

March 21, 2017

Mr. Steve Teel Cleanup Project Manager Department of Ecology – Toxics Cleanup Program Southwest Regional Office

**Re:** Focused Groundwater Monitoring Results

Former Tacoma Metals Site Project No. 160420

Dear Steve:

Aspect Consulting, LLC (Aspect) has prepared this memorandum to summarize groundwater monitoring at the Former Tacoma Metals Site (Site) conducted on December 8, 2016. The groundwater monitoring was conducted to address a Washington State Department of Ecology (Ecology) comment included in Ecology's April 18, 2016, Comments on the Revised Augmented Remedial Investigation and Feasibility Report (Ecology, 2016<sup>1</sup>). The scope of groundwater monitoring was discussed and agreed to during a November 16, 2016, phone call between Aspect (Peter Bannister) and the Ecology Site Manager (Steve Teel). This memo is a record of the monitoring activities and results.

### **Methods**

The scope of groundwater monitoring included inspection, measurement of water levels and field parameters, and collection of groundwater samples from monitoring wells MW-4R, MW-5, MW-6, MW-9, MW-19, and MW-20. These monitoring wells are located along the property boundary near the Puyallup River (Figure 1). An initial Site visit was conducted on December 6, 2016, to assess well conditions with Ecology. During the Site visit, monitoring wells MW-5 and MW-6 could not be located, appearing to have been destroyed or abandoned, and were removed from the planned sampling scope. Monitoring wells MW-4R, MW-9, MW-19, and MW-20 were observed to be in satisfactory condition for sampling, including having locking monument covers and sealed well caps.

Aspect, represented by Eric Knoedler and Adam Griffin, mobilized to sample during low-tide conditions on December 8, 2016, for groundwater sampling; lower-low tide was predicted to occur at approximately 18:30 according to the NOAA tide station in Commencement Bay. Weather conditions included snow and a light breeze. At each monitoring well, the following procedures were followed:

- Water levels were measured from the top of casing to the nearest 0.01 foot.
- Dedicated tubing was installed to the approximate center of the screen.

<sup>&</sup>lt;sup>1</sup> Washington State Department of Ecology (Ecology), 2016, Comments on the *Revised Augmented Remedial Investigation and Feasibility Report*, dated September 2014, prepared by Kennedy/Jenks, Former Tacoma Metals Site, Agreed Order DE 97-5435, Facility/Site No. 1257, Cleanup Site ID No. 3910, Dated April 18, 2016.

- Each well was purged in accordance with U.S. Environmental Protection Agency (EPA) low-flow purge techniques until water quality parameters, recorded on 5-minute intervals, stabilized and turbidity was less than 25 nephelometric turbidity units (NTUs).
- Samples were collected in laboratory-supplied containers. Samples for dissolved metals analysis were collected last using an in-line, 0.45-micron filter.

Field observations and parameters were recorded on field sheets (Appendix A). Table 1 provides field observations and final field parameters summarized by well.

Samples were stored in a cooler under chain-of-custody procedures. Samples were relinquished December 9, 2016, to Friedman & Bruya, Inc., in Seattle, Washington, for laboratory analysis of the following analytes:

- total and dissolved selenium (by EPA 200.8/6020A);
- total chromium (by EPA 200.8/6020A); and
- hexavalent chromium (by EPA 7196/SM 3500 Cr B).

Analysis of hexavalent chromium was subcontracted by Friedman & Bruya to Fremont Analytical in Seattle, Washington.

### Results

The laboratory analytical results are summarized by well in Table 1. The laboratory report is included as Appendix B.

Concentrations of total and dissolved selenium in groundwater were detected from two of the four monitoring wells:

- MW-9 at 1.69 micrograms per liter (µg/L) and 2.08 µg/L, respectively; and
- MW-20 at 5.86 µg/L and 3.99 µg/L, respectively.

Concentrations of total and dissolved selenium were not detected above the method reporting limit of  $1.0 \,\mu\text{g/L}$  in groundwater samples from MW-4R or MW-19.

Concentrations of total chromium ranged from 1.48  $\mu$ g/L at MW-4R to 5.50  $\mu$ g/L at MW-20. Concentrations of hexavalent chromium in groundwater were not detected above the method reporting limit (50  $\mu$ g/L) at any of the monitoring wells sampled.

### Discussion

The selenium concentration in groundwater was less than the proposed cleanup level of 5 µg/L.

Concentrations of total chromium in groundwater were detected below the proposed cleanup level of 288  $\mu$ g/L, below the Clean Water Act criterion of 120  $\mu$ g/L (per Ecology's comments), and below the water quality standard of 50  $\mu$ g/L (per Washington Administrate Code [WAC] 173-200) at all of the monitoring wells.

The method used to detect hexavalent chromium (EPA Method 7196) has a reporting limit of 50 ug/L, which is greater than the proposed cleanup level of 10 ug/L; this method does not provide an accurate means to assess concentrations relative to cleanup levels. However, detections of total

chromium, which includes hexavalent chromium, were between 1.48 and 5.50 ug/L (Table 1), indicating that concentrations of hexavalent chromium did not exceed cleanup levels. Therefore, we recommend that Ecology consider the total chromium results for assessing groundwater conditions. Further, we recommend that future hexavalent chromium analysis use EPA Method 7199 to provide detection limits below the proposed cleanup level.

# Limitations

Work for this project was performed for the Estate of Sophie Sussman (Client), and this letter was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This letter does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

Sincerely,

# ASPECT consulting, LLC



### Peter Bannister, PE

Associate Engineer pbannister@aspectconsulting.com

Attachments: Table 1 – Groundwater Quality Data

Figure 1 – Sample Location and Affected Soil Area Map (Figure 3, Kennedy/Jenks

Consultants)

Appendix A – Groundwater Sampling Records

Appendix B – Laboratory Reports

cc: Loren Dunn, Riddell Williams

# **Table 1 - Groundwater Quality Data**

Project No. 160420, Former Tacoma Metals Site, Tacoma, Washington

### **Field Observations**

Well ID	Sample Date Time	Sample Tube Intake Depth	Static Depth to Water
		ft bTOC	ft bTOC
MW-4R	12/8/16 19:25	19	9.65
MW-9	12/8/16 19:55	17.5	12.07
MW-19	12/8/16 18:50	20	8.54
MW-20	12/8/16 18:10	25	8.76

### **Field Parameters**

Well ID	Sample Date Time	Temperature	Specific Conductivity	Dissolved Oxygen	рН	Oxidation- Reduction Potential	Turbidity
		°C	μS/cm	mg/L		mV	NTU
MW-4R	12/8/16 19:25	13.6	200.2	0.31	5.95	29.8	40.1
MW-9	12/8/16 19:55	12.7	1143	0.2	6.53	1	23.7
MW-19	12/8/16 18:50	13.2	297.6	0.23	6.19	-4.9	5.71
MW-20	12/8/16 18:10	12.8	2250	0.32	7.39	-26.5	9.15

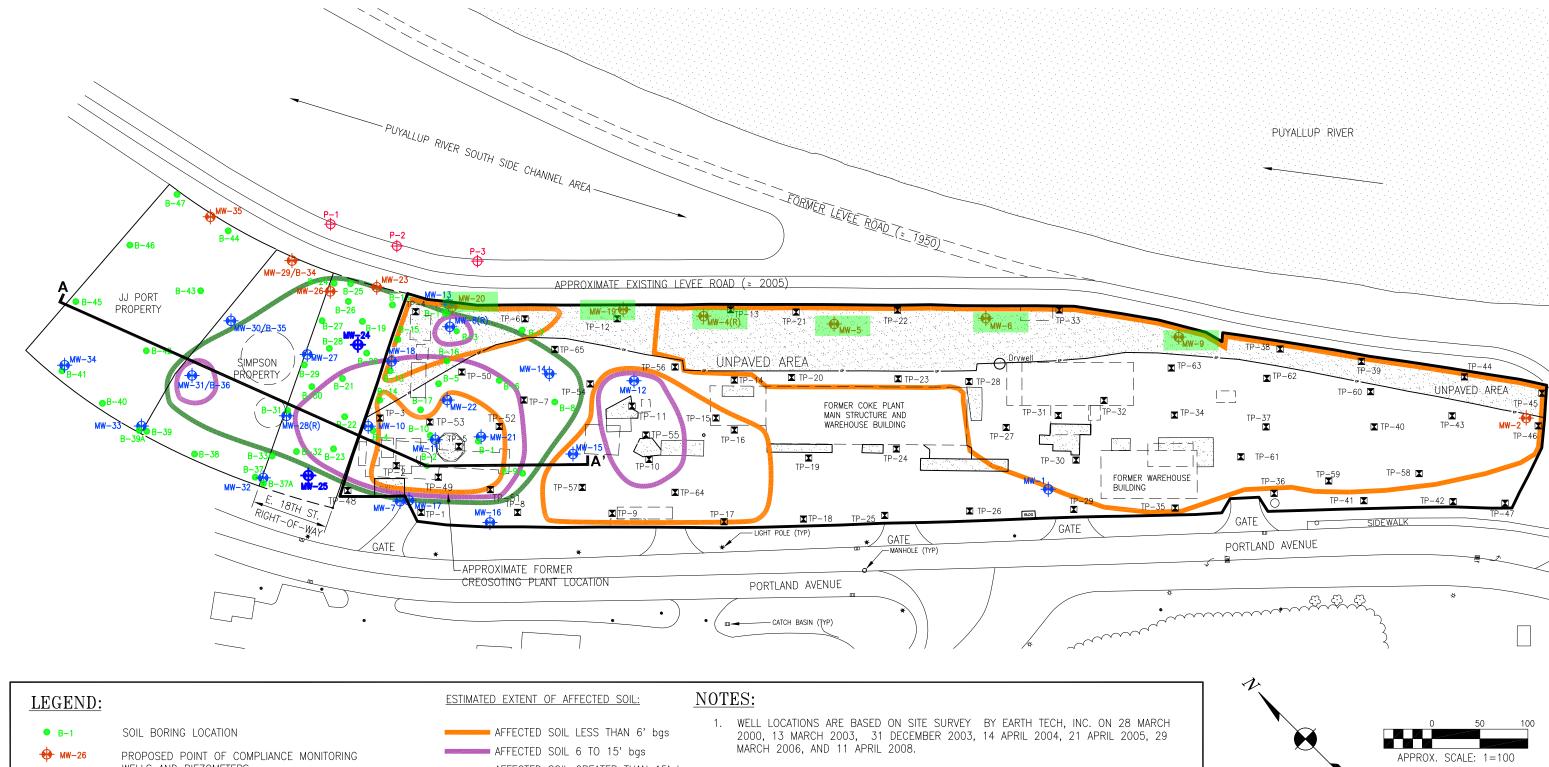
**Laboratory Analytical Results** 

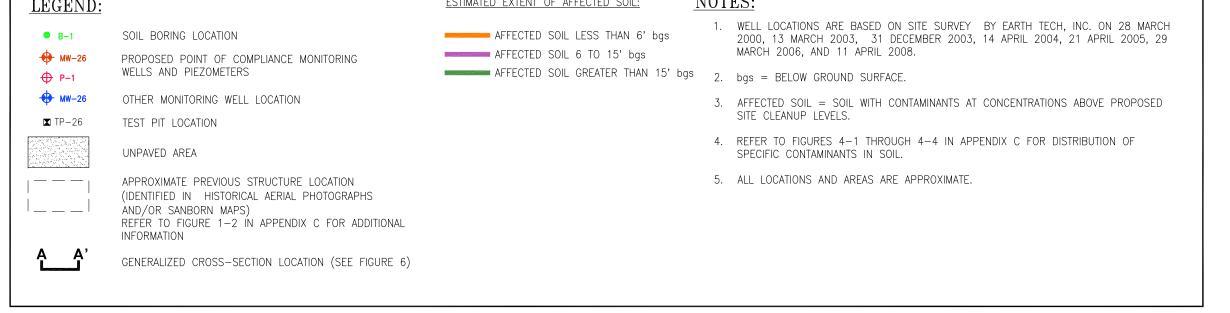
Well ID	Sample Date Time	Total Chromium µg/L	Hexavalent Chromium µg/L	Total Selenium µg/L	Dissolved Selenium µg/L
MW-4R	12/8/16 19:25	1.48	<50	<1.0	<1.0
MW-9	12/8/16 19:55	1.97	<50	1.69	2.08
MW-19	12/8/16 18:50	3.74	<50	<1.0	<1.0
MW-20	12/8/16 18:10	5.50	<50	5.86	3.99
-	Cleanup Level µg/L)	288	10	5	5

### Notes

Units: ft bTOC = feet below top of casing; C = degrees Celcius; mg/L = micrograms/Liter; mV = millivolts; NTU =

nephthalometric turbidity units;  $\mu$ g/L = micrograms/Liter **BOLD** values exceed Proposed Cleanup Levels provided in the Revised Augemented Remedial Investigation and Feasibilty Study Report - Former Tacoma Metals Site (Kennedy/Jenks, 2014).







### Kennedy/Jenks Consultants

FORMER TACOMA METALS FACILITY TACOMA, WA

> **SAMPLE LOCATION AND** AFFECTED SOIL AREA MAP

996098.00\2013 RI UPDATE\FIG\_03

FIGURE 3

# **APPENDIX A**

**Groundwater Sampling Records** 



GROUND	WATER S	AMPLING RI	CORD			WELL NUMBER: MW-20 Page: \ of (					
Project Nan	ne:	Tacoma Metals				Project Number: 160420					
		ENK/ACG				Starting Wate Casing Stick Total Depth	er Level (ft ] up (ft): (ft TOC):	FOC): 4	.76'		
		)C)				Casing Diam					
	Interval (ft. T	100 17-11-11-11-11-11-11-11-11-11-11-11-11-1		_			10				
	ımes: 3/4" =	(ft Water) = 0.02 gpf = 0.09 Lpf	2" = 0.16 gp	of 4"		6" = 1.47	gpf		Sample Into	ake Depth (ft TOC): 24 25'	
PURGING		REMENTS	2 0.02 25		2.10 251	0 0.00	-р.				
Criteria:		Typical 0.1-0.5 Lpm	Stable and minimal	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	14/-4	Temp.	Specific Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	рН	Eh ORP (mv)	Turbidity (NTU)	Comments	
1755	(gui oi L)	100	(it)	12.1	1991	1.37	7.39	1096		Start purge @ 1752	
1757			9.18								
(800		100	9.21	12.6	2009	0.55	7.44	55.9	9.15	PETRO-LIKE GADE	
1405			9.23	12.9	2156	0.34	7.41				
(810			9.23	12.8	2250	0.32	1.39	-26.5			
			1					5.74	# 15 Table		
			1000								
1175											
										Stop purge @ 15 13	
Total Calla	na Dunnadi	1.5	<b>L</b>			Total Casino	Volumos F	Somoved:		Stop purge @ ( 6	
	ns Purged:		9.23'					0	.23 AL		
	ater Level (ft		4.23			Ending Tota	I Depth (ft T	OC):			
SAMPLE	INVENTO	ORY					Anno	arance			
Time	Volume	Bottle Type		Quantity	Filtration	Preservation		Turbidity & Sediment	MU	Remarks U -20-120816	
1815	250 mL	Poly		1	n/a	n/a			Cr6+		
1815	250 mL	Poly		1	n/a	HNO3			Total Cr &	Total Se	
1815	250 mL	Poly		1	у	HNO3			Dissolved	Se	
METHOI Sampling F		ith IDs:			VST	1101016	63(4	57100			
		Peristaltic pum	E TOTAL	11					nd water + [	Dedicated tubing	
0 0		Water:									
Observation	nis/Contimen	ts:									
-	-1-1-1-1	-la\D	00.400.0	10	0	Marie Control					
	rs\eknoedler\De	sktop\ProjectDocs\1	60420 Sussman	n\Groundwater		<u> </u>	4	7.52.4			



GROUNE	WATER S	SAMPLING R	ECORD			WELL NUMBER: MW-19 Page: of 1					
		Tacoma Metals				Project Numl	ber:	160420			
Date: Developed	t 2/8/	ENK AC	6			Starting Water Level (ft TOC): 5, 5 4  Casing Stickup (ft):					
	Point of Well		TOC			Total Depth (ft TOC):					
	nterval (ft. TC Interval (ft. T					Casing Diam	eter (inches	s) <u>:</u>	2		
		(ft Water)		(1 = 6.)/-		(1.)/1)					
Casing volu	ımes: 3/4" =	= 0.02 gpf = 0.09 Lpf	2'' = 0.16 gp	of 4"	= 0.65 gpf	6" = 1.47			Sample Int	ake Depth (ft TOC): ~~	
PURGING		REMENTS									
Criteria:		Typical 0.1-0.5 Lpm	Stable and minimal	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)		Temp.	Specific Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	рН	Eh ORP (mv)	Turbidity (NTU)	Comments	
1835	(34, 5, 2)	250	8.54	12.3	515.2	0.49	6.42	-		Start purge @	
1840		S 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	9.09	13.1	312.2	0.31	6.31		•	JUIGHT PETER DOOR	
1845		And the second	9.14	13.1	297.7	0.26		-11.6	5,7(	75 77.100	
1980			9.19	13.2			6.19				
10			4000	1,7,0			8,11	-4.1			
				A1 3							
			2- 1, 1, 2, 2, 3, 1								
				V 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1							
						an (%) 144					
										Stop purge @ \\$50	
otal Gallor	ns Purged:					Total Casing	Volumes R	emoved:			
nding Wat	er Level (ft T	OC):				Ending Total	Depth (ft To	OC).			
	INVENTO						Doput (it it				
Time	Volume	Bottle Type		Quantity	Filtration	Preservation	Appea	Turbidity &	0.00	Remarks 2-19-120816	
850	250 mL	Poly		1	n/a	n/a		Sediment		17 100010	
950	250 mL	Poly		1	n/a	HNO3			Cr6+	F-1-10-	
1850	250 mL	Poly		1	у	HNO3			Total Cr &		
10"	2002	1 3.9	7		у	111403			Dissolved S	Se	
7 S											
METHOD											
ampling E	quipment wit	h IDs:			YSI	110101	6636	YELL	ous)		
		Peristaltic pump								edicated tubing	
		Nater:		7			Tea may				
								1-77			
heonietia	10/Came										



GROUNE	WATER S	SAMPLING R	ECORD			WELL NUMBER: MW−4(R) Page: of					
Project Nar	ne:	Tacoma Metals				Project Numl	ber:	160420			
Developed Measuring I Screened Ir	by: Point of Well nterval (ft. TC	ENK   & C G   C C   C C C C C C C C C C C C C C	TOC			Starting Wate Casing Stick Total Depth ( Casing Diam	up (ft): (ft TOC <u>):</u>				
Casing Volu Casing volu	ume umes: 3/4" =	(ft Water = 0.02 gpf = 0.09 Lpf	) x 2" = 0.16 gp	(Lpfv)(g	= 0.65 gpf	6" = 1.47			Sample Int	take Depth (ft TOC):	
		REMENTS									
Criteria:		Typical 0.1-0.5 Lpm	Stable and minimal	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	Water Level (ft)	Temp.	Specific Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	рН	Eh ORP (mv)	Turbidity (NTU)	Comments	
1900			9.65	12.9	204.0		5.81	15.5		Start purge @	
1910				13.1	199.0	0.39		20.0			
1915			10.95	15.1	197.8	6.33	5A8	24.1			
	ns Purged:		11.15	13.6	200.23	Total Casing		emoved:		Stop purge @ \925	
	ter Level (ft T	OC):				Ending Total	Depth (ft To	OC):			
Time	Volume	Bottle Type		Quantity	Filtration	Preservation	Appea	arance		Remarks	
							Color	Turbidity & Sediment	Mu	0-4(R)-120816	
1925	250 mL	Poly	17.00	1	n/a	n/a			Cr6+		
1925	250 mL	Poly		1	n/a	HNO3			Total Cr &	Total Se	
0123	250 mL	Poly		1	У	HNO3			Dissolved S	Se	
METHOD		h IDs:			Y5I					Dedicated tubing	



GROUN	DWATER S	SAMPLING R	ECORD			WELL NUMBER: MW-9 Page: of					
		Tacoma Metals				Project Num	ber <u>:</u>	160420	)		
Date:	12/4/14	ENK ACE				Starting War	ter Level (ft	TOC): 17	-07		
Developed	by:	ENK ACE	) 			Casing Stick	cup (ft):				
		: DC)				Total Depth Casing Dian					
		OC)				Casing Dian	neter (interies	3)			
Casing Vo	lume	(ft Water)	X	(Lpfv)(	apf) =	(L)(gal)					
Casing vol	umes: 3/4" =	= 0.02 gpf = 0.09 Lpf	2" = 0.16 g	pf 4"	= 0.65 gpf	6" = 1.47	7 gpf		Sample Int	ake Depth (ft TOC):	
PURGIN		REMENTS						N.			
Criteria:		Typical 0.1-0.5 Lpm	Stable and minimal	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Cumul. Volume (gal or L)	Purge Rate (No. 1) (gpm or Lpm)	Water ↓ Level  (ft)	Temp.	Specific Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	pН	Eh ORP (mv)	Turbidity (NTU)	Comments	
1940		250	12.07	9.0	1052	1.20	5-97	69,2		Start purge @ 194	
1945			12.09	12.6	1224	0.33	6.33	23.0	26.2		
1950			12.10		1184	0.28	6.41	3.9	35.5		
1955				12.7	1143	6.20	6.53	1.0	23.7		
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				ļ							
				<u> </u>			<u> </u>			Stop purge @	
Total Gallo	ns Purged:				_	Total Casing	Volumes R	emoved:		-	
Ending Wa	ter Level (ft T	OC):				Ending Total	Depth (ft To	OC):		_	
	INVENTO							,			
7 11111							Appea	arance			
Time	Volume	Bottle Type		Quantity		Preservation	Color	Turbidity & Sediment	Mw-	Remarks 9-120816	
1955	250 mL	Poly		1	n/a	n/a			Cr6+		
	250 mL	Poly		1	n/a	HNO3			Total Cr &	Total Se	
1955	250 mL	Poly		1	У	HNO3			Dissolved S	Se	
1955	230 IIIL			I							
1, 15	230 IIIL						<del></del>				
1, 15	230 IIIL									ш.	
1, 15	230 1112	·									
1955					:						
METHOD	os	h IDe:			VKT 1	INCOL	101-2/	V.21.	24.0		
METHOD Sampling E	DS equipment with	h IDs:									
METHOE Sampling Eq	DS equipment with	Peristaltic pump								edicated tubing	
METHOD Sampling Eq	DS equipment with									edicated tubing	
METHOE Sampling E Purging Eq Disposal of	OS Equipment with uipment: Discharged \	Peristaltic pump	Drum on sit	e	-	Decon Equi	pment:			edicated tubing	

# **APPENDIX B**

**Laboratory Reports** 

### **ENVIRONMENTAL CHEMISTS**

James E. Bruya, Ph.D. Yelena Aravkina, M.S. Michael Erdahl, B.S. Arina Podnozova, B.S. Eric Young, B.S. 3012 16th Avenue West Seattle, WA 98119-2029 (206) 285-8282 fbi@isomedia.com www.friedmanandbruya.com

December 20, 2016

Adam Griffin, Project Manager Aspect Consulting, LLC 350 Madison Ave. N. Bainbridge Island, WA 98110-1810

Dear Mr Griffin:

Included are the results from the testing of material submitted on December 9, 2016 from the Tacoma Metals 160420, F&BI 612153 project. There are 14 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl Project Manager

Enclosures

c: data@aspect consulting.com

ASP1220R.DOC

### **ENVIRONMENTAL CHEMISTS**

# CASE NARRATIVE

This case narrative encompasses samples received on December 9, 2016 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC Tacoma Metals 160420, F&BI 612153 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	Aspect Consulting, LLC
612153 -01	MW-20-120816
612153 -02	MW-19-120816
612153 -03	MW-4(R)-120816
612153 -04	MW-9-120816

The samples were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

All quality control requirements were acceptable.

# **ENVIRONMENTAL CHEMISTS**

# Analysis For Dissolved Metals By EPA Method 200.8

Client ID: MW-20-120816 Client: Aspect Consulting, LLC

Date Received: 12/09/16 Project: Tacoma Metals 160420, F&BI 612153

 Date Extracted:
 12/15/16
 Lab ID:
 612153-01

 Date Analyzed:
 12/16/16
 Data File:
 612153-01.140

 Matrix:
 Water
 Instrument:
 ICPMS2

Units: ug/L (ppb) Operator: SP

Concentration

Analyte: ug/L (ppb)

Selenium 3.99

# **ENVIRONMENTAL CHEMISTS**

# Analysis For Dissolved Metals By EPA Method 200.8

Client ID: MW-19-120816 Client: Aspect Consulting, LLC

Date Received: 12/09/16 Project: Tacoma Metals 160420, F&BI 612153

 Date Extracted:
 12/15/16
 Lab ID:
 612153-02

 Date Analyzed:
 12/16/16
 Data File:
 612153-02.141

 Matrix:
 Water
 Instrument:
 ICPMS2

Units: ug/L (ppb) Operator: SP

Concentration

Analyte: ug/L (ppb)

Selenium <1

# **ENVIRONMENTAL CHEMISTS**

# Analysis For Dissolved Metals By EPA Method 200.8

Client ID: MW-4(R)-120816 Client: Aspect Consulting, LLC

Date Received: 12/09/16 Project: Tacoma Metals 160420, F&BI 612153

 Date Extracted:
 12/15/16
 Lab ID:
 612153-03

 Date Analyzed:
 12/16/16
 Data File:
 612153-03.142

 Matrix:
 Water
 Instrument:
 ICPMS2

Units: ug/L (ppb) Operator: SP

Concentration

Analyte: ug/L (ppb)

Selenium <1

# **ENVIRONMENTAL CHEMISTS**

# Analysis For Dissolved Metals By EPA Method 200.8

Client ID: MW-9-120816 Client: Aspect Consulting, LLC

Date Received: 12/09/16 Project: Tacoma Metals 160420, F&BI 612153

 Date Extracted:
 12/15/16
 Lab ID:
 612153-04

 Date Analyzed:
 12/16/16
 Data File:
 612153-04.143

 Matrix:
 Water
 Instrument:
 ICPMS2

Units: ug/L (ppb) Operator: SP

Concentration

Analyte: ug/L (ppb)

Selenium 2.08

# **ENVIRONMENTAL CHEMISTS**

# Analysis For Dissolved Metals By EPA Method 200.8

Client ID: Method Blank Client: Aspect Consulting, LLC

Date Received: Not Applicable Project: Tacoma Metals 160420, F&BI 612153

Date Extracted: 12/15/16 Lab ID: I6-827 mb
Date Analyzed: 12/16/16 Data File: I6-827 mb.088
Matrix: Water Instrument: ICPMS2

Units: ug/L (ppb) Operator: SP

Concentration

Analyte: ug/L (ppb)

Selenium <1

# **ENVIRONMENTAL CHEMISTS**

# Analysis For Total Metals By EPA Method 200.8

Client ID: MW-20-120816 Client: Aspect Consulting, LLC

Date Received: 12/09/16 Project: Tacoma Metals 160420, F&BI 612153

 Date Extracted:
 12/14/16
 Lab ID:
 612153-01

 Date Analyzed:
 12/14/16
 Data File:
 612153-01.109

 Matrix:
 Water
 Instrument:
 ICPMS2

Units: ug/L (ppb) Operator: SP

Concentration

Analyte: ug/L (ppb)

Chromium 5.50 Selenium 5.86

# **ENVIRONMENTAL CHEMISTS**

# Analysis For Total Metals By EPA Method 200.8

Client ID: MW-19-120816 Client: Aspect Consulting, LLC

Date Received: 12/09/16 Project: Tacoma Metals 160420, F&BI 612153

Date Extracted:12/14/16Lab ID:612153-02Date Analyzed:12/14/16Data File:612153-02.110Matrix:WaterInstrument:ICPMS2

Units: ug/L (ppb) Operator: SP

Concentration

Analyte: ug/L (ppb)

Chromium 3.74 Selenium <1

# **ENVIRONMENTAL CHEMISTS**

# Analysis For Total Metals By EPA Method 200.8

Client ID: MW-4(R)-120816 Client: Aspect Consulting, LLC

Date Received: 12/09/16 Project: Tacoma Metals 160420, F&BI 612153

Lab ID: 612153-03 Date Extracted: 12/14/16 Date Analyzed: 12/14/16 Data File: 612153-03.111 Matrix: Water Instrument: ICPMS2 ug/L (ppb) Units: Operator: SP

Concentration

Analyte: ug/L (ppb)

Chromium 1.48 Selenium <1

# **ENVIRONMENTAL CHEMISTS**

# Analysis For Total Metals By EPA Method 200.8

Client ID: MW-9-120816 Client: Aspect Consulting, LLC

Date Received: 12/09/16 Project: Tacoma Metals 160420, F&BI 612153

 Date Extracted:
 12/14/16
 Lab ID:
 612153-04

 Date Analyzed:
 12/14/16
 Data File:
 612153-04.112

 Matrix:
 Water
 Instrument:
 ICPMS2

Units: ug/L (ppb) Operator: SP

Concentration

Analyte: ug/L (ppb)

Chromium 1.97 Selenium 1.69

# **ENVIRONMENTAL CHEMISTS**

# Analysis For Total Metals By EPA Method 200.8

Client ID: Method Blank Client: Aspect Consulting, LLC

Date Received: Not Applicable Project: Tacoma Metals 160420, F&BI 612153

Date Extracted:12/14/16Lab ID:I6-822 mbDate Analyzed:12/14/16Data File:I6-822 mb.054Matrix:WaterInstrument:ICPMS2

Units: ug/L (ppb) Operator: SP

Concentration

Analyte: ug/L (ppb)

Chromium <1 Selenium <1

# **ENVIRONMENTAL CHEMISTS**

Date of Report: 12/20/16 Date Received: 12/09/16

Project: Tacoma Metals 160420, F&BI 612153

# QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 200.8

Laboratory Code: 612030-01 (Matrix Spike)

				Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	Result	MS	MSD	Criteria	(Limit 20)
Selenium	ug/L (ppb)	5	<1	105	108	70-130	3

Laboratory Code: Laboratory Control Sample

			Percent	
	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Selenium	ug/L (ppb)	5	108	85-115

# **ENVIRONMENTAL CHEMISTS**

Date of Report: 12/20/16 Date Received: 12/09/16

Project: Tacoma Metals 160420, F&BI 612153

# QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 612125-01 (Matrix Spike)

				Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	Result	MS	MSD	Criteria	(Limit 20)
Chromium	ug/L (ppb)	20	<1	102	98	70-130	4
Selenium	ug/L (ppb)	5	<1	113	109	70-130	4

Laboratory Code: Laboratory Control Sample

			Percent	
	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Chromium	ug/L (ppb)	20	97	85-115
Selenium	ug/L (ppb)	5	92	85-115

### **ENVIRONMENTAL CHEMISTS**

# **Data Qualifiers & Definitions**

- a The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.
- b The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.
- ca The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.
- c The presence of the analyte may be due to carryover from previous sample injections.
- cf The sample was centrifuged prior to analysis.
- d The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.
- dv Insufficient sample volume was available to achieve normal reporting limits.
- f The sample was laboratory filtered prior to analysis.
- fb The analyte was detected in the method blank.
- fc The compound is a common laboratory and field contaminant.
- $hr\ -\ The\ sample\ and\ duplicate\ were\ reextracted\ and\ reanalyzed.\ RPD\ results\ were\ still\ outside\ of\ control\ limits.\ Variability\ is\ attributed\ to\ sample\ inhomogeneity.$
- hs Headspace was present in the container used for analysis.
- ht The analysis was performed outside the method or client-specified holding time requirement.
- ip Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.
- j The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.
- $\boldsymbol{J}$  The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.
- jl The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.
- js The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- lc The presence of the analyte is likely due to laboratory contamination.
- L The reported concentration was generated from a library search.
- nm The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.
- pc The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.
- $\mbox{\it ve}$  The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.
- vo The value reported fell outside the control limits established for this analyte.
- x The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Friedman & Bruya Michael Erdahl 3012 16th Ave. W. Seattle, WA 98119

RE: 612153

Work Order Number: 1612101

December 13, 2016

### **Attention Michael Erdahl:**

Fremont Analytical, Inc. received 4 sample(s) on 12/9/2016 for the analyses presented in the following report.

### Hexavalent Chromium by EPA 7196 / SM 3500 Cr B

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

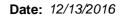
All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Mike Ridgeway Laboratory Director

DoD/ELAP Certification #L2371, ISO/IEC 17025:2005 ORELAP Certification: WA 100009-007 (NELAP Recognized)





CLIENT: Friedman & Bruya Work Order Sample Summary

**Project:** 612153 **Work Order:** 1612101

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1612101-001	MW-20-120816	12/08/2016 6:15 PM	12/09/2016 12:49 PM
1612101-002	MW-19-120816	12/08/2016 6:50 PM	12/09/2016 12:49 PM
1612101-003	MW-4(R)-120816	12/08/2016 7:25 PM	12/09/2016 12:49 PM
1612101-004	MW-9-120816	12/08/2016 7:55 PM	12/09/2016 12:49 PM



# **Case Narrative**

WO#: **1612101**Date: **12/13/2016** 

**CLIENT:** Friedman & Bruya

**Project:** 612153

### I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

### II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

### III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.



# **Qualifiers & Acronyms**

WO#: 1612101

Date Reported: 12/13/2016

### Qualifiers:

- \* Flagged value is not within established control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Reporting Limit
- R High relative percent difference observed

### Acronyms:

%Rec - Percent Recovery

**CCB - Continued Calibration Blank** 

**CCV - Continued Calibration Verification** 

DF - Dilution Factor

**HEM - Hexane Extractable Material** 

ICV - Initial Calibration Verification

LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate

MB or MBLANK - Method Blank

MDL - Method Detection Limit

MS/MSD - Matrix Spike / Matrix Spike Duplicate

PDS - Post Digestion Spike

Ref Val - Reference Value

RL - Reporting Limit

RPD - Relative Percent Difference

SD - Serial Dilution

SGT - Silica Gel Treatment

SPK - Spike

Surr - Surrogate



# **Analytical Report**

Work Order: 1612101

Date Reported: 12/13/2016

Analyst: KT

**CLIENT:** Friedman & Bruya

**Project:** 612153

**Lab ID:** 1612101-001 **Collection Date:** 12/8/2016 6:15:00 PM

Client Sample ID: MW-20-120816 Matrix: Water

Analyses Result RL Qual Units DF Date Analyzed

Hexavalent Chromium by EPA 7196 / SM 3500 Cr B Batch ID: R33326

Chromium, Hexavalent ND 0.0500 mg/L 1 12/9/2016 2:07:00 PM

**Lab ID:** 1612101-002 **Collection Date:** 12/8/2016 6:50:00 PM

Client Sample ID: MW-19-120816 Matrix: Water

Analyses Result RL Qual Units DF Date Analyzed

Hexavalent Chromium by EPA 7196 / SM 3500 Cr B Batch ID: R33326 Analyst: KT

Chromium, Hexavalent ND 0.0500 mg/L 1 12/9/2016 2:11:00 PM

**Lab ID:** 1612101-003 **Collection Date:** 12/8/2016 7:25:00 PM

Client Sample ID: MW-4(R)-120816 Matrix: Water

Analyses Result RL Qual Units DF Date Analyzed

Hexavalent Chromium by EPA 7196 / SM 3500 Cr B Batch ID: R33326 Analyst: KT

Chromium, Hexavalent ND 0.0500 mg/L 1 12/9/2016 2:15:00 PM



# **Analytical Report**

Work Order: **1612101** 

Date Reported: 12/13/2016

Analyst: KT

Batch ID: R33326

CLIENT: Friedman & Bruya

**Project:** 612153

**Lab ID:** 1612101-004 **Collection Date:** 12/8/2016 7:55:00 PM

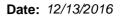
Client Sample ID: MW-9-120816 Matrix: Water

Analyses Result RL Qual Units DF Date Analyzed

Hexavalent Chromium by EPA 7196 / SM 3500 Cr B

Chromium, Hexavalent ND 0.0500 mg/L 1 12/9/2016 2:18:00 PM

Original





Work Order: 1612101

# **QC SUMMARY REPORT**

**CLIENT:** Friedman & Bruya

# Hexavalent Chromium by EPA 7196 / SM 3500 Cr B

<b>Project:</b> 612153					Hexavalent Chromium by EPA 7 196 / SW 3300 Cr
Sample ID ICV_LCS-R33326	SampType: LCS			Units: mg/L	Prep Date: 12/9/2016 RunNo: 33326
Client ID: LCSW	Batch ID: R33326				Analysis Date: 12/9/2016 SeqNo: 632311
Analyte	Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val %RPD RPDLimit Qual
Chromium, Hexavalent	0.252	0.0500	0.2500	0	101 90 110
Sample ID ICB_MB-R33326	SampType: MBLK			Units: mg/L	Prep Date: 12/9/2016 RunNo: 33326
Client ID: MBLKW	Batch ID: R33326				Analysis Date: 12/9/2016 SeqNo: 632312
Analyte	Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val %RPD RPDLimit Qual
Chromium, Hexavalent	ND	0.0500			
Sample ID <b>1612101-001ADUP</b>	SampType: <b>DUP</b>			Units: mg/L	Prep Date: 12/9/2016 RunNo: 33326
Client ID: MW-20-120816	Batch ID: R33326				Analysis Date: 12/9/2016 SeqNo: 632317
Analyte	Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val %RPD RPDLimit Qual
Chromium, Hexavalent	ND	0.0500			0 30
Sample ID <b>1612101-001AMS</b>	SampType: <b>MS</b>			Units: mg/L	Prep Date: 12/9/2016 RunNo: 33326
Client ID: MW-20-120816	Batch ID: R33326				Analysis Date: 12/9/2016 SeqNo: 632318
Analyte	Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val %RPD RPDLimit Qual
Chromium, Hexavalent	0.274	0.0500	0.2500	0.02660	98.8 65 135
Sample ID 1612101-001AMSD	SampType: <b>MSD</b>			Units: mg/L	Prep Date: 12/9/2016 RunNo: 33326
Client ID: MW-20-120816	Batch ID: R33326				Analysis Date: 12/9/2016 SeqNo: 632319
Analyte	Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit RPD Ref Val %RPD RPDLimit Qual
Chromium, Hexavalent	0.276	0.0500	0.2500	0.02660	99.7 65 135 0.2736 0.837 30

Original Page 7 of 9



# Sample Log-In Check List

С	lient Name:	FB		Work Ord	Work Order Number: 1612101							
Lo	ogged by:	Erica Silva		Date Rec	eived:	12/9/2016	16 12:49:00 PM					
Chain of Custody												
1.	Is Chain of C	ustody complete?		Yes	<b>✓</b>	No 🗌	Not Present					
2.	How was the	sample delivered?		<u>FedEx</u>	<u> </u>							
Log	ı İn											
_	Coolers are p	present?		Yes		No 🗸	NA 🗆					
0.	•		Samples	received at a	ppropria		<u>re</u>					
4.	Shipping con	tainer/cooler in good conditio		Yes		No $\square$	<del>_</del>					
5.		ls present on shipping contain		Yes		No 🗌	Not Required ✓					
6.	Was an atten	npt made to cool the samples	s?	Yes	✓	No $\square$	NA 🗆					
7.	Were all item	s received at a temperature	of >0°C to 10.0°C*	Yes	<b>✓</b>	No 🗌	NA $\square$					
8.	Sample(s) in	proper container(s)?		Yes	✓	No $\square$						
9.	Sufficient sar	mple volume for indicated tes	t(s)?	Yes	✓	No $\square$						
10.	Are samples	properly preserved?		Yes	✓	No $\square$						
11.	Was preserva	ative added to bottles?		Yes		No 🗹	NA $\square$					
12.	Is there head	space in the VOA vials?		Yes		No $\square$	NA 🗸					
13.	Did all sampl	es containers arrive in good o	condition(unbroken)	? Yes	<b>✓</b>	No $\square$						
14.	Does paperw	ork match bottle labels?		Yes	✓	No $\square$						
15.	Are matrices	correctly identified on Chain	of Custody?	Yes	<b>✓</b>	No 🗌						
		at analyses were requested?		Yes	<b>✓</b>	No $\square$						
17.	Were all hold	ling times able to be met?		Yes	✓	No $\square$						
Spe	cial Handl	ing (if applicable)										
-		otified of all discrepancies wit	h this order?	Yes		No 🗌	NA 🗸					
		Notified:		ate								
	By Who		Vi	,	☐ Pho	one Fax	In Person					
	Regardi											
	Client In	nstructions:										
19.	Additional rer	marks:										
Item	<u>Information</u>											
		Item #	Temp °C									
	Sample		4.2									

<sup>\*</sup> Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

# STODY

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						MW-9- 120816	Mh-4(R)-120816	MW-19 - 120816	MW.20 - 120816	Sample ID		Phone #(206) 285-8282	City, State, ZIP Seattle		CompanyFriedm	Send Report To Michae	
										Lab ID		Fax#	Seattle, WA 98119	3012 16th Ave W	Friedman and Bruya, Inc.	Michael Erdahl	
						<b>Χ</b> -			11/2/11	Date Sampled		(206) 283-5044	9		uya, Inc.		<u>v</u>
						1958	1925	1850	SISI	Time Sampled		5044					SUBCONTRACT SAMPLE CHAIN OF
						*			Water	Matrix			REMARKS		PROJECT NAME/NO.	SUBCONTRACTER	ACT SA
				4						# of jars		Please Email Results	KS	612153	T NAM	VTRAC	MPL
										Dioxins/Furans		Email I		3			E CH
_	_									ЕРН		Result	24			77	NIV
	_									VPH		S				Francis	
	1									Nitrate	ANAL			0		7	CUS
	_									Sulfate	ANALYSES	0		E-403	PO#		CUSTODY
	- 1										R			$\sim$	#		M

Alkalinity

TOC-9060M

Notes

X X

Seattle, WA 98119-2029 3012 16th Avenue West

Friedman & Bruya, Inc.

Relinguished by:

Michael Erdahl

Friedman and Bruya

1/19/21 DATE

65:11 TIME

COMPANY

PRINT NAME

SIGNATURE

Fax (206) 283-5044

Received by:

Relinquished by: Received by:

Ph. (206) 285-8282

