 30°F, P. CLOUDY

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

Pump Suction Depth (ft): ~ 25'

Purge water disposal: DRUM

Comments/Exceptions to SAP:

Time	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU's)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
9:21	PUMP	ON								
9:26	0.4	0.222	15.0	6.74	23.4	3.03	2.1		18.18	CLEAR/COLORLESS
9:46	2.2	0.229	14.9	6.67	-42.2	2.92	1.41	0.1	18.16	CLEAR/COLORLESS
9:51	2.7	0.234	14.9	6.66	-40.9	2.96	0.91	0.1	18.16	CLEAR/COLORLESS
9:56	3.3	0.234	14.9	6.67	-40.8	2.87	0.91	0.1	18.16	" "
:										
:										
:										
:										
:										
10:00	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
Groundwater Monitoring
Project #: 682722.GW.RP⁰⁵**

DATE: 02/01/17

Time: 10:00

Well ID: T4S1MW-09

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							
<u>Field Filtered using 0.45 micron filter</u>							
	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 HILL WELL SAMPLING FIELD LOG

Date: 02/01/17
Well I.D.: 148 MW-22

Project #: 682722.GW.RP⁰⁵

Field Team: BPO + SB

Total Depth (ft) 23 (-) DTW (ft) 13.47 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 1.62

Field Conditions: 35°F, CLOUDY

Decontamination: Alconox wash, DI wash

PURGE INFORMATION

Purge Method: Transient peristaltic pump with | | new or | 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): ~ 18' Purge water disposal: DRUM

Comments/Exceptions to SAP: 1' OF TUBING OUT OF WELL FOR 18' SUCTION

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
16:57	<u>PUMP</u>	<u>ms/cm ON</u>								
16:59	<u>0.2</u>	<u>0.247</u>	<u>15.0</u>	<u>6.46</u>	<u>95.2</u>	<u>1.89</u>	<u>2.02</u>	<u>0.1</u>	<u>13.50</u>	<u>CLEAR, COLORLESS</u>
17:13	<u>1.7</u>	<u>0.255</u>	<u>14.7</u>	<u>6.40</u>	<u>119.1</u>	<u>0.36</u>	<u>2.35</u>	<u>0.1</u>	<u>13.48</u>	<u>CLEAR, COLORLESS</u>
17:18	<u>2.1</u>	<u>0.254</u>	<u>14.4</u>	<u>6.40</u>	<u>125.0</u>	<u>0.35</u>	<u>1.66</u>	<u><0.1</u>	<u>13.49</u>	<u>CLEAR, COLORLESS</u>
17:23	<u>2.4</u>	<u>0.256</u>	<u>14.1</u>	<u>6.40</u>	<u>127.9</u>	<u>0.32</u>	<u>1.35</u>	<u><0.1</u>	<u>13.49</u>	<u>CLEAR, COLORLESS</u>
17:28	<u>2.7</u>	<u>0.255</u>	<u>14.4</u>	<u>6.40</u>	<u>131.9</u>	<u>0.30</u>	<u>1.17</u>	<u><0.1</u>	<u>13.49</u>	
:										
:										
:										
:										
17:30	<u>Start Sampling</u>									
:	<u>End Sampling</u>									

* 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: 02/01/17 Time: :

Well ID: T481 MW-22

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 HILL WELL SAMPLING FIELD LOG

Date: 2/1/17

Project #: 682722.GW.RP⁰⁵

Well I.D.: TYSIMW-23

Field Team: BO + SB

Total Depth (ft) 25 (-) DTW (ft) 11.90 (X 0.17 gal/ft) = Well Casing Volume (gal.) = 2.2

Field Conditions: 35°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): ~20'

Purge water disposal: DRUM

Comments/Exceptions to SAP: 3 TO 4' OF NOTHING OUT OF WELL TO BE AT SUCTON DEPTH 20'

Time	Purge Volume (gallons)	Specific Conduct. (µS/cm)	Temp. (°C)	pH	ORP (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU's)	Purge Rate (gpm)	DTW (ft)	* Clarity/ Color/Remarks
15:55	PUMP	ON								
15:57	0.3	0.158	15.1	6.62	43.5	4.35	7.08		11.95	- SMALL BLACK SPECS - CLEAR, COLORLESS
16:10	2.2	0.178	15.0	6.55	61.0	2.25	3.72		11.94	- SMALL BLACK SPECS, - CLEAR, COLORLESS
16:15	2.8	0.173	14.7	6.56	56.3	1.77	2.42		11.93	- VERY SMALL AMOUNT OF BLACK SPECS - CLEAR, COLORLESS
16:20	3.3	0.173	14.1	6.56	52.7	1.58	2.18		11.93	- CLEAR, COLORLESS
16:25	3.6	0.173	14.3	6.53	49.8	1.30	1.74		11.93	- CLEAR, COLORLESS
16:30	4.0	0.177	14.2	6.54	50.6	1.31	1.37		11.93	- CLEAR, COLORLESS
:										
:										
16:46										
:	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
Groundwater Monitoring
Project #: 682722.GW.RP⁰⁵**

DATE: 02/01/17 Time: 16:40

Well ID: T451 MW-23

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							
<u>Field Filtered using 0.45 micron filter</u>							
	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	H2S04	Total Organic Carbon (SM5310)
	3	3	3	40 mL	Glass	None	Methane and Carbon Dioxide (RSK 175)
Duplicate ID		Time:					
Comments:							