September 11, 2019 Project No. 923-1000-005.2019

Mr. Bill Kombol
Landsburg PLP Group
31407 Highway 169
PO Box 10
Black Diamond, WA 98010

LANDSBURG MINE SITE SHORT-TERM COMPLIANCE MONITORING REPORT JUNE 2019 SAMPLING

Dear Bill,

The Compliance Monitoring Plan (CMP) (Golder 2017)[1] requires short-term compliance monitoring be conducted during the remediation to ensure that there are no adverse effects to the environment from remediation activities. The CMP states that short-term compliance monitoring will commence when the trench-backfilling begins and will continue for a period of four weeks following completion of the backfilling. To meet this requirement Golder Associates Inc. (Golder) completed short-term compliance monitoring events at the Landsburg Mine Site (the Site) starting in June 2019 and extending for four weeks following completion of the backfilling, which was completed on August 7, 2019. This letter report presents the results of the two short-term monitoring events completed in June 2019. The first event was conducted from June 11 to 13, 2019, and included collecting groundwater samples from monitoring wells LMW-2, LMW-3, LMW-4, LMW-5, LMW-6, LMW-7, LMW-8, LMW-9, LMW-10, LMW-11, LMW-12, LMW-13R, LMW-14, and LMW-15. The second event was conducted from June 25 to 26, 2019, and included measurements of groundwater quality parameters from the monitoring wells.

Figure 1 presents the locations of the monitoring wells. Figures 2A and 2B present a cross-section along the strike at the coal seam that also depicts the location of the monitoring wells. Monitoring wells LMW-2, LMW-4, LMW-10, LMW-12 and LMW-13R are completed to monitor shallow, middle, and deeper zones within the north end of the Rogers Coal Mine subsidence trench. Monitoring wells LMW-3, LMW-5, LMW-8, LMW-9, LMW-11, LMW-14 and LMW-15 are completed to monitor shallow, middle and deeper zones along the southern half of the Rogers Coal Mine. LMW-14 was installed in April 2019 as a dual-purpose south sentinel well and to provide groundwater elevation data at a location immediately south of the trench areas that will be backfilled and capped as part of the Site remedial action. Wells LMW-6 and LMW-7 monitor groundwater from the Frasier and Landsburg Coal Mines to the west and east of the Rogers Coal Mine, respectively.

[1] Golder Associates Inc. (Golder). 2017. Exhibit D of the Consent Decree – Compliance Monitoring Plan Landsburg Mine Site MTCA Remediation Project, Ravensdale, Washington. Prepared by Golder Associates Inc. June 7.

Groundwater sampling was conducted in accordance with the CMP (Golder 2017), and included the following activities:

- Measurement of static water levels at monitoring wells.
- Well purging with the dedicated pumping systems installed in each well to ensure sample representativeness.
- Measurement of field parameters including: pH, specific conductance, temperature, dissolved oxygen, oxidation-reduction potential (ORP) and turbidity.
- Collection of representative samples in appropriate containers provided by the analytical laboratory and associated analyses of groundwater samples. Groundwater samples were analyzed for volatile organic compounds (VOCs; United States Environmental Protection Agency [EPA] Method 8260C) and a total petroleum hydrocarbon (TPH) identification scan (NWTPH-HCID). Under the CMP, sample analyses for VOCs and TPH are only performed monthly during short-term compliance monitoring. The groundwater samples collected during the June 11-13, 2019 event were analyzed for VOCs and TPH.

Appendix A presents the laboratory analytical reports and the data validation report with added data qualifiers noted. Field sampling activities were documented on Sample Integrity Data Sheets (SIDS), provided in Appendix B. Tables 1A and 1B present depths to groundwater measured during the two events and calculated static water level elevations.

Following sample collection, all bottles were sealed, labeled, and placed in an iced cooler until delivery to the laboratory. Groundwater samples were transported under chain-of-custody procedures to Analytical Resources Incorporated (ARI), of Tukwila, Washington, for analyses.

The laboratory data packages underwent data validation. Items of note are provided in a validation memorandum in Appendix A. In general, data were found to be acceptable with minor qualification. Acetone was detected in several of the samples inconsistent with historical results. Investigation by laboratory indicated that some of the preserved sampling vials they provided contained acetone contamination. All acetone detections were rejected during data validation. Data qualifiers are defined, and all data qualifiers assigned under the data validation process are presented in the Appendix A data validation memorandum.

Table 2 presents the field parameter measurements and laboratory analytical results for each groundwater sample. Laboratory analyses did not detect any total petroleum hydrocarbon in any of the groundwater samples.

There were no parameters detected in groundwater above the triggers level concentrations prescribed in the CMP (Golder 2017). The only parameters detected in groundwater samples above the laboratory reporting limit during the June 11-13, 2019 sampling event were benzene, methyl ethyl ketone (MEK), carbon disulfide, 1,1-dichloroethane (1,1-DCA), ethylbenzene, and toluene.

MEK was detected in LMW-8 at a concentration of 7.63 µg/L. MEK is a common lab artefact and may be attributable to potential lab contamination. The detected concentration is significantly less than the MTCA Method B groundwater cleanup level of 4,800 µg/L.

Carbon disulfide was detected in LMW-10 (0.17 µg/L) and LMW-15 (0.85 µg/L). All detected concentrations of carbon disulfide are considerably lower than the MTCA Method A groundwater cleanup level of 800 µg/L. Carbon

disulfide has been detected at these low levels in Site groundwater in previous sampling events. The detection of carbon disulfide is attributed to being present in the coal bed material as a natural constituent.

1,1-DCA was detected in LMW-12 at a concentration of 0.3 µg/L. The detected concentration is consistent with previous concentrations of 1,1-DCA detected in LMW-12 and is significantly less than the MTCA Method B groundwater cleanup level of 7.68 µg/L.

Trace concentrations of benzene, ethylbenzene, and toluene were detected in LMW-14. All detections were at least 10 times lower than their respective MTCA Method A groundwater cleanup levels.

Table 3 presents the groundwater quality parameters (pH, specific conductance, temperature, dissolved oxygen, ORP, and turbidity) for the two events completed in June 2019 and the May 2019 event that was conducted immediately preceding the start of short-term compliance monitoring. Groundwater quality parameters do not appear to be trending significantly upwards or downwards and are within historical norms.

If you have any questions or require any additional information, please contact Gary Zimmerman at (425) 883-0777.

Sincerely,

Golder Associates Inc.

Joseph Xi
Senior Project Engineer

Gary Zimmerman
Principal

JX/GZ/sb

Attachments: Table 1A: Groundwater Elevation Data, Landsburg Mine Site, June 11-13, 2019
Table 1B: Groundwater Elevation Data, Landsburg Mine Site, June 25, 2019
Table 2: June 2019 Groundwater Analytical Results Landsburg Mine Site
Table 3: Short-Term Monitoring Groundwater Parameter Trends
Figure 1: Groundwater Monitoring Locations
Figure 2A: Cross-Section along Strike at Coal Seam, June 11-13, 2019
Figure 2B: Cross-Section along Strike at Coal Seam, June 25, 2019
Appendix A: Laboratory Analytical Reports Data Validation and Quality Assurance / Quality Control Review Memorandum and June 2019 Laboratory Analytical Report
Appendix B: Sample Integrity Data Sheets (SIDS)

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Tables

Table 1A - Groundwater Elevation Data, Landsburg Mine Site, June 11-13, 2019

	LMW-1	LMW-2	LMW-3	LMW-4[1]	LMW-5	LMW-6	LMW-7[1]	LMW-8	LMW-9	LMW-10	LMW-11	LMW-12	LMW-13R	LMW-14[1]	LMW-15
Water Depths															
Date of data collection	NC	6/13/2019	6/12/2019	6/13/2019	6/12/2019	6/12/2019	6/13/2019	6/12/2019	6/11/2019	6/11/2019	6/11/2019	6/11/2019	6/11/2019	6/11/2019	6/11/2019
Time of data collection	NC	8:41 AM	9:40 AM	9:44 AM	10:37 AM	8:32 AM	2:38 PM	1:07 PM	3:40 PM	2:15 PM	10:09 AM	12:32 PM	1:06 PM	9:04 AM	11:19 AM
Measured to Top of PVC (ft btc)	NC	7.98	12.48	9.49	14.00	27.61	209.70	4.60	99.86	0.40	157.72	10.85	11.50	160.55	151.72
Surveyed Elevation															
Top of PVC (ft asl)	765.36	617.79	656.75	619.27	658.27	632.33	771.51	646.97	743.99	618.98	802.19	625.35	625.86	805.12	796.46
Top of Monument (ft asl)	766.16	618.38	657.48	619.89	658.87	633.00	771.88	NC	NC	619.10	802.51	625.49	625.91	805.14	796.61
Ground Level (ft asl)	763.02	614.92	654.40	617.37	655.63	629.95	768.79	645.25	741.13	615.78	799.89	621.90	622.07	802.22	792.64
Corrected Water Elevation															
Using PVC elevation (ft asl)	**NA**	**609.81**	**644.27**	**609.78**	**644.27**	**604.72**	**561.81**	**642.37**	**644.13**	**618.58**	**644.47**	**614.50**	**614.36**	**644.57**	**644.74**

Notes:
[1] Data corrected to accommodate well inclination from vertical
NA = Not applicable
NC = Data not collected
ft btc = feet below top of casing
ft asl = feet above sea level

Table 1B - Groundwater Elevation Data, Landsburg Mine Site, June 25, 2019

	LMW-1	LMW-2	LMW-3	LMW-4[1]	LMW-5	LMW-6	LMW-7[1]	LMW-8	LMW-9	LMW-10	LMW-11	LMW-12	LMW-13R	LMW-14[1]	LMW-15
Water Depths															
Date of data collection	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019	6/25/2019
Time of data collection	10:01 AM	12:13 PM	11:38 AM	12:10 PM	11:29 AM	9:32 AM	8:47 AM	11:34 AM	11:02 AM	12:07 PM	10:23 AM	11:59 AM	11:57 AM	10:08 AM	10:31 AM
Measured to Top of PVC (ft btc)	143.71	7.95	12.56	9.44	14.12	31.62	209.76	4.72	99.77	0.10	157.80	11.07	11.60	160.70	151.81
Surveyed Elevation															
Top of PVC (ft asl)	765.36	617.79	656.75	619.27	658.27	632.33	771.51	646.97	743.99	618.98	802.19	625.35	625.86	805.12	796.46
Top of Monument (ft asl)	766.16	618.38	657.48	619.89	658.87	633.00	771.88	NC	NC	619.10	802.51	625.49	625.91	805.14	796.61
Ground Level (ft asl)	763.02	614.92	654.40	617.37	655.63	629.95	768.79	645.25	741.13	615.78	799.89	621.90	622.07	802.22	792.64
Corrected Water Elevation															
Using PVC elevation (ft asl)	**621.65**	**609.84**	**644.19**	**609.83**	**644.15**	**600.71**	**561.75**	**642.25**	**644.22**	**618.88**	**644.39**	**614.28**	**614.26**	**644.42**	**644.65**

Notes:
[1] Data corrected to accommodate well inclination from vertical
NA = Not applicable
NC = Data not collected
ft btc = feet below top of casing
ft asl = feet above sea level

Table 2: June 2019 Groundwater Analytical Results Landsburg Mine Site

ANALYTE	UNITS	LMW-2	LMW-3	LMW-4	LMW-4 Duplicate	LMW-5	LMW-6	LMW-7	LMW-8	LMW-9	LMW-10	LMW-11	LMW-12	LMW-13R	LMW-14	LMW-15	Equipment Blank	Field Blank	Field Blank 2
		6/13/2019	6/12/2019	6/13/2019	6/13/2019	6/12/2019	6/12/2019	6/12/2019	6/12/2019	6/11/2019	6/11/2019	6/11/2019	6/11/2019	6/11/2019	6/11/2019	6/11/2019	6/12/2019	6/11/2019	6/13/2019
Field Parameter																			
Temperature	°C	10.8	10.9	10.6	-	10.7	9.6	14.4	13.4	10.8	12.1	10.3	11.2	11.6	10.6	11.5	-	-	-
pH	stnd	6.79	7.67	6.85	-	6.82	6.75	7.23	6.70	6.94	8.63	7.18	6.74	7.36	6.60	7.51	-	-	-
Specific Conductance	uS/cm	1000	339	1003	-	807	267	513	662	745	379	573	981	956	2063	518	-	-	-
Dissolved Oxygen	mg/L	0.55	0.57	0.76	-	0.51	0.59	1.14	0.61	0.72	0.49	0.87	0.52	0.54	1.41	1.08	-	-	-
E_h	Rel mV	-122.7	-32.2	-151.8	-	-99.5	-46.4	-47.2	-100.7	-63.6	-153.7	-55.8	-76.9	-132.0	-24.5	-120.5	-	-	-
Turbidity	NTU	0.77	0.67	0.23	-	2.35	3.31	5.7	5.44	2.34	0.97	0.28	57.2	0.54	1.3	1.28	-	-	-
Volatile Organic Compounds (VOCs)																			
Acetone	ug/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10.8 R	6.27 R	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acrolein	ug/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Acrylonitrile	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**0.24**	0.2 U	0.2 U	0.2 U	0.2 U
Bromobenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Bromochloromethane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Bromoethane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Bromoform	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Bromomethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
methyl ethyl ketone	ug/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**7.63**	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
n-Butylbenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Sec-Butylbenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
tert-butylbenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Carbon Disulfide	ug/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.17**	0.1 U	0.1 U	0.1 U	0.1 U	**0.85**	0.1 U	0.1 U	0.1 U
Carbon Tetrachloride	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chlorobenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chloroethane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Chloroethyl vinyl ether	ug/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chloromethane	ug/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Chlorotoluene	ug/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
4-Chlorotoluene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Dichlorodifluoromethane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dibromo-3-Chloropropane	ug/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylene Dibromide	ug/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Dibromomethane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichlorobenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,3-Dichlorobenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,4-Dichlorobenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Trans-1,4-Dichloro-2-butene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**0.3**	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichloroethane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1-Dichloroethene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Cis-1,2-Dichloroethene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Trans-1,2-Dichloroethene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2-Dichloropropane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,3-Dichloropropane	ug/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
2,2-Dichloropropane	ug/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
1,1-Dichloropropene	ug/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Cis-1,3-Dichloropropene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Trans-1,3-Dichloropropene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Ethylbenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**0.23**	0.2 U	0.2 U	0.2 U	0.2 U
Hexachlorobutadiene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Hexanone	ug/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Iodomethane	ug/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cumene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
p-Isopropyltoluene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Methylene Chloride	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methyl isobutyl ketone	ug/L	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Naphthalene	ug/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
n-Propylbenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Styrene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2,3-Trichlorobenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2,4-Trichlorobenzene	ug/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1,2-Tetrachloroethane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1,2,2-Tetrachloroethane	ug/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Tetrachloroethene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Toluene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**1.59**	0.2 U	0.2 U	0.2 U	0.2 U

Table 2: June 2019 Groundwater Analytical Results Landsburg Mine Site

ANALYTE	UNITS	LMW-2	LMW-3	LMW-4	LMW-4 Duplicate	LMW-5	LMW-6	LMW-7	LMW-8	LMW-9	LMW-10	LMW-11	LMW-12	LMW-13R	LMW-14	LMW-15	Equipment Blank	Field Blank	Field Blank 2
1,1,1-Trichloroethane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,1,2-Trichloroethane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Trichloroethene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
CFC-113	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2,3-Trichloropropane	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,2,4-Trimethylbenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,3,5-Trimethylbenzene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Vinyl Acetate	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Vinyl Chloride	ug/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
m, p-Xylene	ug/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
o-Xylene	ug/L	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Total Xylenes	ug/L	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Hydrocarbon Identification																			
Diesel Range	mg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Gas Range	mg/L	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	NA
Lube Oil Range	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	NA	NA

Notes:
U - Analyte was not detected above the Reporting Limit (RL).
J - Analyte was detected above the Method Detection Limit (MDL) but below the RL.
R - Analytical result is unusable because certain data quality criteria were not met.

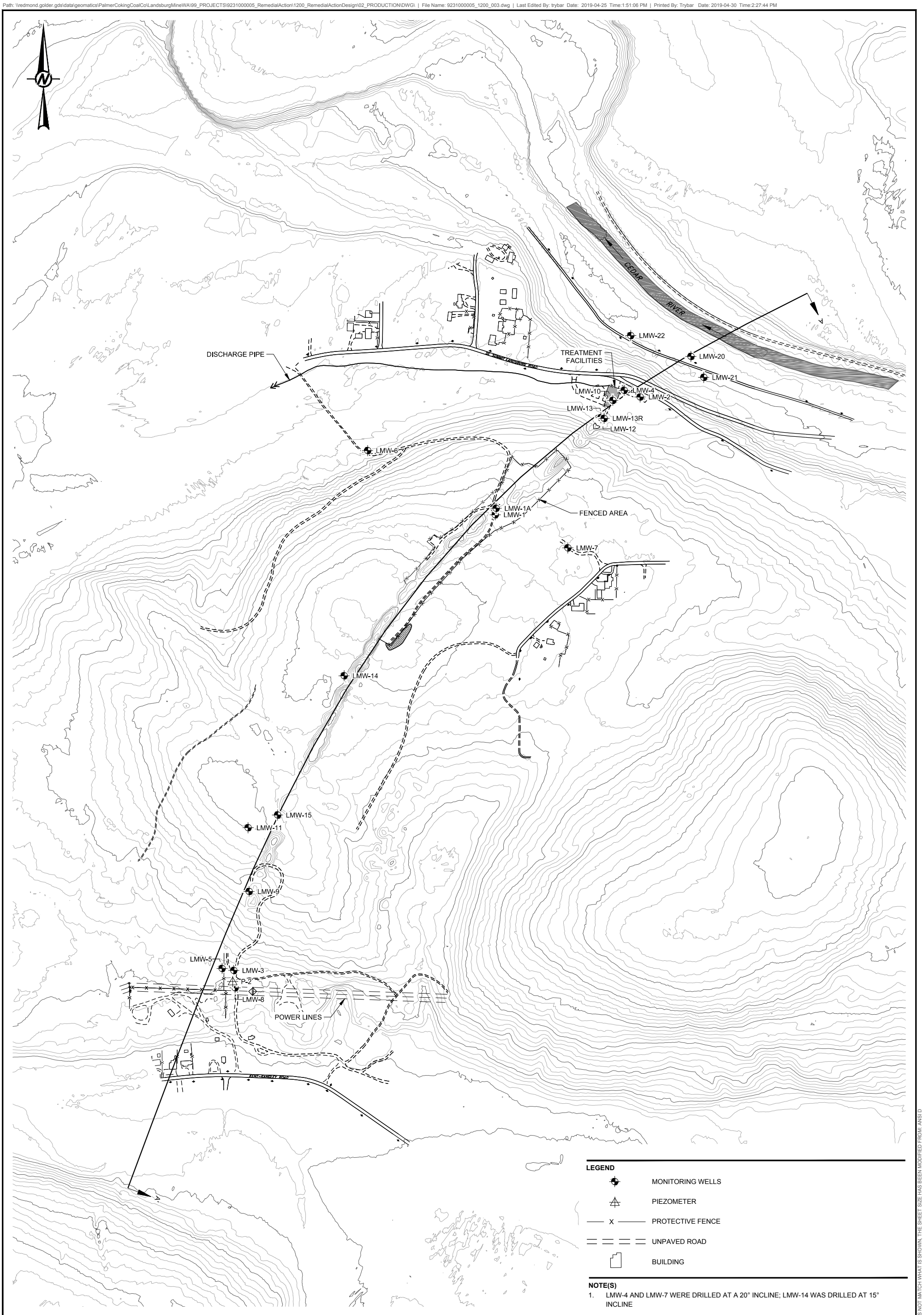
Table 3: Short-Term Groundwater Monitoring Field Parameter Measurements

Well	Date	Temperature (°C)	pH	Conductivity (uS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
LMW-2	5/22/2019	10.8	6.89	677	0.50	-109.8	0.31
LMW-2	6/13/2019	10.8	6.79	729	0.55	-122.7	0.77
LMW-2	6/26/2019	10.9	6.86	746	0.64	-83.4	0.44
LMW-3	5/21/2019	10.5	7.73	235	0.52	-72.6	0.49
LMW-3	6/12/2019	10.9	7.67	248	0.57	-32.2	0.67
LMW-3	6/25/2019	11.2	7.73	242	0.56	-23.0	0.45
LMW-4	5/22/2019	10.5	6.92	697	0.53	-120.5	0.64
LMW-4	6/13/2019	10.6	6.85	726	0.76	-151.8	0.23
LMW-4	6/25/2019	10.5	6.93	743	0.60	-95.9	0.16
LMW-5	5/21/2019	10.6	6.92	548	0.48	-121.3	0.16
LMW-5	6/12/2019	10.7	6.82	586	0.51	-99.5	2.35
LMW-5	6/25/2019	10.7	6.86	569	0.57	-121.1	0.62
LMW-6	5/22/2019	9.4	6.80	180	0.57	-55.3	1.95
LMW-6	6/12/2019	9.6	6.75	188	0.59	-46.4	3.31
LMW-6	6/26/2019	9.8	6.83	190	0.63	-34.5	1.59
LMW-7	5/21/2019	13.0	7.15	419	0.59	-77.5	3.71
LMW-7	6/13/2019	14.4	7.23	409	1.14	-47.2	5.7
LMW-7	6/25/2019	13.1	7.13	423	0.63	-46.1	1.38
LMW-8	5/21/2019	11.1	6.79	429	0.53	-103.7	8.45
LMW-8	6/12/2019	13.4	6.70	515	0.61	-100.7	5.44
LMW-8	6/25/2019	12.6	6.81	505	0.66	-96.3	4.55
LMW-9	5/21/2019	10.2	6.99	507	0.69	-67.4	2.48
LMW-9	6/11/2019	10.8	6.94	542	0.72	-69.6	2.34
LMW-9	6/25/2019	10.4	6.97	524	0.83	-50.7	0.31
LMW-10	5/22/2019	10.4	8.64	266	0.52	-210.4	0.84
LMW-10	6/11/2019	12.1	8.63	287	0.49	-153.7	0.97
LMW-10	6/26/2019	11.6	8.69	282	0.59	-168.9	0.75
LMW-11	5/20/2019	9.8	7.21	390	0.78	-137.1	0.77
LMW-11	6/11/2019	10.3	7.18	412	0.87	-55.8	0.28
LMW-11	6/25/2019	10.0	7.20	391	0.95	-75.3	0.28
LMW-12	5/22/2019	10.1	6.80	667	0.54	-105.8	4.11
LMW-12	6/11/2019	11.2	6.74	720	0.52	-76.9	57.2
LMW-12	6/26/2019	10.4	6.72	681	0.65	-71.8	15.4
LMW-13R	5/22/2019	10.2	7.37	656	0.57	-157.0	1.29
LMW-13R	6/11/2019	11.6	7.36	711	0.54	-132.0	0.54
LMW-13R	6/26/2019	11.0	7.39	701	0.63	-114.2	0.58
LMW-14	5/20/2019	10.0	6.72	1159	0.88	-78.9	1.59
LMW-14	6/11/2019	10.6	6.60	1497	1.41	-45.5	1.3
LMW-14	6/26/2019	10.6	6.62	1540	1.14	-38.1	2.16
LMW-15	5/20/2019	9.5	7.56	356	0.82	-157.2	7.15
LMW-15	6/11/2019	11.5	7.51	383	1.08	-120.5	1.28
LMW-15	6/25/2019	9.9	7.52	358	1.06	-134.9	2.68

Notes:

NC - Not Collected

Figures



LEGEND

- MONITORING WELLS
- PIEZOMETER
- PROTECTIVE FENCE
- UNPAVED ROAD
- BUILDING

NOTE(S)

1. LMW-4 AND LMW-7 WERE DRILLED AT A 20° INCLINE; LMW-14 WAS DRILLED AT 15° INCLINE

0 300 600
1" = 300' FEET

CLIENT
LANDSBURG MINE SITE PLP GROUP

CONSULTANT
GOLDER

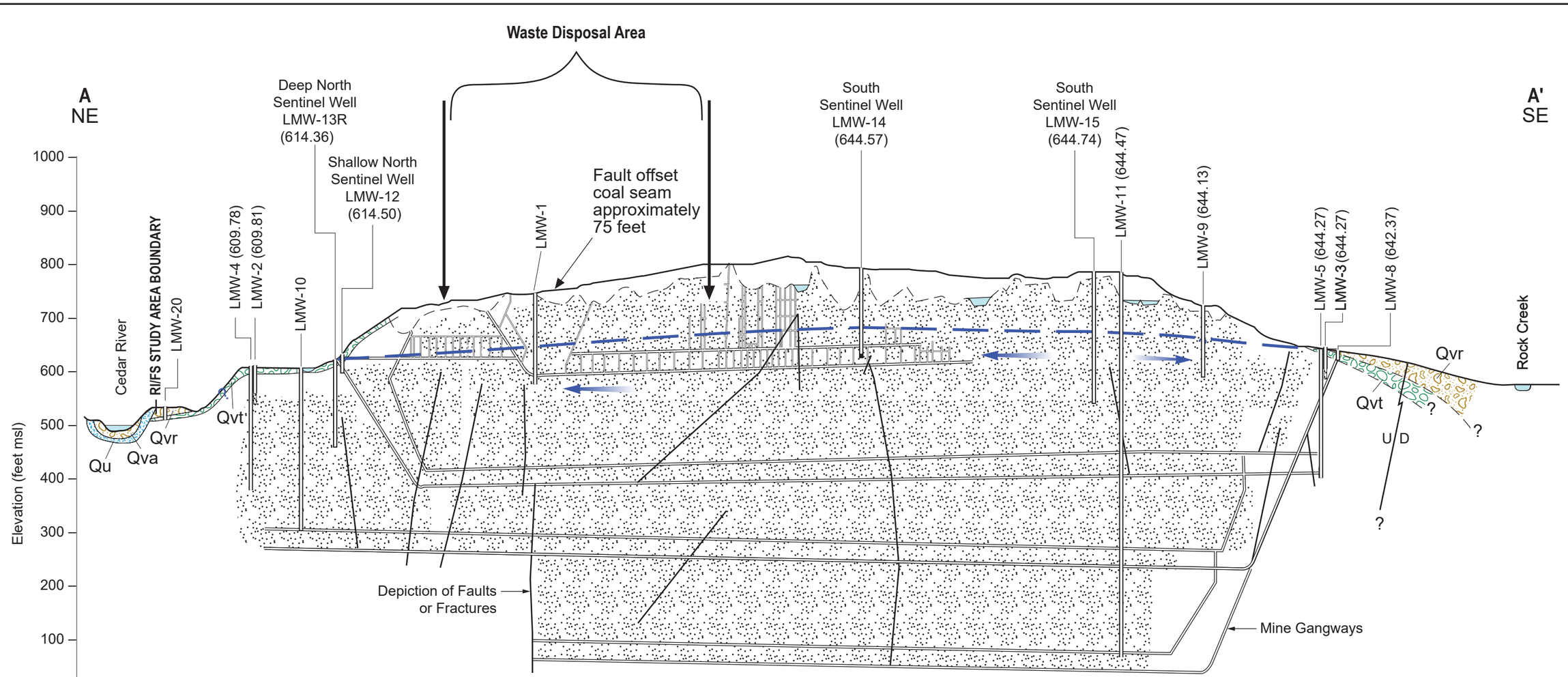
YYYY-MM-DD	2019-04-25
DESIGNED	XXX
PREPARED	XXX
REVIEWED	XXX
APPROVED	XXX

PROJECT
LANDSBURG MINE SITE
MTCA REMEDIAL ACTION

TITLE
SITE MAP

PROJECT NO.	PHASE	REV.	SHEET
9231000005	1200	A	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
0 1 in



EXPLANATION

- Potentiometric surface
- Outline of trench bottom
- LMW-2 (609.81) Well ID (water level in ft. amsl)
- Qvt Till, compact mixture of gravel occasional boulders in clayey silty sand matrix
- Sandstone
- Surface water feature
- Anticipated collapsed zone within mine
- Qu Drift, till, fluvial sand and gravel, lacustrine sand, silt, clay and peat
- Qvr Recessional outwash, well sorted sand and pebble-cobble
- Qva Advanced outwash pebble-cobble gravel may include very fine sand
- Monitoring Interval
- Groundwater Flow Direction

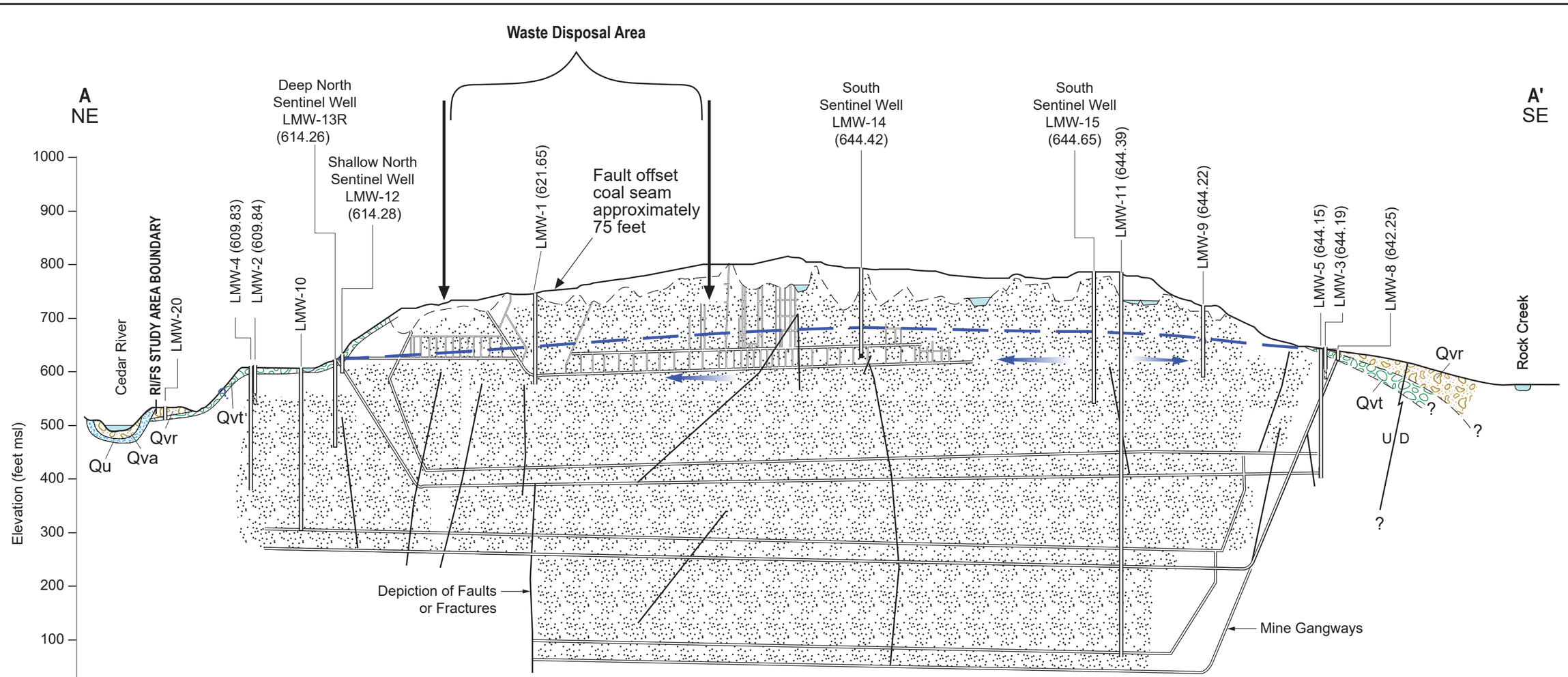
0 500
FEET

Sources for the Geology and Mine Information:
J.E. Luzier 1969; surficial geology
State of Washington, Water Well reports
Mine Superintendant's Records
Landsburg Well Logs

NOTE: Vertical to horizontal scale ratio is 2.5:1
Wells are project normal into the strike of the Cross-Section A-A' Groundwater elevation obtained 6/11/2019 - 6/13/2019

CLIENT	LANDSBURG PLP GROUP
CONSULTANT	GOLDER
YYYY-MM-DD	2019-04-29
PREPARED	REDMOND
DESIGN	
REVIEW	
APPROVED	
PROJECT	LANDSBURG MINE SITE
TITLE	CROSS-SECTION ALONG STRIKE AT COAL SEAM JUNE 11-13, 2019 CROSS-SECTION A-A'
PROJECT No.	923-1000
PHASE	2019
FIGURE	2A

G:\PalmerCokingCoal\Co\LandsburgMineWA\99_PROJECTS\923100002_Ph1_Remediation\R154\02_PRODUCTION\IND\923100_002_R154_003.indd



EXPLANATION

- Potentiometric surface
- Outline of trench bottom
- LMW-2 (609.84) Well ID (water level in ft. amsl)
- Qvt Till, compact mixture of gravel occasional boulders in clayey silty sand matrix
- Sandstone
- Surface water feature
- Anticipated collapsed zone within mine
- Qu Drift, till, fluvial sand and gravel, lacustrine sand, silt, clay and peat
- Qvr Recessional outwash, well sorted sand and pebble-cobble
- Qva Advanced outwash pebble-cobble gravel may include very fine sand
- Monitoring Interval
- Groundwater Flow Direction

0 500
FEET

Sources for the Geology and Mine Information:
J.E. Luzier 1969; surficial geology
State of Washington, Water Well reports
Mine Superintendant's Records
Landsburg Well Logs

NOTE: Vertical to horizontal scale ratio is 2.5:1
Wells are project normal into the strike of the Cross-Section A-A'
Groundwater elevation obtained 6/25/2019

CLIENT	LANDSBURG PLP GROUP
CONSULTANT	GOLDER
YYYY-MM-DD	2019-04-29
PREPARED	REDMOND
DESIGN	
REVIEW	
APPROVED	
PROJECT	LANDSBURG MINE SITE
TITLE	CROSS-SECTION ALONG STRIKE AT COAL SEAM JUNE 25, 2019 CROSS-SECTION A-A'
PROJECT No.	923-1000
PHASE	2019
FIGURE	2B

G:\PalmerCokingCoal\Col\LandsburgMineWA\99_PROJECTS\923100002_Ph1_Remediation\R154102_PRODUCTION\INDD\923100_002_R154_003.indd

APPENDIX A

Laboratory Analytical Reports Data Validation and Quality Assurance / Quality Control Review Memorandum and June 2019 Laboratory Analytical Report

TECHNICAL MEMORANDUM

DATE August 6, 2019 **Project No.** 923-1000-002.2019

TO Bill Kombol
Palmer Coking Coal Company

CC Gary Zimmerman

FROM Joseph Xi **EMAIL jxi@golder.com**

LANDSBURG MINE SITE JUNE 2019 DATA VALIDATION & QUALITY ASSURANCE / QUALITY CONTROL REVIEW

This Data Usability Summary Report (DUSR) presents the findings of the data quality assessment performed on the analyses of water samples collected from June 11, 12, and 13, 2019 at the Landsburg Mine Site in Washington (Site) as part of the Landsburg Groundwater compliance monitoring sampling project. Samples in the laboratory sample delivery group (SDG) as indicated in Table 1 were reviewed in this DUSR to identify quality issues which could affect the use of the sample data for decision making purposes.

Fourteen water samples, one field duplicate sample, two field blanks, and one equipment blank were collected by Golder Associates, Inc. (Golder). Samples were analyzed by Analytical Resources Inc. of Tukwila, Washington for the following parameters:

- Volatile Organic Compounds (VOCs) following United States Environmental Protection Agency (USEPA) USEPA SW-8461[1] Method 8260C, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS); and
- Northwest Total Petroleum Hydrocarbons – Hydrocarbon Identification Scan by NWTPH-HCID.

Quality assurance / quality control (QA/QC) reviews of laboratory data were performed in the laboratory in accordance with the laboratory quality assurance program plan (QAPP). The data validation QA/QC review focused primarily on laboratory results and quality control data to ensure that work plan data quality objectives were met for the project.

Data validation was conducted in accordance with the criteria outlined in the National Functional Guidelines for Organic Review (USEPA 2017[2]), modified to include method specific requirements of the laboratory, and laboratory standard operating procedures. Where there was a discrepancy between the QC criteria in the Guidelines and the QC criterion established in the analytic methodology, method-specific criteria, the QAPP, or professional judgment was used.

[1] USEPA. 2015. Test methods for evaluating solid waste, physical/chemical methods (SW-846): 3rd edition, and subsequent updates, Environmental Protection Agency, National Center for Environmental Publications, Cincinnati, Ohio, accessed at URL http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm

[2] USEPA. 2017. USEPA Contract Laboratory Program, National Functional Guidelines for Organic Superfund Methods Data Review. OLEM 9355.0-136. EPA-540-R-2017—001/002, January. Available on the Web at: https://www.epa.gov/clp/superfund-clp-national-functional-guidelines-data-review (accessed June 26, 2019)

Golder Associates Inc.
18300 NE Union Hill Road, Suite 200, Redmond, Washington, USA 98052 T: +1 425 883-0777 F: +1 425 882-5498

In general, chemical results for the samples collected at the Site were evaluated based on laboratory preservation, hold times, laboratory and field blank contamination, outlying precision or accuracy parameters, or based on professional judgment. The following definitions provide brief explanations of the qualifiers which may have been assigned to data during the data validation process.

Data Qualifier Definitions

J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

J+ The result is an estimated quantity, but the result may be biased high.

U The analyte was analyzed for but was not detected.

R The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.

The validation level for the data is Tier 2A, and included the following:

- Data package completeness assessment
- Verification of required deliverables
- Evaluation of holding times
- Laboratory narrative evaluation
- Evaluation and qualification of QC elements for surrogates, matrix spike samples, laboratory control samples, blanks (method, equipment, and trip blank) laboratory duplicate samples and field duplicate samples
- Evaluation of detection limits

Raw data and calibration elements, including GC instrument tuning and performance check, initial and continuing calibration, internal standard performance, and analyte identification, were not provided by the lab. Data review and validation was performed by an experienced QA chemist independent of the analytical laboratory and not directly involved in the project. Data qualifiers that were applied by the laboratory have been removed from the data summary report sheets, when applicable, and superseded by data validation qualifiers. Overall, the data review showed that data are acceptable for use except where indicated by data qualifiers. Table 2 is a summary of the qualifiers applied to the data. For details about the data validation, refer to the data validation checklist in Attachment A. The following bulleted items highlight comments and/or qualifications to specific parameters:

- EPA Method 8260C: The case narrative notes for ARI Work Order 19E0324 (May of 2019) for the Site May 2019 groundwater monitoring event indicate that VOC vials may have been previously contaminated with acetone based on testing on empty vials from the same QC lot and random acetone detections. ARI has since confirmed that vials from lot ((B9045CVBS) are contaminated with acetone and were used to collect June 2019 samples. All positively detected acetone results are rejected and qualified (R) due to a) ARI's 19E0324 case narrative notes and ARI's July 22, 2019 email communication confirming acetone

contamination in the associated vials and b) elevated acetone detections are not consistent with historical data.

- EPA Method 8260C: Two coolers were received at elevated temperatures (11.6 °C and 11.2 °C) and above EPA's recommended preservation temperature of 6.0 °C. No action is taken since samples associated with these coolers were collected and delivered to the laboratory on June 13, 2019 and did not have enough time to cool.
- Matrix spike analysis was not performed along with the VOCs. No action is taken since adequate accuracy and precision data are provided.

The QAPP stipulated completeness goal of 90% was achieved.

Attachments:
Attachment A: Tables
Table 1: Sample Collection and Analysis Summary
Table 2: Qualifier Summary Table
Attachment B: Level 2A Data Validation Checklist

\\REDMOND.GOLDER.GDS\DATA2\ENVIRONMENTAL\PROJECTS_1992 PROJECTS\923-1000\GW_DATA & REPORTS\2019\BACKFILLING GW\REPORTS\2019 06 REPORT\APPENDIX A\DUSR_JUNE_2019_LANDSBURG-090419.DOCX

ATTACHMENT A

Tables

Table 1: Sample Collection and Analysis Summary
Landsburg Mine Water Sampling Investigation - June 2019

						Analyses			
SDG	**Field Identification**	**Collection Date**	**Lab Identification**	**Matrix**	**QC Samples**	**VOCs (8260C)**	**SVOCs; 1,4-Dioxane (8270D)**	**GasolineTPH-HCID (NWTPH-HCID)**	**Total TAML Metals (200.8/6010C /7470A)**
19F0184	LMW-14-0619	06/11/2019	19F0184-01	GW	-	X	-	X	-
19F0184	LMW-FB-0619	06/11/2019	19F0184-02	GW	FB	X	-	-	-
19F0184	LMW-11-0619	06/11/2019	19F0184-03	GW	-	X	-	X	-
19F0184	LMW-15-0619	06/11/2019	19F0184-04	GW	-	X	-	X	-
19F0184	LMW-12-0619	06/11/2019	19F0184-05	GW	-	X	-	X	-
19F0184	LMW-13R-0619	06/11/2019	19F0184-06	GW	-	X	-	X	-
19F0184	LMW-10-0619	06/11/2019	19F0184-07	GW	-	X	-	X	-
19F0184	LMW-9-0619	06/11/2019	19F0184-08	GW	-	X	-	X	-
19F0184	LMW-6-0619	06/12/2019	19F0184-09	GW	-	X	-	X	-
19F0184	LMW-3-0619	06/12/2019	19F0184-10	GW	-	X	-	X	-
19F0184	LMW-5-0619	06/12/2019	19F0184-11	GW	-	X	-	X	-
19F0184	LMW-8-0619	06/12/2019	19F0184-12	GW	-	X	-	X	-
19F0184	LMW-EB-0619	06/12/2019	19F0184-13	GW	EB	X	-	X	-
19F0184	LMW-7-0619	06/12/2019	19F0184-14	GW	-	X	-	X	-
19F0184	LMW-2-0619	06/13/2019	19F0184-15	GW	-	X	-	X	-
19F0184	LMW-4-0619	06/13/2019	19F0184-16	GW	-	X	-	X	-
19F0184	LMW-4-D-0619	06/13/2019	19F0184-17	GW	FD (LMW-4-0619)	X	-	X	-
19F0184	LMW-FB2-0619	06/13/2019	19F0184-18	FB	FB	X	-	-	-

Notes:
All analyses performed by Analytical Resources, Incorporated (ARI), Tukwila WA

Abbreviations:
EB - Equipment Blank
FB - Field Blank
FD - Field Duplicate
QC - Quality Control
SDG - Sample Delivery Group
GW - Groundwater
TB - Trip Blank
WQ - Water Quality
MS - Matrix Spike
NWTPH - Northwest Total Petroleum Hydrocarbon
SVOCs - Semivolatile Organic Compounds
TAML - Target Analyte Metals List
TPH-HCID - Total Petroleum Hydrocarbons - Hydrocarbon Identification Method
VOCs - Volatile Organic Compounds

Table 2: Qualifier Summary Table
Landsburg Mine Water Sampling Investigation - June 2019

SDG	Sample Name	Constituent	New Result	New RL	Qualifier	Reason
19F0184	LMW-9-0619	Acetone	-	-	R	Preserved vial contamination
19F0184	LMW-8-0619	Acetone	-	-	R	Preserved vial contamination
19F0184	All Samples	All Results	-	-	-	Laboratory applied U-qualifiers indicating non-detect results and J-qualifiers indicating results below the reporting limit are retained unless other qualifications are indicated in this table. All other laboratory qualifiers are removed.

Abbreviations
QC - Quality Control
SDG - Sample Delivery Group
RL - Reporting Limit

Qualifier Definitions
J - Estimated result
U - Non-detect result
R - The data are rejected and unusable.

ATTACHMENT B

Level 2A Data Validation Checklist

QA LEVEL II - DATA EVALUATION CHECKLIST

Company Name: Golder Associates, Inc.
Project Manager: Joe Miller
Project Name: Landsburg Groundwater 2019-06
Project Number: 923-1000-005.2019
Validated by Jessie Compeau/Informa LLC
Validation Date: July 31, 2019
Reviewed by Joseph Xi
Review Date: August 5, 2019
Laboratory: Analytical Resources, Inc. (ARI) in Tukwila, WA
SDG #: 19F0184
Analytical Method (type and no.): See DUSR Table 1
Matrix: ☐ Air ☐ Soil/Sed. ☒ Water ☐ Waste ☐ Other

Work Plan or QAPP reference: Compliance Monitoring Plan and QAPP for Landsburg Mine Site (Exhibit D, to the Consent Decree, 2017).

Applicable Data Validation Guidance:

- National Functional Guidelines for Organic Review, USEPA 2017

Sample Information: See Table 1 (attached)

Field/COC Information		**YES**	**NO**	**NA**	**COMMENTS**
a)	Sampling dates noted?	☒	☐	☐	
b)	Sampling team indicated?	☒	☐	☐	
c)	Sample location noted?	☒	☐	☐	
d)	Sample type indicated (grab/composite)?	☐	☒	☐	COC does not request this information
e)	Field QC noted?	☒	☐	☐	See Table 1
f)	Field parameters collected (note types)?	☐	☐	☒	
g)	Was the COC signed by both field and laboratory personnel?	☒	☐	☐	
h)	Were samples received in good condition?	☒	☐	☐	See Notes 1, 2, and 3
i)	Were the correct preservatives used?	☒	☐	☐	
j)	Was the sample cooler temperature within QC limits?	☐	☒	☐	See Note 4

Laboratory Case Narrative

a)	Does the laboratory narrative indicate deficiencies?	☒	☐	☐	See Note 5

General (reference QAPP or Method)		**YES**	**NO**	**NA**	**COMMENTS**
a)	Were hold times met for sample pretreatment?	☒	☐	☐	
b)	Were hold times met for sample analysis?	☒	☐	☐	
c)	Was the correct method used?	☒	☐	☐	
d)	Were appropriate reporting limits achieved?	☒	☐	☐	See Note 6
e)	Were any sample dilutions noted?	☐	☒	☐	
f)	Were any matrix problems noted?	☐	☒	☐	

QA LEVEL II - DATA EVALUATION CHECKLIST

Blanks	**YES**	**NO**	**NA**	**COMMENTS**
a) Were analytes detected in the method blank(s)?	☐	☒	☐	See Note 7
b) Was a method blank analysis performed according to the method used?	☒	☐	☐	
c) Was a method blank analysis performed for each instrument used for sample analyses?	☒	☐	☐	
d) Were analytes detected in the instrument blank(s)?	☐	☐	☒	
e) Were analytes detected in the field blank(s)?	☐	☒	☐	2 Field Blanks: LMW-FB-0619 and LMW-FB2-0619
f) Were analytes detected in the equipment blank(s)?	☐	☒	☐	1 Equipment Blank: LMW-EB-0619
g) Were analytes detected in the trip blank(s)?	☐	☐	☒	
h) Were analytes detected in the storage blank(s)?	☐	☐	☒	

Surrogate (System Monitoring) Compounds	**YES**	**NO**	**NA**	**COMMENTS**
a) Were surrogate compounds added to all samples?	☒	☐	☐	
b) Were recoveries within control limits?	☒	☐	☐	
c) Were surrogate recoveries not calculated due to dilutions?	☐	☒	☐	
d) Were recoveries not calculated due to interference?	☐	☒	☐	

Laboratory Control Sample	**YES**	**NO**	**NA**	**COMMENTS**
a) Was an LCS analyzed once per SDG?	☒	☐	☐	
b) Were the proper compounds included in the LCS?	☒	☐	☐	
c) Was the LCS accuracy criteria met?	☒	☐	☐	

Matrix Spike/Matrix Spike Duplicate	**YES**	**NO**	**NA**	**COMMENTS**
a) Was MS accuracy criteria met (note %R)?	☐	☐	☒	
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☒	
b) Was MSD accuracy criteria met (note %R)?	☐	☐	☒	
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☒	
c) Were MS/MSD precision criteria met (note RPD)?	☐	☐	☒	

Duplicates	**YES**	**NO**	**NA**	**COMMENTS**
a) Were field duplicates collected (note original and duplicate sample names)?	☒	☐	☐	LMW-4-0619 and LMW-4-D-0619
b) Were field dup. precision criteria met (30%)?	☒	☐	☐	
c) Were lab duplicates analyzed?	☐	☒	☐	
d) Were lab dup. precision criteria met (note RPD)?	☐	☐	☒	

ICP Serial Dilution (SD)	**YES**	**NO**	**NA**	**COMMENTS**
a) Was an ICP SD analyzed once per SDG?	☐	☐	☒	
b) Was the ICP SD criteria met?	☐	☐	☒	

QA LEVEL II - DATA EVALUATION CHECKLIST

Comments/Notes:

1. Review of Cooler Receipt Form notes indicate that one of the bottle label identifications reads LMW-**0**9-0619 and the chain of custody (COC) reads LMW-**9**-0619. Sample identification on the bottle label was corrected to read LMW-**9**-0619.

2. Review of Cooler Receipt Form notes indicate that sample LMW-EB-0619 collection time of **1315** is listed on the COC however a collection time of **1350** is on shown on the sample label. Sample collection time on the label was corrected to read **1315**.

3. COC seals were not affixed to the outside of the cooler. Sample notes indicate that the samples were received in good condition. No action is taken in this case other than to note that the samples were hand delivered by Golder per chain of custody protocols.

4. Review of the Cooler Receipt Form indicates that the cooler temperatures were measured at 11.6 ºC, 4.4 ºC, 11.2 ºC, 7.1 ºC, and 6.6 ºC. Per June 14, 2019 email (Landsburg Cooler Temperatures) between Golder and ARI: Sample containers associated with coolers 1 and 3 exceeded EPA recommended temperature of 6.0 ºC at 11.6 ºC and 11.2 ºC. In this case no action is taken since samples collected on June 13, 2019 did not have enough time to cool as they were collected and delivered to the laboratory on the same day. No action is taken for the cooler received at 7.1 ºC (minor exceedance) other than to note that additional ice or cooling packs should be added to the coolers during an extended sampling event.

5. Case narrative notes indicate that VOC continuing calibration (CC) recoveries are below laboratory acceptance criteria for four analytes (vinyl acetate, bromoform, 1,2-dibromo-3-chloropropane, and dichlorodifluoromethane) and laboratory qualified (Q). Review of the data shows that associated samples are not impacted and only LCS/LCSD results are laboratory qualified (Q). No further action was taken other than to note. All LCS/LCSD % recoveries are within laboratory control limit criteria.

6. QAPP stipulated reporting limits are met for requested compounds and reporting limits (RLs). ARI analyzed and reported three additional VOC compounds (dichlorodifluoromethane (CFC-12), bromoethane, and total xylenes).

7. The case narrative notes for ARI Work Order 19E0324 (May of 2019) for the Site May 2019 groundwater monitoring event indicate that VOC vials may have been previously contaminated with acetone based on testing on empty vials from the same QC lot and random acetone detections. ARI confirmed by email that vials from lot ((B9045CVBS) are contaminated with acetone and were used to collect June 2019 samples. All positively detected acetone results are rejected and qualified (R) due to a) ARI's 19E0324 case narrative notes and ARI's July 22, 2019 email communication confirming acetone contamination in the associated vials and b) elevated acetone detections are not consistent with historical data (Golder, 2019).

Sample Name	Parameter	Analyte	Result	RL	Units
LMW-9-0619	EPA 8260C	Acetone	6.27	5	µg/L
LMW-8-0619	EPA 8260C	Acetone	10.8	5	µg/L

Data Qualification: See Table 2 (attached)

Definitions:

SDG: Sample Delivery Group
COC: Chain of Custody
VOC: Volatile Organic Compound
TCL: Target Compound List
%D: Percent Difference
LCS: Laboratory Control Sample
LCSD: Laboratory Control Sample Duplicate
MS/MSD: Matrix Spike/Matrix Spike Duplicate
MDL: Method Detection Limit
%R: Percent Recovery
CC: Continuing Calibration
RRF: Relative Response Factor
TCLP: Toxicity Characteristic Leaching Procedure
QC: Quality Control
QAPP: Quality Assurance Project Plan
SVOC: Semivolatile Organic Compound
DMC: Deuterated Monitoring Compound
RPD: Relative Percent Difference
RSD: Relative Standard Deviation
CRQL: Contract Required Quantitation Limit
RL: Reporting Limit
PEM: Performance Evaluation Mixture
SPCC: System Performance Check Compound
RT: Retention Time
SPLP: Synthetic Precipitation Leaching Procedure

APPENDIX B

Sample Integrity Data Sheets (SIDS)

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated Pump Grundfos

Date 6/26/19 **Time**

Media Water **Station** LMW-2

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 8.40 @1519 ft below TOC (monument at elev. X) (bottom at 38.1 ft bgs, 4-in casing)

Screen Interval – 27.9-38.1 ft bgs Monument: 2.94 ags

Sand Pack Interval – 24.8-38.1 ft bgs (8-in hole) (~7.8 gal/sand pack vol)

Packer Depth – NA (~22.3 gal/casing vol) (~30.1 gal/total well vol)

Sample Description NA - No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/26/19

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW2
Date 6/26/19
Time Begin Purge 1521
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
8.51	1526	10.8	6.86	1021/744	0.77	-76.7	0.46
8.55	1531	10.9	6.86	1021/746	0.64	-83.4	0.44

Comments:

Grundfos: ~80 Htz

Sulfur odor

Flow Rate: 0.4 gpm

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated Pump Grundfos

Date 6/25/2019 **Time**

Media Water **Station** LMW-3

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 12.55 @ 1253 ft below TOC (monument at elev. X) (bottom at 64.8 ft bgs, 4-in casing)

Screen Interval – 49.8-64.8 ft bgs Monument: 3.08 ags

Sand Pack Interval – 47.1-64.8 ft bgs (8-in hole) (~10.4 gal/sand pack)

Packer Depth – 39.33 ft bgs (~36.1 gal/casing vol) (~16.6 gal/packer casing volume)

(~27.0 gal/total well vol below packer)

Sample Description NA - No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/25/19

Supervisor (signature) [signature] **Date** 6-29-19

FIELD PARAMETERS SHEET

Well ID LMW 3
Date 6/25/2019
Time Begin Purge 1258
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
12.10	1303	11.0	7.74	323.7/237.7	1.60	164.1	0.67
12.10	1308	11.2	7.76	324.2/238.6	1.41	126.9	0.69
12.10	1313	11.2	7.77	326.5/240.0	0.66	50.4	0.64
12.10	1318	11.2	7.75	328.1/241.3	0.57	3.1	0.21
12.10	1323	11.1	7.74	328.8/241.7	0.59	-12.3	0.81
12.10	1328	11.2	7.73	328.8/241.7	0.56	-23.0	0.45

Comments:

Grundfos: 135 Htz
Packer: 130psi

Flow Rate 0.58 gpm

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated Pump Grundfos

Date 6/26/19 **Time**

Media Water **Station** LMW-4

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 10.85 @1559 ft below TOC (monument at elev. X) (bottom at 209.7 ft bgs, 4-in casing)

Screen Interval – 195-209.7 ft bgs Monument: 2.76 ags

Sand Pack Interval – 189-209.7 ft bgs (8-in hole) (~12.3 gal/sand pack)

Packer Depth – 187.3 ft bgs (~133.3 gal/casing vol) (~14.6 gal/packer casing volume)

(~26.9 gal/total well vol below packer)

** Depths corrected for 70° inclination

Sample Description NA - No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/26/19

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW4
Date 6/26/19
Time Begin Purge 1605
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
10.84	1610	10.5	7.00	1026/741	0.82	-49.0	0.23
10.85	1615	10.4	6.94	1024/739	0.68	-84.7	0.19
10.85	1620	10.5	6.94	1026/741	0.64	-88.7	0.13
10.85	1625	10.5	6.93	1027/743	0.60	-95.9	0.16

Comments:

Grundfos: 80 Htz
Packer: 110psi

Flow Rate ~0.25 gpm

Sampler's Initials RS

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated Pump Grundfos

Date 6/25/19 **Time**

Media Water **Station** LMW-5

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 14.11 @1411 ft below TOC (monument at elev. X) (bottom at 241.8 ft bgs, 4-in casing)

Screen Interval – 231.8-241.8 ft bgs Monument: 3.24 ags

Sand Pack Interval – 231.8-241.8 ft bgs (8-in hole) (~5.9 gal/sand pack)

Packer Depth – 222.11 ft bgs (~150.8 gal/casing vol) (~12.9 gal/packer casing volume)

(~18.7 gal/total well vol below packer)

Sample Description NA- No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/25/19

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW 5
Date 6/25/2019
Time Begin Purge 1417
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
14.12	1422	10.5	6.86	782/566	1.06	-96.6	0.68
14.10	1427	10.6	6.86	783/567	0.66	-109.4	0.85
14.11	1432	10.7	6.86	783/569	0.57	-121.1	0.62

Comments:

Grundfos: 135 Htz
Packer: 110psi

Sulfur smell

Flow Rate 0.8 gpm

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated Pump Grundfos

Date 6/26/2019 **Time**

Media Water **Station** LMW-6

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 32.6 @ 0903 ft below TOC (monument at elev. X) (bottom at 105.9 ft bgs, 4-in casing)

Screen Interval – 90.9-105.9 ft bgs Monument: 3.05 ags

Sand Pack Interval – 82.5-105.9 ft bgs (8-in hole) (~13.7 gal/sand pack)

Packer Depth – 81.22 ft bgs (~53 gal/casing vol) (~16.1 gal/packer casing volume)

(~29.9 gal/total well vol below packer)

Sample Description NA - No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/26/19

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW6
Date 6-26-2019
Time Begin Purge 0909
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
31.63	0914	9.5	6.80	266.9/187.9	1.13	-6.8	5.90
31.63	0919	9.8	6.81	266.8/189.2	0.74	-25.0	3.15
31.63	0924	9.8	6.82	266.7/189.2	0.67	-29.9	2.53
31.63	0929	9.8	6.83	266.9/189.4	0.64	-33.1	1.67
31.63	0934	9.8	6.83	266.8/189.5	0.63	-34.5	1.59

Comments:

Grundfos: 180 Htz
Packer: 110psi

Flow Rate 0.75 gpm

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated Pump Grundfos

Date 6/25/19 **Time** N/A no sample.

Media Water **Station** LMW-7

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 223.22 ft below TOC (monument at elev. X) (bottom at 253.7 ft bgs, 4-in casing) @ 0847 6/25/19

Screen Interval – 239.6-253.7 ft bgs Monument: 3.09 ags

Sand Pack Interval – NA

Packer Depth – NA (~28.3 gal/casing vol) ** Depths corrected for 70° inclination

Sample Description NA- No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/25/19

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW 7
Date 6/25/19
Time Begin Purge 0932
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
	0937	12.9	7.19	499.0/384.0	0.84	76.2	15.3
	0942	13.0	7.21	498.7/384.0	0.76	47.4	6.87
	0946	13.0	7.23	499.0/384.9	0.71	11.4	3.72
	0952	13.0	7.22	506/390.7	0.66	-15.1	2.90
	0957	13.0	7.17	533/412.7	0.64	-36.8	2.05
	1000	13.1	7.13	547/422.5	0.63	-46.1	1.38

Comments:

Grundfos: 320 Htz

Flow Rate ~0.5 gpm

Water level meter stuck at 211' ~~bgs~~ Elo bmp, no measurements taken during purge

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler New Tubing and Peristaltic Pump

Date 6/25/2019 **Time**

Media Water **Station** LMW-8

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 4.72 @ 1505 ft below TOC (PVC at black notch) (bottom at 13 ft bgs, 2-in casing)

Screen Interval – 8-13 ft bgs PVC stickup: 1.72 ags

Sand Pack Interval – 6-13 ft bgs (8-in hole) (~5.1 gal/sand pack)

Packer Depth – NA (~1.9 gal/casing vol) (~7.0 gal/total well vol)

Sample Description NA - No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/25/19

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW 8
Date 6/25/2019
Time Begin Purge 1512
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
6.32	1517	12.7	6.78	646/494.0	0.78	-94.8	5.70
7.40	1522	12.6	6.81	662/505	0.66	-96.3	4.55
~~	~~1527~~	~~~~	See note*	~~~~	~~~~	~~~~	~~~~

Comments:

*Parameters already consistent w/ previous round.

Flow Rate ~~gpm~~

350 mL/min

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated QED Bladder

Date 6/25/19 **Time**

Media Water **Station** LMW-9

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 99.77 @ 1102 6/25/19 ft below TOC (PVC at black notch) (bottom at 159 ft bgs, 2-in casing)

Screen Interval – 149-159 ft bgs PVC stickup: 2.86 ags

Sand Pack Interval – 143.5-159 ft bgs (8-in hole) (~11.4 gal/sand pack)

Packer Depth – NA (~10.2 gal/casing vol) (~21.6 gal/total well vol)

Sample Description NA - No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/25/19

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW 9
Date 6/25/19
Time Begin Purge 11:20
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
99.79	11:25	10.3	7.00	725/522	2.27	-4.2	0.65
99.78	11:30	10.4	6.96	726/523	2.26	-29.0	0.44
99.79	1140	10.4	6.96	726/524	3.37*	-39.0	0.25
99.79	1145	10.4	6.97	726/524	0.92	-47.6	0.71
99.80	1150	10.4	6.97	726/524	0.83	-50.7	0.31

Comments:

Tank: 130

*Bad D.O. reading, air bubbles caught. Fixed seal.

Throttle: 95

CPM: 2

CID: ~~50~~ → 51

Changed CID to 51

Flow Rate 500 mL/min ~~gpm~~

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated QED Bladder

Date 6/26/19 **Time**

Media Water **Station** LMW-10

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 0.51 @1327 ft below TOC (PVC) (bottom at 289 ft bgs, 4-in casing)

Screen Interval – 267-289 ft bgs PVC stickup: 3.12 ags

Sand Pack Interval – 258-289 ft bgs (9-in hole) (~18.2 gal/sand pack)

Packer Depth – NA (~191 gal/casing vol) (~209 gal/total well vol)

Sample Description NA - No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/26/19

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW 10
Date 6/26/19 RG
Time Begin Purge ~~1~~ 1330
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
1.08	1335	11.7	8.69	378.0/281.9	0.65	-130.0	0.98
1.58	1340	11.6	8.69	378.3/	0.59	-168.9	~~1.13~~ 0.75

RG

Comments:

Tank: 110

Throttle: 40

CPM: 2

CID:50

Flow Rate 350 mL/min ~~gpm~~

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated QED Bladder

Date 6/25/2019 **Time**

Media Water **Station** LMW-11

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 157.83 @ 1617 ft below TOC (PVC) (bottom at 707 ft bgs, 4-in casing)

Screen Interval – 696-707 ft bgs PVC stickup: 2.70 ags

Sand Pack Interval – 688-707 ft bgs (8-in hole) (~11.2 gal/sand pack)

Packer Depth – NA (~360.4 gal/casing vol) (~371.6 gal/total well vol)

Sample Description No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/25/2019

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW 11
Date 6/25/2019
Time Begin Purge 1620
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
157.83	1625	10.2	7.23	545/392	2.07	-58.3	1.14
157.84	1630	10.1	7.20	544/390.0	1.37	-62.7	1.08
157.83	1635	10.0	7.20	546/389.9	1.06	-70.2	0.44
157.83	1640	10.0	7.20	548/391.4	0.95	-75.3	0.28

Comments:

Tank: 130

Throttle: 110

CPM: 1 44s Refill

CID: ~~20~~ → 16 16s discharge

Flow Rate ~~gpm~~ 375 mL/min

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated QED Bladder

Date 6/26/19 **Time**

Media Water **Station** LMW-12

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 11.13' @ 1135 top of bladder pump casing

Screen Interval – 15-25

Sand Pack Interval – 11-25

Packer Depth – NA

Sample Description NA - No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) _____ **Date** 6/26/19

Supervisor (signature) _____ **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW12
Date 6/26/19
Time Begin Purge 1137
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
RG 11.11 ~~10.98~~	1142	10.5	6.71	945/682	0.74	-68.8	19.7
11.11	1147	10.4	6.72	945/681	0.65	-71.8	15.4

Comments:

Tank: 110

Throttle: 20

CPM: 2

CID: 47

Flow Rate 450 mL/min ~~gpm~~

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated QED Bladder

Date 6/26/19 **Time**

Media Water **Station** LMW-13R

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 11.65' @ 1200 measured to top of bladder pump casing

Screen Interval –115-140

Sand Pack Interval –110-150

Packer Depth – NA

Sample Description NA - No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/26/19

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW 13R
Date 6/26/19
Time Begin Purge 1201
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
11.85	1206	10.9	7.38	953/696	0.74	-105.6	1.15
11.84	1211	11.0	7.39	955/701	0.63	-114.2	0.58

Comments:

Tank: 110

Throttle: 35

CPM: 2

CID: 48

Flow Rate 400 mL/min ~~gpm~~

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated QED Bladder

Date 6/26/2019 **Time**

Media Water **Station** LMW-14

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 166.38 @1015 Below bladder pump casing Stickup 2.90' ags

Screen Interval – 156.5-172.3' bgs

Sand Pack Interval – 152.5-175.8' bgs

Packer Depth – NA ** Depths corrected for 75° inclination

Sample Description NA - No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/26/2019

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW14
Date 6/26/19
Time Begin Purge 1022
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
166.51	1027	10.8	6.72	1984/1454	4.10	-6.9	24.8
166.56	1032	10.7	6.67	2136/1552	1.42	-40.8	3.31
166.56	1037	10.6	6.62	2123/1540	1.14	-38.1	2.16

Comments:

Tank: 140

Throttle: 115

CPM: 2

CID: ~~47~~ 49

Flow Rate 400 mL/min ~~gpm~~

Sampler's Initials RG

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-005.2019

Site Location Ravensdale, WA **Sample ID** No Sample

Sampling Location Groundwater Monitoring Well End of dedicated sampling tube

Technical Procedure Reference(s) TP-1.4-6A, TP-1.2-20, TP-1.2-23

Type of Sampler Dedicated QED Bladder

Date 6/25/19 **Time**

Media Water **Station** LMW-15

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

SWL – 151.84' @ 1700 Below top of bladder pump mount

Screen Interval –235-245

Sand Pack Interval –231-245

Packer Depth – NA

Sample Description NA - No Sample

Field Measurements on Sample (pH, conductivity, etc.)

SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount

Sampler (signature) [signature] **Date** 6/25/2019

Supervisor (signature) [signature] **Date** 6-27-19

FIELD PARAMETERS SHEET

Well ID LMW 15
Date 6/25/19
Time Begin Purge 1702
Time Collect Sample NA

Water Level feet bmp	Time	Temp. °C	pH	Sp C / Cond uS/cm	DO mg/L	ORP mV	Turbidity NTU
151.82	1707	10.1	7.47	495.3/354.3	2.90	-93.9	3.01
151.84	1712	9.9	7.52	497.7/354.5	1.33	-128.7	3.06
151.84	1717	9.9	7.52	503/357.9	1.06	-134.9	2.68

Comments:

Tank: 130psi

Throttle: 95psi

CPM: 2

CID:53

Flow Rate 400 mL/min ~~gpm~~

Sampler's Initials RG