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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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- 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.
- 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

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Table 1Monitoring Well Survey Summary

			Rim Elevation	Top of Casing	Ground Elevation
Well	Northing	Easting	(feet MLLW)	(feet MLLW)	(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

		Concentration (µg/L)							
		Dissolved	Dissolved	Dissolved	Dissolved	Dissolved			
Well ID	Date	Arsenic	Copper	Iron	Lead	Zinc			
Cleanup Criter	ia 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		10	5			
CMW-3	03/09/96	82	2 U		10	4 U			
CMW-3	10/08/96	83	2 U		10	4 U			
CMW-3	08/14/97	144	2 U		10	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



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



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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 Win	Lo	g	of	Bo	rin	g l	No	. CMW-1	
BORING LOCATION: CMU	1-1	ELEVATION AND	DAT	UM:					
DRILLING CONTRACTOR:	ocene	DATE STARTED:	DATE STARTED: 7/10 19 1250 DATE COMPLETED: 7				DMPLETED: 7/10/19		
DRILLING METHOD: Hullow	TOTAL DEPTH:	11	1	69	5	ME	ASUF	RING POINT: Ground	
DRILLING EQUIPMENT: Die dr	ich D50 Turbo	DEPTH TO WATER: ~	1'	6	35		DEP ATC		D FREE WATER
	spoon 18"	LOGGED BY:	N	B	acl	ren	~		
BOREHOLE DIAMETER: 5.2	!5"	HAMMER TYPE/S	YSTE	EM:	A	ito	ł	141	0#/30" drop
SAMPLES	DESCRIPTION			IELC	D-EST	FIMA Sand		%	REMARKS
(feet) (feet) ample Sample No. 6 inches 6 inches	Symbol): color, moisture, plasticity, consistency reaction with HCl, geologic interpretation		Coarse	Fine	Coarse	Medium	Fine	Fines	AND / OR TEST RESULTS
Asp	halt on top (6")							
1		. /	1						Well completed
					-				w/ 0.010-slot
2-									Sch. 40 2" PVC. Screned from
3-TZ dry	loose, gray GRAVE	L W/SAND	6	0.	4	35-	-	5	5-10 fr bys
2 9/1	loose, gray GRAVE vel up to 1" and ra odor, no she	ounded							C
4 3 NO	odol, no shear								ECY Well Tay # BLT 939
5		10							
T 3 dryt	VEL, gravel to 1" a ador, no sheen		. 7			(n		10	
6-3 GRA	ver gravel to 1 a	na lundea	43	0-4	प_	207		·U	
7- 2~	4	,							
I 2 Wet,	gray, loose SA	ND			4	95	-+	5	
I NO	odor, no shear								
9 0 0				_					
10- Weight No	recovery								
11 Weight No 11 Official	/							-	
12-									
13- weight wet	soft, blue gra mace black moth oder, no sheen	, CLAY					1	100	
14 howner No	oder, no sheer	7 3							
15									
Project No. 170092-01, 18	2	ANCHOR QEA 🚟							Page 1 of

.

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 C	E COMPLETED: 7/10/19		
DRILLING METHOD: Hollow - Stan Auger		RING POINT: Grand		
DRILLING EQUIPMENT: Diedrich DSD Turbo	WATER: ~ 6 5 5 ATC:	O FREE WATER		
SAMPLING METHOD: Split-Spean 18"	LOGGED BY: N. Bacher			
BOREHOLE DIAMETER: 8.25"	HAMMER TYPE/SYSTEM: Auto 12	-10#/30" drap		
	FIELD-ESTIMATED % Gravel Sand	REMARKS		
Image: Second system Image: Second system <td< td=""><td>structure, cementation, w w E</td><td>AND / OR TEST RESULTS</td></td<>	structure, cementation, w w E	AND / OR TEST RESULTS		
Grass and top soil	surface			
1		Well completed		
		W 0.010-slot		
2-		Sch 40 2" PVC Screened from		
3-T 14 dry mod dense, light	brunn	5-10 ft 695.		
19 SAND GRAVE TO	101 15+75-10	20/40 Silica		
4 20 and runded, trace for no shecen them 13	s, no odur	smid filter pale		
		,		
5 4 dry, mod, dense, blueis	gruy	ECY Well Tay		
6 10 SAND WI SILT. NO ON	1, no shear 5+ 85-10	# BLT 938		
	2.			
7 driller indicates water hole @ 6'. bgs.				
8-10 moist, mod, soft blueis	Gray 10			
1 CLAY, mod plast, no	dir, no shen			
9-2-1				
10 10 weight moist soft blueigh gra	CLAY, IO			
11 weight moist soft, blueish gra 11 of mod. plast, black orga hummer throughat, no oder, he	12 Jammahres			
hannest throughant, no oder, the	sten			
12-				
12 Weight SAA				
13- Weight SAA				
14 having				
Project No. 170092-01:18	ANCHOR DEA =====	Page 1 of		
BoringLogForm_070819.xlsx 16.5 Wood F hammer	w/ peat like ugs from 15.5-16.5.			

PROJECT	r: Wase	ier Winte	r Well	Install	Lc	bg (of	Bo	rin	g	No	. CMW-4
	LOCATION		W-4		ELEVATION AND DATUM:							
DRILLING	CONTRAC	CTOR: Hold	cene	2 2	DATE STARTED: 7/10 19 0810 DATE COMPLETED: 7/10 19							
DRILLING	METHOD:	Hollow -	TOTAL DEPTH:	16	,5	1		ME	ASUI	RING POINT: Grand		
										O FREE WATER		
SAMPLING	G METHOD	Split.	spoon	184	LOGGED BY:	N	B	ac	he	\checkmark		
BOREHOL	E DIAMET	ER: g,	25"		HAMMER TYPE/S	YSTE	EM:	A	to	245 1	jι	10 #/30 drop
	AMPLES		DE	SCRIPTION			FIELC avel	D-ES	TIMA Sanc		% T	REMARKS
DEPTH (feet) Sample No.	Sample Blows/ 6 inches	NAME (USCS S	ymbol): color, moistu		cy, structure, cementation, ion.	Coarse	Fine	Coarse	Medium	Fine	Fines	AND / OR TEST RESULTS
		Aspl	nult o	n top	(64)							
1-		*		1	. /			-				Well completed
-												W 0.010-510+ Sch. 40 2" PVC.
2-												Screened from
3-	16	drym	d. dense,	brunsh	gray "	3	0	4	65	->	5	5-15 ft bas.
-	14	SAND	W/GEAV	EL, gravel	up to 1"			_				20/40 Siliza
4+		and	angula	r, no odu	r no sheen							Sand Filter pack
5												ELY Well Tag
ι Π	22	dry, m	od dense	e, browni	The gray	3	5	4	60	->	5	# BLT 937
6-7	16	SAND	W GRA	VEL, gran	el up to 1" or no shen				_		_	
7-		ind	mjum	1 10 000	or no shan							
	10	SAA to	9 then	dry mod	dense.	j=	5	4	50	->	5	
8-	10	gray :	SAND W	1 GRAVE	Ly gravel							
9	15	40 1	z" round	led, no o	dor no shen	_						
										-		
10-	6	SAA h	, 11 the	n moist.	mod.soft			4-	10-	V	90	
11-	5	black	brun	SILT . M	on-plast.							
Å	2	true	wood fre	195. NO 00	lor, no shen							
12-								-				
12 11	2	wet loo	se, grav	SAND	nulti-color			4	45 -	*	5	V 121 1. 1
13-	2	grams	to 13.	5, then	nulti-color wet, soft							V 13' but noing
14		gray 3	SILT, NO	m-plast.							100	7
15												
	170092	-01.18		V2	ANCHOR QEA =====							Page 1 of
BoringLogFor	rm_070819.>	15 Isx 16.5	7 to	A to 15.8 16.2, the frag nuer	, then blac n wei, gru t3.	-kis 7 5	ih SAN	70 DU	wn w	1 1 5	PE	AT U

1	Z QE	NCHO A ###	R Ź		AND/OF		L SAM	PLING MENT RECORD	
Sample	Denth:	NF	uplicate II \)A- V Tustall	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/Boretrote Volume: 0.55 gal (Circle one) 3 Casing/Berstrete Volumes: 1.65 gal (Circle one)			
Date:	+	LE	ached	_		(/	volumes: 1.65 gal	
Time	Rate (gpm)	Cum. Vol. (gal.)	Temp. (°C)	рН	Specific Conductivity (µS/cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)	
1212		0.5						Well ran dry.	
WQ dry red reg CAP	parame (30-1	F CASIN EAR FOO	Nell ruds c proxim FI P G	Wars whitely (G (As 2" C) 4" CA	e each tin 3 minu	ING AND R FOOT) DROSITY OLE - 0.9 OLE - 0.9	HOLE 12 13 10 13 10 12 18 37		

1	Z QE	CHO A 🚟	R ≠		AND/OF	0.00	L SAMI ELOPN	PLING MENT RECORD
Well ID:	6	MW-	2			Initial I	Depth to Wa	ater: 8.80 6TOC
Sample	ID: N	+ D	uplicate II	D:	ift-	Depth	to Water af	ter Sampling: 9.10
Sample	Depth:	N	+			Total D	epth to We	11: 13.08 bTOC 2"
Project a	and Task N	o.: <u>\</u> †	0092.	-01.12	S III	Well Di	ameter:	2"
Project I	Name: U	hsser	Winte	v We	ll Install	1 Casir (Circle	ng/ Borchole one)	e Volume: 0.68 gal. - Volumes: 2.04 gal.
Date:	7 26 I By:	117	Rul	. (3 Casir	ng/Borehole	Volumes: 2.04 gal.
Sampled	I By:	N.	Daca	D.		(Circle	one)	0
Method	of Purging: of Samplin	g:	N	A	~p	Total C Volume	asing/Bore es Removed	trole 8.2 gal.
Time	Rate (gpm)	Cum. Vol. (gal.)	Temp. (°C)	рН	Specific Conductivity (μS/cm)	ORP (mV)	Turbidity (NTU)	(color, odor, sheen, and sediment)
1356	0.75	1=5	NA	NA	NA	NA	ЫЛ	well ran dry
CAP	tos. 2 mins oximate	the v CASING EAR FOO 16	was me e min as n	VOLUME (G (AS 2" C/ 4" CA	he and	NG AND R FOOT) PROSITY DLE - 0.5 DLE - 0.9 OLE = 1.3	HOLE 2 8 37	to collect WQ pumping dry to rectange for was repeated with

	ZQE				AND/OF	R DEV		IENT RECORD
Well ID:		CMW	-4			Initial	Depth to Wa	ter: 8.97
Sample I	ID:	A DI	uplicate II	D:	A	Depth	to Water aft	er Sampling: (1.19
Sample I	Depth:	NA				Total [Depth to Wel	11: 14.81 2" Volume: 0.93 gal Volumes: 2.79 jal.
Project a	nd Task N	lo.: <u>1</u> 7	10092	-01.1	8 1.	Well D	lameter:	2"
Project N	lame: <u>V</u>	Jasser	Wint	er We	ell Instay	1 Casi	ng/Berchole	Volume: 0.93 gal
Date:	72	6/19				(Circle	one)	779
Sampled	Ву:	1 D.	Bach	er	8 ell Instaly	3 Casii (Circle	ng/ Borehole one)	Volumes: 2. 401 Jal.
Method o Method o	of Purging of Samplin	:Y g:	phoen N7	pun 7	P	Total C Volume	Casing/Berek es Removed	:l gallons
Time	Rate (gpm)	Cum. Vol. (gal.)	Temp. (°C)	рН	Specific Conductivity (μS/cm)	ORP (mV)	Turbidity	
1444	0.8	1.6	NA-	NA	NA	NA	NA	well rem dry
lotes: W Param (2.5-5 for (M F	reters. 3 mills	ximate	me ea ly 3	a Hor devel ch tim Mihu vas V	loped by e) and a ites. Thou	surg	my the	d pumping dry will to reachinge
	CITY OF DNS/LINE	EAR FOC		(G (ASS	BETWEEN CASI ALLONS/LINEAF SUMING 40% PC	RFOOT))	
	2" = 0. 4" = 0.0 6" = 1.4	65		2" CA	SING AND 6" HO SING AND 8" HO	DLE - 0.9	8	

	Daily Lo)g
V AN QE	JCHOR A 170092-01.18	Anchor QEA, LLC 1201 3rd Avenue, Suite 2600 Seattle, WA 98101 Phone 206.287.9130 Fax 206.287.9131
PROJECT NAM	E: WASSER WANTER CLEANUP	DATE: 8-16.19
SITE ADDRESS	port of theomy	PERSONNEL: STEVE STREET
WEATHER:	WIND FROM: N NE E SE S SW SUNNY CLOUDY RAIN	W NW LIGHT MEDIUM HEAVY ? TEMPERATURE: ©70 . °C [Circle appropriate units]
TIME	COMMENTS ,	
0700	MORE / LEFT FOR SATE	(TACOMA)
0800	ON SPIE U/ NEW	BACITEVE
	WALKES STOR / CHECKES WE	eus
	(SEE GW SAMPORNY FORM	s)
1200	LEFT STIE FOR LAB	(API)
1330	SAMPLES AT CAB	
1415	DEMOB	
	Shaning - ann	
Signature:	Trevan Then	

Daily Safety Briefing Form



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

Person Conducting Meeting: STEVE STREET	Health & Safety Officer: DRUGO TEMPLETON	Project Manager: N74 BACIHUR
TOPICS COVERED:	V	
Emergency Procedures and Evacuation Route	D Lines of Authority	Lifting Techniques
$ ot\!$	✓ Communication	🗹 Slips, Trips, and Falls
☐/ HASP Review and Location	🗹 Site Security	Hazard Exposure Routes
D Safety Equipment Location	Vessel Safety Protocols	Heat and Cold Stress
✓ ✓ Proper Safety Equipment Use	☐ Work Zones	Overhead and Underfoot Hazards
Employee Right-to-Know/ SDS Location	Vehicle Safety and Driving/ Road Conditions	Chemical Hazards
$ ot\!\!\!/$ Fire Extinguisher Location	🖓 Equipment Safety and Operation	🖄 Flammable Hazards
Eye Wash Station Location	Proper Use of PPE	Biological Hazards
🗆 Buddy System	(2) Decontamination Procedures	C Eating/Drinking/Smoking
Self and Coworker Monitoring	🖉 Near Miss Reporting Procedures	A Reviewed Prior Lessons Learned
□ Other:		·

Weather Conditions: <u>CLOWY</u> 70F	Atte	ndees
<u> </u>	Printed Name	Signature
	STEVE SMELL	SBS
Daily Work Scope: GW Stuperna		
Site-specific Hazards:		
Safety Comments:		

	Well ID:	СМИ	1-4	1		11			ater: 8.87
				uplicate	D: CMW	400-081619	Depth	to Water af	ter Sampling: <u>9.65</u>
		Depth:		. E let .	1.0		Total [Depth to We	II: <u>14.65'</u>
	1					092-01.18		iameter:	
	-	-	WASSEN !!	WIN	TEL		1 Casi (Circle		e Volume:
		8.16.							e Volumes:
	1	By:		1	1	·	(Circle		
			ng: le			STAUTIC		asing/Bore	
	Time	Rate (gpm) M h /m	Cum. Vol. (gal.)	Temp. (°C)	рН	Specific Conductivity MS (µ\$/cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)
F	0900	150	FNITFAL	17.6	6.33	0.671	~ 59.9	29.8	NO ODOR, CLEAR
(0905	150	750	17.6	628	0.656	-67.1	7.8	
Ĺ	0910	150	1500	17.3	6.28	0.647	-7Z.6	3.29	£1 *2
0	0915	150	2250	17.2	6.31	0.637	- 78.3	5.77	Fr at
5	0920	150	3000	16.9	6.32	0.641	- 81.1	6.19	u [™] ti
3	0925	150	3750	16.7	6.33	0.637	-83.3	4.17	L CL
4	0930	150	4500	16.6		0.633	-86.0	3.87	44 LL - 1
	0932-	- BypA	SS YSI	- 5	Ampl	ens			
	0934	1	tmple		-				
	Notes:		1						
	total	pura	r Volu	ME :	la.5 (-FACKS			
							-32		
-									
			F CASING		(G	BETWEEN CAS ALLONS/LINEA SUMING 40% P(R FOOT)		

		C QE				AND/OI	R DEV	ELOPN	ENT RECORD
	Well ID:	CMW	-2				Initial	Depth to Wa	ater: 8.82'
	Sample	ID:CMW-	2-0814131	plicate	ID:	·	Depth	to Water af	ter Sampling:
	Sample	Depth:	12'				Total E	epth to We	11: 13.15
	Project	and Task I	No .: fort	r tace	mA 17	0092-01.18	Well D	iameter:	2
	-		WASSER	. ing	nen				e Volume:
		8.16.					(Circle	,	Malumaa
	Sample	d By:	55		,		3 Casil (Circle		e Volumes:
			9: <u>Perriks</u> ng: <u>lor</u>			F		asing/Bore	
DTW	Time	Rate (gpm) ^{ML} / n	Cum. Vol. _{Mu} (gat.)	Temp. (°C)	рН	Specific Conductivity M5/(105/cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)
8.82	1140	150	FWFIFAL	17.0	6.20	3.301	-3.4	11.1	clette, no ondes
8.88	1115	150	750	17.3	624	3.237	-17.6	17.3	
8.88	1120	150	1500	17.5	6.31	2.700	-26.9	32.4	<i>u u</i>
8.88	1125	150	2770	17.5	6.31	2.283	-28.2	34.6	4
8.88	1130	150	3000	11.4	6.30	2.217	-28.4	7.03	u'u
8.88	1136	150	3750	17.4	6.30	2.129	-28.6	4.68	4.2 ii
8.88	1140	150	4500	17.4	6.31	2.056	-27.8	2.59	й II
	1145	- BYPA	SS YSI	- 5	AMPL	670			
	-								
	Notes:								
	-ton A	2 pue	aë vol	ime :	71	Frans			
			F CASING EAR FOO		(0	BETWEEN CAS BALLONS/LINEAL SUMING 40% PC	R FOOT)		987 -
		2" = 0 4" = 0 6" = 1	.65		2" C/ 2" C/ 4" CA	ASING AND 6" H ASING AND 8" H SING AND 10" H ASING AND 12" H	OLE - 0.5 OLE - 0.9 IOLE = 1.3	2 8 37	

	1	ZQE	NCHOI	R Z		AND/O		L SAMI	PLING MENT RECORD
	Well ID:	Gmw	-3		I		Initial	Depth to Wa	ater: 10.05
	Sample	ID:GAW-	3-081613	uplicate	D: /		Depth	to Water aff	er Sampling: 10.11
		Depth:					Total E	epth to We	11: 12:49 2"
	Project	and Task I	No.: Pont	OF TAC	ma /17	0092-01.18	Well D	iameter:	2 "
	1		WASSER		1				• Volume:
	-	8-16-					(Circle		
		i By:		11					Volumes:
			: PEMB	muse	1 45±		(Circle	•	
			ng: <u>(</u> uw			ANTFE		asing/Bore	
W	Time	Rate .(gpm) 	Cum. Vol. مرام (gal.)	Temp. (°C)	рН	Specific Conductivity M < Au3/cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)
c15	1215	150	FUFIFAL	16.5	6.23	0.616	-18.5	2.71	CIERN , NO USONS
11	1270	150	750	16.4	6.22	0.607	-29.8	1.15	ii n
.11	1225		1500	16.3	6.25	0.593	-45.7	2.24	u !
11.0	1230	150	2250	16.3	6.24	0.589	-47.8	2.04	ulu
11.0	1245	150	3000	16.3	6.26	0.581	-49.1	1.95	ulu
	Notes:	r pu	rhe h	orme	: 5	LEPERS			
		ONS/LIN 2" = 0			(C (AS 2" C	BETWEEN CAS SALLONS/LINEA SUMING 40% P ASING AND 6" H	R FOOT) OROSITY IOLE - 0.5) 2	
		4" = 0. 6" = 1.			4" CA	ASING AND 8" H SING AND 10" H SING AND 12" H	IOLE = 1.3	37	

	1	ZQE		~		AND/OI		L SAM	
	Well ID:	CMI	N-1						ater: 16.46
	Sample	ID:CMU-	$\frac{1-081619}{91}$	iplicate l	D: 🗡				ter Sampling: 7 3
	Sample	Depth:	9'		1		Total [Depth to We	ll: <u>10</u>
	Project	and Task I	No.: Pint	of thu	mA /1-	70092-01.18			, ⁽¹
	-		NASSER		<u>M_</u>		1 Casi (Circle		e Volume:
	Date:	8	5-16-6 85	1			•		Valumaa
							(Circle		e Volumes:
			: PERAS					asing/Bore	
	Method	of Samplir	ng: <u>lav</u>	Fur	perat	STAUTE	Volum	es Remove	d:
W	Time	Rate (gpm) m~/m	Cum. Vol. (gal.)	Temp. (°C)	рН	Specific Conductivity Mର୍ଜ (µସ୍ଟ/cm)	ORP (mV)	Turbidity (NTU)	Remarks (color, odor, sheen, and sediment)
46	1010	150	FNTTPAL	19.7	5.82	0.735	30.7	8.72	NO ODOR, CLOTHR
.69	1015	(50	750	19.9	5.82	0.729	23.7	14.9	ti u
72	1020	150	1500	20.0	5.84	0.757	10.1	9.70	11 11
76	1025	150	2250	20.05	5.86	0.721	5.2	4.49	u l u
.81	1030	150	3000			0.715	3.4	3.29	u u
183	1035	150	3750	20.0	5.81	6.704	3.2	2.67	4 11
	1040	- Byl	PASS Y	5I -	- SAI	npios			
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						Y			
-	Notes:	() 12 V				1			
ł	10t A	r pixe	46 60	IME	: 6	LETERS			
-									
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ł									
Ī									
			F CASING EAR FOO		(0	BETWEEN CAS BALLONS/LINEA SUMING 40% PC	R FOOT)		
		2" = 0.	.16		2" C	ASING AND 6" H	OLE - 0.5	2	
		4" = 0.			2" C	ASING AND 8" H SING AND 10" H	OLE - 0.9	8	
		6" = 1.	.47		• =•	SING AND 10" H			

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ARI Assigned Number: Turn-around Requested: Page:
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Printed Name:
Company:
Date & Time:

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. 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

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Anchor QEA LLC 720 Dive Way, Suite 1900 Seattle WA 98101 Phone 2062879130 Fax 206.287.9131 PROJECT NAME: B.T.: (MISSEN WENTER PROJECT NAME: B.T.: (MISSEN WENTER STE ADDRESS: PORT OF TATIONAL PRESONNEL: SS WHATHER: WIND FROM: NTHE E SE S SW W NW LIGHT MEDUM HEAVY MISS WAY OF THE WIND FROM: NTHE E SE S SW W NW LIGHT MEDUM HEAVY MISS WAY OF THE WIND FROM: NTHE E SE S SW W NW LIGHT MEDUM HEAVY MISS WAY OF THE COMMENTS DATE: S-26-19 PRESONNEL: SS WEATHER: WIND FROM: NTHE E SE S SW W NW LIGHT MEDUM HEAVY MISS WAY OF THE COMMENTS 0615 LIFT FOR WISSEN WENTER SFF (PROM SETTIC) 0615 LIFT FOR WISSEN WENTER SFF (PROM SETTIC) 0616 SETTE DEFINIS ALCONTEN ON OTHER AFGE OF GAME-3 - NO KISUM SETTE DEFINIS / LOW TOPE AT 84M ATTEMPTOR BETMEOUT TO MALTIPUE LOCATIONS ? - NO KISUM SETTE DEFINIS / LOW TOPE AT 84M ATTEMPTOR DETMENTER WILLTPUE LOCATIONS ? - NO KISUM SETTE DEFINIS / LOW TOPE AT 84M ATTEMPTOR DETMENTER WILL APPLER LOSS FROM STRUCKLED WE - TOCHTEM 1: MHE SAMPLER W/ 963 AT BATTON OF SUPERING WUT - TOCHTEM 2: MHE SAMPLER W/ 963 AT BATTON OF SUPERMIS FROM - LOCATION 2: SOLLARSE PASS LEANT FORCE AS SUPERMISS FROM WILL - LOCATION 2: SOLLARSE PASS PASS PASS FROM FROM S SUPERMISS FROM WILL - LOCATION 2: SOLLARSE PASS PASS PASS FROM FROM S SUPERMISS FROM - LOCATION 3: SOLLARSE PASS PASS PASS FROM FROM FROM S SUPERMISS FROM - LOCATION 3: SOLLARSE PASS PASS PASS FROM FROM FROM S LOCATION 5: - LOCATION 3: SOLLARSE PASS PASS PASS FROM FROM FROM S FROM A CONTENT - LOCATION 3: SOLLARSE PASS PASS PASS FROM FROM S FROM S CONTENTS - LOCATION SCHEMES FOR FROM FROM FROM FROM S CONTENTS - LOCATION SCHEMES FOR FROM FROM S CONTENTS - LOCATION SCHEMES FOR FROM S FROM S CONTENTS - LOCATION SCHEMES FOR FROM S FROM S CONTENTS - LOCATION SCHEMES FOR FROM S FROM S CONTENTS - LOCATION SCHEMES FROM SEA TO SAMPLE - LOCATI		Daily Log	
SITE ADDRESS: PORT OF THEOMA PERSONNEL: 5 S WEATHER: WIND FROM: N NE E SE S SW W NW LIGHT MEDIUM HEAVY MOSTON LIKEST SUNNY CLOUDY RAIN ? TEMPERATURE: (5 37-60 BURNY SETT W/ NFL BARITON SET / SAM MATCHER DIP SAMPLER LOCATEON ON OTHER SET OF GAW-3 NO VISUAL SETP POFATS / LOW TYPE AT 84M ATTEMPTOR RETRAEVAL TON MULTIPLE LOCATEONS FOR ATM ATTEMPTOR RETRAEVAL TON MULTIPLE LOCATEONS FOR ATM 2 9665 (PAY), * 30' DOWN GRADBERT / FW GARS '(FROM WELD) - FLOCATION 1'S MILE SAMPLER U/S GARS (FROM WELD) - FLOCATION 2'S MILE SAMPLER U/S GAR AT BOTTOM & SUCCESSING 500 - FLOCATION 2'S MILE SAMPLER U/S GAR AT BOTTOM & SUCCESSING 500 - FLOCATION 2'S MILE SAMPLER U/S GAR AT BOTTOM & SUCCESSING 500 - FLOCATION 2'S MILE SAMPLER U/S GAR AT BOTTOM & SUCCESSING 500 - FLOCATION 2'S MILE SAMPLER U/S GAR AT BOTTOM & SUCCESSING 500 - FLOCATION 2'S MILE SAMPLER U/S GAR AT BOTTOM & SUCCESSING 500 - FLOCATION 2'S MILE SAMPLER U/S GAR AT BOTTOM & SUCCESSING 500 - FLOCATION 3'S SOLVARY PUSH BOTOM, SAME MACH AS LOC. #2, WET BUT NO GW RECOMMY - FLOCATION 3'S MILE APPROV D'FROM FORME, REPORT @ 100 NO GW RECOMMY - FLOCATION S'S MILE APPROV D'FROM FORME, REPORT @ 100 - FLOCATION S' MILE APPROV D'FROM FORME, REPORT @ 100 - FLOCATION S' MILE APPROV D'FROM FORME, REPORT @ 100 - FLOCATION S' MILE APPROV D'FROM FORME D'S DUC - FLOCATION SAMPLENCE (COMMUNICE D'S AD - FLOCATION SAMPLENCE (COMMUNICE D'S AD - FLOCATION SAMPLENCE COMMUNICE COMMUNICE D'S BOTTON SECOND COMMENT - FLOCATION SAMPLENCE TO RETURE FORMENT - FLOCATED OFFERE TO RETURE FORMENT - FLOCATED OFFERE TO RETURE SAMPLENCE COMMENT - FLOCATED OFFERE TO RETURE SAMPLENCE COMMENT - FLOCATED OFFERE TO RETURE SAMPLENCE OFFER - FLOC			720 Olive Way, Suite 1900 Seattle, WA 98101
WEATHER: WIND FROM: N NE E SE S SW W NW LIGHT MEDIUM HEAVY MONTOLOGIC TIME COMMENTS 0615 LEFT FOR WASSEN WANTER SFTE (FROM SEATURE: CB 35-50 CONSENSES UNITS (COMMENTS) 06700 ON SETTE W/ NEW BAULTON / 20 SETTUE) 0700 ON SETTE W/ NEW BAULTON / 20 SETTUE MATCHED UP SAMPLING LOCATION ON OTTION AFORE OF GAW-3 NO VISUAL SETTP POFINTS / LOW TIDE AT 87MM ATTEMPTED RETURENT FOR MULTIPLE LOCATION S: TILOCATION IS MITE SAMPLING WALTIPLE LOCATION S: TILOCATION IS MITE SAMPLING W/ SCAFTON S' TILOCATION IS MITE SAMPLING W/ SCAFTON S' TILOCATION IS MITE SAMPLING W/ SCAFTON S FORMANTS COSON TO BALE CHANNEL, SOFT/CAN BY SCAFTON STORENTS FORMULE OF W COSON TO BALE CHANNEL, SOFT/CAN BY HORY (NO REC) "40' DOWN GAME LOCATION 2): MITE SAMPLING Y' GGS AT BOTOM OF SCHEENTING FORM COSON TO BALE CHANNEL, SOFT/CAN BY HORY (NO REC) "40' DOWN GAME COCONTO TO BALE CHANNEL, SOFT/CAN BY HORY (NO REC) "40' DOWN GAME COCONTON 3): SOTTATS PUSH FORM SIME AND SCAFTON OF SCHEENTING FORT COCONTON S: MALE MADE IN SAME AND SCAFTS (LOCATED S) COCONTON S: MALE MADE IN SAME AND SCAFTS (LOCATED S) COCONTON S: MALE SAMPLING Y' BGS AT BOTOM OF SCHEENTING FORME COCONTON S: MALE SAMPLING Y' BGS AT BOTOM OF SCHEENTING FORME COCONTON S: SOTTATS PUSH FORM SAME AND SCAFTS (LOCATED S) COCONTON S: SATARS PUSH FORM SAME AS LOC. #2, WET BUT NO GWS RECOVERY COCATED S: MALE APPROVED 'FROM FORME, REPUSH @ 10' COCATED S: MALE APPROVED 'FROM FORME, REPUSH @ 10' COCATED S: MALE APPROVED 'FROM FORME, REPUSH @ 10' COCATED S: MALE APPROVED 'FROM FORME AS LOC. #2 DECON SAMPLEMA E O FROM FORME AS LOC. #2 DECON SAMPLEMA E O FROM FORME AS LOC. #2 DECON SAMPLEMA E O SEATTIE 10 IS BREAK (NON GELLARLE) (HOW INS LEFT FOR OFFFICE TO PETUNA FFEED SQ ING AT COMPEND OF PERSONAL EQUERANCE 10 IS BREAK (NON GELLARLE) (HOW INS LEFT FOR OFFFICE TO PETUNA FFEED SQ ING AT CANTHERED (A TOFFFICE TO PETUNA FFEED SQ ING AT CANTHERED (SATTANE FROM FORFFICE) (CORFER 1300 AT CANTHERED STORE KENTEL IRON OFFFICE		DE	
0615 LEFT FOR WASSEN WEATTON STATE (FROM SEATTICE) 0700 ON SETE W/ NEW BAUTON / P. Set 4 MATCHED UP SAMPLER LOCATEON ON OTHER LEVE OF GAM. - NO VISION SETP POTOTS / LOW TIDE AT 84M ATTEMPTED RETRIEVAL TO MULTIPLE LOCATIONS : - TIDEATTON 1: MILE SAMPLER W/ APPROX SCREETING FORENTLE OF CLOSEN TO BACK CHANNER, SOFT / IN GRADS (FROM WELD) - TOCATTON 2: MILE SAMPLER W/ AGA AT BOTTOM OF SCREETING FORENTLE CLOSEN TO BACK CHANNER, SOFT / LANGER AS LOC. #2, WET BUT - LOCATTON 3: SOLTATS PUSH POTOT, SAME ANDER AS LOC. #2, WET BUT - LOCATTON 3: SOLTATS PUSH POTOT, SAME ANDER AS LOC. #2, WET BUT - LOCATTON 3: SOLTATS PUSH POTOT, SAME ANDER AS LOC. #2, WET BUT - LOCATTON 3: SOLTATS PUSH POTOT, SAME ANDER AS LOC. #2, WET BUT - LOCATTON 3: MILE, APPROP 10' FROM FONCE, PETUSAL @ 15'' - LOCATTON 5': MILE, APPROP 10' FROM FONCE, PETUSAL @ 16'' - LOCATTON S': MILE, APPROP 10' FROM FONCE, PETUSAL @ 16'' - LOCATTON S': MILE, APPROP 10' FROM FONCE, PETUSAL @ 16'' - LOCATTON S': MILE, APPROP 10' FROM FONCE, PETUSAL @ 1.6' 0 545 SPOKE W/ SAMPLENA EQUEPTION - DE CON SAMPLENA EQU	WEATHER:	WIND FROM: N NE E SE S SW W	NW LIGHT MEDIUM HEAVY ? TEMPERATURE: (٢) 55-60 °C
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ATTOMPTED RETRIEVAL For MULTIPLE LOCATIONS: TROCATION 1: Mille SAMPLER W/ APPARX SCREENING FORTENISE OF W 2'BGS (DRY), ~30'DOWN GERDEENT FOR GRASS "(FROM WEW) - ELOCATION 2): MILE SAMPLER 4'BGS AT BOTTOM & SCREENING FORTE CLOSOR TO BACK CHANNER, SOFT (CLAYEY + DRY (AD REC) ~40'DOWN FROM - LOCATION 3): SOLFARST PUSH POTT SAME AREA AS LOC. #2, WET BUT NO GUS RECOVERY - LOCATION Y: MHE, APPROP 10'FROM FONCE, REFUSAL @ 16" - LOCATION S: MHE, APPROP 10'FROM FONCE, REFUSAL @ 16" - COCATION S: MHE, APPROP 10'FROM FONCE, REFUSAL @ 16" - COCATION S: MHE, APPROP 10'FROM FONCE, REFUSAL @ 16" - COCATION S: MHE, APPROP 10'FROM FONCE, REFUSAL @ 16" - COCATION S: MHE, APPROP 10'FROM FONCE, REFUSAL @ 165 0 \$45 Spoke W/ SANAH ABOLY (ACK OF RECOVER) - DE CON SAMPLENZ EQUERDMENT 1015 BREAM (NON BOLLARIE) (HOM - 1115 LEFT FON OFFERE TO PETUNA FORM EQ & SCAEDURE COURTER - 100 AT OFFERE TO PETUNA FORM & COURTER - 100 AT OFFERE TO PETUNA FORM & COURTER - 100 AT OFFERE TO PETUNA FORM & COURTER - 1300 AT GNTARPHENE TO REAL HEAVEN DROP OFFE			
- Thouthow 1: Mitte Sampler w/ Approx SCREENING FUTURE of W 2'Bas (DRY), ~30' DOWN GRADDONT /FUS apars (FROM WOW) - TOCATTON 2: MITE SAMPLER 4' 393 AT BOTTOM of SCREENING FUTURE CLOSEN TO BACK CHANNEZ, SOFT (CLAYEY + DRY (NO REC) ~40' DOWN FROM - LOCATTON 3): SOUTHEST PUSH POTNT, SAME ANOTH AS LOC. #2, WET BUT NO GW RECOVERY - LOCATTON 4 : MITE, APPROX 20' FROM FONCE, REFUSAL @ 16" - LOCATTON 4 : MITE, APPROX 10' FROM FONCE, REFUSAL @ 16' - COCATTON 57: MITE, APPROX 10' FROM FONCE, REFUSAL @ 16' - COCATTON 57: MITE, APPROX 10' FROM FONCE, REFUSAL @ 16' - COCATTON 57: MITE, APPROX 10' FROM FONCE PETUSAL @ 16' - COCATTON 57: MITE, APPROX 10' FROM FONCE PETUSAL @ 16' - COCATTON 57: MITE, APPROX 10' FROM FONCE PETUSAL @ 16' - COCATTON 57: MITE, APPROX 10' FROM FONCE PETUSAL @ 16' - COCATTON 57: MITE, APPROX 10' FROM FONCE PETUSAL @ 16' - COCATTON 57: MITE, APPROX 10' FROM FONCE PETUSAL @ 16' - COCATTON 57: MITE, APPROX 10' FROM FONCE PETUSAL @ 16' - COCATTON 57: MITE, APPROX 10' FROM FORMER PETUSAL @ 16' - COCATTON 57: MITE, APPROX 10' FROM FORMER PETUSAL OF DECOMMAN - DECOM SAMPLETING EQUIPMENT - DECOM SAMPLETING EQUIPMENT - DECOM SAMPLETING EQUIPMENT - 10 10 DAUDPORD OF PORTSONAL EQUIPMENT - 10 15 - BREAKL (NON BELLARLE) (HOM - 1115 - LEFT FON OFFFICE TO PETUNAL FFORM 50 - HIMO AT OFFFICE TO PETUNAL FFORM EQ F SCHEDULE COUNTING - 1300 AT GUIDALES THE WEAK HEATTL PROP OFFFICE - 1300 AT GUIDALES THERE HEATT PROP OFFFICE - COUNTERPRESE THERE HEATTL PROP OFFFICE		- NO VISIME SEEP POTNTS / LOW	TIDE AT Stm
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- COCATTON 2): MILE SAMPLINE 4 'BGS AT BOTTOM of SUCCENTRY & FARTH CLOSOR TO BACKCHANNER, SOFT (CLAYEY + DRY (NO REC) ~40'DUNN FROM - COCATTON 3): SOLTATST PUSH POTNT, SAME AREA AS LOC. #2, WET BUT NO GW RECORMY - COCATTON 4): MILE, APPROP 20' FROM FORCE, REFUSAL @ 15" - COCATTON 5): MILE, APPROP 10' FROM FORCE, REFUSAL @ 105' - COCATTON 5): MILE, APPROP 10' FROM FORCE REFUSAL @ 105' 0 \$45 SPOKE W/ SAMALL ABOUT LACK OF RECOVERY - DE CON SAMPLENS EQUIPMENT 6910 LEFT SETTE FOR SEATTLE 1015 BREAU (NON BOLLAGUE) (HOW - 1115 LEFT FOR OFFICE TO RETURN FFELD EQ - 1140 AT OFFICE TO RETURN FFELD EQ - 1300 AT GNTHERES THULL REMAIN PROP OFF			
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- LOCATTONY : MHE, APPROX 20' FROM FONCE, REPORT @ 18" - LOCATTON SI: MHE, APPROX 10' FROM FONCE REFUSER @ 1.0 0 845 SPOKE W/ SANALL ABOUT LACK OF RECOVERY - DECON SAMPLENZ EQUEPMENT 6910 LEFT SETTE FON SCATTLE 1010 DROPPEO OF PERSONAL EQUEPMENT 1015 - BREAK (NON BOLLAGLE) (HOW 1115 - LEFT FON OFFECE TO RETURN FREUS EQ 1140 AT OFFECE, RETURN FREUS EQ & SCALEDUE CONSER 1300 AT GNTREPRISE TURK KEMPT PROP OFF			NE ANER AS LOC. #2, WET BUT
- LOCATEDN ST: MHE, APPROD 10 FROM FONCE REFUSAL Q LOS 0 545 SPOKE W/ Stratt Alborg Utzle OF RECOVERY DECON Straptons EQUEPMENT 6910 LEFT STTE FON SCATTLE 1010 DAUPPEO OF PORSONAL EQUEPMENT 1015 - BREAK (NON BELLAGUE) (HOW 1115 - LEFT FON OFFFICE TO RETURN FROM SQ 1140 AT OFFFICE, RETURN FROM & SCALEDUE CONSER 1300 AT GNTHERISS THELL KENTEL PROP OFF			A Intl
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DECON SAMPLENS EQUEPMENT 6910 LEFT STRE FOR SEATTLE 1010 DAOPPEO OF PORSONAL EQUEPMENT 1015 - BREAU (NON BELLAGLE) (HOW 1115 - LEFT FOR OFFFICE TO PETTINN FFELS EQ 1140 AT OFFFICE, RETURN FFELS EQ & SCHEDULE CORRECT 1300 AT GNTREPHISS THERE RENTE PROP OFF			
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Appendix B Well Survey



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

LEGEND

100

TPN 5000350470

NOTES

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

MAP

OF INTX. WITH SR509 N=707135.55 E=1178450.55

N=712318.80 E=1172704.20



HORIZONTAL SCALE: 1"=100' 0 100 200

MONITORING WELL

SITE DATA

1602 MARINE VIEW DR, TACOMA WA 98422

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.

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

MONUMENT "Y" LOCATED IN CENTER OF NORTH BOUND LANE OF TAYLOR WAY APPROX. 250' NORTH

MONUMENT #180 LOCATED AT THE INTERSECTION OF LINCOLN AVE. AND TAYLOR WAY



Appendix C Laboratory Data Reports Appendix D Data Validation Report



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

heisting Rink

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

	247 pages-ADV	,												At	tach	mer	nt 1																			
	EDD Stage	e 2B	LDC #4	58:	32 (An	cho	or E	Inv	iro	nm	ent	al-S	Sea	ttle	W	A /	Po	rt o	f Ta	acc	oma	1, W	las	ser	an	d V	Vin	ter	s)						
LDC	SDG#	DATE REC'D	(3) DATE DUE		ss. \s 0.8)		-		-		-		-		-		-		-		-				-		-		-		-					
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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 Inorgan ic 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 nonconformances 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. Labora tory 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:

	Concentr		
A nalyte	CMW-4-081619	CMW400-081619	RPD
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

VALIDATION COMPLETENESS WORKSHEET

Stage 2B

LDC #: <u>45832A4a</u> **VALI** SDG #: <u>19H0241</u> Laboratory: <u>Analytical Resources, Inc.</u>

Date: <u>8|30|</u>19 Page: <u>1</u> of <u>1</u> Reviewer: <u>ATU</u> 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
<u> </u>	Sample receipt/Technical holding times	AIA	
11.	ICP/MS Tune	A	
.	Instrument Caliloration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blan ks	A	
VI.	Field Blanks	Ň	
VII.	Matrix Spike/Ma trix Spike Duplicates	\overline{N}	CS
VIII.	Duplicate sampl e analysis	N	
IX.	Serial Dilution	N	
Х.	Laboratory control samples	A	lcs
XI.	Field Duplicates	SW	(1,2)
XII.	Internal Standared (ICP-MS)	N	
XIII.	Sample Result Verification	N	
xiv	Overall Assessment of Data	A	

Note:

N = Not provided/applicable SW = See worksheet

A = Acceptable

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	S:			

LDC#: 45832A4a

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:_1__of_1__ Reviewer:_ATL___ 2nd Reviewer:_____

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

	Concentration (ug/L)			
Analyte	11	2	RPD	
Arsenic	3.22	4.38	31	

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



EDD POPULATION COMPLETENESS WORKSHEET

Anchor



	I	 ĺ	V
The LDC job number listed above was entered by	Γ'	•	
Entered from Body or Summary			

	EDD Process	Y/N	Initial	Comments/Action
I.	EDD Completeness	-	FIV	1
Ia.	- All methods present?	Y	1	
Ib.	- All samples present/match report?	4		
Ic.	- All reported analytes present?	<u> </u>		
Id.	- 10% or 100% verification of EDD?	<u> </u>	LV_	
		1		
II.	EDD Preparation/Entry	-	FM	
IIa.	- QC Level applied? (EPAStage2B or EPAStage4)	Ч		
IIb.	- Laboratory EMPC qualified results qualified (J with reason code 23)?	-		
<u>III.</u>	Reasonableness Checks	-	A FN	
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?	- 1_		
IIIg.	-Are all results marked reportable "Yes" unless rejected for overall assessment in the data validation report?	4		
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: <u>*see discrepancy sheet</u>