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ANCHOR QEA

Memorandum

November 14, 2019

To: Panjini Balaraju and Andy Smith, Washington State Department of Ecology

From: Nik Bacher, Anchor QEA, LLC

cc: Sarah Weeks, Port of Tacoma

Re: Monitoring Well Installation and 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: August 16, 2019

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 September 2019, 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 2019). 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 in 2024.

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 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. Calbag vacated the southern 3.4-acres of the property in 2016, at which time portions of the pavement previously under scrap metal piles and equipment were exposed. The Port contracted an engineering consultant to survey the asphalt cap, the survey found cracks, gouges, alligatoring, and other conditions that needed repair. In October 2017 the Port repaired the southern 3.4 acres of the site by grinding down the top 3/4-inch of asphalt, installing a geotextile fabric, and placing a 2-inch asphalt lift. In 2018 Calbag entered a new lease for the 3.4-acre area; use is restricted to equipment storage. The repairs appeared to be in good condition during the 2019 inspection (Windward 2019).

Monitoring Well Installation

Three new monitoring wells were installed on July 10, 2019. These wells were installed at the same locations as the three previously decommissioned compliance groundwater monitoring wells (CMW-1, CMW-2, and CMW-4). The wells were installed by Holocene Drilling, Inc., a Washington State licensed driller, under the supervision by Anchor QEA staff holding a Washington geologist certification. The previous core logs for the decommissioned wells could not be located so the total well depth was determined based on the decommissioning logs (total depth decommissioned) and where water was encountered in the wells. Well installation details are presented in the following list and boring logs are included in Appendix A.

- **CMW-1**
  - Well was drilled to a total depth of 14 feet below ground surface (bgs) and groundwater was encountered at approximately 7 feet bgs.
  - The well was screened from 5 to 10 feet bgs using 2-inch 0.010-slot Schedule 40 PVC in a gray sand unit.
  - Ecology Well Tag #BLT939.
- **CMW-2**
  - Well was drilled to a total depth of 16.5 feet bgs and groundwater was encountered at approximately 6 feet bgs.

  - The well was screened from 5 to 10 feet bgs using 2-inch 0.010-slot Schedule 40 PVC in a gray sand unit.
  - Ecology Well Tag #BLT938.
- **CMW-4**
  - Well was drilled to a total depth of 16.5 feet bgs and groundwater was encountered at approximately 13 feet bgs.
  - The well was screened from 5 to 15 feet bgs using 2-inch 0.010-slot Schedule 40 PVC in a gray sand unit.
  - Ecology Well Tag #BLT937.

The newly installed groundwater monitoring wells (CMW-1, CMW-2, and CMW-4; Figure 2) were developed prior to groundwater sampling on July 26, 2019, by surging the well screen followed by purging groundwater from the well casing using a typhoon pump. All three wells ran dry after removing less than 1.5 gallons preventing water quality parameters to be collected. The wells were surged, pumped dry, and allowed to recover, followed by another cycle of surging and pumping until the discharged water was visibly clear. The details of the well development are presented in the following list and the field forms are included in Attachment A. Well CMW-3 was redeveloped as part of sampling in February 2017 and was not redeveloped again this time.

- **CMW-1:**
  - Total depth of well was 9.96 feet below top of casing and depth to water prior to redevelopment was 6.52 feet below top of casing.
  - Approximately 7.2 gallons of water was removed before the purged water became visually clear.
  - The bottom of the well casing felt firm when tapped with the typhoon pump indicating that any sediment accumulated during installation of the well was removed during development.
- **CMW-2:**
  - Total depth of well was 13.08 feet below top of casing and depth to water prior to redevelopment was 8.80 feet below top of casing.
  - Approximately 8.2 gallons of water was removed before the purged water became visually clear.
  - The bottom of the well casing felt firm when tapped with the typhoon pump indicating that any sediment accumulated during installation of the well was removed during development.
- **CMW-4:**
  - Total depth of well was 14.81 feet below top of casing and depth to water prior to redevelopment was 8.97 feet below top of casing.

- Approximately 11 gallons of water was removed before the purged water became visually clear.
- The bottom of the well casing felt firm when tapped with the typhoon pump indicating that any sediment accumulated during installation of the well was removed during development.

Soil cuttings from the well installation and water from well development were drummed up in 55-gallon drums, labeled, and stored on site. A composite waste characterization sample was collected from the soil cuttings and submitted to Analytical Resources, Inc., in Tukwila, Washington, for analysis. Drum disposal is pending.

All monitoring wells (existing and newly installed) were surveyed for horizontal and vertical positioning on September 4, 2019, by Sitts & Hill, Inc., Tacoma, Washington. The summary of the survey details are presented in Table 1 and the survey map is included in Appendix B.

Groundwater Monitoring

On August 16, 2019, groundwater samples were collected during low-tide from all four existing site wells (CMW-1 through CMW-4). The groundwater level in each well was measured prior to sampling. The groundwater samples were collected from the well using low-flow sampling techniques. 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 via EPA Method 200.8.

On August 26, 2019, Anchor QEA staff attempted to collect porewater downgradient from CMW-3 at low-tide along Hylebos Creek using a combination of MHE and Solinst sampling equipment.

- The MHE sampler (also known as a Henry Sampler) is a stainless steel sampler, 1/4-inch in diameter with a "screened zone" made of interlaced machine slots at the bottom of the sampler. For this investigation both a 48- and 72-inch-long sampler were used. Prior to insertion each MHE sampler was fitted with a "Screen-Sok" used to provide additional filtering of porewater being collected.
- The Solinst drive-point piezometer consists of a 1-foot-long, 3/4-inch diameter stainless steel tip with 3/8-inch diameter well ports screened with 50 mesh stainless steel screens. 3/4-inch drive rods are screwed onto the sampling tip to assemble the sampler to the appropriate length. For this investigation, the sampler was assembled to a total length of 5 feet and fitted

with a drive head on top, allowing the sampler to be advanced with a fence post slide hammer.

After insertion, the sampler was allowed to sit for 10 minutes before sampling was attempted. The sampling attempts are summarized in the following list. Field forms are included in Attachment A.

- **Location-1:**
  - Approximately 30 feet directly downgradient from CMW-3.
  - MHE sampler pushed to 2 feet bgs (refusal). No water purged using low-flow sampling. Sampler damp upon retrieval.
- **Location-2:**
  - Approximately 40 feet directly downgradient from CMW-3.
  - MHE sampler pushed to 4 feet bgs. No water purged using low-flow sampling. Sampler damp upon retrieval.
- **Location-3:**
  - Approximately 40 feet directly downgradient from CMW-3.
  - Solinst push point sampler pushed to 2 feet bgs. No water purged using low-flow sampling. Sampler damp upon retrieval
- **Location-4:**
  - Approximately 20 feet directly downgradient from CMW-3.
  - MHE sampler pushed to refusal at 1.5 feet bgs at several locations. No sample attempted.
- **Location-5:**
  - Approximately 10 feet directly downgradient from CMW-3.
  - MHE sampler pushed to refusal at 10 inches bgs at several locations. No sample attempted.

Results

Analytical results are presented in Table 2 and water level data is presented in Table 3. Both these tables include historical data collected by prior consultants for reference. Laboratory data reports are included in Appendix C and the data validation report is included in Appendix D. Key findings were as follows:

- Dissolved arsenic was detected at a concentration of 6.12 µg/L in CMW-1, 11 µg/L in CMW-2, 154 µg/L in CMW-3, and 4.38 µg/L in CMW-4. The value for CMW-3 exceeds the groundwater cleanup level of 36 µg/L.

Dissolved arsenic concentrations in CMW-3 from 1994 to present are presented on Figure 3. The concentration trend was stable until after the July 2009 sampling event. Measured dissolved arsenic concentrations from monitoring events conducted after July 2009 through February 2017 were all

higher than the values collected during monitoring events up until 2009. The cap was repaired in October 2017 and since then the dissolved arsenic concentrations in CMW-3 have decreased indicating that the cap repair has sealed off surface water infiltration over the cap area allowing for the higher arsenic concentrations previously observed in CMW-3 to naturally recover.

Recommendations

The dissolved arsenic concentrations in groundwater will continue to be monitored in accordance with the Consent Decree, as amended. The next scheduled sampling event will occur in February 2021. Groundwater monitoring results will be submitted to Ecology within 45 days after completion of data validation.

References

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

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

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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.

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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.

Windward, 2019. Environmental Cap and Drainage System Inspection Report: Former Wasser & Winters Log Sort Yard. Prepared by Windward Environmental for Port of Tacoma. October 30, 2019

Attachments

Tables

Figures

Appendices

Tables

Table 1
Monitoring Well Survey Summary

Well	Northing	Easting	Rim Elevation (feet MLLW)	Top of Casing (feet MLLW)	Ground Elevation (feet MLLW)
CMW-1	708571.34	1178735.23	17.18	16.72	17.08
CMW-2	708387.88	1178691.7	19.73	19.08	16.4
CMW-3	708146.04	1178951.51	20.98	20.34	18.77
CMW-4	708281.23	1179363.61	20.48	20.12	20.44

Notes:

Vertical Datum is MLLW per 2016 Port of Tacoma Survey Control Monument "Y" as shown on 2016 Port of Tacoma control map. Elevation = 16.37 feet.

Horizontal Datum is Washington State Plane South Zone, NAD83/2011.

MLLW: mean lower low water

Table 2
Analytical Results

Well ID	Date	Concentration (µg/L)				
		Dissolved Arsenic	Dissolved Copper	Dissolved Iron	Dissolved Lead	Dissolved Zinc
Cleanup Criteria Levels		36	2.9		8.5	86
CMW-1	08/16/19	**6.12**	--	--	--	--
CMW-2	08/16/19	**11**	--	--	--	--
CMW-3	02/07/94	**49**	2 U	--	1 U	**8**
CMW-3	05/17/94	**72**	2 U	--	1	**7**
CMW-3	08/17/94	**95**	2 U	--	1 U	**5**
CMW-3	11/11/94	**82**	2 U	--	**2**	**8**
CMW-3	05/17/95	**74**	2 U	--	1 U	**7**
CMW-3	09/29/95	**100**	2 U	--	1 U	**5**
CMW-3	03/09/96	**82**	2 U	--	1 U	4 U
CMW-3	10/08/96	**83**	2 U	--	1 U	4 U
CMW-3	08/14/97	**144**	2 U	--	1 U	**5**
CMW-3	12/30/97	**123**	2 U	--	1 U	**139**
CMW-3	06/11/98	**89**	2 U	--	1 U	4 U
CMW-3	12/22/98	**190**	2 U	--	1 U	2 U
CMW-3	01/28/00	**7.2**	1 U	--	0.5 U	**99**
CMW-3	07/16/02	**117**	1.02	--	0.5 U	**3.32**
CMW-3 (Duplicate)	07/16/02	**111**	0.979	--	0.5 U	**4.67**
CMW-3	02/23/04	**77.2**	1.07	--	0.2 U	**3.98**
CMW-3 (Duplicate)	02/23/04	**77.5**	1.06	--	**0.675**	**4.79**
CMW-3	07/26/05	**13.1**	2.63	--	2.5 U	5 U
CMW-3 (Duplicate)	07/26/05	**12.9**	2.5 U	--	2.0 U	5 U
CMW-3	01/30/07	**60**	**4.6**	--	2.0 U	**34**
CMW-3	02/26/08	**12**	1.2J	--	2.0 U	**47**
CMW-3 (Duplicate)	02/26/08	**11**	0.8J	--	2.0 U	**35**
CMW-3	07/23/09	**41.3**	1.5	--	2.0 U	**2.7**
CMW-3 (Duplicate)	07/23/09	**41.7**	1.4	--	0.2 U	**1.4**
CMW-3	02/17/12	**2750**	--	--	--	--
CMW-3 (Duplicate)	02/17/12	**3100**	--	--	--	--
CMW-3	05/25/12	**471**	--	--	--	--
CMW-3 (Duplicate)	05/25/12	**455**	--	--	--	--
CMW-3	08/22/14	**346**	--	--	--	--
CMW-3 (Duplicate)	08/22/14	**353**	--	--	--	--
CMW-3	02/13/17	**925**	--	**15700**	--	--
CMW-3 (Duplicate)	02/13/17	**899**	--	**15000**	--	--
CMW-3	02/19/18	**168**	--	--	--	--
CMW-3 (Duplicate)	02/19/18	**201**	--	--	--	--
CMW-3	08/16/19	**154**	--	--	--	--
CMW-4	08/16/19	**3.22**	--	--	--	--
CMW-4 (Duplicate)	08/16/19	**4.38**	--	--	--	--

Notes:
Lead, zinc and copper analyses were discontinued in 2011 with Ecology approval dated June 28, 2011 (Ecology 2011a).
Groundwater samples were analyzed for dissolved metals by EPA Method 200.8.
a. Groundwater cleanup levels established from EPA chronic marine criteria (WAC 173-201A).
b. Results from the February 2012 sampling event are considered invalid due to improper sampling procedures, resulting in higher than normal turbidity
Green Box indicates exceedance of site cleanup level, as established in Consent Decree No. 93-2-08684-4
Bold: Detected result above laboratory reporting limit
--: 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 3
Water Level Data

Well ID	Date	Top of Casing Elevation (feet MLLW)	Depth of Water Below Casing (feet)	Water Level Elevation (feet)
CMW-1	08/16/19	16.72	6.46	10.26
CMW-2	08/16/19	19.08	8.82	10.26
CMW-3	02/07/94	20.34	9.72	10.62
CMW-3	05/17/94	20.34	9.83	10.51
CMW-3	08/17/94	20.34	10.24	10.1
CMW-3	11/11/94	20.34	10.47	9.87
CMW-3	05/17/95	20.34	9.48	10.86
CMW-3	09/29/95	20.34	10.37	9.97
CMW-3	03/09/96	20.34	8.51	11.83
CMW-3	10/08/96	20.34	10.24	10.1
CMW-3	08/14/97	20.34	9.76	10.58
CMW-3	12/30/97	20.34	8.8	11.54
CMW-3	06/11/98	20.34	9.68	10.66
CMW-3	12/22/98	20.34	8.75	11.59
CMW-3	08/13/99	20.34	10.05	10.29
CMW-3	01/28/00	20.34	8.76	11.58
CMW-3	01/08/01	20.34	9.92	10.42
CMW-3	07/16/02	20.34	9.81	10.53
CMW-3	02/23/04	20.34	9.45	10.89
CMW-3	07/26/05	20.34	10.04	10.3
CMW-3	01/30/07	20.34	9.88	10.46
CMW-3	02/26/08	20.34	9.24	11.1
CMW-3	07/23/09	20.34	10.18	10.16
CMW-3	02/17/12	20.34	10.21	10.13
CMW-3	05/25/12	20.34	9.85	10.49
CMW-3	08/22/14	20.34	9.98	10.36
CMW-3	02/13/17	20.34	8.82	11.52
CMW-3	08/16/19	20.34	10.05	10.29
CMW-4	08/16/19	20.12	8.87	11.25

Notes:

Top of Casing elevation from Sitts & Hill Survey, September 2019.

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

Figures

LEGEND:

Wasser Winter Site Boundary

0 2

Miles

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Figure 1
Site Vicinity Map
Monitoring Well Installation and Groundwater Monitoring Report
Former Wasser & Winters Log Sort Yard

LEGEND:

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

NOTE:
1. Monitoring wells CMW-2 and CMW-3 arelocated outside the wall.

0 100
Feet

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Figure 2
Site Plan
Monitoring Well Installation and Groundwater Monitoring Report
Former Wasser & Winters Log Sort Yard

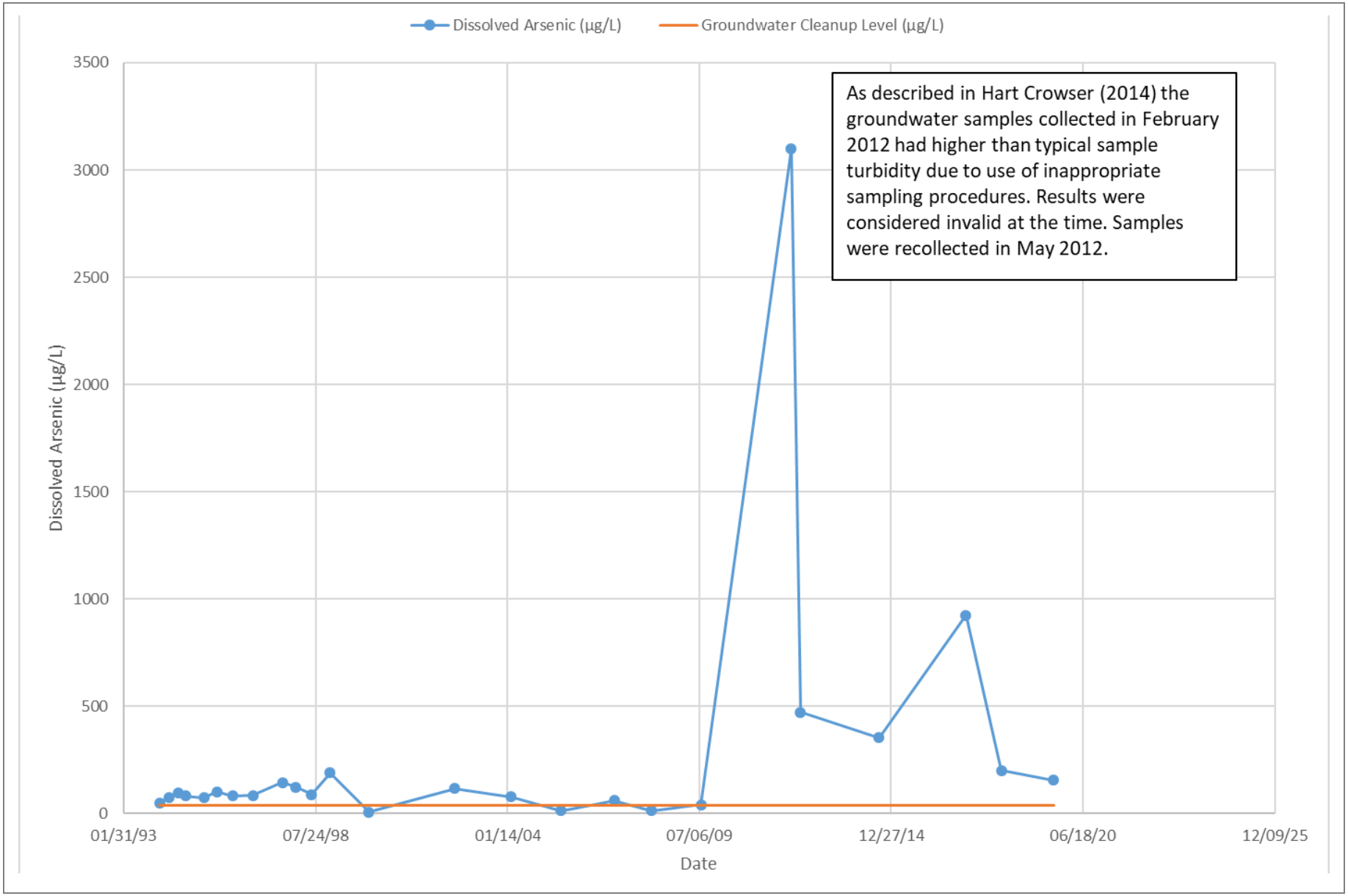

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Figure 3
Dissolved Arsenic Concentration Trends
Monitoring Well Installation and Groundwater Monitoring Report
Former Wasser & Winters Log Sort Yard

Appendix A
Field Forms

PROJECT: Wasser Winter Well Install	Log of Boring No. CMW-1		
BORING LOCATION: CMW-1	ELEVATION AND DATUM:		
DRILLING CONTRACTOR: Holocene	DATE STARTED: 7/10/19 1250	DATE COMPLETED: 7/10/19	
DRILLING METHOD: Hollow-Stem Auger	TOTAL DEPTH: 14' bgs	MEASURING POINT: Ground	
DRILLING EQUIPMENT: Diedrich D50 Turbo	DEPTH TO WATER: ~ 7' bgs	DEPTH TO FREE WATER ATC:	
SAMPLING METHOD: Split-spoon 18"	LOGGED BY: N. Bacher		
BOREHOLE DIAMETER: 8.25"	HAMMER TYPE/SYSTEM: Auto: 140# / 30" drop		

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6 inches	DESCRIPTION: NAME (USCS Symbol): color, moisture, plasticity, consistency, structure, cementation, reaction with HCl, geologic interpretation.	FIELD-ESTIMATED % Gravel: Coarse	Gravel: Fine	Sand: Coarse	Sand: Medium	Sand: Fine	Fines	REMARKS AND / OR TEST RESULTS
				Asphalt on top (6")							Well completed w/ 0.010-slot Sch. 40 2" PVC. Screened from 5-10 ft bgs
3			2	dry, loose, gray GRAVEL w/ SAND	60		← 35 →			5	
			2	gravel up to 1" and rounded							
4			3	no odor, no sheen							ECY Well Tag # BLT 939
5			3	dry to moist, gray SAND w/							
6			3	GRAVEL, gravel to 1" and rounded	← 30 →		← 60 →			10	
			5	no odor, no sheen							
7				▼ ~7'							
8			2	wet, gray, loose SAND			← 95 →			5	
			1	no odor, no sheen							
9			0								
10			weight of hammer	No recovery							
11											
12											
13			weight of hammer	wet, soft, blue gray CLAY w/ trace black mottling						100	
				no odor, no sheen							
14											
15											

Project No. 170092-01.18

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PROJECT: Wasser Winter Well Install	Log of Boring No. CMW-2
BORING LOCATION: CMW-2	ELEVATION AND DATUM:
DRILLING CONTRACTOR: Holocene	DATE STARTED: 7/10/19 / DATE COMPLETED: 7/10/19
DRILLING METHOD: Hollow-Stem Auger	TOTAL DEPTH: 16.5' / MEASURING POINT: Ground
DRILLING EQUIPMENT: Diedrich D50 Turbo	DEPTH TO WATER: ~6' bgs / DEPTH TO FREE WATER ATC:
SAMPLING METHOD: Split-spoon 18"	LOGGED BY: N. Bacher
BOREHOLE DIAMETER: 8.25"	HAMMER TYPE/SYSTEM: Auto: 140#/30" drop

DEPTH (feet)	SAMPLES: Sample No.	Sample	Blows/6 inches	DESCRIPTION (NAME (USCS Symbol): color, moisture, plasticity, consistency, structure, cementation, reaction with HCl, geologic interpretation.)	FIELD-ESTIMATED % Gravel: Coarse	Gravel: Fine	Sand: Coarse	Sand: Medium	Sand: Fine	Fines	REMARKS AND / OR TEST RESULTS
				Grass and top soil surface							
1											Well completed w/ 0.010-slot Sch. 40 2" PVC Screened from 5-10 ft bgs.
2											
3			14	dry, mod. dense, light brown		15	← 75 →			10	20/40 Silica sand filter pack
			19	SAND w/ GRAVEL, gravel to 1"							
4			20	and rounded, trace roots, no odor no sheen, ~~Hard~~ NS							
5			4	dry, mod. dense, blueish gray							ECY Well Tag # BLT 938
			10	SAND w/ SILT. no odor, no sheen		5	← 85 →			10	
6			9								
				driller indicates water in the hole @ 6'. bgs.							
7											
8			0	moist, mod. soft blueish gray						100	
			1	CLAY, mod. plast, no odor, no sheen							
9			1								
10			weight of hammer	moist, soft, blueish gray CLAY,						100	
11				mod. plast, black organic laminations throughout, no odor, no sheen							
12											
13			weight of hammer	SAA							
14											
15											

Project No. 170092-01.18

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BoringLogForm_070819.xlsx

15 — 16.5 weight of hammer

SAA but w/ peat like wood frags from 15.5 - 16.5.

PROJECT: Wasser Winter Well Install	Log of Boring No. CMW-4
BORING LOCATION: CMW-4	ELEVATION AND DATUM:
DRILLING CONTRACTOR: Holocene	DATE STARTED: 7/10/19 0840 / DATE COMPLETED: 7/10/19
DRILLING METHOD: Hollow-Stem Auger	TOTAL DEPTH: 16.5' / MEASURING POINT: Ground
DRILLING EQUIPMENT: Diedrich D50 Turbo	DEPTH TO WATER: ~13' / DEPTH TO FREE WATER ATC:
SAMPLING METHOD: Split-spoon 18"	LOGGED BY: N. Bacher
BOREHOLE DIAMETER: 8.25"	HAMMER TYPE/SYSTEM: Auto: 140# / 30" drop

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/6 inches	DESCRIPTION: NAME (USCS Symbol): color, moisture, plasticity, consistency, structure, cementation, reaction with HCl, geologic interpretation.	FIELD-ESTIMATED % Gravel: Coarse	Gravel: Fine	Sand: Coarse	Sand: Medium	Sand: Fine	Fines	REMARKS AND / OR TEST RESULTS
0				Asphalt on top (6")							
1											Well completed w/ 0.010-slot Sch. 40 2" PVC. Screened from 5-15 ft bgs. 20/40 silica sand filter pack
2											
3			16	dry, mod. dense, brownish gray SAND w/ GRAVEL, gravel up to 1" and angular, no odor, no sheen	30		← 65 →			5	
4			14								
5			19								ECY Well Tag # BLT 937
6			22	dry, mod. dense, brownish gray SAND w/ GRAVEL, gravel up to 1" and angular, no odor, no sheen	35		← 60 →			5	
7			16								
8			22								
9			10	SAA to 9' then dry, mod. dense, gray SAND w/ GRAVEL, gravel to 1/2" rounded, no odor, no sheen	15		← 80 →			5	
10			10								
11			15								
12			6	SAA to 11' then moist, mod. soft black brown SILT. non-plast. trace wood frags. no odor, no sheen			← 10 →			90	
13			5								
14			2								
15			2	wet, loose, gray SAND. multi-color grains to 13.5, then wet, soft gray SILT, non-plast.			← 95 →			5	▽ 13' but rising
			1							100	

Project No. 170092-01.18	ANCHOR QEA	Page 1 of 1

15 — 0 — 2 — 16.5 — 1

SAA to 15.8, then blackish brown PEAT to 16.2, then wet, gray SAND w/ shell fragments.

ANCHOR QEA

WELL SAMPLING AND/OR DEVELOPMENT RECORD

Well ID: CMW-1
Sample ID: NA Duplicate ID: NA
Sample Depth: NA
Project and Task No.: 170092-01.18
Project Name: Wasser Winter Well Install
Date: 7/26/19
Sampled By: N. Bacher
Method of Purging: Typhoon pump
Method of Sampling: NA

Initial Depth to Water: 6.52' bTOC
Depth to Water after Sampling: 7.25
Total Depth to Well: 9.96' bTOC
Well Diameter: 2"
1 Casing/~~Borehole~~ Volume: 0.55 gal
(Circle one)
3 Casing/~~Borehole~~ Volumes: 1.65 gal
(Circle one)
Total ~~Casing/Borehole~~ Volumes Removed: 7.2 gallons

Time	Rate (gpm)	Cum. Vol. (gal.)	Temp. (°C)	pH	Specific Conductivity (µS/cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)
1242	1	0.5	NA	NA	NA	NA	NA	Well ran dry.

Notes: Well purged dry after 30 seconds. Not able to collect WQ parameters. Well was developed by surging and pumping dry (30-45 seconds on time each time) and allowing well to recharge for approximately 3 minutes. Then the process was repeated until purge water was visibly clear

CAPACITY OF CASING (GALLONS/LINEAR FOOT)

2" = 0.16
4" = 0.65
6" = 1.47

VOLUME BETWEEN CASING AND HOLE (GALLONS/LINEAR FOOT) (ASSUMING 40% POROSITY)

2" CASING AND 6" HOLE - 0.52
2" CASING AND 8" HOLE - 0.98
4" CASING AND 10" HOLE = 1.37
4" CASING AND 12" HOLE - 2.09

ANCHOR QEA

WELL SAMPLING AND/OR DEVELOPMENT RECORD

Well ID: CMW-2
Sample ID: NA Duplicate ID: NA
Sample Depth: NA
Project and Task No.: 170092-01.18
Project Name: Wasser Winter Well Install
Date: 7/26/19
Sampled By: N. Bacher
Method of Purging: Typhoon Pump
Method of Sampling: NA

Initial Depth to Water: 8.80 bTOC
Depth to Water after Sampling: 9.10
Total Depth to Well: 13.08 bTOC
Well Diameter: 2"
1 Casing/~~Borehole~~ Volume: 0.68 gal.
(Circle one)
3 Casing/~~Borehole Volumes~~: 2.04 gal.
(Circle one)
Total ~~Casing/Borehole~~ Volumes Removed: 8.2 gal.

Time	Rate (gpm)	Cum. Vol. (gal.)	Temp. (°C)	pH	Specific Conductivity (µS/cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)
1356	0.75	1.5	NA	NA	NA	NA	NA	well ran dry

Notes: Well purged dry after 2 mins. Not able to collect WQ parameters. Well was developed by surging and pumping dry (1.5-2 mins on time each time) and allowing well to recharge for approximately 3 minutes. Then the process was repeated until purge water was visibly clear.

CAPACITY OF CASING (GALLONS/LINEAR FOOT)

2" = 0.16
4" = 0.65
6" = 1.47

VOLUME BETWEEN CASING AND HOLE (GALLONS/LINEAR FOOT) (ASSUMING 40% POROSITY)

2" CASING AND 6" HOLE - 0.52
2" CASING AND 8" HOLE - 0.98
4" CASING AND 10" HOLE = 1.37
4" CASING AND 12" HOLE - 2.09

ANCHOR QEA

WELL SAMPLING AND/OR DEVELOPMENT RECORD

Well ID: CMW-4
Sample ID: NA Duplicate ID: NA
Sample Depth: NA
Project and Task No.: 170092-01.18
Project Name: Wasser Winter Well Install
Date: 7/26/19
Sampled By: N. Bacher
Method of Purging: Typhoon pump
Method of Sampling: NA

Initial Depth to Water: 8.97
Depth to Water after Sampling: 11.19
Total Depth to Well: 14.81
Well Diameter: 2"
1 Casing/~~Borehole~~ Volume: 0.93 gal
(Circle one)
3 Casing/~~Borehole~~ Volumes: 2.79 gal.
(Circle one)
Total ~~Casing/Borehole~~ Volumes Removed: 11 gallons.

Time	Rate (gpm)	Cum. Vol. (gal.)	Temp. (°C)	pH	Specific Conductivity (µS/cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)
1444	0.8	1.6	NA	NA	NA	NA	NA	well ran dry

Notes: Well purged dry after 2 mins. Not able to collect WQ parameters. Well was developed by surging and pumping dry (2.5-3 mins on time each time) and allowing the well to recharge for approximately 3 minutes. Then the process was repeated until purge water was visibly clear.

CAPACITY OF CASING (GALLONS/LINEAR FOOT)

2" = 0.16
4" = 0.65
6" = 1.47

VOLUME BETWEEN CASING AND HOLE (GALLONS/LINEAR FOOT) (ASSUMING 40% POROSITY)

2" CASING AND 6" HOLE - 0.52
2" CASING AND 8" HOLE - 0.98
4" CASING AND 10" HOLE = 1.37
4" CASING AND 12" HOLE - 2.09

Daily Log

ANCHOR QEA

170092-01.18

Anchor QEA, LLC
1201 3rd Avenue, Suite 2600
Seattle, WA 98101
Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: WASSER WINTER CLEANUP **DATE:** 8.16.19

SITE ADDRESS: PORT OF TACOMA **PERSONNEL:** STEVE SMITH

WEATHER: **WIND FROM:** N | NE | E | SE | S | SW | W | NW — LIGHT | MEDIUM | HEAVY

SUNNY (circled) | CLOUDY | RAIN | ? — **TEMPERATURE:** °F (circled) 70 . °C

[Circle appropriate units]

TIME	COMMENTS
0700	MOBE / LEFT FOR SITE (TACOMA)
0800	ON SITE W/ NIK BACHER
	– WALKED SITE / CHECKED WELLS
	(SEE GW SAMPLING FORMS)
1300	LEFT SITE FOR LAB (ARI)
1330	SAMPLES AT LAB
1415	DEMOB

Signature: Stephen Smith

Daily Safety Briefing Form

ANCHOR QEA

Date: 8.16.19
Project No: 170092-01.08
Project Name: Wasser Winter Cleanup Monitoring

Person Conducting Meeting: STEVE SMITH
Health & Safety Officer: DAVID TEMPLETON
Project Manager: NICK BACHER

TOPICS COVERED:

- ☑ Emergency Procedures and Evacuation Route
- ☑ Directions to Hospital
- ☐ HASP Review and Location
- ☑ Safety Equipment Location
- ☑ Proper Safety Equipment Use
- ☐ Employee Right-to-Know/ SDS Location
- ☑ Fire Extinguisher Location
- ☐ Eye Wash Station Location
- ☐ Buddy System
- ☑ Self and Coworker Monitoring
- ☑ Lines of Authority
- ☐ Communication
- ☑ Site Security
- ☐ Vessel Safety Protocols
- ☐ Work Zones
- ☐ Vehicle Safety and Driving/ Road Conditions
- ☐ Equipment Safety and Operation
- ☐ Proper Use of PPE
- ☐ Decontamination Procedures
- ☑ Near Miss Reporting Procedures
- ☑ Lifting Techniques
- ☑ Slips, Trips, and Falls
- ☑ Hazard Exposure Routes
- ☐ Heat and Cold Stress
- ☑ Overhead and Underfoot Hazards
- ☑ Chemical Hazards
- ☑ Flammable Hazards
- ☐ Biological Hazards
- ☑ Eating/Drinking/Smoking
- ☑ Reviewed Prior Lessons Learned
- ☐ Other:

Weather Conditions: CLOUDY / 70F

Daily Work Scope: GW SAMPLING

Site-specific Hazards: TRAFFIC, MIDGES

Safety Comments:

Attendees

Printed Name	Signature
STEVE SMITH	SBS

ANCHOR QEA

WELL SAMPLING AND/OR DEVELOPMENT RECORD

Well ID: CMW-4
Sample ID: CMW-4-081619 Duplicate ID: CMW-400-081619
Sample Depth: 13'
Project and Task No.: PORT OF TACOMA / 170092-01.18
Project Name: WASSER WINTER
Date: 8.16.19
Sampled By: SS
Method of Purging: PERISTALTIC / YSI
Method of Sampling: LOW FLOW PERISTALTIC

Initial Depth to Water: 8.87'
Depth to Water after Sampling: 9.65
Total Depth to Well: 14.65'
Well Diameter: 2"
1 Casing/Borehole Volume: (Circle one)
3 Casing/Borehole Volumes: (Circle one)
Total Casing/Borehole Volumes Removed:

DTW	Time	Rate (gpm) ML/m	Cum. Vol. (gal.)	Temp. (°C)	pH	Specific Conductivity (mS/cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)
8.87	0900	150	INITIAL	17.6	6.33	0.651	-59.9	29.8	NO ODOR, CLEAR
9.31	0905	150	750	17.6	6.28	0.656	-67.1	7.8	" "
9.44	0910	150	1500	17.3	6.28	0.647	-72.6	5.29	" "
9.60	0915	150	2250	17.2	6.31	0.637	-78.3	5.77	" "
9.75	0920	150	3000	16.9	6.32	0.641	-81.1	6.19	" "
9.83	0925	150	3750	16.7	6.33	0.637	-83.3	4.77	" "
9.94	0930	150	4500	16.6	6.33	0.633	-86.0	3.87	" "
	0932 — BYPASS YSI — SAMPLED								
	0934 — SAMPLED DUPLICATE								

Notes:
TOTAL PURGE VOLUME: 6.5 LITERS

CAPACITY OF CASING (GALLONS/LINEAR FOOT)	VOLUME BETWEEN CASING AND HOLE (GALLONS/LINEAR FOOT) (ASSUMING 40% POROSITY)
2" = 0.16	2" CASING AND 6" HOLE - 0.52
4" = 0.65	2" CASING AND 8" HOLE - 0.98
6" = 1.47	4" CASING AND 10" HOLE = 1.37
	4" CASING AND 12" HOLE - 2.09

ANCHOR QEA

WELL SAMPLING AND/OR DEVELOPMENT RECORD

Well ID: CMW-2
Sample ID: CMW-2-081619 Duplicate ID: —
Sample Depth: 12'
Project and Task No.: PORT OF TACOMA | 170097-01.18
Project Name: WASSON WINTER
Date: 8.16.19
Sampled By: SS
Method of Purging: PERISTALTIC / YSI
Method of Sampling: LOW FLOW PERISTALTIC

Initial Depth to Water: 8.82'
Depth to Water after Sampling: 8.
Total Depth to Well: 13.15
Well Diameter: 2"
1 Casing/Borehole Volume: (Circle one)
3 Casing/Borehole Volumes: (Circle one)
Total Casing/Borehole Volumes Removed:

DTW	Time	Rate (gpm) mL/m	Cum. Vol. mL (gal.)	Temp. (°C)	pH	Specific Conductivity mS/(cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)
8.82'	1110	150	INITIAL	17.0	6.20	3.301	-3.4	11.1	CLEAR, NO ODORS
8.88'	1115	150	750	17.3	6.24	3.237	-17.6	17.3	" "
8.88'	1120	150	1500	17.5	6.31	2.700	-26.9	32.4	" "
8.88'	1125	150	2250	17.5	6.31	2.283	-28.2	34.6	" "
8.88'	1130	150	3000	17.4	6.30	2.217	-28.4	7.03	" "
8.88'	1135	150	3750	17.4	6.30	2.129	-28.6	4.68	" "
8.88'	1140	150	4500	17.4	6.31	2.056	-27.8	2.59	" "
	1145 — BYPASS YSI — SAMPLED								

Notes:

TOTAL PURGE VOLUME: 7 LITERS

CAPACITY OF CASING (GALLONS/LINEAR FOOT)	VOLUME BETWEEN CASING AND HOLE (GALLONS/LINEAR FOOT) (ASSUMING 40% POROSITY)
2" = 0.16	2" CASING AND 6" HOLE - 0.52
4" = 0.65	2" CASING AND 8" HOLE - 0.98
6" = 1.47	4" CASING AND 10" HOLE = 1.37
	4" CASING AND 12" HOLE - 2.09

ANCHOR QEA

WELL SAMPLING AND/OR DEVELOPMENT RECORD

Well ID: GMW-3
Sample ID: GMW-3-081619 Duplicate ID: /
Sample Depth: 11'
Project and Task No.: PORT OF TACOMA / 170092-01.18
Project Name: WASSEK
Date: 8-16-19
Sampled By: SS
Method of Purging: PERISTALTIC / YSI
Method of Sampling: LOW FLOW PERISTALTIC

Initial Depth to Water: 10.05
Depth to Water after Sampling: 10.11
Total Depth to Well: 12.49
Well Diameter: 2"
1 Casing/Borehole Volume: (Circle one)
3 Casing/Borehole Volumes: (Circle one)
Total Casing/Borehole Volumes Removed:

DTW	Time	Rate ~~(gpm)~~ ML/M	Cum. Vol. ML ~~(gal.)~~	Temp. (°C)	pH	Specific Conductivity MS/~~µS~~/cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)
10.05	1215	150	INITIAL	16.5	6.23	0.616	-18.5	2.71	CLEAR, NO ODORS
10.11	1220	150	750	16.4	6.22	0.607	-29.8	1.15	" "
10.11	1225	150	1500	16.3	6.25	0.593	-45.7	2.24	" "
10.11	1230	150	2250	16.3	6.24	0.589	-47.8	2.04	" "
10.11	1235	150	3000	16.3	6.26	0.581	-49.1	1.95	" "
	1240 – BYPASS YSI / SAMPLED								

Notes:
TOTAL PURGE VOLUME: 5 LITERS

CAPACITY OF CASING (GALLONS/LINEAR FOOT)	VOLUME BETWEEN CASING AND HOLE (GALLONS/LINEAR FOOT) (ASSUMING 40% POROSITY)
2" = 0.16	2" CASING AND 6" HOLE - 0.52
4" = 0.65	2" CASING AND 8" HOLE - 0.98
6" = 1.47	4" CASING AND 10" HOLE = 1.37
	4" CASING AND 12" HOLE - 2.09

ANCHOR QEA

WELL SAMPLING AND/OR DEVELOPMENT RECORD

Well ID: CMW-1
Sample ID: CMW-1-081619 Duplicate ID: /
Sample Depth: 9'
Project and Task No.: PORT OF TACOMA / 170092-01.18
Project Name: WASSON WINTER
Date: 8.16.19
Sampled By: BS
Method of Purging: PERISTALTIC / YSI
Method of Sampling: LOW FLOW PERISTALTIC

Initial Depth to Water: 6.46'
Depth to Water after Sampling: 6.73'
Total Depth to Well: 10'
Well Diameter: 2"
1 Casing/Borehole Volume: (Circle one)
3 Casing/Borehole Volumes: (Circle one)
Total Casing/Borehole Volumes Removed:

DTW	Time	Rate ~~(gpm)~~ mL/m	Cum. Vol. (gal.)	Temp. (°C)	pH	Specific Conductivity MS (µS/cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)
6.46	1010	150	~~INITIAL~~	19.7	5.82	0.735	30.7	8.72	NO ODOR, CLEAR
6.64	1015	150	750	19.9	5.82	0.729	23.7	14.9	" "
6.72	1020	150	1500	20.0	5.84	0.757	10.1	9.70	" "
6.76	1025	150	2250	20.0	5.86	0.721	5.2	4.49	" "
6.81	1030	150	3000	20.0	5.82	0.715	3.4	3.29	" "
6.83	1035	150	3750	20.0	5.81	6.704	3.2	2.67	" "
	1040 - BYPASS YSI - SAMPLED								

Notes:
TOTAL PURGE VOLUME: 6 LITERS

CAPACITY OF CASING (GALLONS/LINEAR FOOT)	VOLUME BETWEEN CASING AND HOLE (GALLONS/LINEAR FOOT) (ASSUMING 40% POROSITY)
2" = 0.16	2" CASING AND 6" HOLE - 0.52
4" = 0.65	2" CASING AND 8" HOLE - 0.98
6" = 1.47	4" CASING AND 10" HOLE = 1.37
	4" CASING AND 12" HOLE - 2.09

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested: STANDARD	Page: 1 of 1	
ARI Client Company: ANCHOR QEA	Phone: 206-287-9130	Date: 8-16-19	Ice Present?
Client Contact: NIK BACHER		No. of Coolers:	Cooler Temps: 0.7
Client Project Name: LOT 11 THEA - WINTER GW MONITORING			
Client Project #: 130092-01.18	Samplers: S. SMITH		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: Dissolved As	Notes/Comments
CMW-4 - 081619	8-16-19	0952	H_2O	1	Y	Filter Filtered
CMW400 - 081619		0934		1	Y	
CMW-1 - 081619		1040		1	Y	
CMW-2 - 081619		1145		1	Y	
GMW-3 - 081619	8-16-19	1240	H_2O	1	Y	Filter Filtered
						25

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Stephen Smith	Printed Name: Erin Seiler	Printed Name:	Printed Name:
	Company: AQ	Company: ARI	Company:	Company:
	Date & Time: 8-16-19 1338	Date & Time: 8/16/19 1338	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Daily Log

ANCHOR QEA

Anchor QEA, LLC
720 Olive Way, Suite 1900
Seattle, WA 98101
Phone 206.287.9130 Fax 206.287.9131

PROJECT NAME: POT: WASSEN WINTER **DATE:** 8-26-19

SITE ADDRESS: PORT OF TACOMA **PERSONNEL:** SS

WEATHER: MOSTLY OVERCAST **WIND FROM:** N | NE | E | SE | S | SW | W | NW — SUNNY | CLOUDY | RAIN | ? — LIGHT | MEDIUM | HEAVY

TEMPERATURE: °F 55-60 °C [Circle appropriate units]

TIME	COMMENTS
0615	LEFT FOR WASSEN WINTER SITE (FROM SEATTLE)
0700	ON SITE W/ NEW BACHOR / EQ SET UP
	- MATCHED UP SAMPLING LOCATION ON OTHER SIDE OF GMW-3
	- NO VISUAL SEEP POINTS / LOW TIDE AT 8AM
	- ATTEMPTED RETRIEVAL IN MULTIPLE LOCATIONS:
	LOCATION 1: MHE SAMPLER W/ ~ APPROX SCREENING INTERVAL OF WELL 2' BGS (DRY), ~30' DOWN GRADIENT IN GRASS (FROM WELL)
	LOCATION 2: MHE SAMPLER 4' BGS AT BOTTOM OF SCREENING INTERVAL CLOSER TO BACK CHANNEL, SOFT/CLAYEY + DRY (NO REC) ~40' DOWN FROM WELL
	LOCATION 3: SOLENOST PUSH POINT, SAME AREA AS LOC. #2, WET BUT NO GW RECOVERY
	LOCATION 4: MHE, APPROX 20' FROM FENCE, REFUSAL @ 18"
	LOCATION 5: MHE, APPROX 10' FROM FENCE, REFUSAL @ 1.0'
0845	SPOKE W/ SARAH ABOUT LACK OF RECOVERY
	- DECON SAMPLING EQUIPMENT
0910	LEFT SITE FOR SEATTLE
1010	DROPPED OF PERSONAL EQUIPMENT
1015	- BREAK (NON BILLABLE) 1 HOUR
1115	- LEFT FOR OFFICE TO RETURN FIELD EQ
1140	- AT OFFICE, RETURN FIELD EQ + SCHEDULE COURIER
1300	AT ENTERPRISE TRUCK RENTAL DROP OFF
1345	BACK AT OFFICE / FORM WORK

Signature: Stapleton Smeltz

Appendix B
Well Survey

NORTH

HORIZONTAL SCALE: 1"=100'

100 0 100 200

LEGEND

MONITORING WELL

SITE DATA

1602 MARINE VIEW DR, TACOMA WA 98422

TPN 5000350470

NOTES

1. EQUIPMENT USED: TOPCON QS ROBOTIC TOTAL STATION AND TOPCON DIGITAL LEVEL.
2. THIS SURVEY WAS PERFORMED BY FIELD TRAVERSE WITH THE FINAL RESULTS MEETING OR EXCEEDING THE CURRENT TRAVERSE STANDARDS CONTAINED IN W.A.C. 332-130-090. ALL MEASUREMENTS WERE MADE WITH A TOPCON QS ROBOTIC STATION AND TOPCON DIGITAL LEVEL IN ACCORDANCE WITH THE EQUIPMENT MANUFACTURER'S SPECIFICATIONS.
3. FIELD WORK PERFORMED IN SEPTEMBER OF 2019 UNDER JOB NUMBER 18524.
4. THE PURPOSE OF THIS EXHIBIT IS TO ILLUSTRATE ONLY THOSE LOCATIONS AND MEASUREMENTS AS FIELD LOCATED BY SITTS & HILL IN SEPTEMBER 2019 SHOWN HEREON FOR MONITORING WELL LOCATION AND ELEVATION.

VERTICAL DATUM

MLLW PER 2016 PORT OF TACOMA SURVEY CONTROL MONUMENT "Y" AS SHOWN ON 2016 PORT OF CONTROL MAP
ELEVATION = 16.37
SEE HORIZONTAL DATUM STATEMENT FOR LOCATION

HORIZONTAL DATUM

WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, NAD 83/2011
BASED ON 2016 PORT OF TACOMA SURVEY CONTROL MAP

MONUMENT "Y" LOCATED IN CENTER OF NORTH BOUND LANE OF TAYLOR WAY APPROX. 250' NORTH OF INTX. WITH SR509
N=707135.55
E=1178450.55

MONUMENT #180 LOCATED AT THE INTERSECTION OF LINCOLN AVE. AND TAYLOR WAY
N=712318.80
E=1172704.20

STA	NORTHING	EASTING	RIM ELEVATION	TOP OF PIPE	GROUND ELEVATION
MW - 1	708571.34	1178735.23	17.18	16.72	17.08
MW - 2	708387.88	1178691.70	19.73	19.08	16.40
MW- 3	708146.04	1178951.51	20.98	20.34	18.77
MW - 4	708281.23	1179363.61	20.48	20.12	20.44

REVISIONS

APPROVALS
DESIGNED --
DRAWN SIT
CHECKED DMS
DATE 10-02-2019
SCALE AS NOTED

SEAL
MICHAEL A. MCHUGH
STATE OF WASHINGTON
REGISTERED PROFESSIONAL LAND SURVEYOR
PRELIMINARY

PREPARED BY
SITTS & HILL ENGINEERS, INC.
CIVIL • STRUCTURAL • SURVEYING
4815 CENTER STREET | TACOMA, WA 98409
PHONE: (253) 474-9449 | FAX: (253) 474-0163
http://www.sitts-hill-engineers.com/

PREPARED FOR
ANCHOR QEA, LLC
1119 PACIFIC AVENUE, SUITE 1600
TACOMA, WA 98402

PROJECT
WASSER WINTER
MONITORING WELL SURVEY

SHEET TITLE
SURVEY EXHIBIT

SHEET NO.
1 OF 1

PROJECT NO.
18524

O:\18500\18524\Drawings\18524 Survey Exhibit.dwg last edited: 10/02/19 3:25pm by twiss

Appendix C
Laboratory Data Reports

Appendix D
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
dpeterson@anchorqea.com

September 25, 2019

SUBJECT: Tacoma Harbor, Wasser and Winters, Data Validation

Dear Ms. Peterson,

Enclosed is the final validation report for the fraction listed below. This SDG was received on August 28, 2019. Attachment 1 is a summary of the samples that were reviewed for analysis.

LDC Project #45832:

SDG #	Fraction
19H0241	Dissolved Arsenic

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

- USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review; January 2017

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

Sincerely,

Christina Rink

Christina Rink
crink@lab-data.com
Project Manager/Senior Chemist

247 pages-ADV

Attachment 1

EDD Stage 2B LDC #45832 (Anchor Environmental-Seattle WA / Port of Tacoma, Wasser and Winters)

LDC	SDG#	DATE REC'D	(3) DATE DUE	Diss. As (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	19H0241	08/28/19	09/19/19	5	0																																
Total	T/CR			5	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	0	0	5

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: September 4, 2019

Parameters: Dissolved Arsenic

Validation Level: Stage 2B

Laboratory: Analytical Resources, Inc.

Sample Delivery Group (SDG): 19H0241

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CMW-4-081619	19H0241-01	Water	08/16/19
CMW400-081619	19H0241-02	Water	08/16/19
CMW-1-081619	19H0241-03	Water	08/16/19
CMW-2-081619	19H0241-04	Water	08/16/19
CMW-3-081619	19H0241-05	Water	08/16/19

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 a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). 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:

Dissolved Arsenic 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.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

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-4-081619 and CMW400-081619 were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD
	CMW-4-081619	CMW400-081619	
Arsenic	3.22	4.38	31

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.

Port of Tacoma, Wasser and Winters
Dissolved Arsenic - Data Qualification Summary - SDG 19H0241

No Sample Data Qualified in this SDG

Port of Tacoma, Wasser and Winters
Dissolved Arsenic - Laboratory Blank Data Qualification Summary - SDG 19H0241

No Sample Data Qualified in this SDG

LDC #: 45832A4a

SDG #: 19H0241

Laboratory: Analytical Resources, Inc.

VALIDATION COMPLETENESS WORKSHEET

Stage 2B

Date: 8/30/19

Page: 1 of 1

Reviewer: ATL

2nd Reviewer:

METHOD: Dissolved Arsenic (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	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	N	C,S
VIII.	Duplicate sample analysis	N	
IX.	Serial Dilution	N	
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	(1,2)
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-4-081619	19H0241-01	Water	08/16/19
2	CMW400-081619	19H0241-02	Water	08/16/19
3	CMW-1-081619	19H0241-03	Water	08/16/19
4	CMW-2-081619	19H0241-04	Water	08/16/19
5	CMW-3-081619	19H0241-05	Water	08/16/19
6				
7				
8				
9				
10				
11				
12				
13				

Notes:

LDC#: 45832A4a

VALIDATION FINDINGS WORKSHEET

Field Duplicates

Reviewer: ATL
2nd Reviewer:

METHOD: Metals (EPA Method 6010/6020/7000/200.7/200.8)

Analyte	Concentration (ug/L)		RPD	
	1	2		
Arsenic	3.22	4.38	31	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2019\45832A4a.wpd

LDC #: 45832

EDD POPULATION COMPLETENESS WORKSHEET

Anchor

Date: 9/25/19

2nd Reviewer:

The LDC job number listed above was entered by FM.

Entered from Body or Summary

	EDD Process	Y/N	Initial	Comments/Action
I.	EDD Completeness	-	FM	
Ia.	- All methods present?	Y		
Ib.	- All samples present/match report?	Y		
Ic.	- All reported analytes present?	Y		
Id.	- 10% or 100% verification of EDD?	Y		
II.	EDD Preparation/Entry	-	FM	
IIa.	- QC Level applied? (EPAStage2B or EPAStage4)	Y		
IIb.	- Laboratory EMPC qualified results qualified (J with reason code 23)?	—		
III.	Reasonableness Checks	-	FM	
IIIa.	- Do all qualified ND results have ND qualifier (e.g. UJ)?	—		
IIIb.	- Do all qualified detect results have detect qualifier (e.g. J)?	—		
IIIc.	- If reason codes are used, do all qualified results have reason code field populated, and vice versa?	—		
IIId.	- Do blank concentrations in report match EDD, where data was qualified due to blank?	—		
IIIe.	- Is the detect flag set to "N" for all "U" qualified blank results?	—		
IIIf.	- Were there multiple results due to dilutions/reanalysis? If so, were results qualified appropriately?	—/—		
IIIg.	-Are all results marked reportable "Yes" unless rejected for overall assessment in the data validation report?	Y		
IIIh.	-Are there any lab "R" qualified data? / Are the entry columns blank for these results?	—/—		
IIIi.	-Are there any discrepancies between the data packet and the EDD?	N		

Notes: *see discrepancy sheet