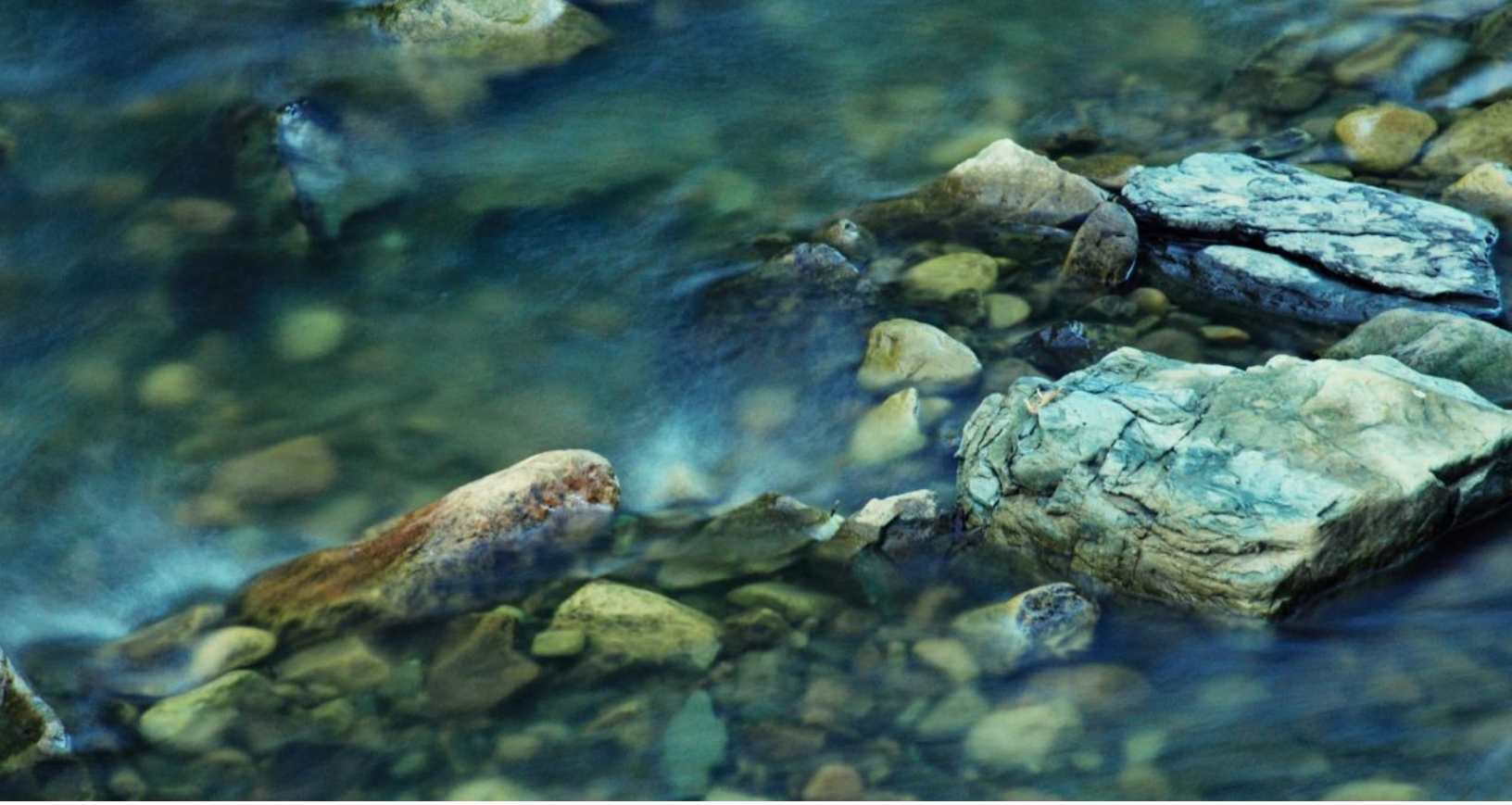

April 2017
Former Wasser & Winters Groundwater Monitoring

ANCHOR QEA

Groundwater Monitoring Report
Former Wasser & Winters Log Sort Yard

Consent Decree No. 93-2-08684-4
Washington State Department of Ecology Facility Site ID #1218
Monitoring date: February 13, 2017

Prepared for Port of Tacoma

Privileged and Confidential
Attorney Work Product
Prepared at Request of Counsel

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Monitoring date: February 13, 2017

Prepared for
Port of Tacoma
P.O. Box 1837
Tacoma, Washington 98401

Prepared by
Anchor QEA, LLC
1119 Pacific Ave Suite 1600
Tacoma, Washington 98402

Table of Contents

TABLES

FIGURES

APPENDICES

Abbreviations

µg/L	micrograms per liter
µS/cm	micro Siemens per centimeter
Asarco	Asarco Incorporated
Calbag	Calbag Metals
Ecology	Washington State Department of Ecology
Port	Port of Tacoma
Site	Former Wasser and Winters Sort Log Facility

1 Introduction

This report summarizes field activities and presents results of the groundwater sampling event conducted by Anchor QEA, LLC, on behalf of the Port of Tacoma (Port) at the Former Wasser & Winters Log Sort Yard Facility located at 1602 Marine View Drive in Tacoma, Washington (Site) (Figure 1). Groundwater sampling activities were conducted in accordance with the requirements set forth in the Consent Decree (93-2-08684-4), dated August 1993, between the Port and the Washington State Department of Ecology (Ecology; 1993).

In 2011, after several groundwater monitoring events, Ecology approved the removal of copper, lead, and zinc from the Site groundwater monitoring analyte list (Ecology 2011a). In addition, a memorandum of understanding between Ecology and the Port reaffirming the 30-month monitoring frequency was issued on September 12, 2011 (Ecology 2011b).

In May 2014, Ecology conducted a periodic review of post-cleanup Site conditions and monitoring data to ensure that human health and the environment are being protected (Ecology 2014). The findings of that report concluded that the Site appears to meet the requirements of Chapter 173-340 Washington Administrative Code, and the selected remedy continues to be protective of human health and the environment. The next 5-year review is expected to be in May 2019.

2 Site Background

From 1972 to 1984, the Wasser & Winters Company operated the Site as a log sort yard. In the 1970s and early 1980s, slag generated by Asarco Incorporated (Asarco) of Tacoma, Washington, was placed on the Site for use as roadbed or ballast. Ecology detected elevated concentrations of metals in surface water samples collected from the Site between November 1983 and June 1984 and concluded that the metals leached from the slag (Norton and Johnson 1985).

In October 1991, Ecology and the Port entered into an Agreed Order (Ecology 1991) to complete a remedial investigation/feasibility study, which was followed by a Consent Decree (93-2-08684-4) for remedial action on the 11.4-acre parcel (Ecology 1993).

Construction of a low-permeability asphalt cap and stormwater drainage system was completed in 1995 in accordance with the Final Engineering and Design Report (Kennedy Jenks 1993). The cap covered the portion of the Site containing Asarco slag.

The property is owned by the Port. The northern part of the site has been leased to WJR Tacoma, LLC, since 1996 and operated as Calbag Metals (Calbag), a scrap metal recycling facility. In July 2001, the tenant began construction of an 85,080-square-foot building, which was completed in December 2001 on the northern portion of the capped area. In 2007, Calbag leased the southern portion of the cap (3.74 acres) and operated through the Spring of 2016. The southern portion of the cap has been unoccupied since Calbag vacated that portion of the site.

3 Groundwater Redevelopment and Monitoring

Groundwater redevelopment was conducted prior to completion of groundwater monitoring. Groundwater redevelopment and monitoring field forms are included in Appendix A.

Well CMW-3 was redeveloped on February 3, 2017, by surging the well screen followed by purging groundwater from the well casing using a typhoon pump.

- Total depth of well CMW-3 was 12.35 feet and depth to water prior to redevelopment was 9.35 feet below top of casing.
- After approximately 10 gallons of water was removed, the pump rate dropped to a trickle and redevelopment was considered complete.
- Water purged during redevelopment was visually clear and turbidity readings were below 10 Nephelometric Turbidity Units.
- The bottom of the well casing felt firm when tapped with the typhoon pump indicating that any sediment previously accumulated in the well was removed during redevelopment.

Following redevelopment, testing was performed to evaluate potential tidal influences at CMW-3. Water quality parameters (pH, conductivity, temperature, dissolved oxygen, oxidation-reduction potential, salinity, and turbidity) were monitored at both high and low tide conditions (approximately 1 hour before to 1 hour after high/low tide).

- Groundwater elevations did not vary significantly between high (9.35 feet below top of casing) and low tide (9.15 feet below top of casing).
- Approximately 3 feet of water was present in the well and parameters were collected at three intervals (6 inches off the well bottom, 1.5 feet off the well bottom, and 2.5 feet off the well bottom) to assess any stratification in the water column.
- Conductivity values did not change vertically or with tide stage. Results were similar at the different depths. Results were not significantly different between high (554 micro Siemens per centimeter [µS/cm]) and low tide (546 µS/cm).

On February 13, 2017, groundwater samples were collected during low-tide from GMW-3. The groundwater sample was collected from the well using low-flow sampling techniques. Previous sampling tubing stored in the casing of the well was removed and fresh tubing was used for purging and sampling. After water quality parameters had stabilized the pump was turned off and a 0.45-micron filter was attached to the sampling tubing prior to the pump being turned back on to collect groundwater samples. The samples were collected directly into laboratory-provided bottles and were immediately placed in a cooler on ice. The cooler was kept under standard chain-of-custody procedures prior to being delivered to Analytical Resources, Inc. Samples were analyzed for dissolved arsenic. Samples were also collected for dissolved iron, and manganese (not part of the required Site monitoring program).

4 Results

Analytical results are presented in Table 1 and water level data is presented in Table 2. Both these tables include historical data collected by prior consultants for reference. Laboratory data reports are included in Appendix B and the data validation report is included in Appendix C. Key findings were as follows:

- Dissolved arsenic was detected at a concentration of 925 micrograms per liter (µg/L). This value exceeds the groundwater cleanup level of 36 µg/L.
- Dissolved iron concentrations were 15,700 µg/L.
- Dissolved manganese concentrations were 4,840 µg/L.

Dissolved arsenic concentrations from 1994 to present are presented on Figure 2. The concentration trend was stable until after the July 2009 sampling event. Measured dissolved arsenic concentrations from monitoring events conducted after July 2009 (2012, 2014, and 2017) are all higher than the values collected during monitoring events up until 2009.

5 References

Ecology (Washington State Department of Ecology), 1991. Agreed Order DE 91-S248. Washington State Department of Ecology. October 1991.

Ecology, 1993. Consent Decree 93-2-08684-4. Washington State Department of Ecology. August 1993.

Ecology, 2011a. Email correspondence to M. Rettman, Port of Tacoma from D. Reale, Washington State Department of Ecology. June 28, 2011.

Ecology 2011b. Memorandum of Understanding, Former Log Yard Groundwater Monitoring and Cap Inspection, Washington Department of Ecology. September 2011.

Ecology, 2014. Final Periodic Review Report. Wasser Winters, Facilities Site ID# 1218. Washington State Department of Ecology, Southwest Region Office, Toxics Cleanup Program, May 2014.

Hart Crowser, 2014. Groundwater Monitoring Report. Former Wasser & Winters Log Sort Yard, Port of Tacoma, Tacoma, Washington., Consent Decree No. 932086884. December 2014.

Kennedy Jenks, 1993. Final Engineering and Design Report, Wasser & Winters Site Log Sort Yard Site, Kennedy Jenks Consultants, Inc. October, 1993.

Norton, D., and Johnson, A., 1985. Completion Report on WQIS Project 1 for the Commencement Bay Nearshore/Tideflats Remedial Investigation: Assessment of Log Sort Yards as Metal Sources to Commencement Bay Waterways, November 1983 to June 1984. Washington State Department of Ecology Memorandum. February 27, 1985.

Figures

LEGEND:

- Groundwater Monitoring Well[1]
- Catch Basin
- Manhole
- Oil/Water Separator (Former Spill Containment Vessel)
- Stormwater Conveyance System
- Existing Ecology Block Wall
- Property Boundary

NOTE:
1. Monitoring well GMW-3 is located outside the wall.

0 100
Feet

Publish Date: 2017/01/17, 2:07 PM | User: ckiblinger
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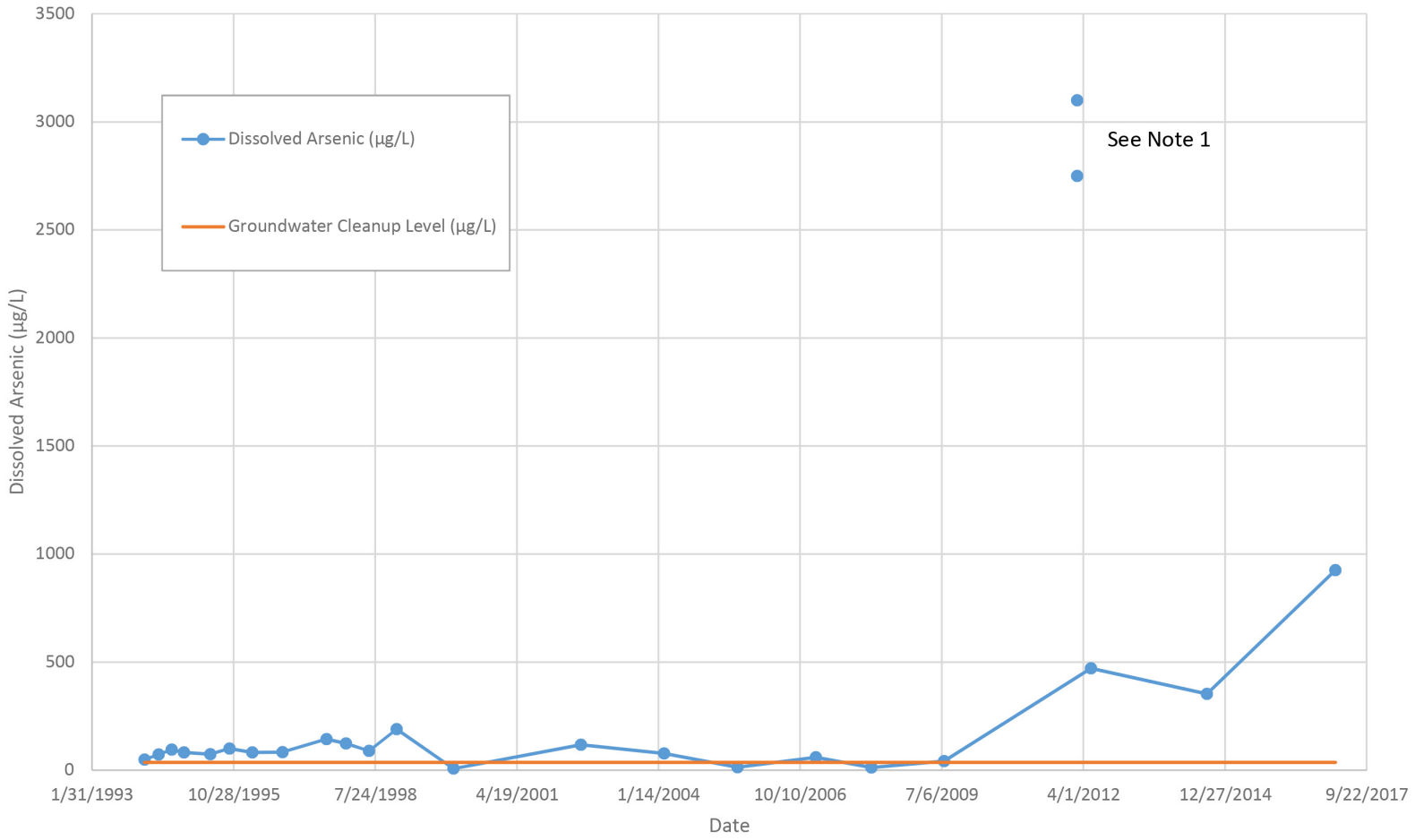
ANCHOR QEA

Figure 1
Compliance Groundwater Quality Monitoring Locations
Former Wasser and Winters Log Sort Yard
Port of Tacoma



Notes:
As described in Hart Crowser (2014) the groundwater samples collected in February 2012 had higher than typical sample turbidity due to use of inappropriate sampling procedures. Results were considered invalid at the time. Samples were recollected in May 2012.

Filepath: T:\Projects\Port_of_Tacoma\Wasser-Winter\Draft Report\Figures\Figure2.docx

ANCHOR QEA

Figure 2
Dissolved Arsenic Concentration Trends
Former Wasser and Winters Log Sort Yard
Port of Tacoma

Tables

Table 1
Analytical Results

		Concentration (µg/L)			
Well ID	**Date**	**Dissolved Arsenic**	**Dissolved Copper**	**Dissolved Lead**	**Dissolved Zinc**
Cleanup Criteria Levels		36	2.9	8.5	86
GMW-3	2/7/1994	**49**	2 U	1 U	8
GMW-3	5/17/1994	**72**	2 U	1	7
GMW-3	8/17/1994	**95**	2 U	1 U	5
GMW-3	11/11/1994	**82**	2 U	2	8
GMW-3	5/17/1995	**74**	2 U	1 U	7
GMW-3	9/29/1995	**100**	2 U	1 U	5
GMW-3	3/9/1996	**82**	2 U	1 U	4 U
GMW-3	10/8/1996	**83**	2 U	1 U	4 U
GMW-3	8/14/1997	**144**	2 U	1 U	5
GMW-3	12/30/1997	**123**	2 U	1 U	**139**
GMW-3	6/11/1998	**89**	2 U	1 U	4 U
GMW-3	12/22/1998	**190**	2 U	1 U	2 U
GMW-3	1/28/2000	7.2	1 U	0.5 U	**99**
GMW-3	7/16/2002	**117**	1.02	0.5 U	3.32
GMW-3 (Duplicate)	7/16/2002	**111**	0.979	0.5 U	4.67
GMW-3	2/23/2004	**77.2**	1.07	0.2 U	3.98
GMW-3 (Duplicate)	2/23/2004	**77.5**	1.06	0.675	4.79
GMW-3	7/26/2005	13.1	2.63	2.5 U	5 U
GMW-3 (Duplicate)	7/26/2005	12.9	2.5 U	2.0 U	5 U
GMW-3	1/30/2007	**60**	**4.6**	2.0 U	34
GMW-3	2/26/2008	12	1.2J	2.0 U	47
GMW-3 (Duplicate)	2/26/2008	11	0.8J	2.0 U	35
GMW-3	7/23/2009	**41.3**	1.5	2.0 U	2.7
GMW-3 (Duplicate)	7/23/2009	**41.7**	1.4	0.2 U	1.4
GMW-3	2/17/2012	**2,750**	--	--	--
GMW-3 (Duplicate)	2/17/2012	**3,100**	--	--	--
GMW-3	5/25/2012	**471**	--	--	--
GMW-3 (Duplicate)	5/25/2012	**455**	--	--	--
GMW-3	8/22/2014	**346**	--	--	--
GMW-3 (Duplicate)	8/22/2014	**353**	--	--	--
GMW-3	2/13/2017	**925**	--	--	--
GMW-3 (Duplicate)	2/13/2017	**899**	--	--	--

Notes:

Bold = Result exceeds cleanup criteria.

1. Lead, zinc, and copper analyses were discontinued in 2011 with Washngton State Department of Ecology approval dated June 28, 2011 (Ecology 2011a).
2. Groundwater samples were analyzed for dissolved metals by U.S. Environmental Protection Agency (EPA) Method 200.8.
3. Groundwater cleanup levels were established from EPA chronic marine criteria (WAC 173-201A).
4. Results from the February 2012 sampling event are considered invalid due to improper sampling procedures, resulting in higher than normal turbidity.

--: Not analyzed

µg/L: micrograms per liter

J: Laboratory analytical result was detected above the method detection limit but below the quantitation limit

U: Compound analyzed, but not detected above detection limit

Table 2
Water Level Data

Well ID	Date	Top of Casing Elevation (feet)	Depth of Water Below Casing (feet)	Water Level Elevation (feet)
GMW-3	2/7/1994	22.11	9.72	12.39
GMW-3	5/17/1994	22.11	9.83	12.28
GMW-3	8/17/1994	22.11	10.24	11.87
GMW-3	11/11/1994	22.11	10.47	11.64
GMW-3	5/17/1995	22.11	9.48	12.63
GMW-3	9/29/1995	22.11	10.37	11.74
GMW-3	3/9/1996	22.11	8.51	13.6
GMW-3	10/8/1996	22.11	10.24	11.87
GMW-3	8/14/1997	22.11	9.76	12.35
GMW-3	12/30/1997	22.11	8.8	13.31
GMW-3	6/11/1998	22.11	9.68	12.43
GMW-3	12/22/1998	22.11	8.75	13.36
GMW-3	8/13/1999	22.11	10.05	12.06
GMW-3	1/28/2000	22.11	8.76	13.35
GMW-3	1/8/2001	22.11	9.92	12.19
GMW-3	7/16/2002	22.11	9.81	12.3
GMW-3	2/23/2004	22.11	9.45	12.66
GMW-3	7/26/2005	22.11	10.04	12.07
GMW-3	1/30/2007	22.11	9.88	12.23
GMW-3	2/26/2008	22.11	9.24	12.87
GMW-3	7/23/2009	22.11	10.18	11.93
GMW-3	2/17/2012	22.11	10.21	11.9
GMW-3	5/25/2012	22.11	9.85	12.26
GMW-3	8/22/2014	22.11	9.98	12.13
GMW-3	2/13/2017	22.11	8.82	13.29

Notes:

Depth to water measured from reference point on top of well casing

Appendix A
Field Forms

LOW TIDE

FIELD SAMPLING DATA SHEET

ANCHOR QEA

1119 Pacific Avenue, Suite 1600
Tacoma, WA 98402
Office: (206) 287-9130 Fax: (206) 287-9131

PROJECT NAME: WASSER WINTER **WELL ID:** CMW-3
SITE ADDRESS: PORT OF TACOMA **BLIND ID:** /
PROJECT # 170092-02.01 **DUP ID:** CMW-300
DATE: 2/3/17

WATER QUALITY DATA Purge Start Time: 12 : 30 Method § - [Select A-G] Pump/Bailer Inlet Depth:

Time	DTW (ft)	Purged (gal)	pH	E Cond (µS)	°F Temp °C	DO (mg/l)	ORP	TDS	Salinity	Turbidity	Water Quality
1240	8.91	0.53	←							→	
1243	8.92	0.69	6.57	580	10.7	0.32	-56.2	*	*	24.1	TRANSPARENT, CLEAR
1246	8.93	0.85	6.57	590	10.7	0.19	-57.7			63.5	
1249	8.94	1.01	6.57	590	10.4	0.14	-58.9			57.1	
1252	8.95	1.17	6.57	591	10.3	0.11	-59.5			54.8	
1255	8.95	1.33	6.56	593	10.3	0.08	-58.6			64.5	
1258	8.95	1.49	6.57	594	10.3	0.06	-58.4			69.9	
1301	8.95	1.65	6.55	594	10.3	0.04	-57.7			121.1	MICRO BUBBLES, H_2O STILL CLEAR
1304	8.95	1.81	6.56	601	10.5	0.05	-58.1	↓	↓	116.2	
1307	8.95	2.00	6.56	600	10.5	0.05	-58.0	↓	↓	118.1	

[Cumulative Totals] [Circle units] [Clarity, Color]

Notes:
DTW=8.82 PDW=12.25 @1230 PUMP ON, 200mL/m. @1240 START FILLING FLOW THROUGH.
@1307 ATTACH FILTER CB1D SAMPLE - CMW-3-021317. 1305 SAMPLE CMW-300
@1318 PUMP OFF

SAMPLER: N. BACHER, S. POTTER
(PRINTED NAME) (SIGNATURE)

* NO READING

Low tide

FIELD SAMPLING DATA SHEET

ANCHOR QEA

Office: 1119 Pacific Avenue, Suite 1600
Tacoma, WA 98402
(206) 287-9130 Fax: (206) 287-9131

2/3/17

PROJECT NAME: Wasser - Winter GW Monitoring
SITE ADDRESS: Port of Tacoma
PROJECT # 170092-02.2

WELL ID: CMW-3
BLIND ID: –
DUP ID: –

WATER QUALITY DATA Purge Start Time: 15:03 Method § - [Select A-G] Pump/Bailer Inlet Depth:

Time	DTW (ft)	Purged (gal)	pH	E Cond (µS)/cm	°F Temp (C)	DO (mg/l)	ORP mV	TDS g/L	Salinity ppt	Turbidity	Water Quality
1510	9.30	0.51									
1515	9.32	0.87	6.79	563	8.53	1.38	244.4	0.532	0.40	2.2	6" from bottom
1518	9.34	1.09	6.76	530	8.67	0.81	240.5	0.500	0.38	2.6	1.5' from bottom
1521	9.34	1.31	6.77	499	8.67	0.65	240.2	0.470	0.35	1.3	2.5' from bottom
1530	9.34	1.82	6.74	512	8.89	0.30	217.3	0.480	0.36	0.9	
1533	9.35	2.04	6.75	502	8.94	0.28	216.7	0.470	0.36	0.4	
1536	9.35	2.26	6.77	469	8.90	0.30	216.9	0.440	0.33	0.4	
1545	9.35	2.91	6.75	508	8.82	0.20	193.2	0.478	0.36	1.1	
1548	9.35	3.13	6.76	505	8.93	0.20	190.4	0.473	0.36	1.8	
1551	9.35	3.35	6.78	467	8.92	0.20	188.4	0.437	0.33	0.3	
1600	9.35	4.00	6.76	521	8.95	0.19	180.1	0.488	0.37	0.2	
1603	9.38	4.22	6.77	510	8.95	0.17	172.5	0.478	0.36	0.2	
1606	9.38	4.44	6.79	484	8.86	0.17	173.6	0.454	0.34	0.2	
1615	9.38	5.09	6.74	507	8.87	0.15	175.2	0.478	0.36	0.9	
1618	9.38	5.31	6.76	546	8.81	0.15	164.2	0.514	0.39	0.5	
1621	9.38	[Cumulative Totals]	6.77	517	[Circle units] 8.75	0.17	164.8	0.487	0.37	0.2	[Clarity, Color]

Notes: DTW = 5.53 9.15 @ ~~1505~~ 1503

1505 pump on, checking rate, 275 mL/min

1623 pump off, getting dark, facility closing

SAMPLER: Nik Bucher (PRINTED NAME) [signature] (SIGNATURE)

32.45 = 0930

High tide

FIELD SAMPLING DATA SHEET

ANCHOR QEA

Office: 1119 Pacific Avenue, Suite 1600, Tacoma, WA 98402, (206) 287-9130, Fax: (206) 287-9131

2/3/17

PROJECT NAME: Wasser - Winter GW Monitoring
WELL ID: CMW-3
SITE ADDRESS: PORT OF TACOMA
BLIND ID: /
PROJECT # 170092-02-01
DUP ID: /

WATER QUALITY DATA — Purge Start Time: 9:19 — Method § - [Select A-G] — Pump/Bailer Inlet Depth:

Time	DTW (ft)	Purged (gal)	pH	E Cond (µS/cm)	°F Temp (°C)	DO (mg/l)	ORP mV	TDS g/L	Salinity	Turbidity	Water Quality
0925	9.45	0.33	6.84	286	8.81	1.60	287.8	0.269	0.20	13.5	
0930	9.45	0.69	6.84	286	8.81	1.60	287.8	0.269	0.20	13.5	6" off bottom
0933	9.45	1.05	6.76	554	8.96	1.38	312.8	0.519	0.39	9.8	1.5' off bottom
0936	9.45	1.41	6.77	545	8.94	1.26	298.0	0.507	0.39	5.0	2.5' off bottom
0945	9.45	2.06	6.75	573	9.06	0.94	279.0	0.535	0.41	2.6	6" off bottom
0948	9.45	2.28	6.76	572	9.05	0.93	271.4	0.534	0.41	1.7	1.5' off bottom
0957	9.46	2.5	6.76	556	8.96	0.89	266.7	0.531	0.39	1.2	2.5' off bottom
1000	9.46	3.15	6.76	517	8.97	0.66	252.3	0.483	0.37	0.4	6" off bottom
1003	9.46	3.37	6.77	539	9.09	0.67	252.6	0.504	0.38	0.3	1.5' off bottom
1006	9.46	3.5	6.79	530	9.03	0.68	239.7	0.495	0.37	0.3	2.5' off bottom
1015	9.46	4.24	6.77	530	9.09	0.58	229.8	0.495	0.37	0.1	6" off bottom
1018	9.46	4.46	6.78	528	9.22	0.57	229.0	0.491	0.37	0.1	1.5' off bottom
1021	9.46	4.68	6.80	490	9.21	0.60	224.0	0.456	0.34	0.1	2.5' off bottom

[Cumulative Totals] [Circle units] [Clarity, Color]

Notes:

DTW = 9.35 @ 0919

0920 pump on, checking rate. 250mL/min. DTW = 9.45'

1024 checking rate; 300 mL/min.

1027 pump off.

SAMPLER: N.K Bacher (PRINTED NAME) (SIGNATURE)

WELL REDEVELOPMENT

FIELD SAMPLING DATA SHEET

ANCHOR QEA

1119 Pacific Avenue, Suite 1600
Tacoma, WA 98402

Office: (206) 287-9130 Fax: (206) 287-9131

2/3/17

PROJECT NAME: Wasser-Winter GW Monitoring
WELL ID: CMW-3
SITE ADDRESS: PORT OF TACOMA
BLIND ID:
PROJECT # 170092-02.01
DUP ID:

WATER QUALITY DATA Purge Start Time: 8:27 Method § - [Select A-G] Pump/Bailer Inlet Depth:

Time	DTW (ft)	Purged (gal)	pH	E Cond (µS/cm)	°F Temp (°C)	DO (mg/l)	ORP	TDS g/L	Salinity ppt	Turbidity	Water Quality
0841	—	~3	6.58	552	10.37	1.41	588.3	0.514	0.39	24.5	clear
0845		~5	6.56	324	10.43	0.81	581.0	0.274	0.20	18.6	clear
0848	—		6.56	304	10.46	1.25	579.4	0.273	0.20	11.5	clear
0850		~7	6.57	305	10.48	1.26	570.7	0.275	0.89	14.1	clear
0852			6.57	306	10.41	1.20	557.7	0.282	0.21	1.2	clear
0854			6.58	321	10.45	1.12	546.5	0.278	0.21	2.0	clear
0856		~10	6.60	306	10.43	1.02	538.6	0.276	0.21	4.4	clear
	Pump off										
0857	10.30										
0858	10.15										
0900	10.02										
0902	9.92										
0905	9.68										
0908	9.54										
0911	9.42										

[Cumulative Totals] [Circle units] [Clarity, Color]

Notes:

DTW = 9.25 @ 0827
TD = 12.35 @ 0827. hard bottom.

0836 start redevelopment.
0846 pump rate slowing down,
0850 pump dribbling still keeping flow through full but barely.
0856 well dry, pump rate > than recharge rate.

SAMPLER:

(PRINTED NAME) (SIGNATURE)

Appendix B
Lab Data Reports

Appendix C
Data Validation Report

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Anchor QEA, LLC
720 Olive Way, Suite 1900
Seattle, WA 98101
ATTN: Ms. Delaney Peterson

March 21, 2017

SUBJECT: Port of Tacoma, Wasser & Winters, Data Validation

Dear Ms. Peterson,

Enclosed is the final validation report for the fraction listed below. This SDG was received on March 3, 2017. Attachment 1 is a summary of the samples that were reviewed for analysis.

LDC Project #38210:

SDG #	Fraction
17B0210	Metals

The data validation was performed under Stage 2B guidelines. The analyses were validated using the following documents, as applicable to each method:

- Engineering and Design Report Wasser & Winters Log Sort Yard Site Final, Revised, Tacoma, Washington, October 1993
- USEPA, Contract Laboratory National Functional Guidelines Superfund Organic Methods Data Review, January 2010

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Chemist

Attachment 1

EDD	Stage 2B	LDC #38210 (Anchor Environmental-Seattle WA / Port of Tacoma, Wasser Winger GWM)																																			
LDC	**SDG#**	**DATE REC'D**	**(3) DATE DUE**	**(3)Diss. Metals (200.8)**		**(2)Diss. Metals (200.8)**																															
Matrix:	Water/Sediment			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	17B0210	03/03/17	03/24/17	1	0	1	0																														
Total	T/CR			1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

Shaded cells indicate Stage 4 validation (all other cells are Stage 2B validation). These sample counts do not include MS, MSD, or DUP's.

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Port of Tacoma, Wasser and Winters

LDC Report Date: March 17, 2017

Parameters: Metals

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 17B0210

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CMW-3-021317	17B0210-01	Water	02/13/17
CMW-300-021317	17B0210-02	Water	02/13/17
CMW-3-021317MS	17B0210-01MS	Water	02/13/17
CMW-3-021317DUP	17B0210-01DUP	Water	02/13/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Engineering and Design Report Wasser & Winters Log Sort Yard Site Final (Revised), Tacoma, Washington (October 1993) and a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines (CLPNFG) for Inorganic Superfund Data Review (January 2010). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Arsenic, Iron, and Manganese by Environmental Protection Agency (EPA) Method 200.8

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the method.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Iron	8.13 ug/L	All samples in SDG 17B0210

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CMW-3-021317MS, no data were qualified for Manganese percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CMW-3-021317 and CMW-300-021317 were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD
	CMW-3-021317	CMW-300-021317	
Arsenic	925	899	3
Iron	15700	15000	5
Manganese	4840	4710	3

XII. Internal Standards (ICP-MS)

Internal standards were not reviewed for stage 2B validation.

XIII. Sample Result Verification

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Port of Tacoma, Wasser and Winters
Metals - Data Qualification Summary - SDG 17B0210

No Sample Data Qualified in this SDG

Port of Tacoma, Wasser and Winters
Metals - Laboratory Blank Data Qualification Summary - SDG 17B0210

No Sample Data Qualified in this SDG

LDC #: 38210A4a

SDG #: 17B0210

Laboratory: Analytical Resources, Inc.

VALIDATION COMPLETENESS WORKSHEET

Stage 2B

Date: 03/13/17

Page: 1 of 1

Reviewer: ATL

2nd Reviewer: a

METHOD: Metals (EPA Method 200.8)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	N	
V.	Laboratory Blanks	SW	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	~~A~~ SW	3: Mn > 4X
VIII.	Duplicate sample analysis	A	
IX.	Serial Dilution	N	
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	~~A~~ SW	
XII.	Internal Standard (ICP-MS)	N	
XIII.	Sample Result Verification	N	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CMW-3-021317	17B0210-01	Water	02/13/17
2	CMW-300-021317	17B0210-02	Water	02/13/17
3	CMW-3-021317MS	17B0210-01MS	Water	02/13/17
4	CMW-3-021317DUP	17B0210-01DUP	Water	02/13/17
5				
6				
7				
8				
9				
10				
11				
12				
13				

Notes:

LDC #: 38210A4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: ATL
2nd reviewer: [signature]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1	W	Al, Sb, **As**, Ba, Be, Cd, Ca, Cr, Co, Cu, **Fe**, Pb, Mg, **Mn**, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
2	W	Al, Sb, **As**, Ba, Be, Cd, Ca, Cr, Co, Cu, **Fe**, Pb, Mg, **Mn**, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
QC		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
4, 3	W	Al, Sb, **As**, Ba, Be, Cd, Ca, Cr, Co, Cu, **Fe**, Pb, Mg, **Mn**, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti

Comments: Mercury by CVAA if performed

LDC # 38210A4a **VALIDATION FINDINGS WORKSHEET**

PB/ICB/CCB QUALIFIED SAMPLES

Reviewer: ATL

2nd Reviewer:

METHOD: Trace metals (EPA200.8) Soil preparation factor applied: NA

Sample Concentration units, unless otherwise noted: ug/L Associated Samples: All

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Action Level	no qualifiers (>5x)								
Fe		8.13		40.65									

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".

Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

LDC#: 38210A4a

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Reviewer: ATL

2nd Reviewer:

METHOD: Metals (EPA Method 200.8)

Analyte	Concentration (ug/L)		RPD ~~(≤100)~~	
	1	2		
Arsenic	925	899	3	
Iron	15700	15000	5	
Manganese	4840	4710	3	

V:\38210A4a-1.wpd

The attached zipped file contains two files:

File	Format	Description
1) Readme_PortofTacoma_032017.docx	MS Word 2003	A "Readme" file (this document).
2) LDC38210_17B0210_VEDD_20170314.xls	MS Excel 2003	A spreadsheet for the following SDG(s): 17B0210 38210A

No discrepancies were observed between the hardcopy data packages and the electronic data deliverables during EDD population of validation qualifiers. A 100% verification of the EDD was not performed.

Please contact Christina Rink at (760) 827-1100 if you have any questions regarding this electronic data submittal.

LDC #: 38210

EDD POPULATION COMPLETENESS WORKSHEET

Anchor

Date: 3/20/17

2nd Reviewer: AQ

The LDC job number listed above was entered by BA.

	EDD Process	Y/N	Init	Comments/Action
I.	EDD Completeness	-		
Ia.	- All methods present?	Y	BA	
Ib.	- All samples present/match report?	Y	BA	
Ic.	- All reported analytes present?	Y	BA	
Id	-10% verification of EDD?	Y	BA	
II.	EDD Preparation/Entry	-		
IIa.	- QC Level applied? (EPAStage2B or EPAStage4)	Y	BA	
IIb.	- Laboratory EMPC qualified results qualified (J with reason code 23)?	N/A	BA	
III.	Reasonableness Checks	-		
IIIa.	- Do all qualified ND results have ND qualifier (i.e. UJ)?	N/A	BA	
IIIb.	- Do all qualified detect results have detect qualifier (i.e. J)?	N/A	BA	
IIIc.	- If reason codes used, do all qualified results have reason code field populated, and vice versa?	N/A	BA	
IIId.	- Do blank concentrations in report match EDD, where data was qualified due to blank?	N/A	BA	
IIIe.	- Were any results reported above calibration range? If so, were results qualified appropriately?	N/A	BA	
IIIf.	- Are all results marked reportable "Yes" unless rejected for overall assessment in the data validation report?	Y	BA	
IIIg.	-Are there any lab "R" qualified data? / Are the entry columns blank for these results?	N/A	BA	
IIIh.	- Is the detect flag set to "N" for all "U" qualified blank results?	Y	BA	

Notes: *see readme