

TECHNICAL MEMORANDUM

DATE October 12, 2021

Project No. 152030402

TO Mr. Alan Noell
Washington State Department of Ecology (Ecology)

FROM Gary Zimmerman and Joseph Xi, PE

**JUNE 2021 REMEDIAL INVESTIGATION GROUNDWATER SAMPLING ACTIVITIES
RESERVE SILICA RECLAMATION SITE
FACILITY ID NO.: 2041; CLEANUP SITE NO.: 4728**

1.0 INTRODUCTION

A Remedial Investigation (RI) and Feasibility Study (FS) Work Plan (Work Plan) was prepared for the Reserve Silica Reclamation Site (Site) under Agreed Order No. DE 16052. The Work Plan was submitted to Ecology in July 2021. During the finalization of the Work Plan, Ecology approved¹ the completion of preliminary RI tasks during 2020 to support the overall RI/FS and to provide additional data in support of finalizing the Work Plan. The following preliminary RI tasks were completed in 2020:

- Conduct a frequency domain electromagnetic (EM) geophysical survey across the Lower Disposal Area (LDA) to map areas where alkaline groundwater (i.e., high pH) is present within the LDA.
- Install a new groundwater monitoring well (identified as P-14) within an area of the LDA where the indicated conductivity readings from the EM survey were the highest.
- Collect a groundwater sample from new well P-14 and analyze the sample for the chemicals of potential concern (COPCs) approved by Ecology.
- Collect a groundwater sample from an existing monitoring well (P-11) located on the west side of the Lower Haul Road, which is hydrologically downgradient of the LDA, and analyze the sample for the list of COPCs approved by Ecology.

The results of the above preliminary RI tasks completed in 2020 were presented in a technical memorandum dated January 29, 2021². The work was completed in accordance with the Sampling and Analysis Plan and Quality Assurance Project Plan, included as Appendices D and E, respectively, to the Work Plan.

This technical memorandum provides the groundwater sampling results from the June 2021 sampling of P-14 and P-11. The June 2021 results, in conjunction with the December 2020 results, provide data on potential wet-/dry-seasonal differences in groundwater quality at P-14 and P-11. The locations of P-14 and P-11 are provided in Figure 1.

¹ Washington State Department of Ecology (Ecology). 2020. Draft Remedial Investigation/Feasibility Study Work Plan (Golder Associates, June 30, 2020) comments for the following Site: Reserve Silica Reclamation. September 30.

² Golder Associates Inc. (Golder). 2021. Reserve Silica Reclamation Site – 2020 Remedial Investigation Activities, Facility ID No.: 2041; Cleanup Site No.: 4728. January 29.

2.0 GROUNDWATER SAMPLING AND ANALYTICAL RESULTS

On June 10, 2021, groundwater samples were collected from P-14. P-11 was observed to have less than 1 foot of water in the well and pumped dry during purging of the well. P-11 did not recharge with sufficient volume within 24 hours to allow sample collection.

Groundwater sampling and analyses were performed following the procedures described in the Work Plan. Samples from well P-14 were analyzed for the expanded list of COPCs: antimony, arsenic, beryllium, chromium, lead, mercury, nickel, selenium, silver, thallium, vanadium, and 2,3,7,8-substituted dioxins & furans. Laboratory analytical data has been reviewed, validated, and is suitable for use in the RI.

Table 1 presents a summary of the historical laboratory metals analytical results for the groundwater samples collected from wells P-14 and P-11. Table 2 presents the historical dioxins and furans analytical results. The analytical results indicate the following:

- During the June 2021 sampling round, antimony and arsenic were detected in groundwater samples collected from P-14 at concentrations exceeding Model Toxics Control Act (MTCA) cleanup. During the December 2020 sampling round, antimony, arsenic, and lead were detected in groundwater samples collected from both wells P-11 and P-14 at concentrations exceeding MTCA cleanup levels.
- In general, P-14 analyte concentrations appeared to be similar between the December 2020 and June 2021 sampling events, except for lead, which decreased from 18.8 micrograms per liter ($\mu\text{g/L}$) in December 2020 to 4.64 $\mu\text{g/L}$ in June 2021, a decrease of around 75%.
- Vanadium was detected in P-14 in December 2020 and June 2021, but at a reported concentration that was below the MTCA cleanup level. Vanadium was detected in P-11 in December 2020 at a reported concentration that exceeded MTCA cleanup level.
- Beryllium, chromium, mercury, silver, and thallium were not detected in P-14 in either the December 2020 or June 2021 sampling events.
- There were no dioxins or furans compounds detected above the laboratory reporting limits during either the December 2020 or the June 2021 sampling events.
- Based on the results of the sampling across the December 2020 and June 2021 rounds, antimony and vanadium will be added as COPCs for RI sampling of shallow/alluvial monitoring wells (MW-1A, -2A, -3A, -4A, -5A, -6A, -7A, -8A, -9A, -10A, P-14, P-15, P-16, P-17).

Data obtained during these remedial investigation activities will be evaluated in conjunction with the extensive amount of existing Site environmental data during the development of the RI Report.

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Attachments

Tables 1 and 2

Figure 1

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Tables

Table 1: Summary of Field Parameters and Laboratory Analytical Results for Metals

				Results					
				P-14		P-11			
Analyte	CAS Number	Units	Site PSL ¹	12/11/2020	6/10/2021	12/11/2020	6/10/2021	Percent Difference P-11:P-14 12/11/2020	
Water Levels and Elevations									
Depth to Water	-	feet BTOC	-	31.09	33.57	14.02	17.90	-	
Groundwater Elevation	-	feet NAVD88	-	742.23	739.75	725.00	721.12	-	
Screened Interval	-	feet BGS	-	40 - 50	40 - 50	14 - 19	14 - 19	-	
Field Parameter									
pH	-	pH	-	13.30	13.06	12.67	Insufficient Quantity for Sample	-	
Conductivity	-	µS/cm	-	18697	18706	6113		-	
Temperature	-	°C	-	11.6	12.9	11.6		-	
Dissolved Oxygen	-	mg/L	-	0.12	0.67	1.25		-	
Oxidation Reduction Potential	-	mV	-	-61.2	-175.2	15.9		-	
Turbidity	-	NTU	-	17.9	1.88	34.3		-	
Total Metals									
Antimony	7440-36-0	µg/L	6	147	138	201	Insufficient Quantity for Sample	37%	
Arsenic	7440-38-2	µg/L	5	270	277	1670		519%	
Beryllium	7440-41-7	µg/L	4	2	U 2	U 0.76		J	-
Chromium	7440-47-3	µg/L	50	5	U 5	U 45.1			802%
Copper ²	7440-50-8	µg/L	640	NA	NA	75.5			-
Mercury	7439-97-6	µg/L	2	0.1	U 0.1	U 0.11			-
Lead	7439-92-1	µg/L	15	18.8	4.64	138			634%
Nickel	7440-02-0	µg/L	100	36.8	43.1	112			204%
Selenium	7782-49-2	µg/L	50	11.9	9.49	6.41			-46%
Silver	7440-22-4	µg/L	80	2	U 2	U 0.35		J	-
Thallium	7440-28-0	µg/L	0.16	1	U 2	U 0.54		J	-
Vanadium	7440-62-2	µg/L	80	23.4	21.6	116			396%

Notes:

1 - Applicable Site Preliminary Screening Level (PSL) is provided in Table 5-3 of the RI Work Plan.

2 - Copper is not a contaminant of potential concern at the Site. In lieu of a Site PSL, the CUL is either the MTCA Method A CUL or the lower of (1) either the MTCA Method B Cancer or Non-Cancer CULs, (2) the Federal copper Action Level, and (3) the Washington State copper Action Level.

"U" qualifier - indicates analyte was not detected above reporting limit.

"J" qualifier - indicates analyte was not detected above reporting limit, but was estimated between method detection limit and reporting limit.

BTOC - Below Top of Casing | BGS - Below Ground Surface | MTCA - Model Toxics Control Act | GW - Groundwater | CUL - Cleanup Level | µS/cm - microsiemens per centimeter | mV - millivolts | NA - Not Analyzed | NTU - Nephelometric Turbidity Units | PSL - Preliminary Screening Level

Table 2: Summary of Laboratory Analytical Results for Dioxins and Furans

				Results (µg/L)			
				P-14			
Analyte	CAS Number	Site PSL (µg/L) ¹	Toxicity Equivalency Factor ²	12/11/2020		6/10/2021	
Dioxins/Furans							
2,3,7,8-TCDF	51207-31-9	-	0.1	9.92E-06	U	9.62E-06	U
2,3,7,8-TCDD	1746-01-6	6.70E-07	1	9.92E-06	U	9.62E-06	U
1,2,3,7,8-PeCDF	57117-41-6	-	0.03	9.92E-06	U	9.62E-06	U
2,3,4,7,8-PeCDF	57117-31-4	-	0.3	9.92E-06	U	9.62E-06	U
1,2,3,7,8-PeCDD	40321-76-4	-	1	9.92E-06	U	9.62E-06	U
1,2,3,4,7,8-HxCDF	70648-26-9	-	0.1	4.90E-07	J	9.62E-06	U
1,2,3,6,7,8-HxCDF	57117-44-9	-	0.1	9.92E-06	U	9.62E-06	U
2,3,4,6,7,8-HxCDF	60851-34-5	-	0.1	4.90E-07	J	9.62E-06	U
1,2,3,7,8,9-HxCDF	72918-21-9	-	0.1	9.92E-06	U	9.62E-06	U
1,2,3,4,7,8-HxCDD	39227-28-6	-	0.1	6.80E-07	J	9.62E-06	U
1,2,3,6,7,8-HxCDD	57653-85-7	-	0.1	9.92E-06	U	9.62E-06	U
1,2,3,7,8,9-HxCDD	19408-74-3	-	0.1	9.92E-06	U	9.62E-06	U
1,2,3,4,6,7,8-HpCDF	67562-39-4	-	0.01	9.92E-06	U	2.70E-06	J
1,2,3,4,7,8,9-HpCDF	55673-89-7	-	0.01	9.92E-06	U	9.62E-06	U
1,2,3,4,6,7,8-HpCDD	35822-46-9	-	0.01	9.92E-06	U	9.62E-06	U
OCDF	39001-02-0	-	0.0003	1.98E-05	U	1.92E-05	U
OCDD	3268-87-9	-	0.0003	4.96E-05	U	4.81E-05	U
Total Dioxin/Furan Toxicity Equivalency (TEQ)	-	6.70E-07	-	1.66E-07	-	2.70E-08	-

Notes:

1 - Applicable Site Preliminary Screening Level (PSL) is provided in Table 5-3 of the RI Work Plan.

2 - Sum of dioxin/furan concentrations calculated using Ecology's Toxicity Equivalent Factors calculation methodology and guidance. *Evaluating the Toxicity and Assessing the Carcinogenic Risk of Environmental Mixtures Using Toxicity Equivalency Factors* (Ecology 2007).

"U" qualifier - indicates analyte was not detected above reporting limit.

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MTCA - Model Toxics Control Act | GW - Groundwater | CUL - Cleanup Level

Figures

