APPENDIX F
GROUNDWATER

GROUNDWATER CHARACTERIZATION STUDY OF THE WHARF BOSTON EXPANSION PROJECT

REVISION 2 TOPICAL REPORT RSI-3137

PREPARED FOR
Coeur Wharf
10928 Wharf Road
Lead, South Dakota 57754

JUNE 2022

RESPEC

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REVISION 2 TOPICAL REPORT RSI-3137

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JUNE 2022

Project Number M0025.21001

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

Coeur Wharf (Wharf) is proposing to expand its existing gold mine operations in the proposed permit area known as the Boston Expansion, which is located on the southern edge of the Wharf Mine along the Portland Ridgeline. This area is approximately 4 miles west of Lead, South Dakota, in Lawrence County. The proposed permit area consists of approximately 50 acres of private land immediately adjacent to the existing Wharf Mine located in Sections 2 and 3, Township 4 North, Range 2 East. Figure 1-1 shows the expansion study area. The blue outline represents the current permitted mine boundaries for Wharf and Golden Reward, and the red outline represents the proposed Boston Expansion Area.

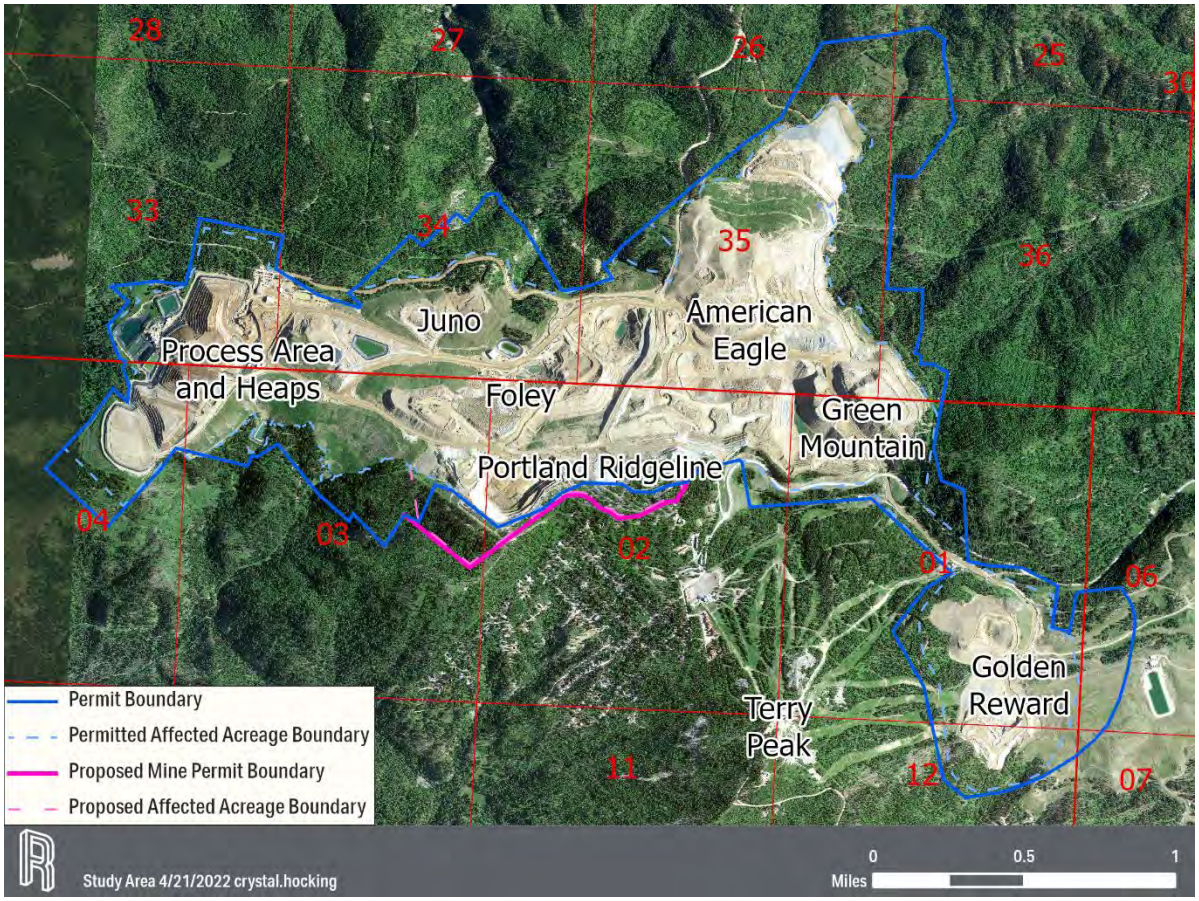


Figure 1-1. Boston Expansion Baseline Study Area Map.

A baseline water quality study in the Boston Expansion Area was completed per requirements of the South Dakota Department of Agriculture and Natural Resources (SD DANR). The SD DANR mining rules, Administrative Rules of South Dakota (ARSD) 74:29, and South Dakota Codified Law (SDCL) 456B, require a sampling plan to adequately characterize baseline water quality. Rule ARSD 74:29:2:07 requires that water quality grab samples be collected monthly for at least 1 year; permit requirements also require water level measurement data for at least 1 year.

The following is a list of descriptions, analysis, and sampling required by South Dakota law for mine permit applicants:

1. SDCL 45-6B-7 (9) (a-mm): Baseline water quality (Appendix E) and level of aquifers (Section 2.5)
2. SDCL 45-6B-92 (4): Water: direct or indirect sources of drinking water (description of) (Section 2.7)
3. ARSD 74:29:02:07: Water quality (Appendix E) and water level data (Section 2.5)
4. ARSD 74:29:02:11: Effect on hydrologic balance on surface and groundwater (Section 4.0)
5. ARSD 74:29:02:11(1): Baseline Surface and Groundwater reports
6. ARSD 74:29:02:11(4): Well location inventory map (Figures 3-1 to 3-2, Appendix G)
7. ARSD 74:29:02:11(5): Potentiometric surface map (Figure 2-2)
8. ARSD 74:29:02:11(7): Surface and groundwater monitoring plan for life of mine (Section 3.2)
9. ARSD 74:29:02:11(11): Estimate of project water requirements (Section 2.7.3)
10. ARSD 74:29:07:08: Hydrologic balance – water quality (Section 2.6).

The purpose of this report is to summarize the condition of the groundwater environment near the proposed mining expansion based on available hydrogeology and water quality data. A statistical analysis of the available water quality data is also included. Identifying baseline groundwater conditions is critical to understanding the groundwater system, including potential impacts to the actual mining operation and associated impacts to subsurface water quality and quantity.

This report is organized to optimize available information and understanding of the site's hydrogeology and groundwater quality. Chapter 2.0 provides information regarding the site hydrogeology, including descriptions of the hydrogeologic units and potentiometric surface. Water quality information is presented in Chapter 3.0, and Chapter 4.0 summarizes potential impacts to the groundwater system as a result of the Boston Expansion project. References are cited in Chapter 5.0.

The report concludes with additional well information and water quality data provided in the appendices. Appendix A contains information regarding the existing groundwater monitoring program at Wharf. Geology maps and cross sections are provided in Appendix B. Available monitoring well-completion diagrams for baseline wells are provided in Appendix C, and Appendix D provides information on water level and water quality sampling protocols. The raw water quality data for baseline sites from January 2, 2016, through April 3, 2021, including laboratory data sheets, are provided in Appendix E. Time-series graphs of water quality data, a map of the well locations, and water rights for Wharf and Golden Reward are provided in Appendices F, G, and H, respectively.

2.0 GEOLOGY AND HYDROGEOLOGY

2.1 GENERAL GEOLOGY

The Wharf Mine and proposed Boston Expansion Area are located in the north-central portion of the Black Hills uplift in western South Dakota. The area is dominated by a sequence of relatively flat lying to gently dipping rock units. Within the Boston Expansion Area, the geology consists of Precambrian metamorphic rocks overlain by sediments of the Cambrian Deadwood Formation. These rocks have been intruded by Tertiary-age igneous stocks, dikes, and sills. Mineralization in the Boston Expansion Area is primarily within the Deadwood Formation and also in and along the Tertiary intrusions. Although the geology of the Boston Expansion is based on surficial bedrock geology, drillhole data in and adjacent to the area are the primary basis.

A geologic map of the Boston Expansion and cross sections are provided in Appendix B. No mapped faults or structures exist within the Boston Expansion; however, faults do occur in the Wharf area and play a role in anisotropic flow conditions. A set of north-east trending en echelon faults have been mapped in the upper Annie Creek drainage [J. M. Montgomery Consulting Engineers, Inc., 1989]. Several north-south trending faults have also been mapped in the Labrador Gulch and Cleopatra Creek drainages north of the Juno and Foley Pits.

Pre-mineral fractures exist on a 35 to 55 degree azimuth, the same general trend that the historic underground workings follow. The intrusion of sills on the property, specifically the lower trachyte sill, varies along bedding planes and especially along the unconformity with the lower Deadwood and where the lower Deadwood transitions to an interbedded facies. Numerous samplings throughout the Boston Expansion were completed to analyze the geochemical characterization of ore and discard rock for the project. The geochemical data are presented in the Large-Scale Mine Permit.

2.2 HYDROGEOLOGIC UNITS

Hydrogeology information for each major formation in the Boston Expansion Area is provided in the following text.

2.2.1 PRECAMBRIAN

The Precambrian Ellison Formation is the dominant rock unit within the area and underlies the entire project at depth. The formation consists of interbedded quartzites and phyllites that are strongly folded and foliated. Foliation dips near vertically and strikes approximately north-south. Precambrian units that underlie the majority of the Boston Expansion Area are not conducive for hosting large-scale, disseminated deposits such as those found in the overlying Paleozoic sediments and Tertiary intrusives.

Precambrian rock units in the Black Hills are not considered significant aquifers but can be adequate aquifers for smaller yields on a localized basis. Water flow within the Precambrian is dominated by secondary permeability that results from fracturing and weathering [Driscoll et al., 2002]. Precambrian rocks with greater fracture density have higher porosity and permeability. Rahn [1985] estimated the total porosity of the Precambrian aquifers to be 3 percent and the effective porosity to be 1 percent.

The Precambrian has only minor storage capacity where it is fractured and jointed. The deep Precambrian (i.e., greater than 500 feet) has virtually no storage because lithostatic forces keep fractures closed. Deep exploration holes in the Wharf area confirmed that significant amounts of water were not encountered at depth from 500 to over 2,000 feet [Lessard, 1990; Sarratt, 2021]. On well logs, the Precambrian is often described as "crystalline rock."

2.2.2 DEADWOOD FORMATION

The Cambrian Deadwood Formation unconformably overlies the Precambrian and consists of quartz and limestone conglomerate, sandstone, quartzite, siltstone, shale, and limestone. Locally, a pebble conglomerate is present at the basal unconformity. The Deadwood Formation is informally divided into the lower, middle, and upper members based upon stratigraphy and preference for hosting mineralization. Within the Boston Expansion Area, the dominant ore host is predominantly the upper member. The Deadwood Formation within the Wharf area is approximately 400 feet thick and dips southwesterly at 6 to 15 degrees [J. M. Montgomery Consulting Engineers, Inc, 1996]. The Deadwood Formation is cut by small faults in the Golden Reward area and effectively compartmentalizes the aquifer into zones [Golden Reward Mining Company, 1990]. The Deadwood Formation within the Nevada Gulch area has sporadic hydrologically disconnected zones and may be partially saturated locally.

The hydraulic properties of the Deadwood Formation are extremely variable in the Wharf area because of varying lithology and the degree of hydrothermal alteration. Hydraulic conductivity measurements in Annie Creek Valley are approximately 7×10^{-4} centimeters per second (cm/s) [J. M. Montgomery Consulting Engineers, Inc., 1996]; a hydraulic conductivity value of 1.6×10^{-4} cm/s was measured in Ross Valley [Klohn Leonoff Consulting Engineers, 1986]. Rahn [1985] estimated that the effective porosity of the aquifer is 5 percent. In the northern Black Hills, the effective porosity is presumably lower in areas where the formation has undergone extensive hydrothermal alteration. The transmissivity of the Deadwood Formation within the Black Hills region typically ranges from 250 to 1,000 square feet per day (ft^2/day) [Downey, 1984]. Three pumping tests conducted in the Deadwood Formation in the Golden Reward area resulted in estimated transmissivity values of 1.5 to 6 ft^2/day [Hydrometrics, Inc., 1988].

2.2.3 WINNIPEG SHALE

The Ordovician-age Winnipeg Shale consists of friable, green shale. Within the Wharf Mine area and where the Deadwood Formation is present on Green Mountain and Foley Ridge, the Winnipeg Shale lies conformably above the Deadwood Formation. The Winnipeg Shale is above the water table within the project area and, therefore, is not considered a hydrogeologic unit in this study. The Winnipeg Shale has not been confirmed as occurring within the Boston Expansion.

2.2.4 WHITEWOOD AND ENGLEWOOD FORMATIONS

The Ordovician Whitewood Formation overlies the Winnipeg Shale and consists of silty dolomite, grading from thinly bedded near the base to thick bedded or massive in the middle and upper portions. The Whitewood Formation ranges in thickness from 36 to 56 ft along the western side of the Wharf property. The Mississippian Englewood Formation consists of pink calcareous siltstone and argillaceous limestone that grade into the overlying Madison Formation. Locally the Englewood may

have a dense gray shale at the base. The Englewood formation ranges in thickness from 35 to 50 ft at Wharf. The Whitewood and Englewood Formations are considered secondary aquifers, containing limited quantities of water within the fractures and porosity of the carbonates. The Whitewood and Englewood Formations do not occur in the Boston Expansion.

2.2.5 MADISON AQUIFER

The Madison Formation, which is also referred to as the Pahasapa Limestone in the Black Hills region, consists of limestone, sandy limestone and dolomite. It is the primary bedrock aquifer underlying the western-most portion of the Wharf Mine, including McKinley Gulch, the Process Area and Ross Valley. The Madison Formation dips gently westward at 2 to 5 degrees and ranges in thickness from 500 to 600 ft in Spearfish Canyon, southwest of the mine site.

Groundwater flow in the Madison Formation near Wharf is unconfined and occurs mainly in fractures and small dissolution cavities in the upper part of the formation. Horizontal groundwater flow is generally to the west, and vertical flow is predominantly downward. However, the fractures and solution cavities are not uniformly distributed in the aquifer and they form preferential flow paths that control the direction of groundwater flow locally. The Madison Aquifer is not present in the Boston Expansion area.

2.2.6 TERTIARY INTRUSIVES

Tertiary-age igneous intrusions are common throughout the Wharf Mine area. The intrusions are locally subdivided into monzonite porphyry, phonolite porphyry, and porphyry breccia. These rocks primarily intrude the Precambrian and Deadwood Formation as sills, although dikes and stocks are also present within the area. The sills are typically more than 20 feet thick; however, local thicknesses may be 100 feet or greater. A significant monzonite porphyry sill intrudes the upper portion of the Deadwood Formation in the project area near Green Mountain. A phonolite porphyry sill also overlies the Winnipeg Shale on Foley Ridge and Green Mountain. Within the Wharf Mine area, porphyry breccia was discovered along the west side of Bald Mountain. These intrusions, and the fluids associated with them, are responsible for hydrothermal gold deposits in the mining district. Tertiary-intrusive rock units are hydraulically similar to the Precambrian units. Because of their limited size and low porosity, the Tertiary-intrusive rock units are not an important aquifer in the area.

2.2.7 COLLUVIUM AND ALLUVIUM

Colluvium and alluvium have very limited extent across the Boston Expansion Area. Saturated areas of this unconsolidated material are limited to springs and creek bottoms. No saturated alluvium was identified within the Boston Expansion Area because of its location at the top of a ridge and hydrographic divide.

2.3 GROUNDWATER OCCURRENCE DEPTH

Groundwater depth in the Boston Expansion Area was evaluated by drilling and through records of historical underground and surface workings in the Wharf area. All evaluations of historical records and the results of recent drilling programs along the Portland Ridgeline indicate that this region is devoid of any significant water at the depths projected for surface mining, and groundwater is not anticipated to be encountered within the proposed Boston Expansion Area.

Historical records show that underground workings in the Wharf area are dry. A complete evaluation of water potential in underground workings in the general area is included in the Clinton Expansion groundwater characterization report [J. M. Montgomery Consulting Engineers, Inc., 1996].
Three exploration borings in and adjacent to the Boston Expansion Area were advanced to depths of 767.87 to 1,211.65 feet below the ground surface. The bottom of the boring elevations ranged from 5,408 to 5,765 feet, and the exploration drillers did not note any groundwater occurrence in the drill holes, indicating a water table was not present at these depths [Sarratt, 2021].

2.4 SPRINGS

No springs or seeps are located within the proposed Boston Expansion Area. Several springs are located around the Wharf Mine area and are provided in Table 2-1. Because these springs are fed by groundwater sources, they are discussed in this groundwater characterization report. A few springs may be the result of hydrologically isolated water zones while others may be the expression of the regional water table.

As part of the Boston Expansion project and at the request of the SD DANR, Wharf conducted a field inventory for springs in May 2021. The inventory involved walking up the Lost Camp drainage from its confluence with Annie Creek to search for a source of water. A small spring, Lost Camp Headwaters, was identified and is shown in Figure 2-1. The Lost Camp Headwaters spring was sampled while flowing in May 2021, but the site was dry in June and July 2021. The field inventory also identified a stormwater outfall from the subdivision, which was contributing flow to the drainage but was not sampled. Wharf acknowledges that another source of flow may exist to Lost Camp Creek that has yet to be identified, which could include, but not limited to, additional springs or gaining stream conditions. RESPEC hydrologists conducted an additional inventory of the Lost Camp drainage during May 2022 to attempt to identify additional sources of flow within the drainage (see Appendix J).

Seven spring localities are currently sampled as part of Wharf's ongoing water quality monitoring program: False Bottom Spring, Ross Spring, Beaver Springs, War Eagle, Annie Creek II, Ross Valley French Drain, and Lost Camp Headwaters (Figure 2-2). Measured flows at these seven springs range from 1 to 2,010 gpm; higher flows occur in the spring and early summer and low to no flows occur in the later summer and fall. False Bottom Spring is located at the headwaters of False Bottom Creek, War Eagle is located on Cleopatra Creek, Lost Camp Headwaters is at the upper reach of Lost Camp Gulch, and the other four monitored springs are located on tributaries of Annie Creek.

The majority of the area springs and seeps identified in previous investigations are typically dry with intermittent periods of low flows. Based on historical surveys presented in the Golden Reward Mining Permit Application [Hydrometrics, Inc., 1988] and Wharf's Clinton Application [Wharf Resources (USA) Inc., 1997], other minor, unnamed springs in the area are located in drainages of False Bottom Creek, Deadwood Creek, Nevada Gulch, Fantail Creek, and Stewart Gulch. A map of springs is presented in Figure 2-2. The majority of these springs produce only a few gallons of water per minute during the wet springtime of the year.

Table 2-1. Springs and Seeps in the Vicinity of the Wharf Mine (Page 1 of 2)

Map I.D.	Name or Previous Identifier	Source[a]	Flowing	Latitude	Longitude
1	—	1		44.3343	–103.809997
2	FI 16	1		44.331298	–103.820999
3	FI 14	1		44.331001	–103.821998
4	SI 8	1		44.326698	–103.809997
5	SI 11	1		44.3246	–103.804
6	SI 12	1		44.324199	–103.805
7	LI 2	1		44.320098	–103.801002
8	AI 1	1		44.3152	–103.803001
9	AI 1	1		44.315101	–103.803001
10	AI 1	1		44.314998	–103.803001
11	AI 4	1		44.314701	–103.805
12	AI 2	1		44.3106	–103.805
13	AI 2	1		44.3106	–103.804
14	AI 2	1		44.310298	–103.804
15	SP-4	2		44.367599	–103.824996
16	SP-5	2		44.366901	–103.824996
17	False Bottom Spring, SP-7	2		44.3619	–103.828002
18	SP-8	2		44.366401	–103.833
19	SP-1	2		44.360599	–103.834999
20	SP-9	2		44.3684	–103.829002
21	SP-10	2		44.368598	–103.828002
22	SP-14	2		44.348999	–103.820999
23	SP-15	2		44.350601	–103.828002
24	SP-17	2		44.351501	–103.830001
25	SP-20	2		44.345901	–103.810997
26	FI 10	1		44.332901	–103.811996
27	FI 10	1		44.332901	–103.811996
28	NI 9	1		44.3358	–103.820999
29	FI 1	1		44.330699	–103.821998
30	SI 1	1		44.327999	–103.816001
31	AI 7	1		44.3152	–103.811996
32	AI 6	1		44.315498	–103.809997

Table 2-1. Springs and Seeps in the Vicinity of the Wharf Mine (Page 2 of 2)

Map I.D.	Name or Previous Identifier	Source[(a)]	Flowing	Latitude	Longitude
33	SP-6	2	X	44.364101	–103.827003
34	SP-13	2	X	44.3516	–103.816001
35	SP-18	2	X	44.350299	–103.811996
36	NI 13	1	X	44.3381	–103.810997
37	SI 7	1	X	44.326698	–103.811996
38	—	1	X	44.325801	–103.801002
39	SI 13	1	X	44.324001	–103.805
40	LI 1	1	X	44.3204	–103.801002
41	Ross Spring	3	X	44.339199	–103.872001
42	Beaver Springs	3	X	44.339698	–103.866996
43	—	3	X	44.365001	–103.833
44	—	3	X	44.3679	–103.830001
45	—	3	X	44.352699	–103.823997
46	—	3	X	44.326599	–103.814002
47	—	3	X	44.3162	–103.803001
48	—	3	X	44.336399	–103.819999
49	War Eagle	3	X	44.350898	–103.847999
50	Ross Valley French Drain	3	X	44.342601	–103.870002
51	Annie Creek II	3	X	44.339599	–103.866996
52	Lost Camp Headwater	3	X	44.3323	–103.8474

(a) 1—Golden Reward Application, 1996 Exhibit
2—Clinton Expansion Application, Exhibit 3-6.2
3—Wharf Resources.

Figure 2-1. Lost Camp Headwaters Spring.

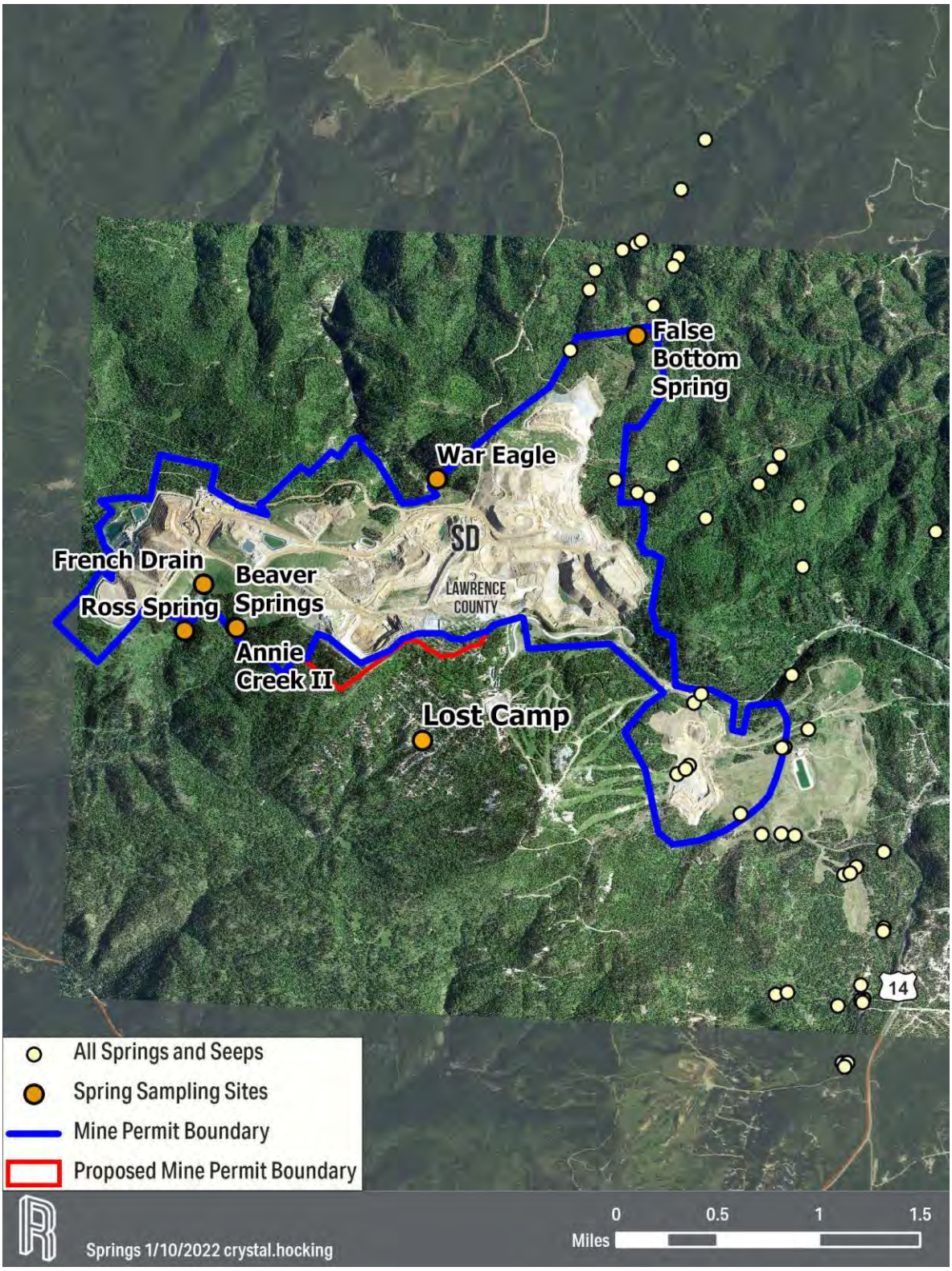


Figure 2-2. Springs and Spring Sampling Sites Map.

2.5 REGIONAL POTENTIOMETRIC SURFACE

2.5.1 WATER LEVEL MEASUREMENTS

Depth to water has been periodically collected from more than 40 monitoring wells surrounding the Wharf Mine. Water levels are measured immediately before water quality sampling and measured quarterly or monthly (depending on sampling schedule) using a water level meter.

The recording period for each monitoring well varies, although data from January 2000 through April 2021 were reviewed for Wharf monitoring wells as part of this investigation. During this process, RESPEC identified and removed several erroneous data points, which were determined by comparing data points to water level trends and the average water level at the monitoring well. Wharf noted that one water level meter was faulty from late 2015 through early 2017. For example, five data points from August 2015 through August 2016 at Monitoring Well (MW) 41 were excluded from the dataset, as shown in Figure 2-3 [Hocking and Minnick, 2019].

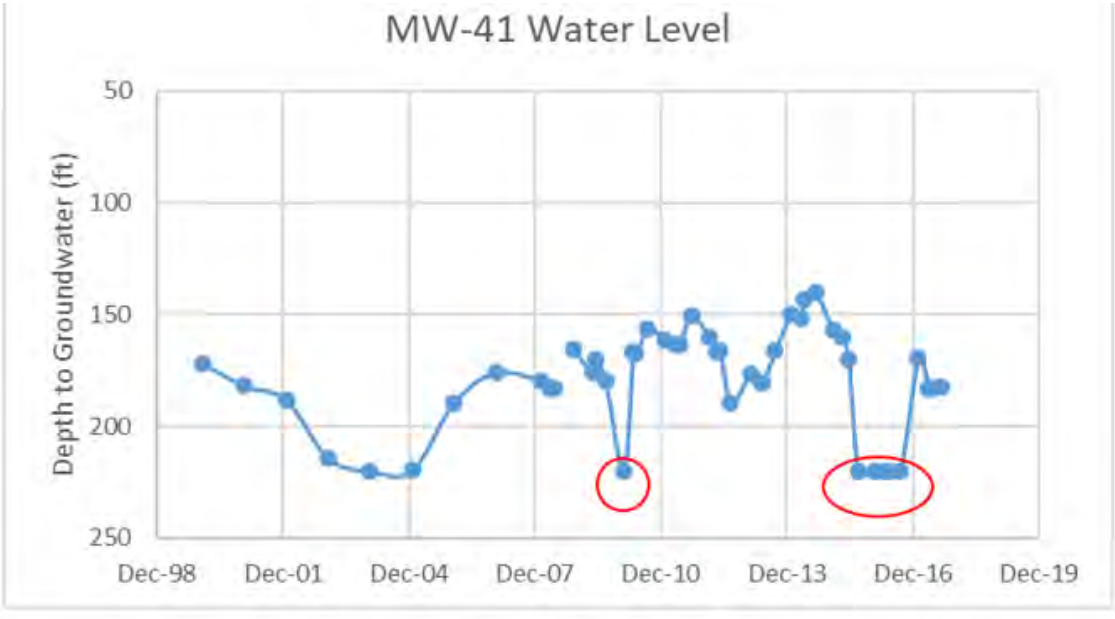


Figure 2-3. Measured Depth to Water at MW-41. Red circles indicate erroneous data caused by a faulty water level meter and questionable January 2010 measurement.

The water table or regional potentiometric surface was updated as part of recent groundwater modeling [Hocking and Minnick, 2019]. Because seasonal fluctuations and abnormal data points can skew a potentiometric surface based on a single point in time, an average water table or regional potentiometric surface was used to provide a more accurate surface for model calibration. The average (calculated mean) water-table elevation map, shown in Figure 2-4, was created using monitoring well data from 2000 through August 2017 and excluded obvious erroneous data points. RESPEC also reviewed additional water level data through April 2020. The average water elevation for most wells from 2000 through 2020 was similar to the data used to generate the previous potentiometric map (2000–2017); therefore, updating the regional potentiometric map was not warranted. Average water level measurements are provided in Table 2-2 with additional measurements in Appendix E and well locations shown in Figure 2-4.

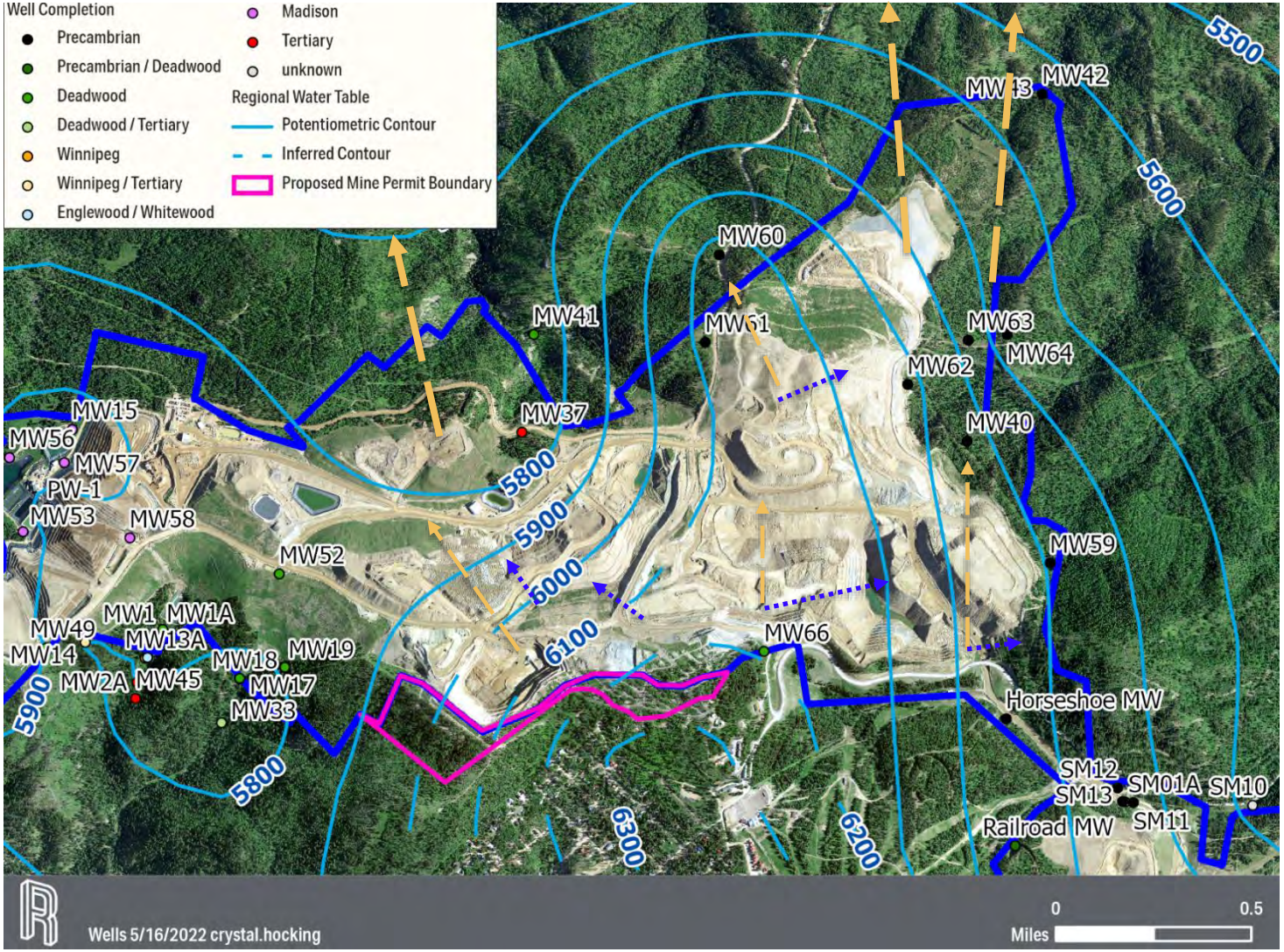


Figure 2-4. Average Potentiometric Surface (Feet Above Mean Sea Level) and Generalized Groundwater Transport Flow Direction (Modified From Hocking and Minnick, [2019]). The flow vectors indicate shallow flow (blue vectors) and deep flow (gold vectors).

Table 2-2. Well Construction Summary and Average (2000–2017) Regional Water-Table Elevations (Page 1 of 2)

Well Name	Easting (ft)	Northing (ft)	Collar Elevation (ft)	Total Depth (ft)	Screen Interval Depth (ft)	Formation	Average Water Elevation (ft)
PW-1	45,398.800	50,148.400	6,058.10	520.00	275–510	Madison	5,866
HDH-10A	44,737.987	49,877.056	6,045.50	340.00	120–300	Madison	5,922
HDH-12	44,571.382	50,707.757	5,963.83	78.00	28–66	Madison	5,920
MW-1	47,034.970	48,576.710	5,924.39	304.00	275–290	Deadwood	5,864
MW-1A	47,034.270	48,549.444	5,919.80	170.00	136–156	Englewood/ Whitewood	5,840
MW-2	46,690.450	47,813.130	5,844.86	304.00	290–296	Porphyry	5,782
MW-2A	46,721.690	47,844.070	5,846.12			Deadwood/ Porphyry	5,808
MW-9	43,180.155	49,780.991	5,983.85	269.00	262–265	Porphyry	5,774
MW-9A	43,180.331	49,780.946	5,983.59	240.50	237–240	Englewood	5,764
MW-10	43,174.309	50,238.360	5,889.57	164.00	155–158	Madison	5,770
MW-10A	43,174.486	50,238.423	5,888.43	117.00	130–133	Madison	5,767
MW-13	46,848.590	48,181.380	5,872.63			Englewood/ Whitewood	5,840
MW-13A	46,815.250	48,173.395	5,874.44			Winnipeg	5,800
MW-14	45,993.300	48,350.850	6,121.40	425.00	385–425	Winnipeg/ Porphyry	5,793
MW-15	45,683.130	51,234.230	6,044.21	165.00	110–155	Madison	5,933
MW-17	48,102.300	47,963.580	5,803.88	125.00	90–110	Deadwood	5,763
MW-18	48,099.970	47,953.680	5,803.14	70.00	53–73	Deadwood	5,761
MW-19	48,704.330	48,140.840	5,942.30	270.00	250–270	Deadwood	5,810
MW-33	47,887.990	47,343.400	5,732.60	120.00	120–30	Porphyry/ Deadwood	5,710
MW-37	51,749.868	51,482.935	6,268.52	725.00	546–706	Phonolite	5,716
MW-40	57,763.991	51,644.331	6,073.02	300.00	195–310	Precambrian	5,937
MW-41	51,848.034	52,815.830	5,907.96	240.00	178–238	Deadwood	5,733
MW-42	58,554.220	56,410.410	5,636.96	65.00	46–66	Precambrian	5,637
MW-43	58,554.840	56,404.890	5,637.57	130.00	110–130	Precambrian	5,638
MW-44	45,111.310	51,026.090	6,001.86	90.00	67–87	Porphyry	5,938
MW-45	46,713.930	47,622.300	5,809.67			Phonolite	5,775
MW-48	44,421.038	49,237.722	6,127.01	300.00	250–300	Deadwood	5,868
MW-49	45,469.688	48,242.057	6,152.16	300.00	240–300	Deadwood	5,905
MW-50	43,635.209	48,164.385	6,001.01	140.00	90–140	Deadwood	5,950
MW-51	44,669.558	47,372.529	6,019.68	200.00	140–180	Precambrian	5,964
MW-52	48,572.617	49,405.905	6,251.98	460.00	420–460	Deadwood	5,855

Table 2-2. Well Construction Summary and Average (2000–2017) Regional Water-Table Elevations (Page 2 of 2)

Well Name	Easting (ft)	Northing (ft)	Collar Elevation (ft)	Total Depth (ft)	Screen Interval Depth (ft)	Formation	Average Water Elevation (ft)
MW-53	45,084.900	49,815.000	6,050.90	300.00	160–200	Madison	5,932
MW-54	44,695.900	50,172.900	6,014.90	200.00	60–100	Madison	5,929
MW-55	44,451.700	50,522.400	5,985.60	500.00	60–100	Madison	5,837
MW-56	44,854.900	50,815.700	6,009.00	260.00	60–100	Madison	5,927
MW-57	45,601.100	50,777.600	6,046.80	180.00	110–150	Madison	5,937
MW-58	46,529.900	49,800.000	6,177.70	600.00	260–300	Madison	5,894
MW-59	5,8960.63	5,0045.03	6,153.50	250.00	170–250	Precambrian	5,896
MW-60	54,298.611	54,020.165	6,265.12	400.00	300–400	Precambrian	6,144
MW-61	54,168.163	52,820.488	6,364.97	520.00	420–520	Precambrian	6,123
MW-62	56,922.849	52,378.143	6,092.13	200.00	80–200	Precambrian	6,030
MW-63	5,7711.78	53,017.902	6,067.53	300.00	200–300	Precambrian	5,871
MW-64	58,236.104	53,117.369	6,018.48	400.00	300–400	Precambrian	5,739
MW-66	55161.54	48660.3	6,456.11	420.00	360-420	Deadwood	6,164[a]
Foley Shaft	53,314.390	47,076.240	6,421.50	793.00			6,328[b]
Railroad MW	58,672.948	46,182.613	6,254.08				5,950
Horseshoe MW	58,498.325	47,901.446	5,980.78				5,942

(a) Water level data for MW-66 was based on an average from July 2019 through March 2021.

(b) The Foley Shaft was used only as an approximation of the regional water table in the area due to lack of other available data in the vicinity. It is not shown on the potentiometric map and the contours have been dashed to show the uncertainty of the water table surrounding this location.

Water level readings for several wells (including Nevada Gulch MW and Joseph Well) were not collected because these wells are blocked or inaccessible. In some instances, measurements could not be taken because the water level meter cable kinked when lowered into the well because of various facilities located in the well, such as power supply cables and pump columns.

The regional water table mirrors topography to a certain extent. For example, the groundwater table on the eastern flank of Terry Peak slopes gently to the northeast. Water depth is typically greater than 200 feet below ground surface. The groundwater level is closest to the land surface at well SM-09 in Nevada Gulch where the groundwater table is approximately at the same level of the stream. The water level is furthest from the land surface at wells MM04A and MW-19. Water levels in the area may be impacted by local users pumping water and seasonal or long-term climate conditions; thus, the potentiometric data are only an approximate representation of current conditions.

There is insufficient distribution of data to support drawing site-wide potentiometric maps of each aquifer. The regional potentiometric map was constructed using available water level data from Wharf's groundwater monitoring program. The majority of wells in the American Eagle and eastern side of the Wharf Mine are completed within the Precambrian (e.g., MW-62). A potentiometric map of only the

Precambrian would be limited to this area of the site. Moving toward the west, the Precambrian is deeper and monitoring wells begin to be completed in overlying formations such as the Deadwood aquifer (e.g., MW-41). The Deadwood is absent, as it has been mined, from the majority of the American Eagle and eastern Wharf area, however the Deadwood Formation occurs overlying the Precambrian further east outside of the mine. In some locations, shale and less permeable units of the Deadwood could serve to semi-confine or separate the Deadwood and Precambrian, though fractures and brecciation are also just as likely to provide hydraulic connection between the two units.

A higher density of water level observation wells occurs in the western-most portion of the Wharf Mine between the process area and Annie Creek. Most of these wells are completed in younger Paleozoic aquifers that include the Madison, Englewood, Winnipeg, and Deadwood. Few observation wells are completed into the deep Precambrian of this area. RESPEC acknowledges that the potential exists for minor differences in water levels or hydrologically isolated zones between the Madison, Englewood, Winnipeg, Deadwood, and Precambrian units in this area. Any potentiometric maps attempted to be drawn of these units would be limited in extent to the small area surrounding the processing facilities because of the lack of spatially distributed data. Because the younger Paleozoic aquifers are not present in the Boston Expansion and will not be directly impacted, variations in potentiometric levels associated with younger overlying aquifers would not provide data regarding water level or groundwater occurrences at the Boston Expansion.

2.5.2 GROUNDWATER GRADIENTS AND VELOCITIES

Based on the potentiometric surface, the average gradient in the Wharf Mine area is fairly steep with gradients from 0.02 to 0.13. In previous investigations, the groundwater velocity was calculated as 1.3 ft/day in the Deadwood Formation and 0.15 ft/day in the Precambrian [J. M. Montgomery Consulting Engineers, Inc., 1996].

Two major flow regimes exist within the model domain: (1) shallow and (2) deep groundwater flow. The shallow flow is predominantly influenced by recharge in the unsaturated zone and the pressure gradient that occurs perpendicular to the water-table elevation contours. Solute transport is influenced by shallow groundwater flow as recharge moves through a high-permeability pit fill. The pit fill is isotropic, so the flow direction depends on the pressure gradients. A deeper flow regime in the fractured Precambrian bedrock is predominantly influenced by the north-south trending, anisotropic, fracture-controlled flow. After the solutes reach the Precambrian bedrock, fracture-controlled, anisotropic hydraulic conductivity dominates the flow-direction factor and results in a general northern flow that is influenced primarily by the anisotropic flow and secondarily by the pressure gradient. Flows within other aquifers, such as the Deadwood or Madison, may be less influenced by fracture flow than the Precambrian but are still likely to experience more anisotropy than unconsolidated bedrock. Figure 2-4 also shows the conceptual flow regime in and around the Wharf Mine. The flow vectors indicate shallow flow (blue vectors) and deep flow (gold vectors). A groundwater flow path simulation was run using U.S. Geological Survey (USGS) MODPATH software [Hocking and Minnick, 2019]. The deeper north trending flow that is influenced by the north-south trending fractures in the Precambrian bedrock was simulated in MODPATH and is shown in Figure 2-5.

Figure 2-5. Modeled Tracked Particle Flow Lines [Hocking and Minnick, 2019]. Location of the Boston Expansion is approximate.

Anisotropic conditions in the Wharf area have been demonstrated by results of pumping and dye tracer tests. Though these tests were conducted at nearby Golden Reward, it is likely comparable anisotropic conditions exist at adjacent Wharf and the Boston Expansion. As part of the pumping test in the West Liberty Pit area, well SM01A was pumped at 17 gallons per minute (gpm) for 2 hours. The results indicated that the Precambrian bedrock aquifer is "highly anisotropic with a preferential north-south groundwater flow direction" [Environmental Resources Management, 2011]. A 2010 dye test at Golden Reward was conducted by applying dye to the southeastern edge of the capped backfill. As part of the analysis, Environmental Resources Management (ERM) indicated that the dye traveled both along the north trending fractures in the Precambrian bedrock as well as east and southeast through both the backfill material and historic underground mine workings [ERM, 2011].

2.6 RECHARGE AND DISCHARGE

The Boston Expansion Area sits northwest of Terry Peak on the west side of a regional groundwater divide; however, the exact location of the groundwater divide is uncertain because of limited water level

data in the vicinity of Terry Peak. Within the Boston Expansion Area, groundwater flow is generally toward the northwest and west toward Lost Camp Gulch. However, anisotropic conditions within the Precambrian indicate that flow may be highly fracture controlled and more northerly than indicated by the regional potentiometric map. A map of generalized groundwater flow directions is provided in Figure 2-4.

Because the Boston Expansion Area lies slightly west of a groundwater divide, the only significant inflow into the area is from precipitation recharge. Based on past studies, precipitation recharge is approximately 3 inches per year on undisturbed land, 9 inches per year on opened pits, and 4.5 inches per year on reclaimed areas [J. M. Montgomery Consulting Engineers, Inc., 1996]. In localized areas around the Wharf Mine, additional groundwater recharge may occur as leakage from the shallow alluvial and colluvial aquifer [Golden Reward Mining Company, 1990].

Sources of groundwater discharge include wells, springs, seeps, and subsurface flow out of the area. False Bottom Spring discharges an average of 10 gpm; baseflow to Deadwood, Cleopatra, and False Bottom Creeks ranges from 100 to 150 gpm [J. M. Montgomery Consulting Engineers, Inc., 1996]. Discharge from wells in the area (described in the next section) is limited.

2.7 GROUNDWATER USE

No water supply wells are located within the Boston Expansion Area. MW-66 is the only well within or immediately adjacent to the Boston Expansion Area. Many other wells are located within the greater Wharf and Golden Reward areas, and the majority of these are monitoring wells owned and operated by Wharf. The following sections detail water use based on local water rights and operational water usage. Wells used strictly for monitoring purposes (including short-duration pumping to acquire water quality samples) are discussed in Sections 3.1 and 3.2 of this report.

2.7.1 WATER RIGHTS

A review of existing wells and the historical use of water in the area was used to evaluate groundwater usage in the local area. The state of South Dakota lists 12 water rights (shown in Table 2-3 and Figure H-1) for groundwater within the following areas:

- Township 4 North, Range 2 East, Sections 1, 2, 3, 4, and 12
- Township 5 North, Range 2 East, Sections 33, 34, 35, and 36
- Township 4 North, Range 3 East, Sections 6 and 7.

The past and present general groundwater uses are related to housing development; mining; and more recently, skiing and snow making. Six of these water rights are controlled by Wharf Resources (including two Golden Reward water rights) and used mostly for mining purposes. The Black Hills Chairlift Company has two appropriated water rights for use in snow making and other activities at Terry Peak. At least four of the active wells are drilled into past mine workings that collect fracture-related flow waters. A list of all Wharf and Golden Reward water rights is provided in Appendix H.

Table 2-3. Groundwater Water Rights in the Vicinity of Wharf

Permit No.	Name	Use	cfs	Sec, T, R	Source
301-1	Black Hills Chairlift Company	Commercial	0.02	1, 4N, 2E	Crystalline rock[(a)]
301A-1	Black Hills Chairlift Company	Commercial	2.13	1, 4N, 2E	Crystalline rock (Ben Hur Mine)
1346-1	Wharf Resources	Domestic	0.22	3, 4N, 2E	Madison limestone
1335-1	Whitetail Court	Commercial	0.036	6, 4N, 3E	Alluvium
1926-1	Gilded Mountain Homeowners Association	Suburban housing development	0.033	6, 4N, 3E	Crystalline rock
1990-1	Gilded Mountain Homeowners Association	Suburban housing development	0.025	6, 4N, 3E	Alluvium
1666-1	Golden Reward Mining Company	Industrial	1.83	6, 4N, 3E	Crystalline rock
1666A-1	Golden Reward Mining Company	Commercial	0.83	7, 4N, 3E	Deadwood; crystalline rock
1761-1	Wharf Resources	Industrial	0.67	33, 5N, 2E	Madison limestone
1406A-1	Terry Valley Trojan Water Project District	Suburban housing development	0.178	34, 5N, 2E	Deadwood (Two Johns Mine)
1493-1	Wharf Resources (USA) Inc.	Industrial	0.536	33, 5N, 2E	Madison Limestone
1365-1	Wharf Resources	Industrial, domestic	0.16	35, 5N, 2E	Crystalline rock (Annie Creek Mine)
1174-1	Wharf Resources	Commercial, municipal	0.67	35, 5N, 2E	Deadwood (Squaw Creek Shaft)

cfs = cubic feet per second.
Sec, T, R = Section, Township, Range
(a) Crystalline rock in the Wharf area is assumed to be the Precambrian.

2.7.2 PRIVATE WELLS

Three private groundwater wells are within 1 mile of the Boston Expansion Area. Two of these wells in the Lost Camp subdivision are ground heat pump well systems and the third is an industrial well utilized by Terry Peak. These three wells are all located hydraulically upgradient or side gradient to the Boston Expansion Area and are therefore the water quality is not expected to be impacted by the Boston Expansion. A map of private wells was created based on well-completion reports available from the SD DANR's online database and historical Wharf surveys [South Dakota Department of Agriculture and Natural Resources, 2021]. All private wells (and monitoring wells) are provided in Appendix H. The well locations outside the permit area must be considered approximate because the state well-completion reports list wells only to the nearest section or quarter section. Wells listed in the SD DANR database that have an improper location or are abandoned are not represented on the map.

2.7.3 OPERATIONAL USE

No additional water usage is required for the Boston Expansion project beyond what is currently used as part of Wharf's ongoing mining operations. Groundwater supply for the Wharf Mine is obtained primarily from wells completed in the Madison Aquifer (e.g., PW-2). Additional water supply for Wharf may be obtained from the Joseph Well 2 within the Clinton Project area; therefore, pumping of the Joseph Well 2 may have minor, localized effects on the water elevation.

3.0 GROUNDWATER QUALITY

3.1 EXISTING GROUNDWATER MONITORING PROGRAM

Water quality and water level monitoring programs have been in place at Wharf since 1985 and at Golden Reward since 1987. At the Wharf Mine, 55 groundwater monitoring wells are being sampled for water quality and water level, and two additional wells are monitored for water level only (see Figure 3-1 and Table 3-1). At the Golden Reward Mine, 21 wells are part of the ongoing monitoring. Appendices A and B contain additional information on sampling frequency and parameter lists for the Wharf and Golden Reward hydrology monitoring programs. Sampling protocols are provided in Appendix D.

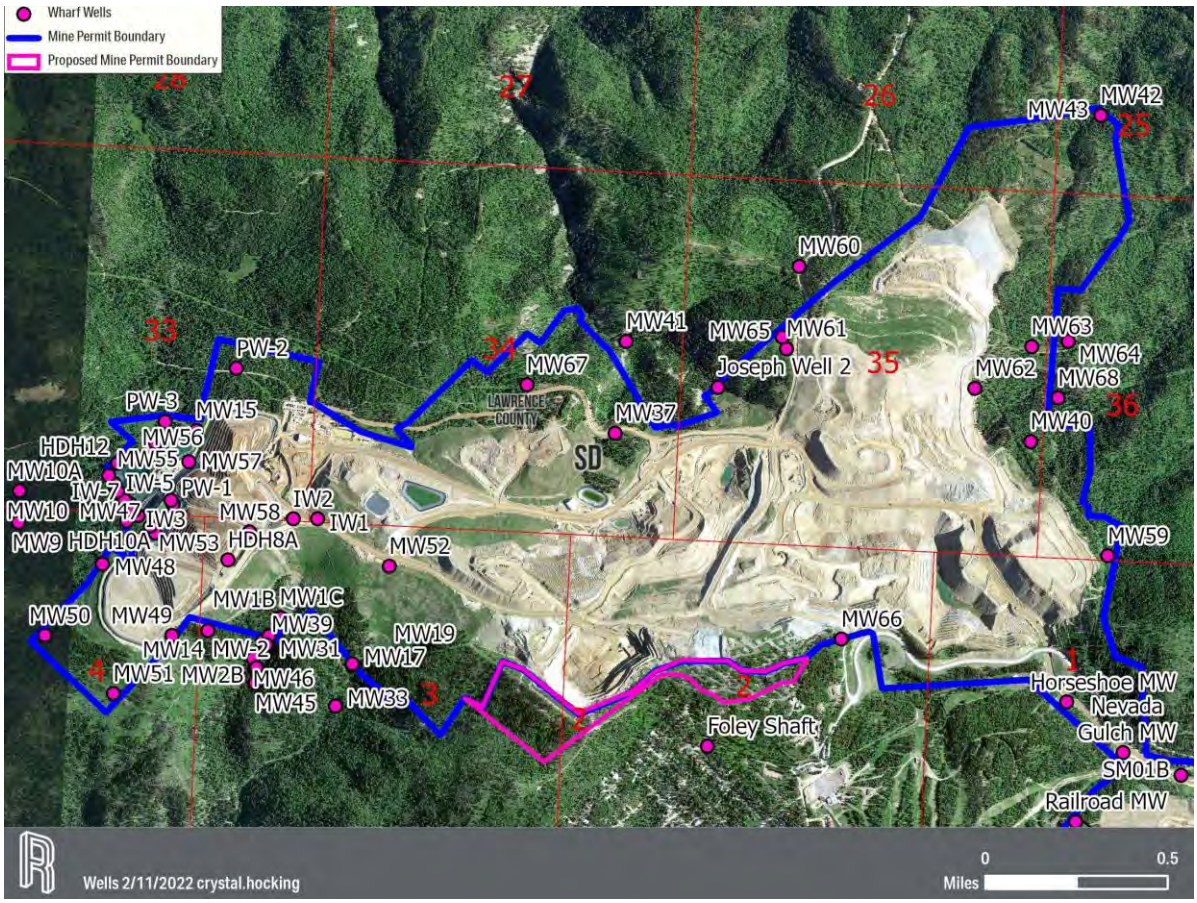


Figure 3-1. Existing Wharf Groundwater Wells at the Wharf Mine.

Of these existing wells, three wells are considered baseline wells for the Boston Expansion Area. The list of the baseline sites for the Boston Expansion Area is provided in Section 3.2. Additional data on sampling methods, results, and analysis are also provided in the following sections.

Of the area springs, seeps, and other surface water monitoring points, water quality samples are collected from 17 sites. According to guidance from the SD DANR, none of these sites are considered baseline sites for the Boston Expansion Area. Additional information on spring sampling frequency and parameter lists are provided in Appendix A.

Table 3-1. Existing Groundwater Monitoring Sites at Wharf

Site	Frequency	Parameter List[a]	Site	Frequency	Parameter List[a]
MW-1	Monthly	1, 2	MW-51	4 times/year	1
MW-1A	Monthly	1, 2	MW-52	4 times/year	1
MW-2	Monthly	1, 2	MW-53	Monthly	1, 2
MW-2A	Monthly	1, 2	MW-54	Monthly	1, 2
MW-9	4 times/year	1	MW-55	Monthly	1, 2
MW-9A	4 times/year	1	MW-56	Monthly	1, 2
MW-10	4 times/year	1	MW-57	Monthly	1, 2
MW-10A	4 times/year	1	MW-58	Monthly	1, 2
MW-13	Monthly	1, 2	MW-59	4 times/year	1
MW-13A	Monthly	1, 2	MW-60	4 times/year	1
MW-14	4 times/year	1	MW-61	4 times/year	1
MW-15	4 times/year	1	MW-62	4 times/year	1
MW-17	4 times/year	1	MW-63	4 times/year	1
MW-18	4 times/year	1	MW-64	4 times/year	1
MW-19[b]	4 times/year	1	MW-65	4 times/year	1
MW-31	Monthly	1, 2	MW-66[b]	Monthly for 1 year then 4 times/year	1
MW-33[b]	4 times/year	1	MW-67	4 times/year	1
MW-37	Monthly	1, 2	MW-68	4 times/year	1
MW-40	4 times/year	1	GWAC6	4 times/year	1
MW-41	4 times/year	1	HDH-8A	4 times/year	1
MW-42	4 times/year	1	HDH-10A	Monthly	1,2
MW-43	4 times/year	1	HDH-11	4 times/year	1
MW-44	4 times/year	1	HDH-12	4 times/year	1
MW-45	Monthly	1, 2	Joseph Well (2)	4 times/year	1
MW-47	4 times/year	1	PW-2	4 times/year	1
MW-48	4 times/year	1	MW-1B	Monthly	Water Level Readings Only
MW-49	4 times/year	1	MW-2B	Monthly	Water Level Readings Only
MW-50	4 times/year	1			

(a) Parameter lists provided in Appendix A.

(b) Site to be included in the permit application analysis.

3.2 BOSTON EXPANSION PROJECT BASELINE MONITORING PROGRAM

The existing Wharf and Golden Reward groundwater monitoring programs were evaluated to determine which sites were applicable to the Boston Expansion Area. Based on location and SD DANR recommendations, four sites were initially chosen (MW-19, MW-33, MW-66, and the Foley Shaft). Of these sites, the Foley Shaft, which is a historic mine shaft and lacks well-completion information, was removed from further consideration as a monitoring well with SD DANR approval on May 12, 2021, after the LifeCycleGeo report was submitted to the SD DANR for review (Appendix I). The report summarized the geochemical analysis of all historic and current Foley Shaft water quality data and indicated that that location did not exhibit a hydrological or geochemical connection necessary to assess potential mine impacts in that direction. The Foley Shaft contains a unique geochemical water quality signature, which indicates that the shaft is potentially influenced by surface water inflow. MW-19 was originally constructed for older mine monitoring of backfill rather than being constructed into previously undisturbed earth; therefore, this location is expected to provide baseline data representative of a mine site and not data representative of a pristine location.

Groundwater monitoring wells that are considered as a baseline for the Boston Expansion Area are provided in Figure 3-2 and Table 3-2. Table 3-2 contains well elevation and depth information, and the well-completion reports for the baseline wells are provided in Appendix C.

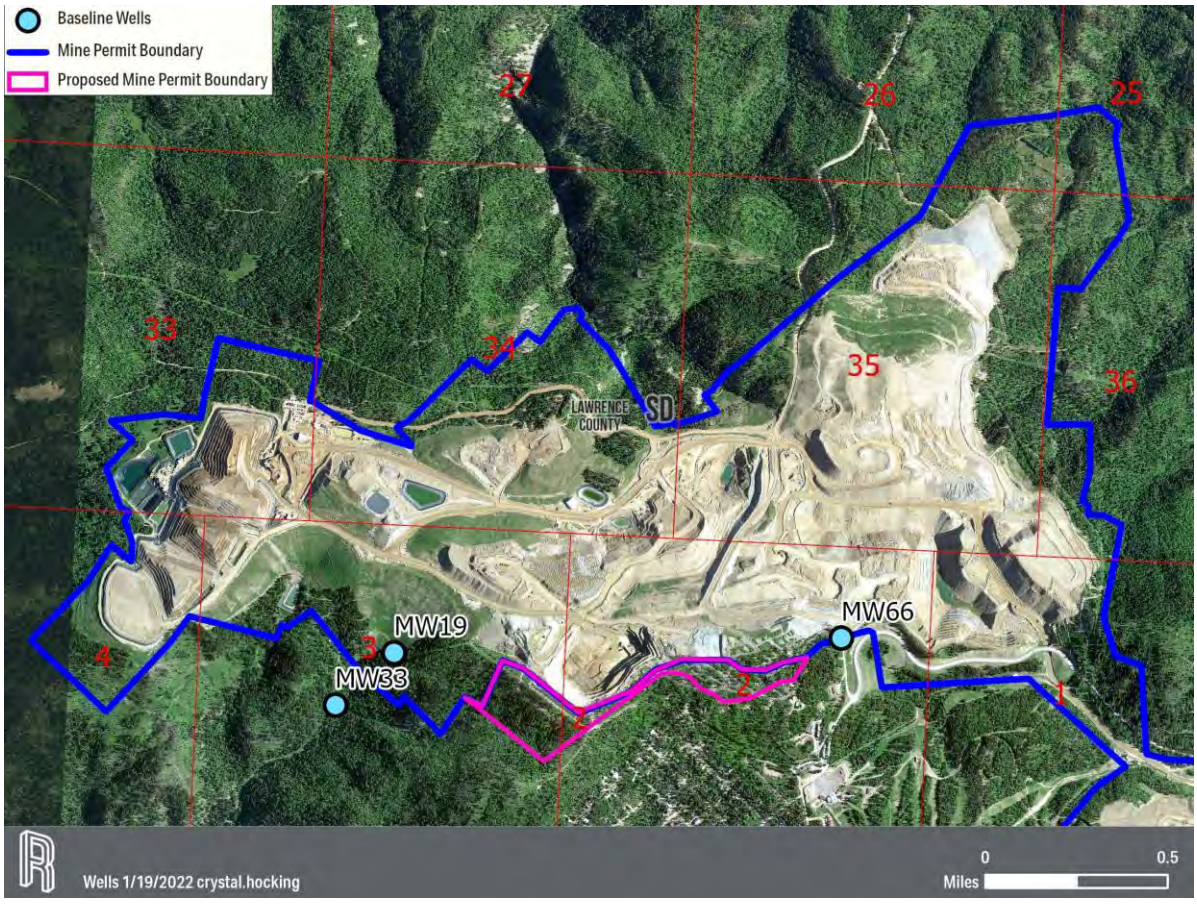


Figure 3-2. Baseline Groundwater Sampling Sites for the Boston Expansion Area.

Table 3-2. Groundwater Monitoring Sites at the Boston Expansion Area

Site	Purpose	Description	Casing Elevation (ft)	Ground Elevation (ft)	Well Depth (ft)	Screen Interval (ft)	Legal Location
MW-19	Existing Wharf sampling site	Well in Annie Creek drainage inside Wharf Mine Permit Area	5,904.04	5,902.30	270	250-270	Sec. 3, T4N, R2E
MW-33	Existing Wharf sampling site	Well in Annie Creek drainage downstream of Wharf Mine	5,732.60	5,730.10	120	120-230	Sec. 3, T4N, R2E
MW-66	Existing Wharf sampling site	Well 200 yards southeast of current open pit	6,457.60	6,456.05	420	360-420	Sec. 2, T4N, R2E

Field measurements include pH, conductivity, oxidation-reduction potential (ORP), dissolved oxygen (DO), temperature, and water depth. For wells MW-19 and MW-33, groundwater metals are analyzed for dissolved concentration except for mercury, which is analyzed for total concentration. Samples from MW-66 have been analyzed for both dissolved and totals metals concentrations. Additional sampling details for existing baseline monitoring sites are provided in Appendix A.

Wharf is currently proposing to continue its current monitoring program throughout operations at the Boston Expansion Area unless otherwise directed by the SD DANR.

3.3 SAMPLING METHODS

Wharf personnel will continue to collect samples from the existing monitoring sites at the Wharf Mine following the approved, established sampling protocols described in Appendix D.

3.4 DATA

Water quality results for baseline hydrology wells (MW-19, MW-33, and MW-66) sampled before this report were finalized, and the laboratory data sheets are provided in Appendix E. Five years of data are included (from January 2016 through June 2021).

Comprehensive statistics for all baseline wells are included in Appendix E and include the number of samples analyzed, number detected, mean, standard deviation, quartile one (Q1), median, quartile three (Q3), minimum, and maximum values. Appendix F contains time-series graphs of water quality data.

If a water quality result was reported as less than the practical quantitation limit (PQL) value in the raw data, that result was included in the statistical analyses as one-half of the PQL value. If two separate PQL values were reported for a single constituent, the PQL occurring more frequently was used as the PQL when reporting the results of the statistical analyses. Similarly, if a PQL was not listed for some of a single constituent's results but was listed for other results of the same constituent, the listed PQL value was used for all of that constituent's results. If statistical analysis results were calculated to be less than the PQL, those results were then reported as N/A instead of the calculated value. Also, if a result was reported as zero in the raw data for a constituent having a specified PQL, one-half of the specified PQL was used in the statistical analyses instead of the zero value.

3.5 ANALYSIS AND SUMMARY OF BASELINE WELL GROUNDWATER CHEMISTRY

3.5.1 GENERAL WATER QUALITY

The groundwater quality results at baseline sampling sites are similar to the results from other sampling sites and are representative for mineralized groundwater in the region. A summary of the baseline groundwater chemistry is presented in the following text.

Field pH values range from 7.06 to 8.22, and the median value among baseline wells is 7.86. MW-66 has the highest pH values that range from 7.76 to over 8.27. Conductivity and total dissolved solids (TDS) values are highest at MW-19 and lowest at MW-66; MW-33 lies between MW19 and MW-66. For many parameters, including conductivity, TDS, dissolved arsenic, dissolved gold, sodium, bicarbonate, nitrate, and sulfate, MW-19 appears to fluctuate notably more than MW-33 and MW-66.

3.5.2 TIME-SERIES ANALYSIS

Water quality data are also presented as time-series graphs in Appendix F. These graphs display the concentration (*y* axis) versus time (*x* axis) for every water quality parameter with multiple analyses and at least one detection. The list of analytes that either resulted in laboratory-analyzed concentrations below the limit of detection in every instance or that only had a single sample collected, over the previous 5 years, include the following:

- No detections from any sample collected from the three baseline monitoring wells over the last 5 years:
  - dissolved cadmium
  - dissolved chromium
  - dissolved copper
  - dissolved lead
  - dissolved silver
  - dissolved zinc
  - total cadmium
  - total copper
  - total gold
  - total mercury
  - total selenium
  - total silver
  - total zinc
  - total cyanide
  - Weak Acid Dissociable (WAD) cyanide
  - ammonia.
- A single sample over the last 5 years (collected from MW-66 during first monthly sampling following installation):
  - dissolved cobalt (<0.001 milligrams per liter [mg/L])
  - dissolved iron (<0.050 mg/L)
  - dissolved manganese (<0.010 mg/L)
  - dissolved molybdenum (0.002 mg/L)
  - dissolved nickel (<0.005 mg/L)
  - total cobalt (<0.001 mg/L)
  - total manganese (0.027 mg/L)
  - total molybdenum (0.002 mg/L)
  - total nickel (<0.005 mg/L)
  - dissolved silicon (12.5 mg/L)
  - total silicon (16.3 mg/L).

Some graphs that only display data for one well in a group are indicative that no data were available from the other wells for that particular parameter and is not an error (e.g., MW-66 had a different sampling program with additional analytes over a limited duration after it was installed in 2019). Samples that were below the detection limit were plotted at one-half the PQL.

Most dissolved metals concentrations are generally at or below the detection limit. Water quality parameters (e.g., conductivity, pH, and TDS) have shown general stability over the last 5 years, although certain parameters have seen greater fluctuations or spikes and many were without a discernable explanation or pattern. Based on the time-series charts in Appendix F, MW-19 appears to fluctuate notably more than MW-33 and MW-66 for many parameters (e.g., dissolved gold, dissolved sodium, bicarbonate, nitrate, dissolved selenium, sulfate, and laboratory conductivity) and is potentially associated with a seasonal or water level cycle.

Nitrate values show minor fluctuations in MW-19 and relatively steady concentrations in MW-33 and MW-66; however, nitrate concentrations above 10 mg/L have only been observed in MW-19 in the past 5 years. All nitrate detections in MW-33 and MW-66 over the last 5 years are less than 2 mg/L.

Arsenic values have been above the detection limit in all three baseline wells, which is a common occurrence in gold-hosted mineralized rock in the region. MW-66 has the highest arsenic levels, MW-33 has one detection of dissolved arsenic, and MW-19 has dissolved arsenic concentrations that vary from 0.009 to 0.019 mg/L. MW-66 was the only baseline well sampled for total arsenic over the last 5 years.

Sodium values have had minor fluctuations. The increases and decreases at MW-33 and MW-19 mirror each other. Field and laboratory pH values have minor fluctuations for most of the wells.

3.5.3 GROUNDWATER CONCENTRATIONS

Four analyzed parameters are above South Dakota's groundwater standards, including nitrate, aluminum, arsenic, and iron. Groundwater standards (and secondary standards) for select parameters are provided in Appendix E.

Nitrate and cyanide are typically of concern at Wharf because nitrate is used in rock blasting, and cyanide primarily results from the heap-leach process. All but 37 of 90 nitrate samples have concentrations below the South Dakota Groundwater Quality Standards drinking water standard of 10 mg/L. MW-33 and MW-66 have background nitrate concentrations less than 1.5 mg/L. During the last 5 years, 39 of the 49 samples from MW-19 have had nitrate concentrations above 10 mg/L with values as high as 18.6 mg/L. During the same period, nitrate concentrations from MW-19 have shown a cyclical pattern but without an increasing or decreasing trend. Cyanide, including total and WAD, was below the detection limit in all baseline well samples. Historical impacts to groundwater from previous mining activities are minor as evidenced in elevated occurrences of nitrate and arsenic in MW-19 and MW-66, respectively.

Baseline monitoring wells and their respective groundwater parameters greater than South Dakota Groundwater Quality Standards include the following:

- MW-33: None
- MW-19: 37 of the 48 nitrate samples collected over the last 5 years at MW-19 have been greater than the standard of 10 mg/L; lower concentrations are generally observed between late spring and early summer, and higher concentrations are between winter and early spring
- MW-66: Since the well was installed in 2019, all of the samples collected at MW-66 for dissolved arsenic (23 samples) have been greater than the South Dakota Groundwater Quality Standard.

4.0 PROJECT IMPACTS

Impacts would be minimal to groundwater hydrology, water quality, and local water supply wells as a result of mining in the Boston Expansion Area. Potential impacts are anticipated to be similar to impacts experienced in previously mined areas of the Wharf and Golden Reward Mines.

4.1 POTENTIAL IMPACTS TO GROUNDWATER HYDROLOGY

The potential impacts of concern to groundwater hydrology are pit inflow, recharge, and discharge changes. Inflows into the pits are not anticipated at the proposed expansion area because recent drilling programs and measured water levels indicate that significant water is not present at the depths projected for surface mining. Existing mine pits have not had groundwater inflow problems, and the low permeability of the rock limits water availability. The proposed Boston Expansion project is also likely to have a low impact on groundwater recharge and discharge in the project area.

The mining removal of rock and eventual backfilling with waste rock will significantly increase the vertical and horizontal permeability of material in that area compared to pre-mining permeability. This increase in permeability will allow recharge precipitation to move downward more rapidly into the groundwater system, which will reduce evapotranspiration, and could potentially result in a small net gain in recharge. Recharge to the pit areas may increase during mining and restoration because higher infiltration rates are expected because the surface cover is disturbed. Higher infiltration rates during mining and reclamation (9 inches per year [in/yr] and 4.5 in/yr, respectively) have been used in groundwater fate and transport modeling of the site. Because the maximum pit bottom is located above the groundwater table, mining, reclamation, and waste rock disposal is not anticipated to have notable impacts to groundwater flow. Withdrawal rates from existing supply wells are not anticipated to increase because operational water usage will remain consistent with current practices.

4.2 POTENTIAL IMPACTS TO GROUNDWATER QUALITY

No spent ore is planned to be disposed of in the Boston Expansion Area. Only minor, if any, impacts on groundwater chemistry are predicted in association with extracting material and waste rock disposal. The presence of mine pits exposes additional rock surfaces to infiltrating water. Similar to the rest of the Wharf and Golden Reward Mine areas, the ore being mined in the Boston Expansion Area has low concentrations of sulfide minerals and will not likely impact water quality.

A comprehensive geochemical analysis of the mined rock is provided in the Large-Scale Mine Permit application. Geochemical tests include acid-base accounting, meteoric water mobility testing, whole rock analysis, and humidity cells. These tests assess acid-rock drainage potential and consider leaching of other metals and elements.

Impacts on groundwater quality resulting from waste rock disposal may be similar to the groundwater impacts in nearby areas that have previously been mined and backfilled with waste rock. Examples of these impacts include increased nitrate concentrations in shallow wells within the Wharf permit boundary. Given these experiences, an increase in nitrate may occur below the Boston Expansion Area. Based on historic observations and modeling of groundwater impacts from backfill at the Wharf Mine,

RESPEC infers that the increase in nitrate from blasting and waste rock disposal is not expected to exceed the groundwater standard of 10 parts per million (ppm) outside the proposed Boston Expansion permit area [Hocking and Meuzelaar, 2021].

4.3 POTENTIAL IMPACTS TO LOCAL WATER SUPPLIES

Mining of the proposed Boston Expansion Area will occur above the water table near the top of a regional hydrographic divide. No water supply wells are located within the Boston Expansion Area, and the majority of active wells in the nearby region are owned by Wharf or the Black Hills Chairlift Company. General water uses are related to housing development, mining, and snow making. Based on the information presented in this report, the expansion project is not anticipated to adversely affect water supply or water quality for Terry Peak snow making or local drinking water wells.

5.0 REFERENCES

Downey, J. S., 1984. *Geohydrology of the Madison and Associated Aquifers in Parts of Montana, North Dakota, South Dakota, and Wyoming*, U.S. Geological Survey Professional Paper 1273–G, prepared by the U.S. Geological Survey, Reston, VA, p. 47.

Driscoll, D. G., J. M. Carter, J. E. Williamson, and L. D. Putnam, 2002. *Hydrology of the Black Hills Area*, U.S. Geological Survey Water-Resources Investigations Report 02-4094, prepared by U.S. Geological Survey, Reston, VA, p. 150.

Environmental Resources Management, 2011. *Evaluation of Hydrogeology and Geochemistry of Sulfate Impacted Groundwater in the West Liberty Pit Area*, prepared by Environmental Resources Management, Greenwood Village, CO, for Wharf Resources (USA), Inc., Lead, SD.

Golden Reward Mining Company, 1990. *Groundwater Discharge Plan Application*, prepared by Golden Reward Mining Co, Lead, SD, for the South Dakota Department of Environment and Natural Resources, Pierre, SD.

Hocking, C. and T. Meuzelaar, 2021. *2020 Groundwater Model Update Fate and Transport of Nitrate and Fluoride at Coeur Wharf*, Revision 4, prepared by RESPEC, Rapid City, SD, and Life Cycle Geo, LLC, Longmont, CO, for Coeur Wharf, Lead, SD.

Hocking, C. M. and M. D. Minnick, 2019. *2018 Groundwater and Nitrate Migration Update From Mining Activities and Spent Ore Disposal in American Eagle/Deep Portland Pits, Revision 1,* RSI-2855, prepared by RESPEC, Rapid City, SD, for Coeur Wharf, Lead, SD.

Hydrometrics, Inc., 1988. *Golden Reward Mining Company Application for Permit*, prepared by Hydrometrics, Inc., Helena, MT, for Golden Reward Mining Company, Lead, SD.

J. M. Montgomery Consulting Engineers, Inc., 1989. *Reliance Waste Rubble Facility Groundwater Characterization for Wharf Resources*, prepared by J. M. Montgomery Consulting Engineers, Inc., Boise, ID, for Wharf Resources, Lead, SD.

J. M. Montgomery Consulting Engineers, Inc., 1996. *Groundwater Characterization Study of the Clinton Extension Project Area*, prepared by J. M. Montgomery Consulting Engineers, Inc., Boise, ID, for Wharf Resources, Lead, SD.

Klohn Leonoff Consulting Engineers, 1986. *Hydrogeology of Ross Valley*, prepared by Klohn Leonoff Consulting Engineers, Vancouver, Canada, for Wharf Resources, Lead, SD, United States.

Lessard, J. F., 1990. Unpublished external memorandum from J. F. Lessard to L. J. Russell, May 21.

Miller, P. A., 1992. Unpublished letter to D. Dorfschmidt, Wharf Resources, Lead, SD.

Rahn, P. H., 1985. "Ground Water Stored in Rocks of Western South Dakota," *Geology of the Black Hills, South Dakota and Wyoming*, second edition, F. J. Rich (ed.), American Geological Institute, Alexandria, VA, pp. 154–173.

Sarratt, K., 2021. Unpublished personal communication between C. Hocking, RESPEC, Rapid City, SD, and K. Sarratt, Coeur Wharf, Lead, SD, May 20.

South Dakota Department of Agriculture and Natural Resources, 2021. "South Dakota Water Well Completion Reports," retrieved June 4, 2021, from *https://apps.sd.gov/nr68welllogs/*

Wharf Resources (USA), Inc., 1997. *Application for Mining Permit Clinton Project, Revision 1*, prepared by Wharf Resources (USA), Inc., Lead, SD, for the South Dakota Department of Environment and Natural Resources, Pierre, SD.

APPENDIX A

EXISTING WHARF HYDROLOGY MONITORING PROGRAM SUMMARY

APPENDIX A: EXISTING WHARF HYDROLOGY MONITORING PROGRAM SUMMARY

Table A-1. Existing Hydrological Monitoring Sites and Sampling Frequency at the Wharf Mine (Page 1 of 3)

Site	Drainage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HDH-8A	RV	X			X	X			X				
MW-1	RV	X	X	X	X	X	X	X	X	X	X	X	X
MW-13	RV	X	X	X	X	X	X	X	X	X	X	X	X
MW-13A	RV	X	X	X	X	X	X	X	X	X	X	X	X
MW-14	RV	X			X	X			X				
MW-1A	RV	X	X	X	X	X	X	X	X	X	X	X	X
MW-2	RV	X	X	X	X	X	X	X	X	X	X	X	X
MW-2A	RV	X	X	X	X	X	X	X	X	X	X	X	X
MW-31	RV	X	X	X	X	X	X	X	X	X	X	X	X
MW-45	RV	X	X	X	X	X	X	X	X	X	X	X	X
Ross Springs	RV	X	X	X	X	X	X	X	X	X	X	X	X
RV French Drain	RV	X	X	X	X	X	X	X	X	X	X	X	X
RVLC Pond	RV	X	X	X	X	X	X	X	X	X	X	X	X
RVSO Discharge	RV	X	X	X	X	X	X	X	X	X	X	X	X
Annie Creek @ USGS	REL	X			X	X			X				
Annie Creek II	REL	X			X	X			X				
Beaver Springs	REL	X			X	X			X				
GWAC6	REL	X							X				
MW-17	REL	X			X	X			X				
MW-18	REL	X			X	X			X				
MW-19	REL	X			X	X			X				
MW-33	REL	X			X	X			X				
MW-52	REL	X			X	X			X				
MW-9	MG	X			X	X			X				
MW-9A	MG	X			X	X			X				
MW-10	MG	X			X	X			X				
MW-10A	MG	X			X	X			X				
HDH-10A	MG	X	X	X	X	X	X	X	X	X	X	X	X
HDH-11	MG	X			X	X			X				
HDH-12	MG	X			X	X			X				
McKinley Gulch	MG	X			X	X			X				
MW-15	MG	X			X	X			X				

Table A-1. Existing Hydrological Monitoring Sites and Sampling Frequency at the Wharf Mine (Page 2 of 3)

Site	Drainage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-44	MG	X			X	X			X				
MW-47	MG	X			X	X			X				
MW-48	MG	X			X	X			X				
MW-49	MG	X			X	X			X				
MW-50	MG	X			X	X			X				
MW-51	MG	X			X	X			X				
MW-53	MG	X	X	X	X	X	X	X	X	X	X	X	X
MW-54	MG	X	X	X	X	X	X	X	X	X	X	X	X
MW-55	MG	X	X	X	X	X	X	X	X	X	X	X	X
MW-56	MG	X	X	X	X	X	X	X	X	X	X	X	X
MW-57	MG	X	X	X	X	X	X	X	X	X	X	X	X
MW-58	MG	X	X	X	X	X	X	X	X	X	X	X	X
FB Spring	FBC	X			X	X			X				
FB-1	FBC	X			X	X			X				
FB-2	FBC	X			X	X			X				
MW-42	FBC	X			X	X			X				
MW-43	FBC	X			X	X			X				
BMT-1	DC	X			X	X			X				
DWD-1	DC	X			X	X			X				
MW-40	DC	X			X	X			X				
MW-59	DC	X			X	X			X				
MW-62	DC	X			X	X			X				
MW-63	DC	X			X	X			X				
MW-64	DC	X			X	X			X				
MW-68	DC	X			X	X			X				
Joseph Well 2	CC	X			X	X			X				
MW-37	CC	X	X	X	X	X	X	X	X	X	X	X	X
MW-41	CC	X			X	X			X				
MW-60	CC	X			X	X			X				
MW-61	CC	X			X	X			X				
MW-65	CC	X			X	X			X				
MW-67	CC	X			X	X			X				
MW-66	AA	X			X	X			X				
Lost Camp	AA								X				

Table A-1. Existing Hydrological Monitoring Sites and Sampling Frequency at the Wharf Mine (Page 3 of 3)

Site	Drainage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spearfish Falls	AA								X				
Squaw War Eagle	AA								X				
PW-2	LG	X			X	X			X				

X = Parameter List 1 (Table A-3) X = Parameter List 2 (Table A-4).

RV = Ross Valley

REL = Reliance

MG = McKinley Gulch

FBC = False Bottom Creek

DC = Deadwood Creek

CC = Cleopatra Creek

AA = Miscellaneous Drainages

Table A-2. Monitoring Wells With Water Level Readings Only

Site	Drainage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-1B	AA	X	X	X	X	X	X	X	X	X	X	X	X
MW-2B	AA	X	X	X	X	X	X	X	X	X	X	X	X

AA = Miscellaneous Drainages.

Table A-3. Water Quality Parameter List 1 (Quarterly) (Page 1 of 3)

Site	ORP (Field), DO (Field), Temp (Field), pH (Lab & Field), EC (Lab & Field), TDS, Bicarbonate, CN (WAD & Total), F, Na, NO2, NO3, NH3	TSS	Cd	As, Se	Au	Hg	Flow Rate	Water Level
French Drain	X			D	D	T	X	
HDH-8A	X			D	D	T		X
MW-1	X			D	D	T		X
MW-13	X			D	D	T		X
MW-13A	X			D	D	T		X
MW-14	X			D	D	T		X
MW-1A	X			D	D	T		X
MW-2	X			D	D	T		X
MW-2A	X			D	D	T		X
MW-31	X			D	D	T		X
MW-45	X			D	D	T		X
Ross Springs	X			D	D	T	X	
RVLC Pond	X			D	D	T		
RVSO Discharge	X			D	D	T	X	
Annie Creek @ USGS	X	X		T	T	T	X	
Annie Creek II	X	X		T	T	T	X	
Beaver Springs	X			D	D	T	X	
GWAC6	X	X		D	D	T		X
MW-17	X			D	D	T		X
MW-18	X			D	D	T		X
MW-19	X			D	D	T		X
MW-33	X			D	D	T		X
MW-52	X			D	D	T		X
HDH-10A	X		D	D	D	T		X
HDH-11	X		D	D	D	T		X
HDH-12	X		D	D	D	T		X
McKinley Gulch	X	X	T	T	T	T	X	
MW-9	X		D	D	D	T		X
MW-9A	X		D	D	D	T		X
MW-10	X		D	D	D	T		X
MW-10A	X		D	D	D	T		X

Table A-3. Water Quality Parameter List 1 (Quarterly) (Page 2 of 3)

Site	ORP (Field), DO (Field), Temp (Field), pH (Lab & Field), EC (Lab & Field), TDS, Bicarbonate, CN (WAD & Total), F, Na, NO2, NO3, NH3	TSS	Cd	As, Se	Au	Hg	Flow Rate	Water Level
MW-15	X		D	D	D	T		X
MW-44	X		D	D	D	T		X
MW-47	X		D	D	D	T		X
MW-48	X		D	D	D	T		X
MW-49	X		D	D	D	T		X
MW-50	X		D	D	D	T		X
MW-51	X		D	D	D	T		X
MW-53	X		D	D	D	T		X
MW-54	X		D	D	D	T		X
MW-55	X		D	D	D	T		X
MW-56	X		D	D	D	T		X
MW-57	X		D	D	D	T		X
MW-58	X		D	D	D	T		X
FB Spring	X	X		D	D	T	X	
FB-1	X	X		T	T	T	X	
FB-2	X	X		T	T	T	X	
MW-42	X			D	D	T		X
MW-43	X			D	D	T		X
BMT-1	X	X		T	T	T	X	
DWD-1	X	X		T	T	T	X	
MW-40	X			D	D	T		X
MW-59	X			D	D	T		X
MW-62	X			D	D	T		X
MW-63	X			D	D	T		X
MW-64	X			D	D	T		X
MW-68	X			D	D	T		X
Joseph Well 2	X			D	D	T		X
MW-37	X			D	D	T		X
MW-41	X			D	D	T		X
MW-60	X			D	D	T		X
MW-61	X			D	D	T		X
MW-65	X			D	D	T		X

Table A-3. Water Quality Parameter List 1 (Quarterly) (Page 3 of 3)

Site	ORP (Field), DO (Field), Temp (Field), pH (Lab & Field), EC (Lab & Field), TDS, Bicarbonate, CN (WAD & Total), F, Na, NO2, NO3, NH3	TSS	Cd	As, Se	Au	Hg	Flow Rate	Water Level
MW-67	X			D	D	T		X
MW-66	X			D	D	T		X
Lost Camp	X	X		T	T	T	X	
Spearfish Falls	X	X		T	T	T	X	
Squaw War Eagle	X	X		T	T	T	X	
PW-2	X			T	D	T		

As = Arsenic
Au = Gold
Cd = Cadmium
CN = Cyanide
D = Dissolved
DO = dissolved oxygen
EC = electrical conductivity
F = Fluoride
Hg = Mercury
Na = Sodium
NO2 = Nitrate
NO3 = Nitrate
NH3 = Ammonia
ORP = oxidation-reduction potential
Se = Selenium
T = Total
TDS = Total Dissolved Solids
TSS = Total Suspended Solids
WAD = Weak Acid Dissociable

Quarterly: flute wells – all zones

Table A-4. Water Quality Parameter List 2 (Monthly)

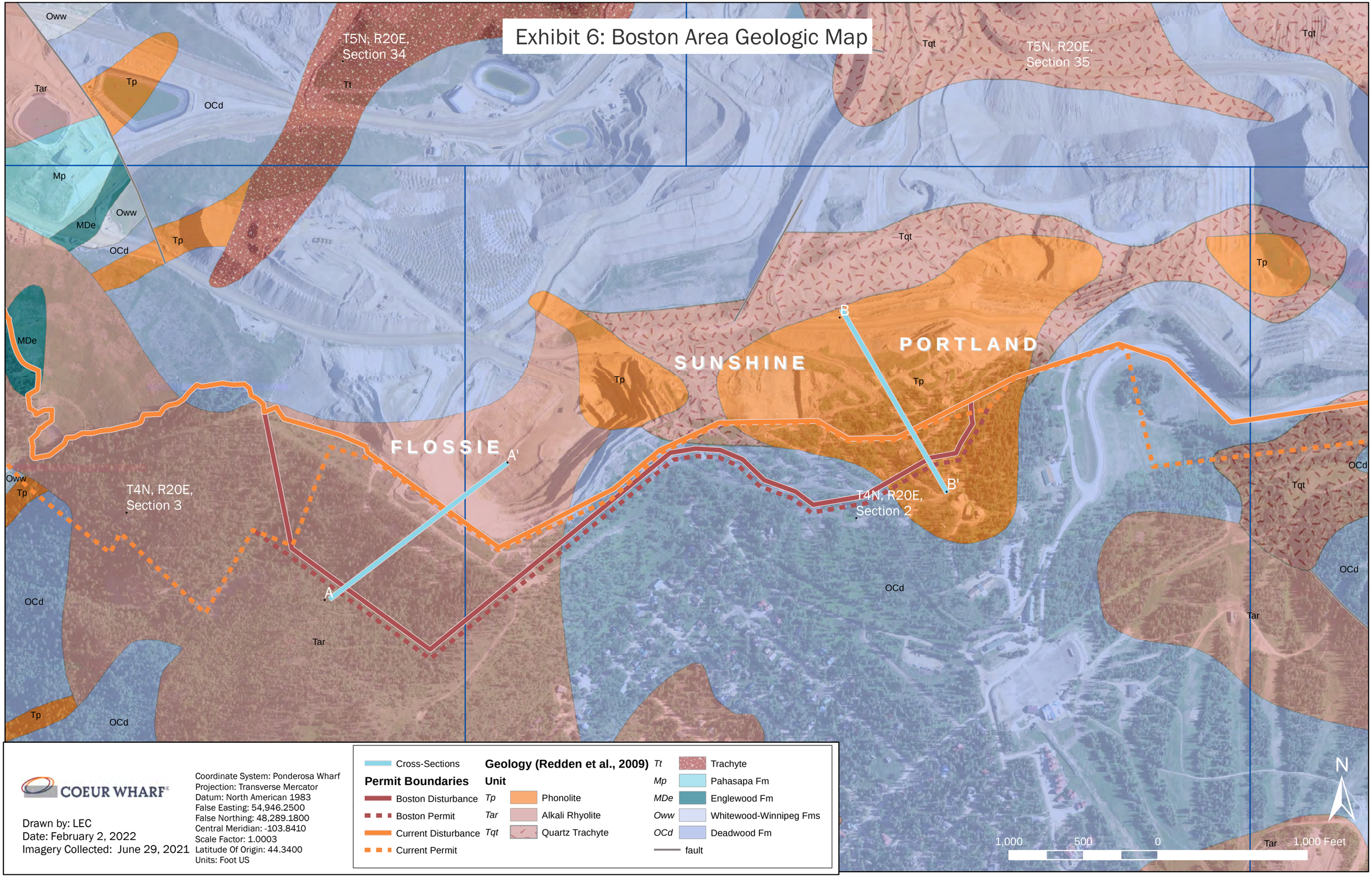
Site	NO2, NO3, NH3 Field: ORP, DO, pH, EC, Temp	As	Flow Rate	Water Level
Ross Spring	X	D	X	
RVSO Discharge	X	D	X	
French Drain	X	D	X	
RVLCP	X	D		
MW-1	X	D		X
MW-1A	X	D		X
MW-31	X	D		X
MW-13	X	D		X
MW-13A	X	D		X
MW-2	X	D		X
MW-2A	X	D		X
MW-45	X	D		X
HDH-10A	X	D		X
MW-53	X	D		X
MW-54	X	D		X
MW-55	X	D		X
MW-56	X	D		X
MW-57	X	D		X
MW-58	X	D		X
MW-37	X	D		X

As = Arsenic
D = Dissolved
DO = dissolved oxygen
EC = electrical conductivity
NO2 = Nitrate
NO3 = Nitrate
NH3 = Ammonia
ORP = oxidation-reduction potential

Monthly: flute wells – top zones only

APPENDIX B
GEOLOGY

Exhibit 6: Boston Area Geologic Map



COEUR WHARF

Drawn by: LEC
Date: February 2, 2022
Imagery Collected: June 29, 2021

Coordinate System: Ponderosa Wharf
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 54,946.2500
False Northing: 48,289.1800
Central Meridian: -103.8410
Scale Factor: 1.0003
Latitude Of Origin: 44.3400
Units: Foot US

Cross-Sections

Permit Boundaries

- Boston Disturbance
- Boston Permit
- Current Disturbance
- Current Permit

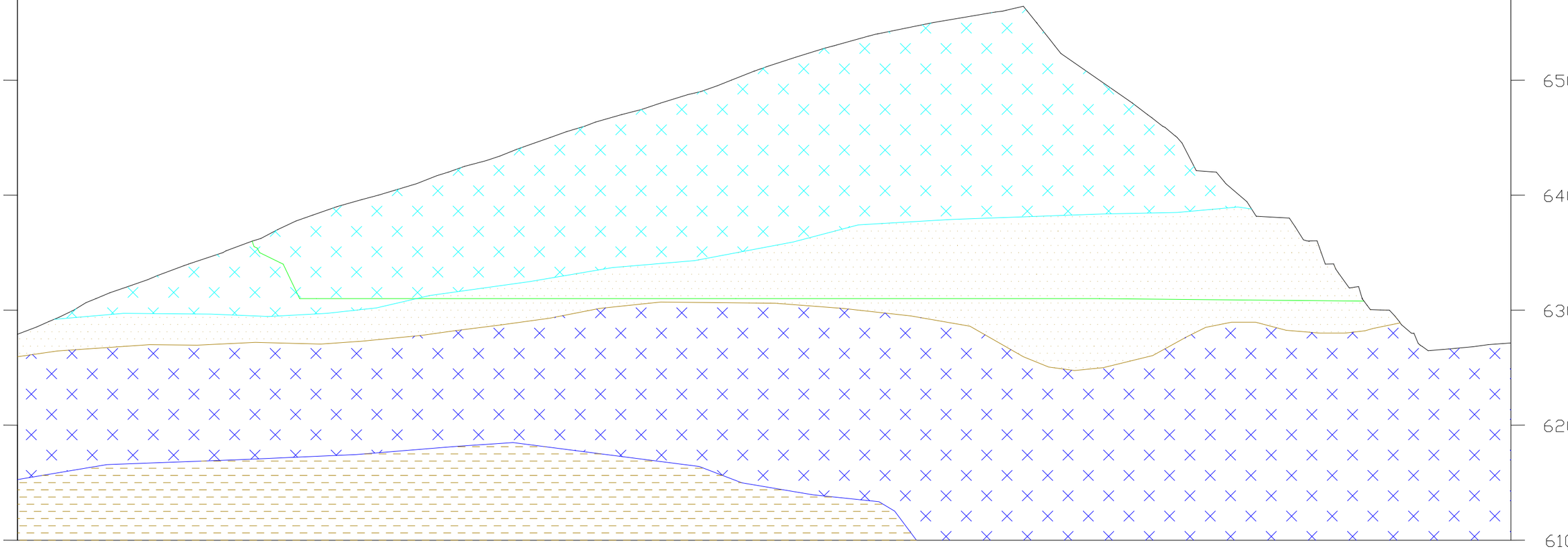
Geology (Redden et al., 2009)

Unit		Unit	
Tp	Phonolite	*Tt*	Trachyte
Tar	Alkali Rhyolite	*Mp*	Pahasapa Fm
Tqt	Quartz Trachyte	*MDe*	Englewood Fm
		Oww	Whitewood-Winnipeg Fms
		OCd	Deadwood Fm
			fault

A

A′

6600′
6500′
6400′
6300′
6200′
6100′



COEUR MINING®

Wharf Resources, Inc.
10928 Wharf Road
Lead, SD 57754

Drawn by: Kenan Sarratt
Date: April 26, 2022

Exhibit 7
Geology Cross Section A
VE = 1

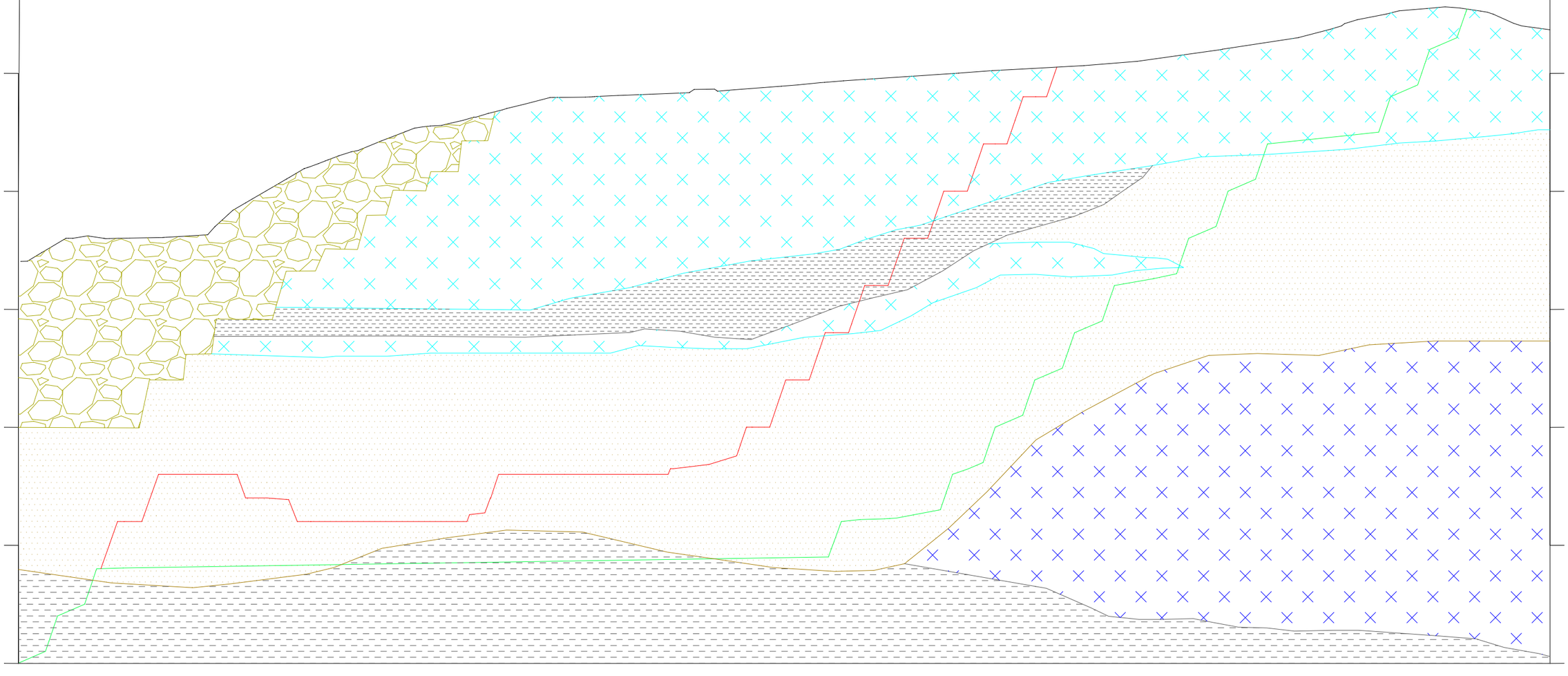
Legend

- Boston Permit Pit
- Current Topo
- Deadwood
- Trachyte
- Phonolite

B

B′

6700′
6600′
6500′
6400′
6300′
6200′
6100′



COEUR MINING®

Wharf Resources, Inc.
10928 Wharf Road
Lead, SD 57754

Drawn by: Kenan Sarratt
Date: April 26, 2022

Exhibit 8
Geology Cross Section B
VE = 1

Legend

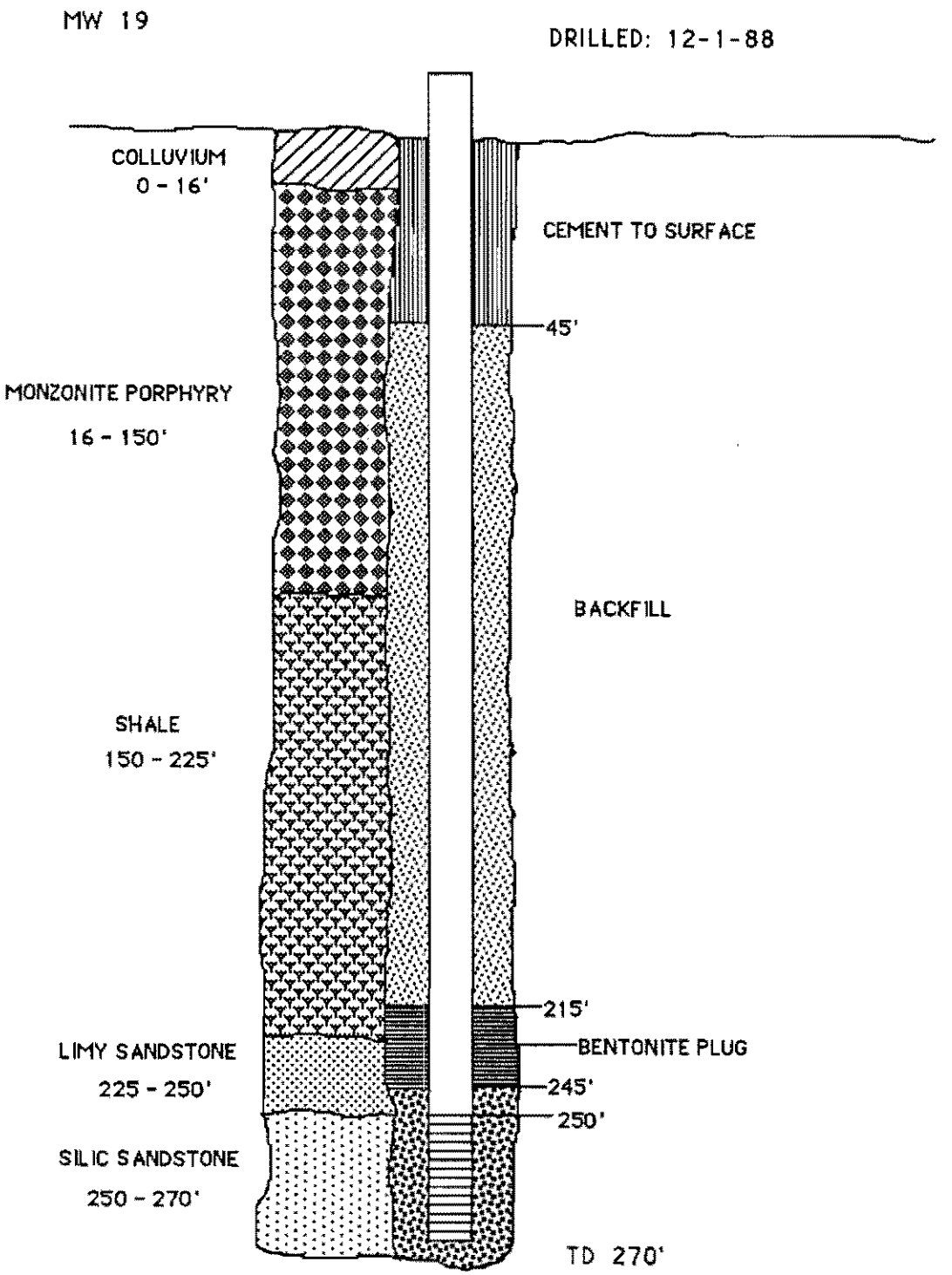
- Current Design Pit
- Boston Permit Pit
- Current Topo
- Fill
- Deadwood
- Shale
- Trachyte
- Phonolite

APPENDIX C

WELL-COMPLETION DIAGRAMS

APPENDIX C-1: MW-19

MW-19


MW 19
DRILLED: 12-1-88
COLLUVIUM
0 - 16'
CEMENT TO SURFACE
45'
MONZONITE PORPHYRY
16 - 150'
BACKFILL
SHALE
150 - 225'
215'
BENTONITE PLUG
LIMY SANDSTONE
225 - 250'
245'
250'
SILIC SANDSTONE
250 - 270'
TD 270'

WHARF RESOURCES DRILL HOLE LOG

Sheet 1 of 3

COMPANY Wharf	PROPERTY Annie Creek	Section No.	HOLE No. MW #19
Started 11-11-88	Bearing :	Lat. (Northing) 48140 ^{89}	Overburden =
Completed 11-16-88	Angle 90°	Dep. (Easting) 48704 $^{33'}$	Casing Depth =
Driller Taylor	Length 270'	Collar Elev. 5942 ^{30} @ CSG	Diff. to Orig. Ground =

Logged by HDD Date 12-1-88

Remarks

Depth From	Depth To	Rock Type	WATER	DESCRIPTION		EPIDOTE, etc.	CHLORITE	CLAY	SERICITE	QUARTZ VEINS	SILICIFICATION	BIOTITE	ORTHOCLASE	HEMATITE	GOETHITE	JAROSITE	MnOx	CuOx	CALCITE	PYRITE	SULFIDE Veinlets	Sample No.	Footage From	Footage To	ASSAYS Au	ASSAYS Ag			Graph rx	or
0	10	Col	D	Colluvium 80% Phonolite Dk Grn 30% Edwd Silic SS 3(60)% Qmp Wh to LtGrn Epidote	Clay 4% Wh-Tan	1		4	2		2			2	1										NF					
10	20	SS	D	Silic SS 60 Wh-Tan MP 37 Wh-LtGray-Rd Wh Pheno	Clay 3% Tan Coat			3			3			1	1										NF					
20	30	MP	D	MP 100 Wh-LtGray-Tan Wh Pheno	Clay Tr Tan Coat			1	2					1											NF					
30	40	MP	W	MP 100 A/A	Clay A/A			1	2					1											NF					
40	50	MP	W	MP 100 30% A/A 70% Gray/Blu Wh Pheno Tr Zoning	Clay A/A			1	1						2										NF					
50	60	MP	M	MP 100 Gray/Blu Wh-Clr Pheno				1						2	2										NF					
60	70	MP	W	MP Tan-Rd-Pink-Tr Gray Wh + Clr Pheno Hem Banding Away From Fracs										4	2		1								NF					
70	80	MP	M	MP 99% Tan-Dirty Gray Clr Pheno Goet + MnOx Dend on Frac	Clay 1% Tan Coat				2					2	3	1	2								NF					
80	90	MP	M	MP 99 A/A	Clay 1 A/A				2					2	3	1	2								.005					
90	100	MP	M	MP 99 A/A	Clay 1 A/A				2					2	3	1	2								.007	.008				
DISTRIBUTION COMMENTS						?/o		Alt Prop	Alt Prop		?/o			F10	F10	F10	F10													

RECLAMATION STATUS:

MINERAL CODE:
1) Trace 4) 4-8% 7) 25-40%
2) Tr-1% 5) 8-15% 8) 40-60%
3) 1-3% 6) 15-25% 9) +60%

WATER CODE:
D = Dry
M = Moist
W = Wetted water

WHARF RESOURCES DRILL HOLE LOG

Sheet 2 of 3

COMPANY Wharf | PROPERTY Annie Creek | Section No. | HOLE No. MW # 19

Started 11-11-88	Bearing	Lat. (Northing) 48140 84	Overburden =
Completed 11-16-88	Angle 90°	Dep. (Easting) 48704 33	Casing Depth =
Driller Taylor	Length 270'	Collar Elev. 5942 30 @ CSG	Diff. to Orig. Ground =

Logged by HDP | Date 12-1-88

Remarks

Depth From	Depth To	Rock Type	WATER	DESCRIPTION			EPIDOTE, etc.	CHLORITE	CLAY	SERICITE	QUARTZ VEINS	SILICIFICATION	BIOTITE	ORTHOCLASE	HEMATITE	GOETHITE	JAROSITE	MnOx	CeOx	CALCITE	PYRITE	SULFIDE Veils.	Sample No.	Footage From	Footage To	Au	Ag	Graph
100	110	MP		MP 100% Dirty Gry Clr Pheno		Clay TR ORN Coat			1						1	2										.001		
110	120	MP		MP 100 A/A		Clay TR A/A			1						1	2										.003		
120	130	MP		MP 100 A/A Increase Coat on Frac		Clay TR A/A			1						2	4		1								.002		
130	140	MP		MP 100 Blu/Gry 3% Py Clr-Wh Pheno											1	3					3					.002		
140	150	MP		MP 100 LtGray Clr-Wh Pheno						1					3	2										.008		
150	160	SH		SH 80 Dk Gray 10% Pyr Massive-Thin Bed	MP 20 A/A	Clay TR Lt Gry									1	1					5					.007		
160	170	SH		SH 96 Dk Gry TR Pyr		Clay 4 Lt Grey Balls			4						2	1					1					.009		
170	180	SH		SH 94 Gry-Orn	MP 2 WH Lt Grn Pheno	Clay 4 A/A			4							3										.004		
180	190	SH		SH 50% A/A	MP 46 WH Lt Grn Pheno	Clay 4 WH Balls			4	2						1					1					.008		
190	200	SH		SH 99 Dk Gry TR Orn		Clay 1 Gry Coat			2							1										.008	.007	

RECLAMATION STATUS:

DISTRIBUTION COMMENTS

MINERAL CODE:
1) Trace 4) 4-8% 7) 25-40%
2) Tr-1% 5) 8-15% 8) 40-60%
3) 1-3% 6) 15-25% 9) +60%

WATER CODE:
D = Dry
M = Moist
W = Wetted

WHARF RESOURCES DRILL HOLE LOG

COMPANY Wharf | PROPERTY Annie Creek | Section No. | HOLE No. MW#19

Started 11-11-88	Bearing -	Lat. (Northing) 48140 84	Overburden =
Completed 11-16-88	Angle 90°	Dep. (Easting) 48704 33	Casing Depth =
Driller Taylor	Length 270'	Collar Elev. 5942 30 @ Csg	Diff. to Orig. Ground =

Logged by HDD | Date 12-1-88

Remarks

Depth From	Depth To	Rock Type	WATER	DESCRIPTION	EPIDOTE, etc.	CHLORITE	CLAY	SERICITE	QUARTZ VEINS	SILICIFICATION	BIOTITE	ORTHOCLASE	HEMATITE	GOETHITE	JAROSITE	MnOx	CuOx	CALCITE	PYRITE	SULFIDE Veins	Sample No.	Footage From	Footage To	Au	Ag	Graph rx	Graph ore
00	210	SH	M	SH 95 DK GRY - YEL/ORN; CLAY 5 GRY COAT			4							1					1					.004			
10	220	SH	M	SH 95 A/A W/1% MASSIVE PYR; CLAY 5 A/A			4							1					2					NF			
20	230	SH/SS	M	SH 50 A/A; LIMY SS 45 ORN M.GR; CLAY 5 A/A			4							2				3	2					NF			
30	240	SS	W	LIMY SS 90 ORN-YEL M.GR → C.GR; SH 7 DK GRY; CLAY 3 LT GRN COAT			3							2				3						.003			
40	250	SS	W	LIMY SS 90 A/A; SH 6 DK GRY YEL; CLAY 4 YEL COAT			4							2				3	2					.003			
250	260	SS	W	SILIC SS 90 ORN-GRY CLR M.GR; SH 7 50% DK GRY 50% WH; CLAY 3 ORN COAT			3			3				3				1						.002			
60	270	SS	W	SILIC SS 85 ORN-WH-CLR RD C.GR; SH 9 DK GRY; MP 3% WH (CONTAM); CLAY 3 A/A			3			4			3	3										.004			

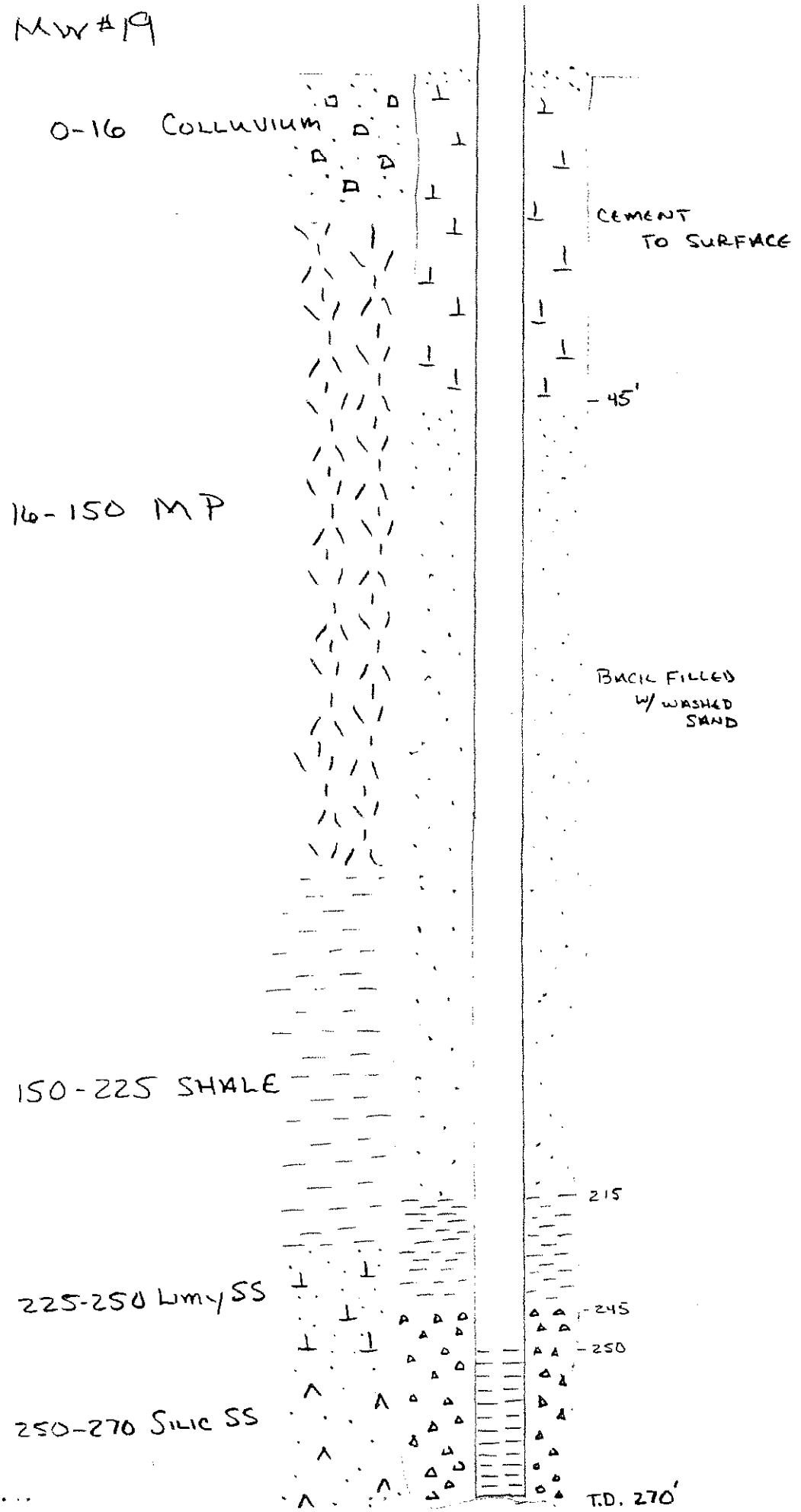
RECLAMATION STATUS:

DISTRIBUTION COMMENTS

MINERAL CODE:
1) Trace 4) 4-8% 7) 25-40%
2) Tr-1% 5) 8-15% 8) 40-60%
3) 1-3% 6) 15-25% 9) +60%

WATER CODE:
D = Dry
M = Moist
W = Wet

MW #19


0-16 Colluvium
CEMENT TO SURFACE
45'
16-150 MP
BACK FILLED W/ WASHED SAND
150-225 SHALE
215
225-250 Lmy/SS
245
250
250-270 Silic SS
T.D. 270'

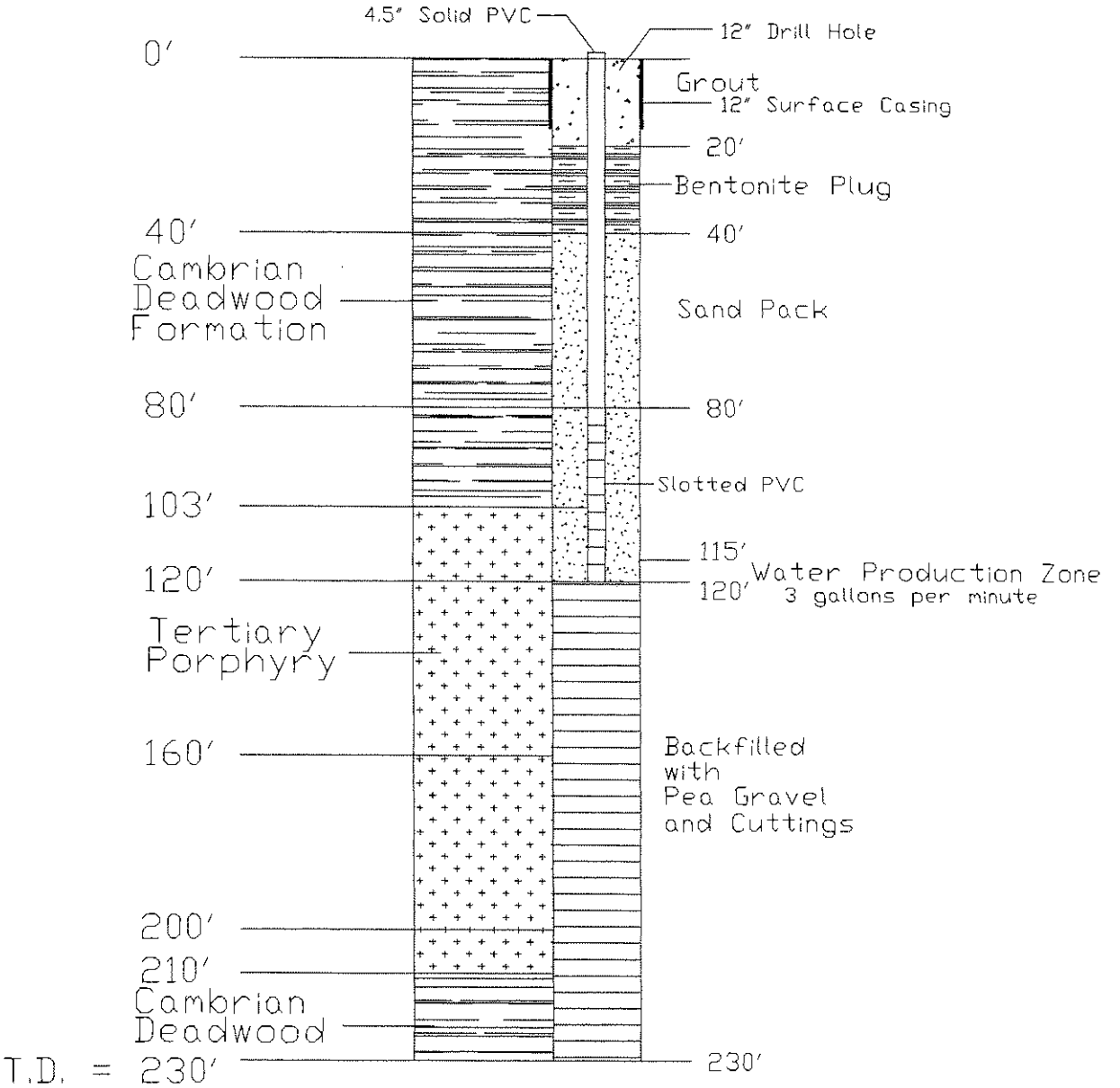
APPENDIX C-2: MW-33

MW-33

WELL COMPLETION DIAGRAM

(Not to Scale)

MW-33



WHARF RESOURC[illegible] DRILL HOLE LOG

COMPANY Bice | PROPERTY Wharf/Annie Cr | Section No. | HOLE No. MW-3

Started 8/25/94	Bearing 0	Lat. (Northing) 47343.4	Overburden =	Logged by GDZ	Date 9/9/9[illegible]
Completed 9/1/94	Angle -90	Dep. (Easting) 47887.99	Casing Depth =	Remarks	
Driller F. Conway	Length 400	Collar Elev. 5730.1	Diff. to Orig. Ground =		

Depth From	Depth To	Rock Type	WATER	DESCRIPTION
0	10	Edi		Ls 100 (sandy) SS Tn
				lt grey-grn 70 org 30
10	20	Edi		95 5
				Sh/Sltest 90 Mon 5 Ls 5 5 & Tr
20	30	Edi		grey 95 lt org red 5 silic Qtz
				Ls 85 Sh 15
30	40	Edi		lt grey - grey 100
				Ls 70 Sh/Sltest 30
40	50	Edi		grey - lt grey 100
				Ls/Pol 90 Sh 10
50	60	Edi		grey - lt grey 100
60	70	Edi		
				Ls 60 Sh 20
70	80	Edi		grey - lt grey 100
				Sh/Sltest 85 Ls 15
80	90	Edi		grey 90 red-org 10
				Ls 70 Sh/Sltest 30
90	100	Edi		lt org 60 grey 40

Sample No.	Footage From	Footage To	ASSAYS Au	Ag			Gr
			NF				3
			NF				3
			NF				3
			NF				3
			.003				3
			NF				3
			NF				3
			NF				3
			.001				3

RECLAMATION STATUS:

DISTRIBUTION COMMENTS: P10; P10 F2 P8; V10 P10; P10

MINERAL CODE:
1) Trace 4) 4-8% 7) 25-40%
2) Tr-1% 5) 8-15% 8) 40-60%
3) 1-3% 6) 15-25% 9) +60%

WATER CODE
D = Dry
M = Moist
W = Wet
Y = Drilled w/H

WHARF RESOURCE DRILL HOLE LOG

COMPANY Bice **PROPERTY** Reliance **Section No.** **HOLE No.** MW-33

Started 8/25/94	**Bearing** Ø	**Lat. (Northing)** 47343.4	**Overburden =**	**Logged by** GDZ **Date** 9/9/94
Completed 9/11/94	**Angle** -90	**Dep. (Easting)** 47887.99	**Casing Depth =**	**Remarks**
Driller Conway	**Length** 400	**Collar Elev.** 5730.1	**Diff. to Orig. Ground =**	

Depth From	Depth To	Rock Type	WATER	DESCRIPTION	EPIDOTE, etc.	CHLORITE	CLAY	SERICITE	QUARTZ VEINS	SILICIFICATION	BIOTITE	ORTHOCLASE	HEMATITE	GOETHITE	JAROSITE	MnOx	CuOx	CALCITE	PYRITE	SULFIDE Veins			Sample No.	Footage From	Footage To	Au	Ag			Gr rx
100	110	Tm		Monz 70 Sltst 30; 5 Mod silic + py									2	2					2							.001				6
		Edi		lt org 65 red 0 lt gry 5																										3
110	120	Tr		Trach 100; 20; Mod Arg										4					4							.001				7
				org brn 70 gry 20 red 10																										
120	130	Tp		Phono 100 speckled; Phyllic Alt				6						3					5							NF				7
				lt gry 90 org brn 10																										
130	140	Tp		95 5; + Mod Arg										2												.003				7
140	150	Tp																								.002				7
150	160	Tp		lt gry 90 org brn 10																						.003				7
160	170	Tp		Tr strkwork Qz					1																	NF				7
170	180	Tp		40				3											4							.001				7
				dk grn 50 lt gry 40 org 10																										
180	190	Tp																								.001				7
190	200	Tm		Monz 50 Phono 50 Sltst Tr 5; Str silic + py; 10				2		1			1						2							NF				6
		Tp		lt gry grn 50 org 45 red 5																										7

RECLAMATION STATUS:

DISTRIBUTION COMMENTS: Sericite: "Phono" 6 P4; Quartz veins: V10; Silicification: f10; Hematite: P10; Goethite: F2 P8; Pyrite: P10

MINERAL CODE:
1) Trace 4) 4-8% 7) 25-40%
2) Tr-1% 5) 8-15% 8) 40-60%
3) 1-3% 6) 15-25% 9) +60%

WATER CODE:
D = Dry
M = Moist
W = Wet
X = Drilled w/H...

WHARF RESOURC . DRILL HOLE LOG

COMPANY Bice | PROPERTY Wharf / Annie Cr | Section No. | HOLE No. MW-33

Started 8/25/94	Bearing Ø	Lat. (Northing) 47343.4	Overburden =	Logged by JBW Date 9/13/94
Completed 9/1/94	Angle −90	Dep. (Easting) 47887.99	Casing Depth =	Remarks
Driller Conway	Length 400	Collar Elev. 5730.1	Diff. to Orig. Ground =	

Depth From	Depth To	Rock Type	WATER	DESCRIPTION	EPIDOTE, etc.	CHLORITE	CLAY	SERICITE	QUARTZ VEINS	SILICIFICATION	BIOTITE	ORTHOCLASE	HEMATITE	GOETHITE	JAROSITE	MnOx	CuOx	CALCITE	PYRITE	SULFIDE Vnlts.	Sample No.	Footage From	Footage To	Au	Ag			Gr rx
200	210	Tm Tp		Monz 85 Sltst 10 Phono 5 1-2 Str Silic 1-2 Str Arg lt grybrn - brn 90 lt gry 5 grn 5						3			1	3					2					NF				6
210	220	Eds		Sltst 90 Ls 10 Monz Tr 2-3 lt grybrn 90 lt gry grn 10						|			|	|					|				NF				4
220	230	Edi		Sltst 60 ls 40 lt. gry seds 1% carb, P brn 100										1				3						.001				3
230	240	Edi Tm		Sltst/ls 15 Monz 85 lt./med gry brn 100 blocky phenos Tm										1				2						NF				3 6
240	250	Tm		Monz 100 lt-gry Tm Tr-1 carb, P brn 100										1				2						NF				6
250	260	Tm		monz 100 Tr carb, P brn 100										1				1						.001				6
260	270	Tm		Monz 100 Incr feox lt-gry phenos brn 100										2				1						NF				6
270	280	Tm		monz 100 brn 100 Same										2				1						NF				6
280	290	Tm		Monz 100 Tr blk Hton fracts brn 100									1	2				1						NF				6
290	300	Tm		Monz 100 brn 100									1	2				1						NF				6

RECLAMATION STATUS:

DISTRIBUTION COMMENTS

MINERAL CODE:
1) Trace 4) 4-8% 7) 25-40%
2) Tr-1% 5) 8-15% 8) 40-60%
3) 1-3% 6) 15-25% 9) +60%

WATER CODE
D = Dry
M = Moist
W = Wet
X = Drilled w/H

WHARF RESOURCES DRILL HOLE LOG

COMPANY: Bice | PROPERTY: Wharf/Annie Cr. | Section No.: | HOLE No.: MW-33

Started: 8/25/94	Bearing: Ø	Lat. (Northing): 47343.4	Overburden =
Completed: 9/1/94	Angle: -90	Dep. (Easting): 47887.99	Casing Depth =
Driller: Conway	Length: 400	Collar Elev.: 5730.1	Diff. to Orig. Ground =

Logged by: JBW | Date: 9/13/94

Remarks:

From	To	Rock Type	Water	Description	Hematite	Goethite	Calcite	Pyrite	GLAUC	Sample No.	Footage From	Footage To	Au	Ag	Gro… rx
300	310	Tt		trachy 100 lt. gry w/ lighter gry stringers; brn 100 (Tt) Tr py T,P Tr carb,P		1	1	1					NF		7
310	320	Tt		Trachy 100 ? V. hard rck – cuttings ground to sand; brn 100		1	1	1					NF		7
320	330	Tt		trachy 100 Tr pyT + carb; brn 100		1	1	1					.001		7
330	340	Tt		trachy 100 incr feox; brn 100 ØpyT		2	1						.012		7
340	350	Tm		monz 100 cuttings ground to sand; brn 100		1	1						.012		7
350	360	TM / Edi		monz 85 sltst/ls 15; brn 100 Tr carb,P		2	1						NF		7 / 3
360	370	Eds		sh 100 lt./med gry sh Øcarb; red 100, F	1								NF		4
370	380	Eds		sh 95 Gl ls 5 Tr-1 pyt – ls; Øfeox Tr-1 glauc – ls			1	1	2				.001		4
380	400	Eds		sh 85 Gl ls 15 Pyt – interstitial to glauc; Øfeox med gry seds			2	2	2				NF		4

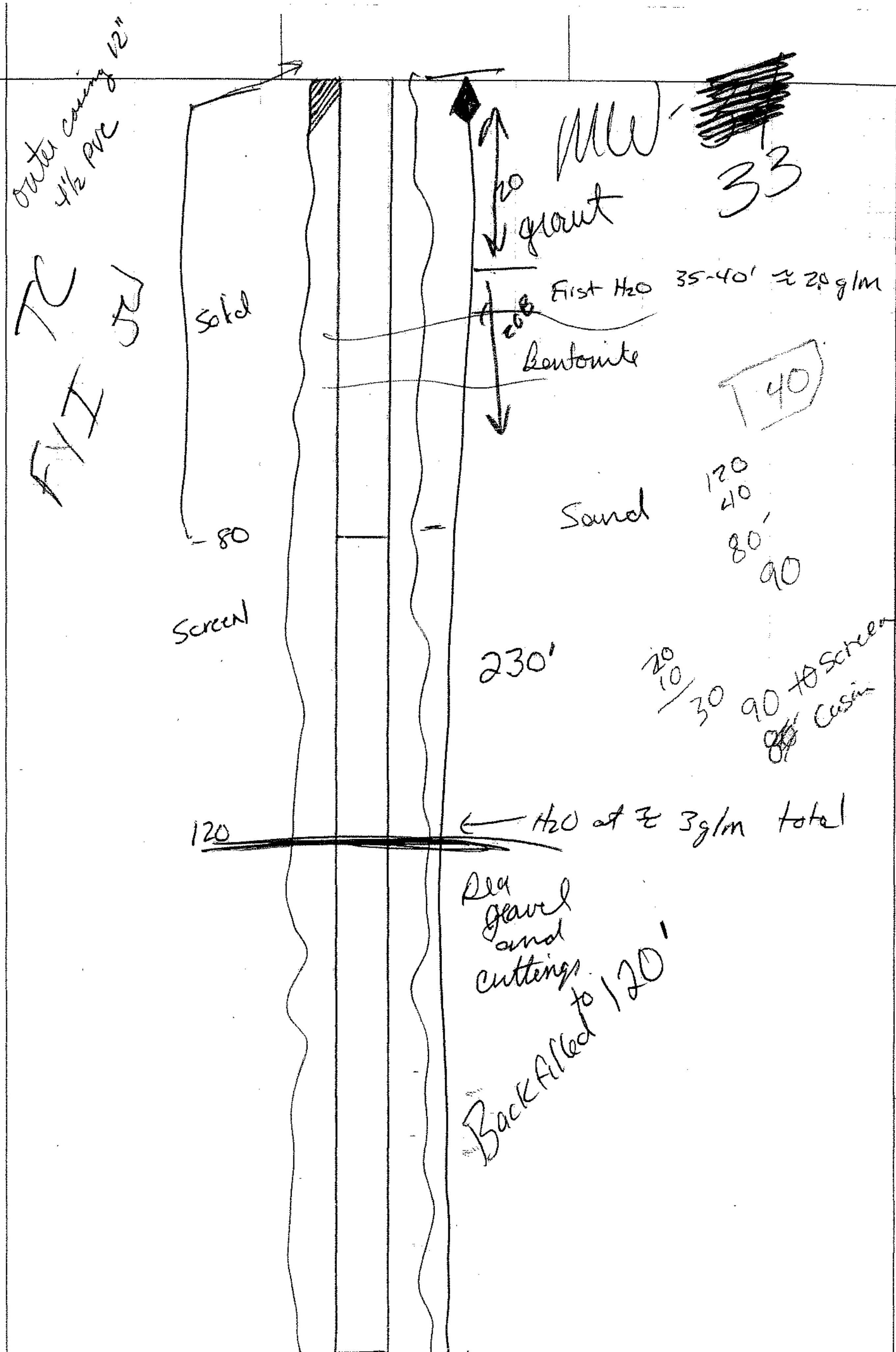
Mineral columns (left to right): Epidote, etc.; Chlorite; Clay; Sericite; Quartz Veins; Silicification; Biotite; Orthoclase; Hematite; Goethite; Jarosite; MnOx; CuOx; Calcite; Pyrite; Sulfide Vnlts.; GLAUC

RECLAMATION STATUS:

DISTRIBUTION COMMENTS: F10 (Hematite); P/G Fl (Goethite); P10 (Calcite); P10 (Pyrite); P10 (GLAUC)

MINERAL CODE:
1) Trace 4) 4–8% 7) 25–40%
2) Tr–1% 5) 8–15% 8) 40–60%
3) 1–3% 6) 15–25% 9) +60%

WATER CODE:
D = Dry
M = Moist
W = Wet
X = Drilled w/ H_2…



APPENDIX C-3: MW-66

SD EForm - 1621LD V1

SOUTH DAKOTA WATER WELL COMPLETION REPORT

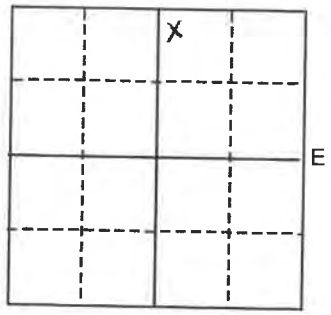
11- 02

Location NW ¼ NE ¼ Sec 2 Twp 4N Rg 2E

County Lawrence

Please mark well location with an "X"

MW-66



Well Completion Date

June 27, 2019

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?

200.0 ft. from yards from open pit mine (identify source)

PROPOSED USE:

☐ Domestic/Stock ☐ Municipal ☑ Business ☐ Test holes
☐ Irrigation ☑ Industrial ☐ Institutional ☑ Monitoring well

METHOD OF DRILLING:

Rotary downhole hammer

CASING DATA: ☐ Steel ☑ Plastic ☐ Other

If other describe Set 425' of 4" 200 psi pvc

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	4.00 IN	0.0 FT	425.0 FT	6.75 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
Bent. hi-yield	65	Lb/gal	300.0 Ft	30.0 Ft
Port. II w/2%	8	Lb/gal	30.0 Ft	0.0 Ft

Describe grouting procedure

Gravel packed from 420'-300'

SCREEN: ☑ Perforated pipe ☐ Manufactured

Diameter 4.00 Inches Length 60.0 Feet

Material 200 psi pvc

Slot Size Set From 420.0 Feet to 360.0 Feet

Other information staggered from bottom

WAS A PACKER OR SEAL USED? ☐ Yes ☑ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?

Lab to which water quality sample sent for analysis

☑ No, Why Not? Monitor well

Well Owner: Coeur-Wharf Mining

Business Name:

Address: 10928 Wharf Road

City, State, Zip: Lead SD 57754

WELL LOG:

FORMATION	DEPTH FROM	DEPTH TO
Drift	0	5
Hard deadwood	5	305
Deadwood fracture broken 15 gpm	305	310
Hard deadwood	310	325
Deadwwod fracture - 20 gpm	325	327
Deadwood	327	420

STATIC WATER LEVEL 290.0 FEET

If flowing: closed in pressure PSI

GPM flow 20.0 through Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate GPM

Can well be completely shut in?

WELL TEST DATA:

☑ Pumped Describe: w/air
☐ Bailed
☐ Other

Pumping Level Below Land Surface

Ft. After Hrs. pumped GPM

Ft. After Hrs. pumped GPM

If pump installed, pump rate: GPM

REMARKS

This well was drilled under license # 324 and this report is true and accurate.

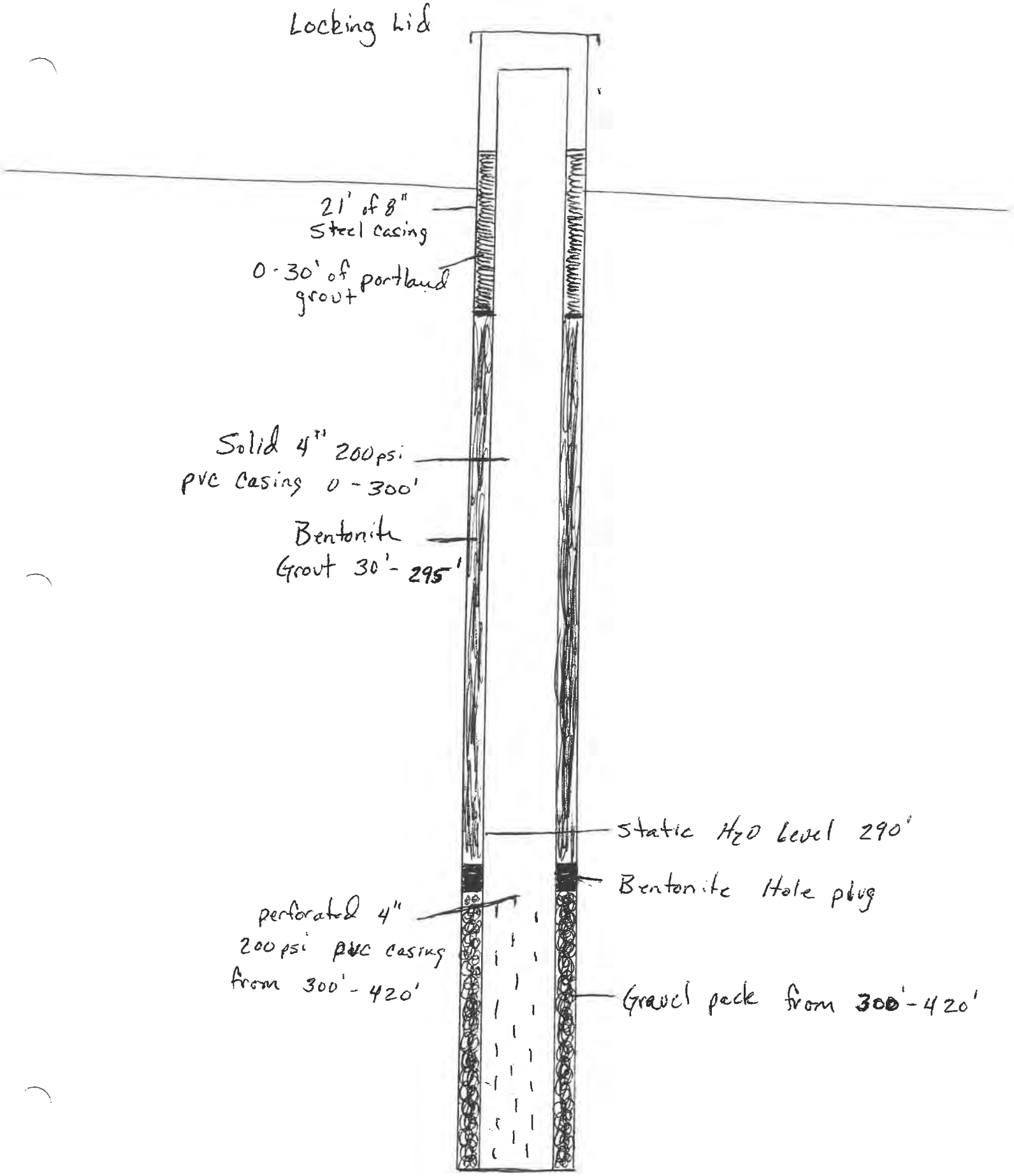
Drilling firm: Alexander Drilling Inc.

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date: 7/16/19

MW #66


Locking Lid
21' of 8" Steel casing
0-30' of portland grout
Solid 4" 200psi PVC casing 0-300'
Bentonite Grout 30'-295'
Static H2O Level 290'
Bentonite Hole plug
perforated 4" 200psi PVC casing from 300'-420'
Gravel pack from 300'-420'

APPENDIX D
SAMPLING METHODS

WHARF RESOURCES (USA) INC.
STANDARD OPERATING PROCEDURE

SAMPLE PRESERVATION, STORAGE, HANDLING AND DOCUMENTATION

Modified from

U.S. Environmental Protection Agency Environmental Response Team

Response Engineering and Analytical Contract

Standard Operating Procedures

Sample Preservation, Storage, and Handling

SOP 2003, Rev. 2.0, 1/9/92

Version 2.0 (3/18/2003)

TABLE OF CONTENTS

LIST OF TABLES

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide general guidelines for the preservation, storage, and handling of water and soil/sediment samples. Requirements for sample volume, container type, and preservation techniques for sample preservation, storage, and handling must be established prior to sample collection.

The methods described in this SOP are typically applicable operating procedures which may be varied or changed as required, dependent upon site conditions or equipment limitations. In all instances, the procedures employed should be documented in the site logbook and associated with the final report.

2.0 METHOD SUMMARY

Proper techniques of preserving, storing, and handling air, water and wastewater samples are critical if the integrity of the samples are to be maintained.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

3.1 Sample Preservation and Storage

Samples should be collected using equipment and procedures appropriate to the matrix, the parameters to be analyzed, and the sampling objective. The volume of the sample collected must be sufficient to perform the analysis requested, as well as the quality assurance/quality control requirements. Depending on the arrangements for sample analysis and the amount of sample required for the analysis, it is possible that aliquots for several analyses may be taken from the same sample container. The laboratory performing the analysis should be contacted to confirm the requirements for sample volumes, container types, and preservation techniques.

Table 1 contains examples of parameters which are typically of interest in environmental site investigations and indicates the required sample volume, the proper types of containers, and the preservation method for water and soil/sediment samples. All samples must be cooled to 4°C from the time of collection until analysis.

All sample containers must be clean and labeled appropriately. To prevent leakage of aqueous samples during shipping, sample containers should be no more than 90 percent full. If air space would affect sample integrity, such as with VOC samples, fill the sample container completely and place the container in a second container to meet the 90 percent requirement. The exterior of the sample containers must be wiped clean and dry prior to sample packaging.

Prior to the sampling of water or wastewater, sample containers must be pre-rinsed with the sample water two or three times prior to sample collection. *Do not pre-rinse the bottle if it already contains a preservative or dechlorinating agent.* When required, preservative is added in the field immediately after the sample is collected. Preservative vials obtained from the laboratory already contain the proper amount of preservative to be added to each sample

container. If the laboratory-supplied preservative is not available, contact the laboratory to determine the proper amount of preservative to use.

All samples must be packaged according to the requirements of U.S. Department of Transportation (U.S. DOT) or International Air Transportation Association (IATA).

Most of Wharf's samples are sent to same laboratory. At the time of collection, the sample containers are placed in a large cooler filled with loose ice. When the cooler is ready to ship, the proper paperwork (parameter sheets) and chain-of–custodies are prepared and placed in the cooler, the cooler is then taped shut and transported to the laboratory.

For more information regarding water sample collection, refer to the Sampling Procedures section in this document.

3.2 Chain-of-Custody Procedures

To establish the documentation necessary to trace sample possession, a Chain-of-Custody Record must be filled out and accompany each set of samples. The record should accompany the water quality data form and the samples to the laboratory. This record documents sample custody transfer from the sampler to the analyst at the laboratory. At a minimum, the record should contain: sample identification; the signature of the collector; the date and time of collection; place and address of collection; substance sample; signature of persons involved in the chain of possession; and, inclusive dates of possession. Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis.

All shipments will be accompanied by the Chain-of-Custody Record identifying its contents. The original record will accompany the shipment, and a copy will be retained by the project leader.

The laboratory should have an assigned laboratory custodian and an alternate who are responsible for overseeing the reception of all custody samples.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

The following are interferences or potential problems associated with sample preservation, storage, and handling:

- Samples should be protected from sunlight which may initiate photodegradation of sample components.
- Delaying sample preservation may cause chemical reactions to occur, altering original sample composition.
- Improper sample preservation may adversely affect analytical results.
- Inadequate sample volume may prohibit the appropriate analyses from being performed.
- Samples can become contaminated if they come in contact with human flesh; therefore, appropriate protective gloves (i.e., rubber, latex, or plastic) should be worn at all times during sampling collection and preservation.
- Samples can also become contaminated from equipment used to collect and preserve the

sample; therefore, all sample collection and preservation equipment must be kept clean.

5.0 EQUIPMENT/APPARATUS

The following specific equipment/apparatus is required to be taken in the field for proper sampling and preservation:

Coolers with loose ice
pH meters
Conductivity meters
Temperature meters
ORP meters
Dissolved Oxygen (DO) meters
Water level indicator
Glass and plastic bottles (various sizes)
Preservatives (acids, bases, and ice)
Flow meter
Tape measure
Watch
Field Book
Pen
Felt Tip Marker
Keys for Well Cap locks
Bailer
Bottle of deionized water
Nitrile gloves
Disposable water filter capsules or
Water filter barrel and Filters
Bottle labels
Two-way radio and/or cell phone

6.0 SAMPLING PROCEDURES

Calibrate the meters to be used that day each morning prior to sampling. Refer to the calibration manuals supplied with the meters. Record the date, time and meters calibrated in the Calibration book. Refer to the manuals for operation of the meters.

Calibrate the chlorine meter and take the meter into the field, if hypochlorite is being utilized and the treated water is being discharged to any of the Surface Water Discharge compliance points or outfalls.

6.1 SURFACE WATER AND SURFACE WATER DISCHARGE PERMIT SAMPLING:

Always start at the furthest downstream location and work your way upstream.

1. Record in field book: sample location, date and time.

   For Surface Water Discharge Permit sampling also record in the field book:

- Air Temperature
- Sky Conditions
- Wind Conditions
- Precipitation
- if visible pollutants include an oil sheen
- Turbidity
- Flow conditions

- Total Residual Chlorine test results if hypochlorite is being utilized and the treated water is being discharged.

2. Prior to sampling, label the sample bottles with location, site name, analyses to be performed (minerals, metals, nutrients, etc.), date and time. Labels are provided by the testing laboratory.

3. Take pH, conductivity, temperature, ORP, and DO readings of the sample solution and record the results in the field book. The meters may be placed directly in the stream. The meters should not be placed into the sample collection bottle. If these meters need to be placed into a bottle to obtain a reading, a separate bottle should be used. Use deionized water to rinse the meters in between measurements to prevent cross-contamination.

4. *Be careful not to touch the inside of the bottles or caps at any time.* Rinse all sample bottles two or three times with sample solution. Collect sample in the rinsed bottles and cap immediately.
    a. If safe, collect the sample from the middle of the stream. If unsafe, collect the sample while standing on the bank and reach out into the stream.
    b. Collect the sample facing upstream, so that the sample entering the bottle has not been influenced by any of your actions.
    c. Plunge the bottle to just below the surface of the water and allow to fill.
    d. Do no stir up sediment from the stream bottom when sampling.

5. Once aqueous samples are collected and before moving to the next site: filter the sample bottles if necessary; add the appropriate preservative to reach the desired pH; then place sampled in a cooler containing loose ice. If using filter barrel, rinse with deionized water between each sample to prevent cross-contamination.

6. Use the flow meter, portable flume, or flume to obtain a flow measurement and record the reading into the field book.

Check the area around the site for any changes from nature or vandalism. Record the changes in the field book. Notify supervisor if vandalism was observed.

6.2 WELL SAMPLING

1. Record in field book: sample location, date and time

2. Remove lock from well cap and remove the well cap. Using the water level indicator, measure the water level in the well. Record depth in the field book.
    a. Measure the depth from the point marked on the well casing to water to the nearest 0.01 feet.
    b. Wipe off probe

3. Prior to sampling, label the sample bottles with location, site name, analyses to be performed (minerals, metals, nutrients, etc.), date and time. Labels are provided by the testing laboratory.

4. Each well should have a pump installed in it or a dedicated bailer. Calculate the amount of time to purge well of three well volumes and purge well for that amount of time; or take a pH reading from the water purging from the well every 2 to 3 minutes during pumping. When three consecutive readings stablilize (+/- 0.5 units), water sampling may commence. Begin pumping or bailing the well.

5. Take pH, conductivity, temperature, ORP, and DO readings of the sample solution and record the results in the field book. The meters should not be placed into the sample collection bottle. If these meters need to be placed into a bottle to obtain a reading, a separate bottle should be used. Use deionized water to rinse the meters in between measurements to prevent cross-contamination.

6. *Be careful not to touch the inside of the bottles or caps at any time.* Rinse all sample bottles two or three times with sample solution. Collect sample in the rinsed bottles and cap immediately.

7. Replace the cap and lock on the well.

8. Once aqueous samples are collected and before moving to the next site: filter the sample bottles if necessary; add the appropriate preservative to reach the desired pH; then place sampled in a cooler containing loose ice.

Check the area around the site for any changes from nature or vandalism. Record the changes in the field book. Notify supervisor if vandalism was observed.

EXAMPLES OF SAMPLE CONTAINERS, VOLUMES TO BE COLLECTED, PRESERVATIVES AND HOLDING TIMES BY PARAMETER AND MATRIX

TABLE 1

Parameter	Matrix[2]	Container[3]	Volume to be Collected	Preservative	Holding Times
Acidity/Alkalinity	W	P or G	500 ml	Cool (4ºC)	14 days
Acidity/Alkalinity	S	P or G	224 grams	Cool (4ºC)	14 days
BNA	W	G (amber)	2 x 1 liter	Cool (4ºC)	7 days until extraction, 40 days after extraction
BNA[4]	S	G	224 grams	Cool (4ºC)	14 days until extraction, 40 days after extraction
BOD	W	P	1 liter	Cool (4ºC)	2 days
COD	W	P or G	1 liter	Cool (4ºC), H_2SO_4, pH<2	28 days
Cr^{+6}	W	P	200 ml	Cool (4ºC)	24 hours
Creosotes[4]	W	G	2 x 1 liter	Cool (4ºC)	?
Creosotes	S	G	224 grams	Cool (4ºC)	?
Cyanide[4]	W	P	125 ml	Cool (4ºC), NaOH, pH>12	14 days
Cyanide	S	G	224 grams	Cool (4ºC)	14 days
Dioxin/Furans	W	G	2 x 1 liter	Cool (4ºC)	7 days until extraction, 40 days after extraction
Dioxin/Furans	S	G	448 grams	Cool (4ºC)	?
Herbicides[4]	W	G	2 x 1 liter	Cool (4ºC)	7 days until extraction, 40 days after extraction
Herbicides	S	G	224 grams	Cool (4ºC)	14 days until extraction, 40 days after extraction
Mercury (Hg)	W	P or G	250 ml	Cool (4ºC), HNO_3, pH<2	28 days
Mercury (Hg)	S	P or G	224 grams	Cool (4ºC)	28 days
Metals (except Cr^{+6} and Hg)	W	P or G	250 ml	Cool (4ºC), HNO_3, pH<2	6 months
Metals (except Hg)	S	G	224 grams	Cool (4ºC)	6 months
Oil and Grease	W	G	2 x 1 liter	Cool (4ºC), H_2SO_4, pH<2	28 days
Oil and Grease	S	G	224 grams	Cool (4ºC)	28 days
Petroleum Hydrocarbons[4]	W	G	2 x 1 liter	Cool (4ºC), H_2SO_4, pH<2	14 days
Petroleum Hydrocarbons	S	G	224 grams	Cool (4º C)	14 days

TABLE 1 (cont.)

Parameter	Matrix[2]	Container[3]	Volume to be Collected	Preservative	Holding Times
Pesticides/PCBs [4]	W	G (amber)	2 x 1 liter	Cool (4° C)	7 days until extraction, 40 days after extraction
Pesticides/PCBs	S	G	224 grams	Cool (4° C)	14 days until extraction, 40 days after extraction
Phenols	W	G	1 liter	Cool (4° C), H_2SO_4, pH<2	7 days until extraction, 40 days after extraction
Phenols	S	G	224 grams	Cool (4° C),	14 days until extraction, 40 days after extraction
Polynuclear Aromatic Hydrocarbons[4]	W	G	1 liter	Cool (4° C),	7 days until extraction, 40 days after extraction
Polynuclear Aromatic Hydrocarbons	S	G	224 grams	Cool (4° C),	14 days until extraction, 40 days after extraction
Reactivity (RCRA) (Cyanide)	W	P	1 liter	Cool (4° C), NaOH, pH>12	?
Reactivity (RCRA) (Sulfide)	W	P	1 liter	Cool (4° C), 4.0 ml zinc acetate solution	?
Reactivity (RCRA) (Cyanide/Sulfide)	S	G (amber)	224 grams	Cool (4° C),	?
Corrosivity (RCRA)	W	P	500 ml	Cool (4°C)	?
Ignitibility (RCRA)	W	G (amber)	500 ml	Cool (4°C)	?
Ignitibility (RCRA)	S	G (amber)	224 grams	Cool (4°C)	?
TCLP-VOCs[5]	W	G	3 x 40 ml vials	Cool (4°C)	?
TCLP-BNAs	W	G (amber)	2 x 1 liter	Cool (4°C)	?
TCLP-Pesticides/Herbicides	W	G (amber)	2 x 1 liter	Cool (4°C)	?
TCLP-Inorganics	W	P	1 liter	Cool (4°C), HNO_3, pH<2	?
TCLP-Nonvolatile Extraction[6]	S	G	448 grams	Cool (4°C)	?
TCLP-Volatile Extraction[6]	S	G	448 grams	Cool (4°C)	?
TOC	W	P or G	500 ml	Cool (4°C), H_2SO_4, pH<2	28 days
TOC	S	G	224 grams	Cool (4°C)	?
TOX	W	G	300 ml	Cool (4°C)	28 days
TOX	S	G	224 grams	Cool (4°C)	?

TABLE 1 (cont.)

Parameter	Matrix[2]	Container[3]	Volume to be Collected	Preservative	Holding Times
VOCs[6]	W	G	3 x 40 ml vials	Cool (4°C)	14 days
VOCs	S	G	40 ml vial	Cool (4°C)	14 days

1 Subcontract laboratory requirements may vary. Verify prior to sample collection.
2 W - water, S - soil/sediment
3 P - polyethylene, G - glass
4 For one sample of every batch of 10 (or less) samples, collect two additional 1 liter volumes for MS/MSD analysis.
5 Avoid excessive turbulence when filling the sample container. The container must be sealed so that no air bubbles are entrapped. No headspace allowed.
6 For one sample of every batch of 10 (or less) samples, collect two additional 16-ounce volumes for MS/MSD analysis.
7 For drinking water samples, if residual chlorine is present, the sample should be preserved with 0.008 percent sodium thiosulfate. U.S. Environmental Protection Agency Methods 330.4 and 330.5 may be used for measurement of residual chlorine. Field-test kits are commercially available for this purpose.

APPENDIX E

WATER QUALITY RESULTS BY SITE

APPENDIX E-1: MW-19 WATER LEVELS AND WATER QUALITY RESULTS

Table E-1. MW-19 Water Level (Page 1 of 3)

Date	Depth (ft)	Elevation (ft)
1/1/2000	121.68	5,820.62
1/1/2001	126.48	5,815.82
1/1/2002	131.92	5,810.38
1/1/2003	166.69	5,775.61
1/1/2004	223.24	5,719.06
1/1/2005	226.43	5,715.87
1/1/2006	178.4	5,763.90
1/9/2007	249	5,693.30
4/17/2007	248	5,694.30
5/16/2007	235	5,707.30
8/2/2007	112	5,830.30
11/13/2007	118	5,824.30
1/10/2008	9[(a)]	
4/8/2008	125	5,817.30
5/20/2008	120	5,822.30
8/13/2008	109	5,833.30
11/19/2008	109.4	5,832.90
1/13/2009	110.1	5,832.20
4/29/2009	119	5,823.30
5/14/2009	114	5,828.30
8/12/2009	107	5,835.30
1/26/2010	109.8	5,832.50
4/5/2010	119.1	5,823.20
5/4/2010	117.2	5,825.10
8/5/2010	109.6	5,832.70
1/21/2011	113.4	5,828.90
4/13/2011	119.7	5,822.60
5/10/2011	115.3	5,827.00
8/19/2011	100.8	5,841.50
1/6/2012	111.2	5,831.10

Table E-1. MW-19 Water Level (Page 2 of 3)

Date	Depth (ft)	Elevation (ft)
4/5/2012	116.9	5,825.40
5/10/2012	117.2	5,825.10
8/1/2012	121.35	5,820.95
1/2/2013	124.75	5,817.55
4/4/2013	129.64	5,812.66
5/8/2013	130.6	5,811.70
8/8/2013	108.4	5,833.90
1/7/2014	99.85	5,842.45
4/2/2014	104.4	5,837.90
5/6/2014	99.91	5,842.39
8/6/2014	98.3	5,844.00
1/5/2015	113.5	5,828.80
4/1/2015	120	5,822.30
5/20/2015	120	5,822.30
8/13/2015	250[(a)]	
1/7/2016	240.08[(a)]	
4/4/2016	123.74	5,818.56
5/8/2016	233.52[(a)]	
8/8/2016	122.43	5,819.87
10/19/2016	126.51	5,815.79
11/7/2016	127.38	5,814.92
12/13/2016	129.3	5,813.00
1/11/2017	130.49	5,811.81
2/13/2017	132.82	5,809.48
3/4/2017	133.71	5,808.59
4/2/2017	134	5,808.30
5/24/2017	135.74	5,806.56
6/14/2017	136.45	5,805.85
7/8/2017	136.67	5,805.63
8/7/2017	137.57	5,804.73
9/9/2017	138.4	5,803.90
10/15/2017	139.88	5,802.42
11/13/2017	140.56	5,801.74
4/7/2018	144.92	5,797.38

Table E-1. MW-19 Water Level (Page 3 of 3)

Date	Depth (ft)	Elevation (ft)
6/5/2018	141.85	5,800.45
7/8/2018	139.16	5,803.14
8/4/2018	136.17	5,806.13
1/3/2019	134.60	5,807.70
4/4/2019	138.09	5,804.21
5/3/2019	134.88	5,807.42
8/7/2019	122.62	5,819.68
1/5/2020	123.20	5,819.10
2/10/2020	124.54	5,817.76
3/4/2020	125.35	5,816.95
4/4/2020	125.08	5,817.22
5/10/2020	121.63	5,820.67
6/10/2020	119.88	5,822.42
7/9/2020	120.12	5,822.18
8/4/2020	120.32	5,821.98
9/16/2020	120.57	5,821.73
10/17/2020	121.57	5,820.73
11/16/2020	122.26	5,820.04
12/15/2020	123.81	5,818.49
1/2/2021	124.31	5,817.99
2/16/2021	126.08	5,816.22
3/1/2021	127.47	5,814.83
4/3/2021	129.13	5,813.17

(a) Data point is suspect; possibly faulty meter.

Table E-2. MW-19 Water Quality From January 7, 2016, Through May 3, 2018

Date Sampled	MCL or Other Advisory Value	1/7/2016	4/4/2016	5/8/2016	8/8/2016	10/19/2016	11/7/2016	12/13/2016	1/11/2017	2/13/2017	3/4/2017	4/2/2017	5/24/2017	6/14/2017	7/8/2017	8/7/2017	9/9/2017	10/15/2017	11/13/2017	12/10/2017	1/15/2018	2/11/2018	3/10/2018	4/7/2018	5/3/2018
Conductivity		445	504	325	449	490			494	500	495	500	425			428					476			472	250
pH	6.5–8.5[a]	7.64	7.41	7.32	7.75	7.3			7.26	7.06	7.26	7.06	7.26			7.29					7.16			7.19	7.13
TDS	1,000[a]	251	322	216	264	319			293	302	330	326	248			275					283			292	183
Bicarbonate		223	125	92	222	155			126	82.4	99.6	94.6	87.9			79.7					79.9			101	37.9
CN, Total		<0.010	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010	<0.010			<0.010					<0.010			<0.010	<0.010
CN, WAD	0.75	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010	<0.010			<0.010					<0.010			<0.010	<0.010
Fluoride	4; 2[a]	0.29	0.195	0.218	0.296	0.238			0.222	0.204	0.209	0.201	0.216			0.187					0.208			0.211	0.282
N, Ammonia		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
N, Nitrate	10	8.99	13.3	7.53	18.6	13	14.2	14.9	14.2	16.2	15.1	15.8	11.7	8.75	12.2	12.6	12.8	13.2	12.8	12.9	14.3	14.1	13.8	14.3	6.28
N, Nitrite	1	<0.050	<0.050	<0.050	<0.050	0.124	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sulfate	500[a]	<10.0	102	58	<10.0	72.3			91	119	105	108	89.1			101					109			100	61.2
Arsenic – D		0.009	0.011	0.014	0.009	0.012	0.012	0.013	0.012	0.013	0.014	0.013	0.014	0.016	0.014	0.014	0.017	0.016	0.015	0.014	0.015	0.017	0.016	0.016	0.018
Gold – D		0.003	<0.001	<0.001	0.004	0.002			0.002	0.001	0.003	0.002	<0.001			0.002				500	0.002			0.001	<0.001
Mercury – T	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002					<0.0002			<0.0002	<0.0002
Selenium – D	0.05[b]	<0.005	0.006	<0.005	<0.005	<0.005			0.006	0.006	<0.005	0.006	<0.005			<0.005					0.007			0.006	<0.005
Sodium – D	200[a]	5.28	9.12	6.93	5.26	8.68			9.13	10.1	9.38	10.3	8.55			9.89					10.4			8.8	7.04
Cond, Field		480	510	360	470	500	500	510	510	500	530	500	430	380	450	450	470	480	480		500	480	480	480	280
Field Depth		240.08	123.74	233.52	122.43	126.51	127.38	129.3	130.49	132.82	133.71	134.00	135.74	136.45	136.67	137.57	138.40	139.88	140.56	141.35	142.71	143.47	144.42	144.92	144.08
ORP, Field		86	113	166	176	193	173	148	108	142	68	96	157	107	99	146	175	126	116	90	16	115	86	145	83
Oxygen, Field		8.68	8.7	11	10.4	10.4	10.3	10.6	10.40	10.09	10.23	10.13	8.53	8.54	8.63	8.26	8.10	8.21	8.14	8.26	8.02	7.5	7.92	8.34	9.34
pH, Field	6.5–8.5[a]	7.56	7.54	7.24	7.49	7.2	7.19	7.27	7.30	7.19	7.16	7.09	6.99	7.15	7.12	6.76	6.64	7.16	6.98	6.90	6.94	6.62	6.94	6.64	6.80
Temp, Field		8.4	9.4	7.7	8.5	8	7.9	7.5	7.6	7.4	8.0	8.4	7.3	7.4	7.5	7.4	8.8	5.3	7.5	7.5	6.7	7.6	7.2	7.4	6.8

Notes:
(a) EPA Secondary drinking water regulation
(b) South Dakota Groundwater Quality Standards
CN = cyanide
D = dissolved
ORP = oxygen reduction potential
T = total
TDS = total dissolved solids
WAD = weak acid dissociable
< = less than limit of detection

All units are mg/L with the following exceptions: Conductivity (umhos/centimeter), pH, anions and cations (meq/L), balance (%), depth (feet), ORP (millivolts), and temperature (degrees Celsius).

Table E-3. MW-19 Water Quality From June 5, 2018, Through April 3, 2021

Date Sampled	MCL or Other Advisory Value	6/5/2018	7/8/2018	8/4/2018	1/3/2019	4/4/2019	5/3/2019	8/7/2019	1/5/2020	2/10/2020	3/4/2020	4/4/2020	5/10/2020	6/10/2020	7/9/2020	8/4/2020	9/16/2020	10/17/2020	11/16/2020	12/15/2020	1/2/2021	2/16/2021	3/1/2021	4/3/2021
Conductivity		276		372	525	509	319	437	480			458	317			466				459	465		513	522
pH	6.5–8.5[a]	7.48		7.47	7.46	7.36	7.64	7.52	7.64			7.29	7.49			7.75				7.69	7.59		7.47	7.52
TDS	1,000[a]	225		243	323	307	212	280	287			284	193			267				257	253		296	321
Bicarbonate		80.7		108	135	128	104	149	193			95	105			224				226	205		140	127
CN, Total		<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010			<0.010				<0.010	<0.010		<0.010	<0.010
CN, WAD	0.75	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010			<0.010				<0.010	<0.010		<0.010	<0.010
Fluoride	4; 2[a]	0.281		0.265	0.231	0.24	0.268	0.252	0.263			0.231	0.26			0.27				0.269	0.249		0.224	0.203
N, Ammonia		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
N, Nitrate	10	5.78	6.59	9.13	14.6	13.6	7.01	10.4	11.4	11.7	12.7	12	7.01	10.3	10.7	10.1	10.4	10	10.8	10.1	11.2	13.2	13.9	13.8
N, Nitrite	1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sulfate	500[a]	46.7		68.8	95.3	92.5	43.6	52.6	40.8			92.4	46.2			<10.0				11	30.7		90.5	101
Arsenic – D	0.01[b]	0.019	0.017	0.015	0.014	0.012	0.017	0.014	0.012	0.012	0.012	0.015	0.016	0.015	0.015	0.01	0.012	0.012	0.012	0.011	0.012	0.012	0.012	0.013
Gold – D		0.001		0.001	0.003	0.002	<0.001	0.002	0.004			<0.001	0.001			0.004				0.005	0.006		0.003	0.003
Mercury – T	0.002	<0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002	<0.0002			<0.0002				<0.0002	<0.0002		<0.0002	<0.0002
Selenium – D	0.05[b]	<0.005		<0.005	<0.005	0.006	<0.005	<0.005	<0.005			<0.005	<0.005			<0.005				<0.005	<0.005		<0.005	<0.005
Sodium – D	200[a]	5.42		7.33	9.1	9.27	5.41	5.93	6.25			8.68	5.54			4.66				4.95	5.84		8.54	8.93
Cond, Field		290	310	390	560	510	320	450	480	500	540	490	750	440	460	460	450	440	470	470	480	500	510	550
Field Depth		141.85	139.16	136.17	134.60	138.09	134.88	122.62	123.20	124.54	125.35	125.08	121.63	119.88	120.12	120.32	120.57	121.57	122.26	123.81	124.31	126.08	127.47	129.13
ORP, Field		166	115	104	73	99	119	172	119	208	171	94	161	100	102	181	190	181	118	172	153	175	102	195
Oxygen, Field		9.07	9.07	8.73	5.60	8.41	9.14	8.66	8.64	8.52	8.26	8.49	9.09	8.70	8.70	8.61	8.77	8.64	8.76	8.77	8.61	8.25	8.17	8.15
pH, Field	6.5–8.5[a]	6.76	6.60	6.75	6.90	6.76	7.18	7.23	7.16	7.09	6.91	6.87	7.04	7.05	7.19	7.26	7.25	7.48	7.51	7.4	7.37	7.12	7.13	7.08
Temp, Field		7.4	7.4	7.3	7.2	7.3	7.3	7.7	7.5	7.3	7.4	7.1	7.4	7.6	7.8	8.3	7.9	7.6	7.7	7.5	7.6	7.7	7.5	7.3

Notes:
(a) Secondary drinking water regulation
(b) South Dakota Groundwater Quality Standards
CN = cyanide
D = dissolved
ORP = oxygen reduction potential
T = total
TDS = total dissolved solids
WAD = weak acid dissociable
< = less than limit of detection

All units are mg/L with the following exceptions: Conductivity (umhos/centimeter), pH, anions and cations (meq/L), balance (%), depth (feet), ORP (millivolts), and temperature (degrees Celsius).

Table E-4. MW-19 Water Quality From May 1, 2021, Through June 26, 2021, and Statistical Summaries

Analyte	MCL or Other Advisory Value	5/1/2021	6/26/2021	n Analyzed	n Detected	Minimum	First Quartile	Median	Mean	Standard Deviation	Third Quartile	Maximum
Conductivity		487	408	30	30	250	425.8	465.5	442.2	73.91	494.8	525
pH	6.5–8.5[a]	7.32	7.62	30	30	7.06	7.268	7.435	7.413	0.1959	7.573	7.75
TDS	1,000[a]	322	240	30	30	183	248.8	281.5	273.8	40.48	305.8	330
Bicarbonate		102	106	30	30	37.9	94.7	107	127.8	49.87	146.8	226
CN, Total		<0.010	<0.010	30	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CN, WAD	0.75	<0.010	<0.010	30	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoride	4; 2[a]	0.196	0.204	30	30	0.187	0.2083	0.231	0.2361	0.03152	0.2645	0.296
N, Ammonia		<0.050	<0.050	49	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N, Nitrate	10	13.4	10.6	49	49	5.78	10.3	12.6	11.88	2.753	13.8	18.6
N, Nitrite	1	<0.050	<0.050	49	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sulfate	500[a]	113	71.1	30	27	5	46.33	80.7	70.89	34.65	100.8	119
Arsenic – D	0.01[b]	0.015	0.015	49	49	0.009	0.012	0.014	0.01378	0.002225	0.015	0.019
Gold – D		0.002	0.002	31	25	0.0005	0.001	0.002	16.13	88.34	0.003	500
Mercury – T	0.002	<0.0002	<0.0002	30	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium – D	0.05[b]	<0.005	<0.005	30	7	0.0025	0.0025	0.0025	0.003433	0.001569	0.004375	0.007
Sodium – D	200[a]	9.89	7.69	30	30	4.66	5.863	8.545	7.743	1.829	9.128	10.4
Cond, Field		530	440	48	48	280	450	480	469.2	74.97	500	750
Field Depth		129.71	130.36	49	49	119.9	124.3	130.5	135.6	22.25	138.4	240.1
ORP, Field		173	189	49	49	16	102	126	133.9	41.47	172	208
Oxygen, Field		6.47	8.65	49	49	5.6	8.26	8.64	8.768	0.9795	9.07	11
pH, Field	6.5–8.5[a]	7.05	7.1	49	49	6.6	6.91	7.12	7.084	0.2453	7.23	7.56
Temp, Field		7.6	7.6	49	49	5.3	7.4	7.5	7.576	0.5723	7.7	9.4

Notes:
(a) Secondary drinking water regulation
(b) South Dakota Groundwater Quality Standards
CN = cyanide
D = dissolved
ORP = oxygen reduction potential
T= total
TDS = total dissolved solids
WAD = weak acid dissociable
< = less than limit of detection
All units are mg/L with the following exceptions: Conductivity (umhos/centimeter), pH, anions and cations (meq/L), balance (%), depth (feet), ORP (millivolts), and temperature (degrees Celsius).

APPENDIX E-2: MW-33 WATER LEVELS AND WATER QUALITY RESULTS

Table E-5. MW-33 Water Level (Page 1 of 2)

Date	Depth (ft)	Elevation (ft)
1/1/2000	23.06	5,709.54
1/1/2001	24.78	5,707.82
1/1/2002	26.34	5,706.26
1/1/2003	26.7	5,705.90
1/1/2004	26.93	5,705.67
1/1/2005	26.15	5,706.45
1/1/2006	24.01	5,708.59
1/9/2007	58.8[(a)]	
5/16/2007	25	5,707.60
8/2/2007	25	5,707.60
11/13/2007	23	5,709.60
1/25/2008	23.4	5,709.20
4/9/2008	23.4	5,709.20
5/13/2008	23.4	5,709.20
8/13/2008	22	5,710.60
11/18/2008	22	5,710.60
1/13/2009	22.4	5,710.20
4/29/2009	19.6	5,713.00
5/14/2009	19	5,713.60
8/12/2009	20.4	5,712.20
1/26/2010	24.29	5,708.31
4/5/2010	23.3	5,709.30
5/4/2010	21.17	5,711.43
8/5/2010	22.53	5,710.07
1/11/2011	22.4	5,710.20
4/13/2011	19.22	5,713.38
5/10/2011	17.6	5,715.00
8/19/2011	18.24	5,714.36
1/6/2012	21.40	5,711.20
4/5/2012	19.60	5,713.00
5/10/2012	21.55	5,711.05
8/1/2012	22.71	5,709.89

Table E-5. MW-33 Water Level (Page 2 of 2)

Date	Depth (ft)	Elevation (ft)
1/2/2013	25.30	5,707.30
4/3/2013	24.05	5,708.55
5/8/2013	23.88	5,708.72
8/8/2013	20.34	5,712.26
1/1/2014	19.10	5,713.50
4/2/2014	18.92	5,713.68
5/6/2014	13.45	5,719.15
8/6/2014	18.15	5,714.45
1/5/2015	21.53	5,711.07
4/1/2015	30	5,702.60
5/20/2015	17	5,715.60
1/2/2016	23.12	5,709.48
4/3/2016	21.23	5,711.37
5/9/2016	21.31	5,711.29
8/8/2016	22.2	5,710.40
1/11/2017	24.62	5,707.98
4/2/2017	24.19	5,708.41
5/10/2017	24.18	5,708.42
8/7/2017	25.65	5,706.95
4/7/2018	26.76	5,705.84
8/5/2018	25.43	5,707.17
1/3/2019	29.65	5,702.95
4/4/2019	25.03	5,707.57
5/3/2019	22.25	5,710.35
8/7/2019	22.31	5,710.29
1/5/2020	23.61	5,708.99
4/4/2020	21.95	5,710.65
5/10/2020	19.41	5,713.19
8/4/2020	22.35	5,710.25
12/15/2020	23.61	5,708.99
1/2/2021	23.72	5,708.88
2/16/2021	24.08	5,708.52
3/2/2021	24.26	5,708.34
4/3/2021	24.43	5,708.17

(a) Data point is suspect.

Table E-6. MW-33 Water Quality From January 2, 2016, Through April 3, 2021

Date Sampled	MCL or Other Advisory Value	1/2/2016	4/3/2016	5/9/2016	8/8/2016	1/11/2017	4/2/2017	5/10/2017	8/7/2017	1/15/2018	4/7/2018	5/3/2018	8/5/2018	1/3/2019	4/4/2019	5/3/2019	8/7/2019	1/5/2020	4/4/2020	5/10/2020	8/4/2020	12/15/2020	1/2/2021	2/16/2021	3/2/2021	4/3/2021
Conductivity		354	358	354	354	357	356	356	353	363	362	359	360	360	360	361	359	355	362	358	361	357	349	361	359	362
pH	6.5–8.5[a]	7.85	7.9	7.88	7.82	7.93	7.81	7.87	7.94	7.96	7.85	8.03	7.91	8.05	7.96	8.05	7.95	7.92	7.9	7.98	7.93	7.89	7.89	7.89	7.95	8.02
TDS	1,000[a]	190	200	178	178	189	189	175	172	179	182	189	193	162	187	133	189	183	191	193	160	175	172	173	163	164
Bicarbonate		227	232	231	228	235	233	234	229	234	234	232	238	234	238	224	231	240	235	234	234	236	227	230	232	237
CN, Total		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
CN, WAD	0.75	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoride	4; 2[a]	0.264	0.275	0.249	0.296	0.307	0.292	0.285	0.259	0.326	0.294	0.334	0.33	0.282	0.309	0.31	0.304	0.276	0.299	0.286	0.275	0.264	0.268	0.276	0.277	0.263
N, Ammonia		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
N, Nitrate	10	0.163	0.154	0.15	0.163	0.124	0.208	0.121	<0.050	0.24	0.137	0.147	0.134	0.121	0.126	0.138	0.186	0.151	0.153	0.176	0.138	0.12	0.165	0.158	0.162	0.127
N, Nitrite	1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sulfate	500[a])	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Arsenic – D	0.01[b]	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Gold – D		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury – T	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium – D	0.05[b]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium – D	200[a]	4.15	4.33	4.07	4.56	3.75	3.95	3.98	4.49	4.61	3.89	4.05	4.1	4.64	4.19	3.73	3.32	3.8	4.23	3.65	3.64	3.95	3.82	3.6	3.59	3.54
Cond, Field		360	330	360	370	360	350	370	340	390	350	360	360	380	350	350	360	340	390	390	340	360	350	350	350	370
Field Depth		23.12	21.23	21.31	22.20	24.62	24.19	24.18	25.65	26.70	26.76	25.98	25.43	29.65	25.03	22.25	22.31	23.61	21.95	19.41	22.35	23.61	23.72	24.08	24.26	24.43
ORP, Field		21	60	142	196	119	107	199	154	83	70	138	148	41	227	222	227	138	224	230	202	225	111	249	87	210
Oxygen, Field		8.53	8.9	10.7	10.6	11.67	10.12	10.34	8.45	7.90	8.66	7.58	8.53	8.13	7.59	8.48	8.39	8.87	7.94	7.91	7.92	8.42	9.25	8.05	8.81	8.49
pH, Field	6.5–8.5[a]	7.92	7.9	8.03	7.72	8.23	7.88	7.82	7.80	7.86	7.78	7.48	7.54	7.66	7.27	7.67	7.79	7.76	7.32	7.53	7.78	7.66	7.88	7.70	7.80	8.16
Temp, Field		8.3	8.9	9	15.3	5.5	8.3	8.8	8.9	2.7	7.2	8.4	9.3	4.9	5.5	5.8	9.2	4.3	4.7	5.4	11.0	5.6	5.1	6.1	7.0	6.6

Notes:
(a) Secondary drinking water regulation
(b) South Dakota Groundwater Quality Standards
CN = cyanide
D = dissolved
ORP = oxygen reduction potential
T = total
TDS = total dissolved solids
WAD = weak acid dissociable
< = less than limit of detection

All units are mg/L with the following exceptions: Conductivity (umhos/centimeter), pH, anions and cations (meq/L), balance (%), depth (feet), ORP (millivolts), and temperature (degrees Celsius).

Table E-7. MW-33 Water Quality From May 1, 2021, Through June 26, 2021, and Statistical Summaries

Date Sampled	MCL or Other Advisory Value	5/1/2021	6/26/2021	n Analyzed	n Detected	Minimum	First Quartile	Median	Mean	Standard Deviation	Third Quartile	Maximum
Conductivity		356	359	27	27	349	356	359	358.0	3.294	360.5	363
pH	6.5–8.5[a]	7.97	8.13	27	27	7.81	7.89	7.93	7.934	0.07345	7.965	8.13
TDS	1,000[a]	154	179	27	27	133	172	179	177.5	14.36	189	200
Bicarbonate		235	235	27	27	224	231	234	232.9	3.651	235	240
CN, Total		<0.010	<0.010	27	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CN, WAD	0.75	<0.010	<0.010	27	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoride	4; 2[a]	0.257	0.264	27	27	0.249	0.266	0.282	0.2860	0.02266	0.3015	0.334
N, Ammonia		<0.050	<0.050	27	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N, Nitrate	10	0.166	0.156	27	26	0.025	0.1305	0.151	0.1485	0.03609	0.163	0.24
N, Nitrite	1	<0.050	<0.050	27	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sulfate	500[a]	<10.0	<10.0	27	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic – D	0.01[b]	<0.005	<0.005	27	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gold – D		<0.001	<0.001	27	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mercury – T	0.002	<0.0002	<0.0002	27	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium – D	0.05[b]	<0.005	<0.005	27	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium – D	200[a]	3.79	3.89	27	27	3.32	3.74	3.95	3.974	0.3384	4.17	4.64
Cond, Field		370	380	27	27	330	350	360	360.4	15.75	370	390
Field Depth		23.93	24.58	27	27	19.41	22.33	24.08	23.95	2.025	24.83	29.65
ORP, Field		218	189	27	27	21	109	154	156.9	65.60	220	249
Oxygen, Field		8.73	8.51	27	27	7.58	8.09	8.51	8.795	1.007	8.885	11.67
pH, Field	6.5–8.5[a]	7.65	7.69	27	27	7.27	7.66	7.78	7.751	0.2115	7.87	8.23
Temp, Field		9.4	10	27	27	2.7	5.5	7.2	7.452	2.543	8.95	15.3

Notes:
(a) Secondary drinking water regulation
(b) South Dakota Groundwater Quality Standards
CN = cyanide
D = dissolved
ORP = oxygen reduction potential
T= total
TDS = total dissolved solids
WAD = weak acid dissociable
< = less than limit of detection
All units are mg/L with the following exceptions: Conductivity (umhos/centimeter), pH, anions and cations (meq/L), balance (%), depth (feet), ORP (millivolts), and temperature (degrees Celsius).

APPENDIX E-3: MW-66 WATER LEVELS AND WATER QUALITY RESULTS

Table E-8. MW-66 Water Level

Date	Depth (ft)	Elevation (ft)
7/8/2019	288.83	6167.28
8/16/2019	290.26	6165.85
9/14/2019	292.30	6163.81
10/6/2019	236.34[(a)]	
11/23/2019	293.01	6163.10
12/21/2019	293.34	6162.77
1/12/2020	293.55	6162.56
4/10/2020	291.82	6164.29
5/1/2020	287.10	6169.01
8/15/2020	288.59	6167.52
12/4/2020	293.56	6162.55
1/26/2021	294.83	6161.28
2/2/2021	295.20	6160.91
3/12/2021	295.20	6160.91
4/3/2021	294.56	6167.65
5/27/2021	288.46	6165.65
6/25/2021	290.46	6164.96
7/17/2021	291.15	6165.31
8/1/2021	290.80	6161.96
9/5/2021	294.15	6160.43
10/10/2021	295.68	6163.16
11/14/2021	292.95	6167.65

(a) Data point is suspect because the water level did not likely increase 60 ft from September to October 2019 and then decrease in November.

Table E-9. MW-66 Water Quality From July 8, 2019, Through August 15, 2020 (Page 1 of 2)

Date Sampled	MCL or Other Advisory Value	7/8/2019	8/16/2019	9/14/2019	10/6/2019	10/6/2019	11/23/2019	12/21/2019	1/12/2020	4/10/2020	5/1/2020	8/15/2020
Conductivity		249	246	244	95.4	241	255	255	253	255	248	250
Hardness		92.9										
pH	6.5–8.5[a]	8.15	8.08	8.11	6.79	7.97	8.01	8.07	8.03	8.06	7.76	8.16
TDS	1,000[a]	163	146	113	56	65	67	139	119	135	133	94
Acidity			<10.0	<10.0	12	<10.0		<10.0				
Alkalinity			112	109	32.7	108		109				
Bicarbonate		136	136	133	39.9	132	135	133	135	136	134	135
Carbonate		0										
Chloride	250[a]	3.9										
CN, Total		<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
CN, WAD	0.75	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoride	4; 2[a]	0.62	<0.010	0.559	1.15	0.524	0.495	0.51	0.501	0.463	0.457	0.478
N, Ammonia		<0.050	0.549	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
N, Nitrate	10	1.14	<0.050	1.21	0.111	1.12	1.32	1.32	1.24	1.31	1.26	1.22
N, Nitrite	1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sulfate	500[a]	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Aluminum – D		0.016										
Aluminum – T	0.05–0.2[a]	2.69										
Arsenic – D	0.01 [e]	0.025	0.024	0.024	0.021	0.023	0.025	0.026	0.027	0.027	0.028	0.029
Arsenic – T		0.022	0.025	0.024	0.026	0.023	0.025	0.027				
Barium – D	2[e]	0.033	0.034	0.033	0.031	0.033	0.033	0.035				
Barium – T		0.048	0.04	0.034	0.034	0.035	0.039	0.039				
Cadmium – D	0.005[e]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
Cadmium – T		<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001				
Calcium – D		20.5	25.1	23.3	10.8	21.9	21.5	21.9				
Chromium – D	0.1[e]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
Chromium – T		0.002	<0.001	<0.001			0.001	0.001				
Cobalt – D		<0.001										
Cobalt – T		<0.001										
Copper – D	1.0[a] [e]; 1.3[b]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005				
Copper – T		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005				
Gold – D		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Gold – T		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
Iron – D	0.3[a]; 5[c]	<0.050										
Iron – T		1.18										

Table E-9. MW-66 Water Quality From July 8, 2019, Through August 15, 2020 (Page 2 of 2)

Date Sampled	MCL or Other Advisory Value	7/8/2019	8/16/2019	9/14/2019	10/6/2019	10/6/2019	11/23/2019	12/21/2019	1/12/2020	4/10/2020	5/1/2020	8/15/2020
Lead – D	0.015[b] [e]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
Lead – T		0.002	<0.001	<0.001	0.002	<0.001	<0.001	<0.001				
Magnesium – D		10.1	10.2	10.9	1.72	10	11.2	11.4				
Manganese – D		<0.010										
Manganese – T	0.05[a]; 0.8[c]	0.027										
Mercury – T	0.002[e]	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum – D		0.002										
Molybdenum – T	0.04[d]	0.002										
Nickel – D		<0.005										
Nickel – T	0.1[d]	<0.005										
Potassium – D		1.33	1.1	0.98	0.78	0.76	1.05	1.11				
Selenium – D	0.05[e]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium – T		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005				
Silicon – D		12.5										
Silicon – T		16.3										
Silver – D	0.1[e]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
Silver – T		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
Sodium – D	200[a]	13.3	10.7	10.8	3.69	10.7	10.7	10.6	10.3	10.6	10.1	9.85
Zinc – D		<0.050	<0.050	<0.050	0.055	<0.050	<0.050	<0.050				
Zinc – T		<0.050	<0.050	<0.050	0.068	<0.050	<0.050	<0.050				
Anions		2.45										
Balance		0.268										
Cations		2.47										
Cond, Field		260	250	240	90	240	260	250	250	250	260	230
Field Depth		288.83	290.26	292.30	236.34	293.01	293.34	293.55	293.90	291.82	287.10	288.59
ORP, Field		198	113	148	23	-12	-18	210	116	188	59	162
Oxygen, Field		7.94	8.18	6.85	3.93	7.82	6.69	6.58	6.91	7.09	7.43	7.56
pH, Field	6.5–8.5[a]	8.14	8.14	7.95	6.52	8.13	8.05	7.95	8.04	8.07	8.0	8.06
Temp, Field		7.0		7.1	8.1	6.8	6.8	6.8	6.8	6.9	6.9	7.3

Notes
(a) Secondary drinking water regulation.
(b) Action level which, if exceeded, triggers treatment.
(c) Permit limit calculated by Region 8 Drinking Water Toxicologist based on human-health criteria.
(d) Health advisory–lifetime.
(e) South Dakota Groundwater Quality Standards

CN = cyanide
D = dissolved
ORP = oxygen reduction potential
T= total
TDS = total dissolved solids
WAD = weak acid dissociable
< = less than limit of detection

All units are mg/L with the following exceptions: Conductivity (umhos/centimeter), pH, anions and cations (meq/L), balance (%), depth (feet), ORP (millivolts), and temperature (degrees Celsius).

Table E-10. MW-66 Water Quality From December 4, 2020, Through November 14, 2021 (Page 1 of 3)

Date Sampled	MCL or Other Advisory Value	12/4/2020	1/26/2021	2/2/2021	3/12/2021	4/3/2021	5/27/2021	6/25/2021	7/17/2021	8/1/2021	9/5/2021	10/10/2021	11/14/2021
Conductivity		242	248	250	250	251	247	252	249	249	250	248	248
Hardness							98.5	99.8	101	102	98.8	101	103
pH	6.5–8.5[a]	8.1	8.1	8.05	8.22	8.15	8.24	8.27	8.24	8.16	8.18	8.06	7.97
TDS	1,000[a]	128	113	128	130	140	138	126	98	121	116	122	101
Acidity							<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Alkalinity							111	108	109	110	108	109	109
Bicarbonate		133	136	132	133	134	135	132	133	134	132	133	133
Carbonate													
Chloride	250[a]						3.73	3.67	3.95	3.29	4.04	4.64	4.15
CN, Total		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
CN, WAD	0.75	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoride	4; 2[a]	0.423	0.426	0.467	0.382	0.44	0.459	0.412	0.43	0.418	0.408	0.399	0.419
N, Ammonia		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
N, Nitrate	10	1.17	1.21	1.22	1.24	1.22	1.06	1.19	1.25	1.18	1.26	1.25	1.19
N, Nitrite	1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Sulfate	500[a]	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Aluminum – D							<0.010	<0.010	<0.010	<0.010	0.016	<0.010	<0.010
Aluminum – T	0.05–0.2[a]						0.057	0.052	0.045	0.028	0.082	0.118	0.08
Arsenic – D	0.01 [e]	0.027	0.027	0.027	0.027	0.028	0.028	0.027	0.029	0.025	0.028	0.029	0.029
Arsenic – T							0.029	0.029	0.028	0.026	0.029	0.03	0.032
Barium – D	2[e]						0.032	0.034	0.034	0.032	0.033	0.035	0.037

Table E-10. MW-66 Water Quality From December 4, 2020, Through November 14, 2021 (Page 2 of 3)

Date Sampled	MCL or Other Advisory Value	12/4/2020	1/26/2021	2/2/2021	3/12/2021	4/3/2021	5/27/2021	6/25/2021	7/17/2021	8/1/2021	9/5/2021	10/10/2021	11/14/2021
Barium – T							0.035	0.038	0.036	0.036	0.037	0.037	0.04
Cadmium – D	0.005[e]						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium – T							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium – D							21.5	21.4	21	21.4	21	20.5	22.8
Chromium – D	0.1[e]						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium – T							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt – D													
Cobalt – T													
Copper – D	1.0[a] [e]; 1.3[b]						<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper – T							<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Gold – D		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Gold – T							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron – D	0.3[a]; 5[c]						<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Iron – T							<0.050	<0.050	<0.050	<0.050	0.056	0.092	0.072
Lead – D	0.015[b] [e]						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead – T							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium – D							10.9	11.3	11.8	11.7	11.3	12	11.2
Manganese – D							<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Manganese – T	0.05[a]; 0.8[c]						<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury – T	0.002[e]	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum – D													
Molybdenum – T	0.04[d]												
Nickel – D							<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Table E-10. MW-66 Water Quality From December 4, 2020, Through November 14, 2021 (Page 3 of 3)

Date Sampled	MCL or Other Advisory Value	12/4/2020	1/26/2021	2/2/2021	3/12/2021	4/3/2021	5/27/2021	6/25/2021	7/17/2021	8/1/2021	9/5/2021	10/10/2021	11/14/2021
Nickel – T	0.1[d]						<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Potassium – D							1.07	1.03	1.23	1.21	1.14	1.11	0.93
Selenium – D	0.05[e]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium – T							<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silicon – D													
Silicon – T													
Silver – D	0.1[e]						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silver – T							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sodium – D	200[a]	10.8	10.3	9.79	9.62	10.1	9.7	10.5	10.7	10.6	10.5	11.1	11.9
Zinc – D							<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Zinc – T							<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Anions							2.42	2.37	2.4	2.4	2.39	2.42	2.41
Balance							-0.058	2.11	2.26	2.61	1.47	1.92	3.78
Cations							2.42	2.48	2.52	2.53	2.46	2.52	2.59
Cond, Field		240	250	250	250	240	260	250	250	250	250	202	230
Field Depth		293.56	294.83	295.20	295.20	294.56	288.46	290.46	291.15	290.80	294.15	295.68	292.95
ORP, Field		50	160	54	137	57	97	157	127	100	143	240	196
Oxygen, Field		7.3	6.97	7.25	6.98	6.85	7.04	7.39	6.99	6.99	7.02	7.06	6.98
pH, Field	6.5–8.5[a]	8.07	8.09	8.06	8.24	7.99	8.26	8.3	8.26	8.20	8.19	8.12	8.06
Temp, Field		7.2	7.2	7.2	7.1	7.2	7.2	7.1	7.3	7.4	7.1	6.9	6.9

Notes
(a) Secondary drinking water regulation.
(b) Action level which, if exceeded, triggers treatment.
(c) Permit limit calculated by Region 8 Drinking Water Toxicologist based on human-health criteria.
(d) Health advisory–lifetime.
(e) South Dakota Groundwater Quality Standards

CN = cyanide
D = dissolved
ORP = oxygen reduction potential
T= total
TDS = total dissolved solids
WAD = weak acid dissociable
< = less than limit of detection

All units are mg/L with the following exceptions: Conductivity (umhos/centimeter), pH, anions and cations (meq/L), balance (%), depth (feet), ORP (millivolts), and temperature (degrees Celsius).

Table E-11. MW-66 Water Quality Statistical Summaries (Page 1 of 3)

Analyte	MCL or Other Advisory Value	n Analyzed	n Detected	Minimum	First Quartile	Median	Mean	Standard Deviation	Third Quartile	Maximum
Conductivity		22	22	241	248	249	249	3.67	251	255
Hardness		9	9	92.9	98.7	100	100	2.92	101	103
pH	6.5–8.5[a]	22	22	7.76	8.05	8.10	8.10	0.111	8.16	8.27
TDS	1,000[a]	22	22	65.0	113	124	120	23.1	135	163
Acidity		11	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Alkalinity		11	11	108	109	109	109	1.21	110	112
Bicarbonate		22	22	132	133	134	134	1.39	135	136
Carbonate		1	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chloride	250[a]	8	8	3.29	3.72	3.93	3.92	0.368	4.07	4.64
CN, Total		21	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CN, WAD	0.75	22	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fluoride	4; 2[a]	22	21	0.382	0.420	0.458	0.465	0.0583	0.500	0.620
N, Ammonia		22	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N, Nitrate	10	22	21	1.06	1.19	1.22	1.22	0.0625	1.25	1.32
N, Nitrite	1	22	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sulfate	500[a]	22	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aluminum – D		8	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aluminum – T	0.05–0.2[a]	8	8	0.028	0.0503	0.0685	0.394	0.868	0.091	2.69
Arsenic – D	0.01[e]	22	22	0.023	0.0253	0.027	0.0268	0.00173	0.028	0.029
Arsenic – T		13	13	0.022	0.025	0.027	0.0268	0.00285	0.029	0.032
Barium – D	2[e]	13	13	0.032	0.033	0.033	0.0337	0.00132	0.034	0.037
Barium – T		13	13	0.034	0.036	0.037	0.038	0.00344	0.039	0.048
Cadmium – D	0.005[e]	13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium – T		13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Calcium – D		13	13	20.5	21.0	21.5	21.8	1.22	21.9	25.1

Table E-11. MW-66 Water Quality Statistical Summaries (Page 2 of 3)

Analyte	MCL or Other Advisory Value	n Analyzed	n Detected	Minimum	First Quartile	Median	Mean	Standard Deviation	Third Quartile	Maximum
Chromium – D	0.1[e]	13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium – T		12	3	0.0005	0.0005	0.0005	0.000708	0.000431	0.000625	0.002
Cobalt – D		1	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt – T		1	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper – D	1.0[a] [e]; 1.3[b]	13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper – T		13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gold – D		22	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gold – T		13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron – D		8	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron – T	0.3[a]; 5[c]	8	4	0.025	0.025	0.041	0.188	0.376	0.0770	1.180
Lead – D	0.015[b] [e]	13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead – T		13	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium – D		13	13	10.0	10.9	11.2	11.1	0.617	11.4	12.0
Manganese – D		8	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese – T	0.05[a]; 0.8[c]	8	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mercury – T	0.002	22	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Molybdenum – D		1	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Molybdenum – T	0.04[d]	1	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel – D		8	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel – T	0.1[d]	8	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Potassium – D		13	13	0.76	1.03	1.10	1.08	0.138	1.14	1.33
Selenium – D		22	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Selenium – T	0.05[e]	13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silicon – D		1	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silicon – T		1	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver – D		13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table E-11. MW-66 Water Quality Statistical Summaries (Page 3 of 3)

Analyte	MCL or Other Advisory Value	n Analyzed	n Detected	Minimum	First Quartile	Median	Mean	Standard Deviation	Third Quartile	Maximum
Silver – T		13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sodium – D	200[a]	22	22	9.62	10.2	10.6	10.6	0.770	10.7	13.3
Zinc – D		13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc – T		13	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anions		8	8	2.37	2.40	2.41	2.41	0.0222	2.42	2.45
Balance		8	8	-0.058	1.17	2.02	1.80	1.16	2.35	3.78
Cations		8	8	2.42	2.47	2.50	2.50	0.0488	2.52	2.59
Cond, Field		22	22	202	240	250	246	13	250	260
Field Depth		22	22	287	291	293	292	2.43	294	296
ORP, Field		22	22	-18	68.5	132	122	67.3	162	240
Oxygen, Field		22	22	6.58	6.97	7.03	7.18	0.394	7.37	8.18
pH, Field	6.5–8.5[a]	22	22	7.95	8.05	8.08	8.11	0.098	8.18	8.30
Temp, Field		21	21	6.80	6.90	7.10	7.06	0.184	7.20	7.40

Notes
(a) Secondary drinking water regulation.
(b) Action level which, if exceeded, triggers treatment.
(c) Permit limit calculated by Region 8 Drinking Water Toxicologist based on human-health criteria.
(d) Health advisory–lifetime.
CN = cyanide
D = dissolved
ORP = oxygen reduction potential
T = total
TDS = total dissolved solids
WAD = weak acid dissociable
< = less than limit of detection

All units are mg/L with the following exceptions: Conductivity (umhos/centimeter), pH, anions and cations (meq/L), balance (%), depth (feet), ORP (millivolts), and temperature (degrees Celsius).

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 01/07/16 at 04:25 PM by Steve Albrecht
Sample Matrix: Water

Lab ID#: 20160113104
Received: 01/12/16 at 11:45 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	445	µmhos/cm	1	0.400	5.00	SM 2510B	JAM 01/13/16
pH	7.64	S.U.	1			SM 4500-H+ B	JAM 01/14/16
Total Dissolved Solids	251	mg/L	100ml	8.28	50.0	SM 2540 C	TMN 01/13/16
Non-Metallics							
Bicarbonate	223	mg/L	1	0.501	10.0	SM 2320 B	JAM 01/14/16
Cyanide, Total	< 0.010	mg/L	1	0.00025	0.010	Kelada 01	TMN 01/15/16
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 01/15/16
Fluoride	0.290	mg/L	1	0.003	0.050	SM 4500 F-C	GRT 01/15/16
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 01/13/16
Nitrogen, Nitrate (NO3)	8.99	mg/L	10	0.104	0.500	SM 4500-NO3 F	BLL 01/13/16
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 01/13/16
Sulfate (SO4)	< 10.0	mg/L	1	0.679	1.00	SM 4500-SO4 E	BLL 01/13/16
Metals - Dissolved							
Arsenic (As)	0.009	mg/L	10	0.00062	0.005	EPA 200.8	TNA 01/13/16
Gold (Au)	0.003	mg/L	1			EPA 231.2	TNA 01/13/16
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 01/13/16
Sodium (Na)	5.28	mg/L	1	0.147	0.500	SM 3111 B	GRT 01/13/16
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000024	0.0002	EPA 245.1	GRT 01/13/16
Field Test							
Field Conductivity	480	µmhos/cm	1			Field Conductivity	BLL 01/12/16
Field Total Depth	240	ft	1			Field Total Depth	BLL 01/12/16
Field ORP	86.0	mV	1			Field ORP	BLL 01/12/16
Field Oxygen (O2)	8.68	mg/L	1			Field Oxygen	BLL 01/12/16
Field pH	7.56	S.U.	1			Field pH	BLL 01/12/16
Field Temperature	8.40	° C	1			Field Temp.	BLL 01/12/16

Report Approved By:

Report Approved On: 1/15/2016 3:27:50 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 04/04/16 at 09:45 AM by Steve Albrecht
Sample Matrix: Water

Lab ID#: 20160406308
Received: 04/05/16 at 10:50 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	504	µmhos/cm	1	0.400	5.00	SM 2510B	JAM 04/06/16
pH	7.41	S.U.	1			SM 4500-H+ B	JAM 04/08/16
Total Dissolved Solids	322	mg/L	100ml	23.2	50.0	SM 2540 C	TMN 04/06/16
Non-Metallics							
Bicarbonate	125	mg/L	1	0.327	10.0	SM 2320 B	JAM 04/08/16
Cyanide, Total	< 0.010	mg/L	1	0.00043	0.010	Kelada 01	TMN 04/07/16
Cyanide, WAD	< 0.010	mg/L	1	0.00068	0.010	Kelada 01	TMN 04/07/16
Fluoride	0.195	mg/L	1	0.003	0.050	SM 4500 F-C	GRT 04/06/16
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 04/06/16
Nitrogen, Nitrate (NO3)	13.3	mg/L	20	0.372	1.00	SM 4500-NO3 F	BLL 04/06/16
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 04/06/16
Sulfate (SO4)	102	mg/L	2	0.603	2.00	SM 4500-SO4 E	BLL 04/06/16
Metals - Dissolved							
Arsenic (As)	0.011	mg/L	10	0.00087	0.005	EPA 200.8	TNA 04/06/16
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 04/06/16
Selenium (Se)	0.006	mg/L	10	0.001	0.005	EPA 200.8	TNA 04/06/16
Sodium (Na)	9.12	mg/L	1	0.141	0.500	SM 3111 B	TMS 04/06/16
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000024	0.0002	EPA 245.1	TMS 04/06/16
Field Test							
Field Conductivity	510	µmhos/cm	1			Field Conductivity	BLL 04/05/16
Field Total Depth	120	ft	1			Field Total Depth	BLL 04/05/16
Field ORP	113	mV	1			Field ORP	BLL 04/05/16
Field Oxygen (O2)	8.70	mg/L	1			Field Oxygen	BLL 04/05/16
Field pH	7.54	S.U.	1			Field pH	BLL 04/05/16
Field Temperature	9.40	° C	1			Field Temp.	BLL 04/05/16

Report Approved By:

Report Approved On: 4/8/2016 1:38:53 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 05/08/16 at 10:50 AM by D Witte/S Albrecht/J Thorp
Sample Matrix: Water

Lab ID#: 20160511112
Received: 05/10/16 at 11:20 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	325	µmhos/cm	1	0.400	5.00	SM 2510B	JAM	05/11/16
pH	7.32	S.U.	1			SM 4500-H+ B	JAM	05/15/16
Total Dissolved Solids	216	mg/L	100ml	23.2	50.0	SM 2540 C	TMN	05/11/16
Non-Metallics								
Bicarbonate	92.0	mg/L	1	0.327	10.0	SM 2320 B	JAM	05/15/16
Cyanide, Total	< 0.010	mg/L	1	0.00043	0.010	Kelada 01	TMN	05/11/16
Cyanide, WAD	< 0.010	mg/L	1	0.00068	0.010	Kelada 01	TMN	05/11/16
Fluoride	0.218	mg/L	1	0.003	0.050	SM 4500 F-C	TNA	05/11/16
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM	05/13/16
Nitrogen, Nitrate (NO3)	7.53	mg/L	10	0.186	0.500	SM 4500-NO3 F	BLL	05/11/16
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL	05/11/16
Sulfate (SO4)	58.0	mg/L	2	0.603	2.00	SM 4500-SO4 E	BLL	05/11/16
Metals - Dissolved								
Arsenic (As)	0.014	mg/L	10	0.00087	0.005	EPA 200.8	TNA	05/11/16
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	05/11/16
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA	05/11/16
Sodium (Na)	6.93	mg/L	1	0.141	0.500	SM 3111 B	TMS	05/11/16
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.000024	0.0002	EPA 245.1	TMS	05/11/16
Field Test								
Field Conductivity	360	µmhos/cm	1			Field Conductivity	BLL	05/10/16
Field Total Depth	230	ft	1			Field Total Depth	BLL	05/10/16
Field ORP	166	mV	1			Field ORP	BLL	05/10/16
Field Oxygen (O2)	11.0	mg/L	1			Field Oxygen	BLL	05/10/16
Field pH	7.24	S.U.	1			Field pH	BLL	05/10/16
Field Temperature	7.70	° C	1			Field Temp.	BLL	05/10/16

Report Approved By:

Report Approved On: 5/17/2016 7:09:45 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 08/08/16 at 01:50 PM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20160810207
Received: 08/09/16 at 10:10 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	449	µmhos/cm	1	0.400	5.00	SM 2510B	JAM 08/10/16
pH	7.75	S.U.	1			SM 4500-H+ B	JAM 08/10/16
Total Dissolved Solids	264	mg/L	100ml	23.2	50.0	SM 2540 C	ELR 08/10/16
Non-Metallics							
Bicarbonate	222	mg/L	1	0.327	10.0	SM 2320 B	JAM 08/10/16
Cyanide, Total	< 0.010	mg/L	1	0.00043	0.010	Kelada 01	TMN 08/11/16
Cyanide, WAD	< 0.010	mg/L	1	0.00068	0.010	Kelada 01	TMN 08/11/16
Fluoride	0.296	mg/L	1	0.003	0.050	SM 4500 F-C	ELR 08/10/16
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 08/11/16
Nitrogen, Nitrate (NO3)	18.6	mg/L	20	0.372	1.00	SM 4500-NO3 F	BLL 08/10/16
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 08/10/16
Sulfate (SO4)	< 10.0	mg/L	1	0.301	1.00	SM 4500-SO4 E	BLL 08/10/16
Metals - Dissolved							
Arsenic (As)	0.009	mg/L	10	0.00087	0.005	EPA 200.8	TNA 08/10/16
Gold (Au)	0.004	mg/L	1			EPA 231.2	TNA 08/10/16
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 08/10/16
Sodium (Na)	5.26	mg/L	1	0.141	0.500	SM 3111 B	TMS 08/10/16
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 08/10/16
Field Test							
Field Conductivity	470	µmhos/cm	1			Field Conductivity	BLL 08/10/16
Field Total Depth	120	ft	1			Field Total Depth	BLL 08/10/16
Field ORP	176	mV	1			Field ORP	BLL 08/10/16
Field Oxygen (O2)	10.4	mg/L	1			Field Oxygen	BLL 08/10/16
Field pH	7.49	S.U.	1			Field pH	BLL 08/10/16
Field Temperature	8.50	° C	1			Field Temp.	BLL 08/10/16

Report Approved By:

Report Approved On: 8/15/2016 1:52:29 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 10/19/16 at 11:45 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20161021103
Received: 10/20/16 at 11:55 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	490	µmhos/cm	1	0.382	5.00	SM 2510B	JAM 10/21/16
pH	7.30	S.U.	1			SM 4500-H+ B	JAM 10/21/16
Total Dissolved Solids	319	mg/L	100ml	23.2	50.0	SM 2540 C	TMN 10/20/16
Non-Metallics							
Bicarbonate	155	mg/L	1	0.327	10.0	SM 2320 B	JAM 10/21/16
Cyanide, Total	< 0.010	mg/L	1	0.00043	0.010	Kelada 01	TMN 10/24/16
Cyanide, WAD	< 0.010	mg/L	1	0.00068	0.010	Kelada 01	TMN 10/24/16
Fluoride	0.238	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 10/25/16
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 10/21/16
Nitrogen, Nitrate (NO3)	13.0	mg/L	10	0.186	0.500	SM 4500-NO3 F	BLL 10/21/16
Nitrogen, Nitrite (NO2)	0.124	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 10/21/16
Sulfate (SO4)	72.3	mg/L	1	0.301	1.00	SM 4500-SO4 E	BLL 10/21/16
Metals - Dissolved							
Arsenic (As)	0.012	mg/L	10	0.00087	0.005	EPA 200.8	TNA 10/21/16
Gold (Au)	0.002	mg/L	1			EPA 231.2	TNA 10/24/16
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 10/21/16
Sodium (Na)	8.68	mg/L	1	0.141	0.500	SM 3111 B	TMS 10/24/16
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 10/21/16
Field Test							
Field Conductivity	500	µmhos/cm	1			Field Conductivity	BLL 10/20/16
Field Total Depth	130	ft	1			Field Total Depth	BLL 10/20/16
Field ORP	193	mV	1			Field ORP	BLL 10/20/16
Field Oxygen (O2)	10.4	mg/L	1			Field Oxygen	BLL 10/20/16
Field pH	7.20	S.U.	1			Field pH	BLL 10/20/16
Field Temperature	8.00	° C	1			Field Temp.	BLL 10/20/16

Report Approved By:

Report Approved On: 10/25/2016 2:37:52 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 11/07/16 at 03:10 PM by Steve Albrecht/Darnell Witte
Sample Matrix: Water

Lab ID#: 20161109311
Received: 11/08/16 at 01:00 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Non-Metallics								
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM	11/09/16
Nitrogen, Nitrate (NO3)	14.2	mg/L	10	0.186	0.500	SM 4500-NO3 F	BLL	11/10/16
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL	11/10/16
Metals - Dissolved								
Arsenic (As)	0.012	mg/L	10	0.00087	0.005	EPA 200.8	TNA	11/10/16
Field Test								
Field Conductivity	500	µmhos/cm	1			Field Conductivity	BLL	11/08/16
Field Total Depth	130	ft	1			Field Total Depth	BLL	11/08/16
Field ORP	173	mV	1			Field ORP	BLL	11/08/16
Field Oxygen (O2)	10.3	mg/L	1			Field Oxygen	BLL	11/08/16
Field pH	7.19	S.U.	1			Field pH	BLL	11/08/16
Field Temperature	7.90	° C	1			Field Temp.	BLL	11/08/16

Report Approved By:

Report Approved On: 11/15/2016 8:18:59 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 12/13/16 at 11:00 AM by Steve Albrecht
Sample Matrix: Water

Lab ID#: 20161216103
Received: 12/15/16 at 11:20 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Non-Metallics							
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 12/16/16
Nitrogen, Nitrate (NO3)	14.9	mg/L	20	0.372	1.00	SM 4500-NO3 F	BLL 12/16/16
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 12/16/16
Metals - Dissolved							
Arsenic (As)	0.013	mg/L	10	0.00087	0.005	EPA 200.8	TNA 12/16/16
Field Test							
Field Conductivity	510	µmhos/cm	1			Field Conductivity	BLL 12/15/16
Field Total Depth	130	ft	1			Field Total Depth	BLL 12/15/16
Field ORP	148	mV	1			Field ORP	BLL 12/15/16
Field Oxygen (O2)	10.6	mg/L	1			Field Oxygen	BLL 12/15/16
Field pH	7.27	S.U.	1			Field pH	BLL 12/15/16
Field Temperature	7.50	° C	1			Field Temp.	BLL 12/15/16

Report Approved By:

Report Approved On: 12/19/2016 9:16:17 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 01/11/17 at 09:50 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20170113302
Received: 01/12/17 at 11:40 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	494	µmhos/cm	1	0.382	5.00	SM 2510B	JAM 01/13/17
pH	7.26	S.U.	1			SM 4500-H+ B	JAM 01/13/17
Total Dissolved Solids	293	mg/L	100ml	23.2	50.0	SM 2540 C	TMN 01/15/17
Non-Metallics							
Bicarbonate	126	mg/L	1	0.327	10.0	SM 2320 B	JAM 01/13/17
Cyanide, Total	< 0.010	mg/L	1	0.00043	0.010	Kelada 01	TMN 01/12/17
Cyanide, WAD	< 0.010	mg/L	1	0.00068	0.010	Kelada 01	TMN 01/12/17
Fluoride	0.222	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 01/13/17
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 01/16/17
Nitrogen, Nitrate (NO3)	14.2	mg/L	20	0.372	1.00	SM 4500-NO3 F	BLL 01/13/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 01/13/17
Sulfate (SO4)	91.0	mg/L	2	0.603	2.00	SM 4500-SO4 E	BLL 01/13/17
Metals - Dissolved							
Arsenic (As)	0.012	mg/L	10	0.00087	0.005	EPA 200.8	TNA 01/13/17
Gold (Au)	0.002	mg/L	1			EPA 231.2	TNA 01/13/17
Selenium (Se)	0.006	mg/L	10	0.001	0.005	EPA 200.8	TNA 01/13/17
Sodium (Na)	9.13	mg/L	1	0.141	0.500	SM 3111 B	TMS 01/13/17
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 01/13/17
Field Test							
Field Conductivity	510	µmhos/cm	1			Field Conductivity	BLL 01/12/17
Field Total Depth	25	ft	1			Field Total Depth	BLL 01/12/17
Field ORP	108	mV	1			Field ORP	BLL 01/12/17
Field Oxygen (O2)	10.4	mg/L	1			Field Oxygen	BLL 01/12/17
Field pH	7.30	S.U.	1			Field pH	BLL 01/12/17
Field Temperature	7.60	° C	1			Field Temp.	BLL 01/12/17

Report Approved By:

Report Approved On: 1/18/2017 2:32:42 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 02/13/17 at 03:05 PM by Darnell Witte/Steve Albrecht
Sample Matrix: Water

Lab ID#: 20170215209
Received: 02/14/17 at 10:50 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	500	µmhos/cm	1	0.382	5.00	SM 2510B	EJF 02/15/17
pH	7.06	S.U.	1			SM 4500-H+ B	EJF 02/15/17
Total Dissolved Solids	302	mg/L	100ml	23.2	50.0	SM 2540 C	ELR 02/15/17
Non-Metallics							
Bicarbonate	82.4	mg/L	1	0.327	10.0	SM 2320 B	EJF 02/15/17
Cyanide, Total	< 0.010	mg/L	1	0.00043	0.010	Kelada 01	TMN 02/15/17
Cyanide, WAD	< 0.010	mg/L	1	0.00068	0.010	Kelada 01	TMN 02/15/17
Fluoride	0.204	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 02/15/17
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	EJF 02/15/17
Nitrogen, Nitrate (NO3)	16.2	mg/L	20	0.372	1.00	SM 4500-NO3 F	BLL 02/15/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 02/15/17
Sulfate (SO4)	119	mg/L	2	0.603	2.00	SM 4500-SO4 E	BLL 02/15/17
Metals - Dissolved							
Arsenic (As)	0.013	mg/L	10	0.00087	0.005	EPA 200.8	TNA 02/15/17
Gold (Au)	0.001	mg/L	1			EPA 231.2	TNA 02/15/17
Selenium (Se)	0.006	mg/L	10	0.001	0.005	EPA 200.8	TNA 02/15/17
Sodium (Na)	10.1	mg/L	1	0.151	0.500	SM 3111 B	TMS 02/15/17
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 02/15/17
Field Test							
Field Conductivity	500	µmhos/cm	1			Field Conductivity	BLL 02/14/17
Field Total Depth	130	ft	1			Field Total Depth	BLL 02/14/17
Field ORP	142	mV	1			Field ORP	BLL 02/14/17
Field Oxygen (O2)	10.1	mg/L	1			Field Oxygen	BLL 02/14/17
Field pH	7.19	S.U.	1			Field pH	BLL 02/14/17
Field Temperature	7.90	° C	1			Field Temp.	BLL 02/14/17

Report Approved By:

Report Approved On: 2/21/2017 10:42:42 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 03/04/17 at 02:30 PM by Steve Albrecht
Sample Matrix: Water

Lab ID#: 20170308203
Received: 03/07/17 at 11:30 AM by Trey Anawaty
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	495	µmhos/cm	1	0.382	5.00	SM 2510B	JAM 03/08/17
pH	7.26	S.U.	1			SM 4500-H+ B	JAM 03/09/17
Total Dissolved Solids	330	mg/L	100ml	23.2	50.0	SM 2540 C	TMN 03/08/17
Non-Metallics							
Bicarbonate	99.6	mg/L	1	0.327	10.0	SM 2320 B	JAM 03/09/17
Cyanide, Total	< 0.010	mg/L	1	0.00043	0.010	Kelada 01	TMN 03/11/17
Cyanide, WAD	< 0.010	mg/L	1	0.00068	0.010	Kelada 01	TMN 03/10/17
Fluoride	0.209	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 03/08/17
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 03/08/17
Nitrogen, Nitrate (NO3)	15.1	mg/L	20	0.372	1.00	SM 4500-NO3 F	BLL 03/08/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 03/08/17
Sulfate (SO4)	105	mg/L	4	1.21	4.00	SM 4500-SO4 E	BLL 03/08/17
Metals - Dissolved							
Arsenic (As)	0.014	mg/L	10	0.00087	0.005	EPA 200.8	TNA 03/08/17
Gold (Au)	0.003	mg/L	1			EPA 231.2	TNA 03/08/17
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 03/08/17
Sodium (Na)	9.38	mg/L	1	0.151	0.500	SM 3111 B	GRT 03/08/17
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 03/09/17
Field Test							
Field Conductivity	530	µmhos/cm	1			Field Conductivity	BLL 03/08/17
Field Total Depth	130	ft	1			Field Total Depth	BLL 03/08/17
Field ORP	68.0	mV	1			Field ORP	BLL 03/08/17
Field Oxygen (O2)	10.2	mg/L	1			Field Oxygen	BLL 03/08/17
Field pH	7.16	S.U.	1			Field pH	BLL 03/08/17
Field Temperature	8.00	° C	1			Field Temp.	BLL 03/08/17

Report Approved By:

Report Approved On: 3/13/2017 7:23:17 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 04/02/17 at 03:20 PM by Steve Albrecht
Sample Matrix: Water

Lab ID#: 20170405213
Received: 04/04/17 at 12:15 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	500	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 04/05/17
pH	7.06	S.U.	1			SM 4500-H+ B	JAM 04/05/17
Total Dissolved Solids	326	mg/L	100ml	18.1	50.0	SM 2540 C	ELR 04/05/17
Non-Metallics							
Bicarbonate	94.6	mg/L	1	0.618	10.0	SM 2320 B	JAM 04/05/17
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 04/06/17
Cyanide, WAD	< 0.010	mg/L	1	0.0007	0.010	Kelada 01	TMN 04/06/17
Fluoride	0.201	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 04/05/17
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 04/05/17
Nitrogen, Nitrate (NO3)	15.8	mg/L	20	0.372	1.00	SM 4500-NO3 F	BLL 04/05/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 04/05/17
Sulfate (SO4)	108	mg/L	4	1.21	4.00	SM 4500-SO4 E	BLL 04/06/17
Metals - Dissolved							
Arsenic (As)	0.013	mg/L	10	0.00087	0.005	EPA 200.8	TNA 04/05/17
Gold (Au)	0.002	mg/L	1			EPA 231.2	TNA 04/06/17
Selenium (Se)	0.006	mg/L	10	0.001	0.005	EPA 200.8	TNA 04/05/17
Sodium (Na)	10.3	mg/L	1	0.151	0.500	SM 3111 B	TMS 04/05/17
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 04/05/17
Field Test							
Field Conductivity	500	µmhos/cm	1			Field Conductivity	BLL 04/04/17
Field Total Depth	130	ft	1			Field Total Depth	BLL 04/04/17
Field ORP	96.0	mV	1			Field ORP	BLL 04/04/17
Field Oxygen (O2)	10.1	mg/L	1			Field Oxygen	BLL 04/04/17
Field pH	7.09	S.U.	1			Field pH	BLL 04/04/17
Field Temperature	8.40	° C	1			Field Temp.	BLL 04/04/17

Report Approved By:

Report Approved On: 4/7/2017 2:42:49 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 05/10/17 at 10:30 AM by Steve Albrecht
Sample Matrix: Water

Lab ID#: 20170512210
Received: 05/11/17 at 11:10 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	432	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 05/12/17
pH	7.27	S.U.	1			SM 4500-H+ B	JAM 05/12/17
Total Dissolved Solids	263	mg/L	100ml	18.1	50.0	SM 2540 C	ELR 05/12/17
Non-Metallics							
Bicarbonate	102	mg/L	1	0.618	10.0	SM 2320 B	JAM 05/12/17
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 05/12/17
Cyanide, WAD	< 0.010	mg/L	1	0.0007	0.010	Kelada 01	TMN 05/12/17
Fluoride	0.224	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 05/15/17
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 05/12/17
Nitrogen, Nitrate (NO3)	11.8	mg/L	20	0.372	1.00	SM 4500-NO3 F	BLL 05/12/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 05/12/17
Sulfate (SO4)	86.1	mg/L	2	0.603	2.00	SM 4500-SO4 E	BLL 05/12/17
Metals - Dissolved							
Arsenic (As)	0.014	mg/L	10	0.00087	0.005	EPA 200.8	TNA 05/12/17
Gold (Au)	0.001	mg/L	1			EPA 231.2	TNA 05/12/17
Selenium (Se)	0.006	mg/L	10	0.001	0.005	EPA 200.8	TNA 05/12/17
Sodium (Na)	8.54	mg/L	1	0.151	0.500	SM 3111 B	TMS 05/12/17
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 05/12/17
Field Test							
Field Conductivity	450	µmhos/cm	1			Field Conductivity	BLL 05/11/17
Field Total Depth	140	ft	1			Field Total Depth	BLL 05/11/17
Field ORP	145	mV	1			Field ORP	BLL 05/11/17
Field Oxygen (O2)	11.0	mg/L	1			Field Oxygen	BLL 05/11/17
Field pH	7.00	S.U.	1			Field pH	BLL 05/11/17
Field Temperature	7.40	° C	1			Field Temp.	BLL 05/11/17

Report Approved By:

Report Approved On: 5/16/2017 1:10:16 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 05/24/17 at 11:10 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20170526205
Received: 05/25/17 at 11:30 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	425	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 05/26/17
pH	7.26	S.U.	1			SM 4500-H+ B	JAM 05/26/17
Total Dissolved Solids	248	mg/L	100ml	18.1	50.0	SM 2540 C	ELR 05/25/17
Non-Metallics							
Bicarbonate	87.9	mg/L	1	0.618	10.0	SM 2320 B	JAM 05/26/17
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 05/26/17
Cyanide, WAD	< 0.010	mg/L	1	0.0007	0.010	Kelada 01	TMN 05/26/17
Fluoride	0.216	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 05/26/17
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 05/30/17
Nitrogen, Nitrate (NO3)	11.7	mg/L	10	0.078	0.500	SM 4500-NO3 F	BLL 05/26/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL 05/26/17
Sulfate (SO4)	89.1	mg/L	2	1.06	2.00	SM 4500-SO4 E	BLL 05/26/17
Metals - Dissolved							
Arsenic (As)	0.014	mg/L	10	0.00047	0.005	EPA 200.8	TNA 05/26/17
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 05/26/17
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 05/26/17
Sodium (Na)	8.55	mg/L	1	0.151	0.500	SM 3111 B	TMS 05/26/17
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 05/26/17
Field Test							
Field Conductivity	430	µmhos/cm	1			Field Conductivity	BLL 05/25/17
Field Total Depth	140	ft	1			Field Total Depth	BLL 05/25/17
Field ORP	157	mV	1			Field ORP	BLL 05/25/17
Field Oxygen (O2)	8.53	mg/L	1			Field Oxygen	BLL 05/25/17
Field pH	6.99	S.U.	1			Field pH	BLL 05/25/17
Field Temperature	7.30	° C	1			Field Temp.	BLL 05/25/17

Report Approved By:

Report Approved On: 5/31/2017 8:42:10 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 06/14/17 at 04:00 PM by Steve Albrecht
Sample Matrix: Water

Lab ID#: 20170616209
Received: 06/15/17 at 10:45 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Non-Metallics								
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	BAA	06/16/17
Nitrogen, Nitrate (NO3)	8.75	mg/L	10	0.078	0.500	SM 4500-NO3 F	BLL	06/15/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL	06/15/17
Metals - Dissolved								
Arsenic (As)	0.016	mg/L	10	0.00047	0.005	EPA 200.8	TNA	06/16/17
Field Test								
Field Conductivity	380	µmhos/cm	1			Field Conductivity	BLL	06/15/17
Field Total Depth	140	ft	1			Field Total Depth	BLL	06/15/17
Field ORP	107	mV	1			Field ORP	BLL	06/15/17
Field Oxygen (O2)	8.54	mg/L	1			Field Oxygen	BLL	06/15/17
Field pH	7.15	S.U.	1			Field pH	BLL	06/15/17
Field Temperature	7.40	° C	1			Field Temp.	BLL	06/15/17

Report Approved By:

Report Approved On: 6/19/2017 2:47:34 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 07/08/17 at 02:50 PM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20170712106
Received: 07/11/17 at 10:20 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Non-Metallics								
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM	07/12/17
Nitrogen, Nitrate (NO3)	12.2	mg/L	10	0.078	0.500	SM 4500-NO3 F	BLL	07/12/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL	07/12/17
Metals - Dissolved								
Arsenic (As)	0.014	mg/L	10	0.00047	0.005	EPA 200.8	TNA	07/12/17
Field Test								
Field Conductivity	450	µmhos/cm	1			Field Conductivity	BLL	07/12/17
Field Total Depth	140	ft	1			Field Total Depth	BLL	07/12/17
Field ORP	99.0	mV	1			Field ORP	BLL	07/12/17
Field Oxygen (O2)	8.63	mg/L	1			Field Oxygen	BLL	07/12/17
Field pH	7.12	S.U.	1			Field pH	BLL	07/12/17
Field Temperature	7.50	° C	1			Field Temp.	BLL	07/12/17

Report Approved By:

Report Approved On: 7/17/2017 1:00:49 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 08/07/17 at 10:08 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20170809104
Received: 08/08/17 at 12:20 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	428	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 08/09/17
pH	7.29	S.U.	1			SM 4500-H+ B	JAM 08/09/17
Total Dissolved Solids	275	mg/L	100ml	18.1	50.0	SM 2540 C	ELR 08/09/17
Non-Metallics							
Bicarbonate	79.7	mg/L	1	0.618	10.0	SM 2320 B	JAM 08/09/17
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 08/09/17
Cyanide, WAD	< 0.010	mg/L	1	0.0007	0.010	Kelada 01	TMN 08/09/17
Fluoride	0.187	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 08/09/17
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 08/10/17
Nitrogen, Nitrate (NO3)	12.6	mg/L	10	0.078	0.500	SM 4500-NO3 F	BLL 08/09/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL 08/09/17
Sulfate (SO4)	101	mg/L	2	1.06	2.00	SM 4500-SO4 E	BLL 08/09/17
Metals - Dissolved							
Arsenic (As)	0.014	mg/L	10	0.00047	0.005	EPA 200.8	TNA 08/09/17
Gold (Au)	0.002	mg/L	1			EPA 231.2	TNA 08/09/17
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 08/09/17
Sodium (Na)	9.89	mg/L	1	0.053	0.500	SM 3111 B	TMS 08/09/17
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000012	0.0002	EPA 245.1	TMS 08/09/17
Field Test							
Field Conductivity	450	µmhos/cm	1			Field Conductivity	BLL 08/10/17
Field Total Depth	140	ft	1			Field Total Depth	BLL 08/10/17
Field ORP	146	mV	1			Field ORP	BLL 08/10/17
Field Oxygen (O2)	8.26	mg/L	1			Field Oxygen	BLL 08/10/17
Field pH	6.76	S.U.	1			Field pH	BLL 08/10/17
Field Temperature	7.40	° C	1			Field Temp.	BLL 08/10/17

Report Approved By:

Report Approved On: 8/15/2017 6:44:36 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 09/09/17 at 02:30 PM by Lynn Blackman
Sample Matrix: Water

Lab ID#: 20170912201
Received: 09/11/17 at 12:00 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Non-Metallics							
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	TMS 09/12/17
Nitrogen, Nitrate (NO3)	12.8	mg/L	10	0.078	0.500	SM 4500-NO3 F	BLL 09/12/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL 09/12/17
Metals - Dissolved							
Arsenic (As)	0.017	mg/L	10	0.00047	0.005	EPA 200.8	TNA 09/12/17
Field Test							
Field Conductivity	470	µmhos/cm	1			Field Conductivity	BLL 09/12/17
Field Total Depth	140	ft	1			Field Total Depth	BLL 09/12/17
Field ORP	175	mV	1			Field ORP	BLL 09/12/17
Field Oxygen (O2)	8.10	mg/L	1			Field Oxygen	BLL 09/12/17
Field pH	6.64	S.U.	1			Field pH	BLL 09/12/17
Field Temperature	8.80	° C	1			Field Temp.	BLL 09/12/17

Report Approved By:

Report Approved On: 9/14/2017 9:44:10 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 10/15/17 at 11:40 AM by Lyn Weaver
Sample Matrix: Water

Lab ID#: 20171018104
Received: 10/17/17 at 11:00 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Non-Metallics								
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	TMS	10/23/17
Nitrogen, Nitrate (NO3)	13.2	mg/L	10	0.078	0.500	SM 4500-NO3 F	BLL	10/18/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL	10/18/17
Metals - Dissolved								
Arsenic (As)	0.016	mg/L	10	0.00047	0.005	EPA 200.8	TNA	10/18/17
Field Test								
Field Conductivity	480	µmhos/cm	1			Field Conductivity	BLL	10/17/17
Field Total Depth	140	ft	1			Field Total Depth	BLL	10/17/17
Field ORP	126	mV	1			Field ORP	BLL	10/17/17
Field Oxygen (O2)	8.21	mg/L	1			Field Oxygen	BLL	10/17/17
Field pH	7.16	S.U.	1			Field pH	BLL	10/17/17
Field Temperature	5.30	° C	1			Field Temp.	BLL	10/17/17

Report Approved By:

Report Approved On: 10/24/2017 9:40:58 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

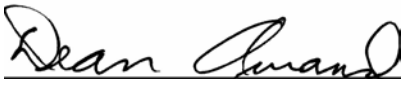
Sample Site: MW-19
Sampled: 11/13/17 at 12:10 PM by Steve Albrecht
Sample Matrix: Water

Lab ID#: 20171115201
Received: 11/14/17 at 09:10 AM by Tanya Nelsen
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Non-Metallics							
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 11/16/17
Nitrogen, Nitrate (NO3)	12.8	mg/L	10	0.078	0.500	SM 4500-NO3 F	BLL 11/15/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL 11/15/17
Metals - Dissolved							
Arsenic (As)	0.015	mg/L	10	0.00047	0.005	EPA 200.8	TNA 11/15/17
Field Test							
Field Conductivity	480	µmhos/cm	1			Field Conductivity	BLL 11/15/17
Field Total Depth	140	ft	1			Field Total Depth	BLL 11/15/17
Field ORP	116	mV	1			Field ORP	BLL 11/15/17
Field Oxygen (O2)	8.14	mg/L	1			Field Oxygen	BLL 11/15/17
Field pH	6.98	S.U.	1			Field pH	BLL 11/15/17
Field Temperature	7.50	° C	1			Field Temp.	BLL 11/15/17

Report Approved By:



Report Approved On: 11/17/2017 4:33:33 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 12/10/17 at 12:00 PM
by Steve Albrecht/Lyn Weaver
Sample Matrix: Water

Lab ID#: 20171213204
Received: 12/12/17 at 03:00 PM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Non-Metallics								
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM	12/13/17
Nitrogen, Nitrate (NO3)	12.9	mg/L	10	0.078	0.500	SM 4500-NO3 F	BLL	12/13/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL	12/13/17
Metals - Dissolved								
Arsenic (As)	0.014	mg/L	10	0.00047	0.005	EPA 200.8	TNA	12/15/17
Field Test								
Field Conductivity	500	µmhos/cm	1			Field Conductivity	BLL	12/13/17
Field Total Depth	140	ft	1			Field Total Depth	BLL	12/13/17
Field ORP	90.0	mV	1			Field ORP	BLL	12/13/17
Field Oxygen (O2)	8.26	mg/L	1			Field Oxygen	BLL	12/13/17
Field pH	6.90	S.U.	1			Field pH	BLL	12/13/17
Field Temperature	7.50	° C	1			Field Temp.	BLL	12/13/17

Report Approved By:

Report Approved On: 12/15/2017 1:09:53 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 01/15/18 at 02:00 PM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20180118107
Received: 01/16/18 at 10:45 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	476	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 01/19/18
pH	7.16	S.U.	1			SM 4500-H+ B	JAM 01/19/18
Total Dissolved Solids	283	mg/L	100ml	18.1	50.0	SM 2540 C	TMN 01/18/18
Non-Metallics							
Bicarbonate	79.9	mg/L	1	0.618	10.0	SM 2320 B	JAM 01/19/18
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 01/19/18
Cyanide, WAD	< 0.010	mg/L	1	0.0007	0.010	Kelada 01	TMN 01/19/18
Fluoride	0.208	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 01/22/18
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 01/18/18
Nitrogen, Nitrate (NO3)	14.3	mg/L	10	0.078	0.500	SM 4500-NO3 F	BLL 01/18/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL 01/18/18
Sulfate (SO4)	109	mg/L	2	1.06	2.00	SM 4500-SO4 E	BLL 01/19/18
Metals - Dissolved							
Arsenic (As)	0.015	mg/L	10	0.00047	0.005	EPA 200.8	TNA 01/18/18
Gold (Au)	0.002	mg/L	1			EPA 231.2	TNA 01/18/18
Selenium (Se)	0.007	mg/L	10	0.001	0.005	EPA 200.8	TNA 01/18/18
Sodium (Na)	10.4	mg/L	1	0.053	0.500	SM 3111 B	TMS 01/18/18
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000012	0.0002	EPA 245.1	TMS 01/18/18
Field Test							
Field Conductivity	500	µmhos/cm	1			Field Conductivity	BLL 01/17/18
Field Total Depth	140	ft	1			Field Total Depth	BLL 01/17/18
Field ORP	16.0	mV	1			Field ORP	BLL 01/17/18
Field Oxygen (O2)	8.02	mg/L	1			Field Oxygen	BLL 01/17/18
Field pH	6.94	S.U.	1			Field pH	BLL 01/17/18
Field Temperature	6.70	° C	1			Field Temp.	BLL 01/17/18

Report Approved By:

Report Approved On: 1/25/2018 3:32:14 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 02/11/18 at 11:25 AM by Lyn Weaver
Sample Matrix: Water

Lab ID#: 20180214211
Received: 02/13/18 at 10:50 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Non-Metallics							
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 02/14/18
Nitrogen, Nitrate (NO3)	14.1	mg/L	10	0.078	0.500	SM 4500-NO3 F	BLL 02/14/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL 02/14/18
Metals - Dissolved							
Arsenic (As)	0.017	mg/L	10	0.00047	0.005	EPA 200.8	TNA 02/14/18
Field Test							
Field Conductivity	480	µmhos/cm	1			Field Conductivity	BLL 02/14/18
Field Total Depth	140	ft	1			Field Total Depth	BLL 02/14/18
Field ORP	115	mV	1			Field ORP	BLL 02/14/18
Field Oxygen (O2)	7.50	mg/L	1			Field Oxygen	BLL 02/14/18
Field pH	6.62	S.U.	1			Field pH	BLL 02/14/18
Field Temperature	7.60	° C	1			Field Temp.	BLL 02/14/18

Report Approved By:

Report Approved On: 2/16/2018 12:34:38 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 03/10/18 at 11:45 AM
by Lyn Weaver/Steve Albrecht
Sample Matrix: Water

Lab ID#: 20180313210
Received: 03/12/18 at 11:55 AM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Non-Metallics							
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 03/13/18
Nitrogen, Nitrate (NO3)	13.8	mg/L	20	0.157	1.00	SM 4500-NO3 F	BLL 03/13/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL 03/13/18
Metals - Dissolved							
Arsenic (As)	0.016	mg/L	10	0.00047	0.005	EPA 200.8	TNA 03/13/18
Field Test							
Field Conductivity	480	µmhos/cm	1			Field Conductivity	BLL 03/12/18
Field Total Depth	140	ft	1			Field Total Depth	BLL 03/12/18
Field ORP	86.0	mV	1			Field ORP	BLL 03/12/18
Field Oxygen (O2)	7.92	mg/L	1			Field Oxygen	BLL 03/12/18
Field pH	6.94	S.U.	1			Field pH	BLL 03/12/18
Field Temperature	7.20	° C	1			Field Temp.	BLL 03/12/18

Report Approved By:

Report Approved On: 3/16/2018 9:08:03 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 04/07/18 at 01:50 PM
by Lyn Weaver/Steve Albrecht
Sample Matrix: Water

Lab ID#: 20180410210
Received: 04/09/18 at 12:40 PM
by Tasha Swanson
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	472	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 04/10/18
pH	7.19	S.U.	1			SM 4500-H+ B	JAM 04/10/18
Total Dissolved Solids	292	mg/L	100ml	17.4	50.0	SM 2540 C	TMN 04/11/18
Non-Metallics							
Bicarbonate	101	mg/L	1	0.618	10.0	SM 2320 B	JAM 04/10/18
Cyanide, Total	< 0.010	mg/L	1	0.00045	0.010	Kelada 01	TMN 04/11/18
Cyanide, WAD	< 0.010	mg/L	1	0.00077	0.010	Kelada 01	TMN 04/11/18
Fluoride	0.211	mg/L	1	0.003	0.050	SM 4500 F-C	TNA 04/10/18
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 04/11/18
Nitrogen, Nitrate (NO3)	14.3	mg/L	10	0.167	0.500	SM 4500-NO3 F	BLL 04/10/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.006	0.050	SM 4500-NO2 B	BLL 04/10/18
Sulfate (SO4)	100	mg/L	2	0.955	2.00	SM 4500-SO4 E	BLL 04/11/18
Metals - Dissolved							
Arsenic (As)	0.016	mg/L	10	0.000527	0.005	EPA 200.8	TNA 04/10/18
Gold (Au)	0.001	mg/L	1			EPA 231.2	TNA 04/11/18
Selenium (Se)	0.006	mg/L	10	0.001	0.005	EPA 200.8	TNA 04/10/18
Sodium (Na)	8.80	mg/L	1	0.045	0.500	SM 3111 B	TMS 04/10/18
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000014	0.0002	EPA 245.1	TMS 04/10/18
Field Test							
Field Conductivity	480	µmhos/cm	1			Field Conductivity	BLL 04/10/18
Field Total Depth	140	ft	1			Field Total Depth	BLL 04/10/18
Field ORP	145	mV	1			Field ORP	BLL 04/10/18
Field Oxygen (O2)	8.34	mg/L	1			Field Oxygen	BLL 04/10/18
Field pH	6.64	S.U.	1			Field pH	BLL 04/10/18
Field Temperature	7.40	° C	1			Field Temp.	BLL 04/10/18

Report Approved By:

Report Approved On: 4/12/2018 10:26:23 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 05/03/18 at 11:45 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20180511106
Received: 05/10/18 at 10:45 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	250	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 05/11/18
pH	7.13	S.U.	1			SM 4500-H+ B	JAM 05/15/18
Total Dissolved Solids	183	mg/L	100ml	17.4	50.0	SM 2540 C	TMN 05/14/18
Non-Metallics							
Bicarbonate	37.9	mg/L	1	0.618	10.0	SM 2320 B	JAM 05/15/18
Cyanide, Total	< 0.010	mg/L	1	0.00045	0.010	Kelada 01	TMN 05/15/18
Cyanide, WAD	< 0.010	mg/L	1	0.00077	0.010	Kelada 01	TMN 05/15/18
Fluoride	0.282	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 05/14/18
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 05/11/18
Nitrogen, Nitrate (NO3)	6.28	mg/L	10	0.167	0.500	SM 4500-NO3 F	BLL 05/11/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.006	0.050	SM 4500-NO2 B	BLL 05/11/18
Sulfate (SO4)	61.2	mg/L	2	0.955	2.00	SM 4500-SO4 E	BLL 05/11/18
Metals - Dissolved							
Arsenic (As)	0.018	mg/L	10	0.000527	0.005	EPA 200.8	TNA 05/11/18
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 05/14/18
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 05/11/18
Sodium (Na)	7.04	mg/L	1	0.045	0.500	SM 3111 B	TMS 05/11/18
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000014	0.0002	EPA 245.1	TMS 05/11/18
Field Test							
Field Conductivity	280	µmhos/cm	1			Field Conductivity	BLL 05/10/18
Field Total Depth	140	ft	1			Field Total Depth	BLL 05/10/18
Field ORP	83.0	mV	1			Field ORP	BLL 05/10/18
Field Oxygen (O2)	9.34	mg/L	1			Field Oxygen	BLL 05/10/18
Field pH	6.80	S.U.	1			Field pH	BLL 05/10/18
Field Temperature	6.80	° C	1			Field Temp.	BLL 05/10/18

Report Approved By:

Report Approved On: 5/16/2018 10:12:55 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 06/05/18 at 08:45 AM by Justin Thorp/Bret S
Sample Matrix: Water

Lab ID#: 20180608104
Received: 06/07/18 at 10:00 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	276	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 06/08/18
pH	7.48	S.U.	1			SM 4500-H+ B	JAM 06/12/18
Total Dissolved Solids	225	mg/L	100ml	17.4	50.0	SM 2540 C	TMN 06/08/18
Non-Metallics							
Bicarbonate	80.7	mg/L	1	0.618	10.0	SM 2320 B	JAM 06/12/18
Cyanide, Total	< 0.010	mg/L	1	0.00045	0.010	Kelada 01	TMN 06/11/18
Cyanide, WAD	< 0.010	mg/L	1	0.00077	0.010	Kelada 01	TMN 06/11/18
Fluoride	0.281	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 06/13/18
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	TMS 06/12/18
Nitrogen, Nitrate (NO3)	5.78	mg/L	10	0.167	0.500	SM 4500-NO3 F	BLL 06/11/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.006	0.050	SM 4500-NO2 B	BLL 06/08/18
Sulfate (SO4)	46.7	mg/L	1	0.477	1.00	SM 4500-SO4 E	BLL 06/08/18
Metals - Dissolved							
Arsenic (As)	0.019	mg/L	10	0.000527	0.005	EPA 200.8	TNA 06/08/18
Gold (Au)	0.001	mg/L	1			EPA 231.2	TNA 06/08/18
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 06/08/18
Sodium (Na)	5.42	mg/L	1	0.045	0.500	SM 3111 B	TMS 06/08/18
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000014	0.0002	EPA 245.1	TMS 06/08/18
Field Test							
Field Conductivity	290	µmhos/cm	1			Field Conductivity	BLL 06/07/18
Field Total Depth	140	ft	1			Field Total Depth	BLL 06/07/18
Field ORP	166	mV	1			Field ORP	BLL 06/07/18
Field Oxygen (O2)	9.07	mg/L	1			Field Oxygen	BLL 06/07/18
Field pH	6.76	S.U.	1			Field pH	BLL 06/07/18
Field Temperature	7.40	° C	1			Field Temp.	BLL 06/07/18

Report Approved By:

Report Approved On: 6/15/2018 2:47:09 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 07/08/18 at 11:20 AM by Steve Podall/Darnell Witte
Sample Matrix: Water

Lab ID#: 20180711204
Received: 07/10/18 at 12:25 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Non-Metallics							
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	TMS 07/12/18
Nitrogen, Nitrate (NO3)	6.59	mg/L	5	0.084	0.250	SM 4500-NO3 F	BLL 07/11/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.006	0.050	SM 4500-NO2 B	BLL 07/11/18
Metals - Dissolved							
Arsenic (As)	0.017	mg/L	10	0.000527	0.005	EPA 200.8	TNA 07/11/18
Field Test							
Field Conductivity	310	µmhos/cm	1			Field Conductivity	BLL 07/10/18
Field Total Depth	140	ft	1			Field Total Depth	BLL 07/10/18
Field ORP	115	mV	1			Field ORP	BLL 07/10/18
Field Oxygen (O2)	9.07	mg/L	1			Field Oxygen	BLL 07/10/18
Field pH	6.60	S.U.	1			Field pH	BLL 07/10/18
Field Temperature	7.40	° C	1			Field Temp.	BLL 07/10/18

Report Approved By:

Report Approved On: 7/13/2018 10:49:39 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 08/04/18 at 04:05 PM
by Darnell W/Steve P/Brett S
Sample Matrix: Water

Lab ID#: 20180808302
Received: 08/07/18 at 01:00 PM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	372	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 08/08/18
pH	7.47	S.U.	1			SM 4500-H+ B	JAM 08/08/18
Total Dissolved Solids	243	mg/L	100ml	17.4	50.0	SM 2540 C	TMN 08/09/18
Non-Metallics							
Bicarbonate	108	mg/L	1	0.618	10.0	SM 2320 B	JAM 08/08/18
Cyanide, Total	< 0.010	mg/L	1	0.00045	0.010	Kelada 01	TMN 08/09/18
Cyanide, WAD	< 0.010	mg/L	1	0.00077	0.010	Kelada 01	TMN 08/09/18
Fluoride	0.265	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 08/10/18
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 08/09/18
Nitrogen, Nitrate (NO3)	9.13	mg/L	5	0.084	0.250	SM 4500-NO3 F	BLL 08/08/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.006	0.050	SM 4500-NO2 B	BLL 08/08/18
Sulfate (SO4)	68.8	mg/L	1	0.477	1.00	SM 4500-SO4 E	BLL 08/08/18
Metals - Dissolved							
Arsenic (As)	0.015	mg/L	10	0.000527	0.005	EPA 200.8	TNA 08/08/18
Gold (Au)	0.001	mg/L	1			EPA 231.2	TNA 08/08/18
Selenium (Se)	< 0.005	mg/L	10	0.00047	0.005	EPA 200.8	TNA 08/08/18
Sodium (Na)	7.33	mg/L	1	0.045	0.500	SM 3111 B	TMS 08/08/18
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000014	0.0002	EPA 245.1	TMS 08/08/18
Field Test							
Field Conductivity	390	µmhos/cm	1			Field Conductivity	BLL 08/07/18
Field Total Depth	140	ft	1			Field Total Depth	BLL 08/07/18
Field ORP	104	mV	1			Field ORP	BLL 08/07/18
Field Oxygen (O2)	8.73	mg/L	1			Field Oxygen	BLL 08/07/18
Field pH	6.75	S.U.	1			Field pH	BLL 08/07/18
Field Temperature	7.30	° C	1			Field Temp.	BLL 08/07/18

Report Approved By:

Report Approved On: 8/13/2018 7:53:48 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 09/12/18 at 03:15 PM by Brett S
Sample Matrix: Water

Lab ID#: 20180914104
Received: 09/13/18 at 09:50 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Non-Metallics							
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 09/17/18
Nitrogen, Nitrate (NO3)	12.4	mg/L	10	0.167	0.500	SM 4500-NO3 F	BLL 09/14/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.006	0.050	SM 4500-NO2 B	BLL 09/14/18
Metals - Dissolved							
Arsenic (As)	0.013	mg/L	10	0.000527	0.005	EPA 200.8	TNA 09/14/18
Field Test							
Field Conductivity	480	µmhos/cm	1			Field Conductivity	BLL 09/13/18
Field Total Depth	130	ft	1			Field Total Depth	BLL 09/13/18
Field ORP	150	mV	1			Field ORP	BLL 09/13/18
Field Oxygen (O2)	8.50	mg/L	1			Field Oxygen	BLL 09/13/18
Field pH	6.95	S.U.	1			Field pH	BLL 09/13/18
Field Temperature	7.20	° C	1			Field Temp.	BLL 09/13/18

Report Approved By:

Report Approved On: 9/19/2018 3:28:03 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 01/03/19 at 01:45 PM
by Brett S, Steve P, Darnell W
Sample Matrix: Water

Lab ID#: 20190109303
Received: 01/08/19 at 03:25 PM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	525	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 01/09/19
pH	7.46	S.U.	1			SM 4500-H+ B	JAM 01/11/19
Total Dissolved Solids	323	mg/L	100ml	17.4	50.0	SM 2540 C	TMN 01/09/19
Non-Metallics							
Bicarbonate	135	mg/L	1	0.618	10.0	SM 2320 B	JAM 01/11/19
Cyanide, Total	< 0.010	mg/L	1	0.00045	0.010	Kelada 01	TMN 01/11/19
Cyanide, WAD	< 0.010	mg/L	1	0.00077	0.010	Kelada 01	TMN 01/09/19
Fluoride	0.231	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 01/09/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 01/10/19
Nitrogen, Nitrate (NO3)	14.6	mg/L	10	0.167	0.500	SM 4500-NO3 F	BLL 01/09/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.006	0.050	SM 4500-NO2 B	BLL 01/09/19
Sulfate (SO4)	95.3	mg/L	2	0.955	2.00	SM 4500-SO4 E	BLL 01/09/19
Metals - Dissolved							
Arsenic (As)	0.014	mg/L	10	0.000385	0.005	EPA 200.8	TNA 01/10/19
Gold (Au)	0.003	mg/L	1			EPA 231.2	TNA 01/09/19
Selenium (Se)	< 0.005	mg/L	10	0.00047	0.005	EPA 200.8	TNA 01/10/19
Sodium (Na)	9.10	mg/L	1	0.045	0.500	SM 3111 B	TMS 01/09/19
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000014	0.0002	EPA 245.1	TMS 01/09/19
Field Test							
Field Conductivity	560	µmhos/cm	1			Field Conductivity	BLL 01/08/19
Field Total Depth	130	ft	1			Field Total Depth	BLL 01/08/19
Field ORP	73.0	mV	1			Field ORP	BLL 01/08/19
Field Oxygen (O2)	5.60	mg/L	1			Field Oxygen	BLL 01/08/19
Field pH	6.90	S.U.	1			Field pH	BLL 01/08/19
Field Temperature	7.20	° C	1			Field Temp.	BLL 01/08/19

Report Approved By:

Report Approved On: 1/17/2019 12:29:08 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 04/04/19 at 11:20 AM by Brett S
Sample Matrix: Water

Lab ID#: 20190410204
Received: 04/09/19 at 12:10 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	509	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 04/12/19
pH	7.36	S.U.	1			SM 4500-H+ B	JAM 04/12/19
Total Dissolved Solids	307	mg/L	100ml	21.0	50.0	SM 2540 C	TMN 04/10/19
Non-Metallics							
Bicarbonate	128	mg/L	1	0.288	10.0	SM 2320 B	JAM 04/12/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 04/11/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 04/11/19
Fluoride	0.240	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 04/10/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	TMS 04/11/19
Nitrogen, Nitrate (NO3)	13.6	mg/L	20	0.334	1.00	SM 4500-NO3 F	BLL 04/10/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 04/10/19
Sulfate (SO4)	92.5	mg/L	2	0.594	2.00	SM 4500-SO4 E	BLL 04/11/19
Metals - Dissolved							
Arsenic (As)	0.012	mg/L	10	0.000385	0.005	EPA 200.8	TNA 04/10/19
Gold (Au)	0.002	mg/L	1			EPA 231.2	TNA 04/10/19
Selenium (Se)	0.006	mg/L	10	0.00047	0.005	EPA 200.8	TNA 04/10/19
Sodium (Na)	9.27	mg/L	1	0.124	0.500	SM 3111 B	TMS 04/10/19
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS 04/10/19
Field Test							
Field Conductivity	510	µmhos/cm	1			Field Conductivity	BLL 04/09/19
Field Total Depth	140	ft	1			Field Total Depth	BLL 04/09/19
Field ORP	99.0	mV	1			Field ORP	BLL 04/09/19
Field Oxygen (O2)	8.41	mg/L	1			Field Oxygen	BLL 04/09/19
Field pH	6.76	S.U.	1			Field pH	BLL 04/09/19
Field Temperature	7.30	° C	1			Field Temp.	BLL 04/09/19

Report Approved By:

Report Approved On: 4/12/2019 2:35:44 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 05/03/19 at 11:00 AM by Brett S, Darnell W
Sample Matrix: Water

Lab ID#: 20190508109
Received: 05/07/19 at 12:25 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	319	µmhos/cm	1	0.237	5.00	SM 2510B	HBK 05/09/19
pH	7.64	S.U.	1			SM 4500-H+ B	SAA 05/10/19
Total Dissolved Solids	212	mg/L	100ml	21.0	50.0	SM 2540 C	TMN 05/08/19
Non-Metallics							
Bicarbonate	104	mg/L	1	0.288	10.0	SM 2320 B	SAA 05/10/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 05/07/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 05/07/19
Fluoride	0.268	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 05/08/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM 05/08/19
Nitrogen, Nitrate (NO3)	7.01	mg/L	10	0.094	0.500	SM 4500-NO3 F	BLL 05/08/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 05/08/19
Sulfate (SO4)	43.6	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL 05/08/19
Metals - Dissolved							
Arsenic (As)	0.017	mg/L	10	0.000385	0.005	EPA 200.8	TNA 05/08/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 05/08/19
Selenium (Se)	< 0.005	mg/L	10	0.00047	0.005	EPA 200.8	TNA 05/08/19
Sodium (Na)	5.41	mg/L	1	0.124	0.500	SM 3111 B	TMS 05/08/19
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS 05/08/19
Field Test							
Field Conductivity	320	µmhos/cm	1			Field Conductivity	BLL 05/07/19
Field Total Depth	130	ft	1			Field Total Depth	BLL 05/07/19
Field ORP	119	mV	1			Field ORP	BLL 05/07/19
Field Oxygen (O2)	9.14	mg/L	1			Field Oxygen	BLL 05/07/19
Field pH	7.18	S.U.	1			Field pH	BLL 05/07/19
Field Temperature	7.30	° C	1			Field Temp.	BLL 05/07/19

Report Approved By:

Report Approved On: 5/10/2019 2:17:39 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 08/07/19 at 10:00 AM by Darnell Witte / Steve Podall
Sample Matrix: Water

Lab ID#: 20190809207
Received: 08/08/19 at 12:20 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	437	µmhos/cm	1	0.237	5.00	SM 2510B	HBK 08/09/19
pH	7.52	S.U.	1			SM 4500-H+ B	TMS 08/09/19
Total Dissolved Solids	280	mg/L	100ml	21.0	50.0	SM 2540 C	SAA 08/09/19
Non-Metallics							
Bicarbonate	149	mg/L	1	0.288	10.0	SM 2320 B	TMS 08/09/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 08/13/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 08/13/19
Fluoride	0.252	mg/L	1	0.013	0.050	SM 4500 F-C	KDS 08/08/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	KDS 08/09/19
Nitrogen, Nitrate (NO3)	10.4	mg/L	10	0.094	0.500	SM 4500-NO3 F	BLL 08/09/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 08/09/19
Sulfate (SO4)	52.6	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL 08/09/19
Metals - Dissolved							
Arsenic (As)	0.014	mg/L	10	0.000385	0.005	EPA 200.8	TNA 08/09/19
Gold (Au)	0.002	mg/L	1			EPA 231.2	TNA 08/09/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA 08/09/19
Sodium (Na)	5.93	mg/L	1	0.124	0.500	SM 3111 B	TMS 08/09/19
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS 08/09/19
Field Test							
Field Conductivity	450	µmhos/cm	1			Field Conductivity	BLL 08/08/19
Field Total Depth	120	ft	1			Field Total Depth	BLL 08/08/19
Field ORP	172	mV	1			Field ORP	BLL 08/08/19
Field Oxygen (O2)	8.66	mg/L	1			Field Oxygen	BLL 08/08/19
Field pH	7.23	S.U.	1			Field pH	BLL 08/08/19
Field Temperature	7.70	° C	1			Field Temp.	BLL 08/08/19

Report Approved By:

Report Approved On: 8/15/2019 3:07:46 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 01/05/20 at 11:00 AM
by Darnell Witte, Steve Podall
Sample Matrix: Water

Lab ID#: 20200108104
Received: 01/06/20 at 12:20 PM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	480	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 01/09/20
pH	7.64	S.U.	1			SM 4500-H+ B	JAM 01/09/20
Total Dissolved Solids	287	mg/L	100ml	21.0	50.0	SM 2540 C	TMN 01/08/20
Non-Metallics							
Bicarbonate	193	mg/L	1	0.288	10.0	SM 2320 B	JAM 01/09/20
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 01/08/20
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 01/08/20
Fluoride	0.263	mg/L	1	0.013	0.050	SM 4500 F-C	SAA 01/08/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM 01/13/20
Nitrogen, Nitrate (NO3)	11.4	mg/L	10	0.094	0.500	SM 4500-NO3 F	BLL 01/08/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 01/08/20
Sulfate (SO4)	40.8	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL 01/08/20
Metals - Dissolved							
Arsenic (As)	0.012	mg/L	10	0.00073	0.005	EPA 200.8	TNA 01/09/20
Gold (Au)	0.004	mg/L	1			EPA 231.2	TNA 01/09/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 01/09/20
Sodium (Na)	6.25	mg/L	1	0.124	0.500	SM 3111 B	TMS 01/08/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS 01/08/20
Field Test							
Field Conductivity	480	µmhos/cm	1			Field Conductivity	BLL 01/07/20
Field Total Depth	120	ft	1			Field Total Depth	BLL 01/07/20
Field ORP	119	mV	1			Field ORP	BLL 01/07/20
Field Oxygen (O2)	8.64	mg/L	1			Field Oxygen	BLL 01/07/20
Field pH	7.16	S.U.	1			Field pH	BLL 01/07/20
Field Temperature	7.50	° C	1			Field Temp.	BLL 01/07/20

Report Approved By:

Report Approved On: 1/14/2020 2:28:19 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 02/10/20 at 02:15 PM
by Steve Podall, Darnell Witte
Sample Matrix: Water

Lab ID#: 20200212207
Received: 02/11/20 at 12:00 PM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Non-Metallics							
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM 02/13/20
Nitrogen, Nitrate (NO3)	11.7	mg/L	10	0.094	0.500	SM 4500-NO3 F	BLL 02/12/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 02/12/20
Metals - Dissolved							
Arsenic (As)	0.012	mg/L	10	0.00073	0.005	EPA 200.8	TNA 02/12/20
Field Test							
Field Conductivity	500	µmhos/cm	1			Field Conductivity	BLL 02/11/20
Field Total Depth	120	ft	1			Field Total Depth	BLL 02/11/20
Field ORP	208	mV	1			Field ORP	BLL 02/11/20
Field Oxygen (O2)	8.52	mg/L	1			Field Oxygen	BLL 02/11/20
Field pH	7.09	S.U.	1			Field pH	BLL 02/11/20
Field Temperature	7.30	° C	1			Field Temp.	BLL 02/11/20

Report Approved By:

Report Approved On: 2/18/2020 12:39:58 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 03/04/20 at 02:20 PM by Steve Podall
Sample Matrix: Water

Lab ID#: 20200306213
Received: 03/05/20 at 10:20 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Non-Metallics								
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM	03/10/20
Nitrogen, Nitrate (NO3)	12.7	mg/L	10	0.094	0.500	SM 4500-NO3 F	BLL	03/09/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL	03/09/20
Metals - Dissolved								
Arsenic (As)	0.012	mg/L	10	0.00073	0.005	EPA 200.8	TNA	03/06/20
Field Test								
Field Conductivity	540	µmhos/cm	1			Field Conductivity	BLL	03/05/20
Field ORP	171	mV	1			Field ORP	BLL	03/05/20
Field Oxygen (O2)	8.26	mg/L	1			Field Oxygen	BLL	03/05/20
Field pH	6.91	S.U.	1			Field pH	BLL	03/05/20
Field Temperature	7.40	° C	1			Field Temp.	BLL	03/05/20

Report Approved By:

Report Approved On: 3/11/2020 1:04:33 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 04/04/20 at 11:45 AM by Darnell Witte, Brett Sheeder
Sample Matrix: Water

Lab ID#: 20200407310
Received: 04/06/20 at 12:30 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	458	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 04/07/20
pH	7.29	S.U.	1			SM 4500-H+ B	JAM 04/07/20
Total Dissolved Solids	284	mg/L	100ml	14.7	50.0	SM 2540 C	TMN 04/08/20
Non-Metallics							
Bicarbonate	95.0	mg/L	1	0.288	10.0	SM 2320 B	JAM 04/07/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 04/07/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 04/07/20
Fluoride	0.231	mg/L	1	0.010	0.015	SM 4500 F-C	SAA 04/07/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	TMS 04/07/20
Nitrogen, Nitrate (NO3)	12.0	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL 04/07/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 04/07/20
Sulfate (SO4)	92.4	mg/L	2	0.594	2.00	SM 4500-SO4 E	BLL 04/07/20
Metals - Dissolved							
Arsenic (As)	0.015	mg/L	10	0.00073	0.005	EPA 200.8	TNA 04/07/20
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 04/07/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 04/07/20
Sodium (Na)	8.68	mg/L	1	0.124	0.500	SM 3111 B	TMS 04/07/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 04/07/20
Field Test							
Field Conductivity	490	µmhos/cm	1			Field Conductivity	BLL 04/06/20
Field Total Depth	130	ft	1			Field Total Depth	BLL 04/06/20
Field ORP	94.0	mV	1			Field ORP	BLL 04/06/20
Field Oxygen (O2)	8.49	mg/L	1			Field Oxygen	BLL 04/06/20
Field pH	6.87	S.U.	1			Field pH	BLL 04/06/20
Field Temperature	7.10	° C	1			Field Temp.	BLL 04/06/20

Report Approved By:

Report Approved On: 4/8/2020 1:49:41 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 05/10/20 at 01:45 PM by Lynn Blackman
Sample Matrix: Water

Lab ID#: 20200512111
Received: 05/11/20 at 12:30 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	317	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 05/13/20
pH	7.49	S.U.	1			SM 4500-H+ B	JAM 05/13/20
Total Dissolved Solids	193	mg/L	100ml	14.7	50.0	SM 2540 C	TMN 05/12/20
Non-Metallics							
Bicarbonate	105	mg/L	1	0.288	10.0	SM 2320 B	JAM 05/13/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 05/12/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 05/12/20
Fluoride	0.260	mg/L	1	0.010	0.015	SM 4500 F-C	SAA 05/12/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	TMS 05/14/20
Nitrogen, Nitrate (NO3)	7.01	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL 05/12/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 05/12/20
Sulfate (SO4)	46.2	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 05/12/20
Metals - Dissolved							
Arsenic (As)	0.016	mg/L	10	0.00073	0.005	EPA 200.8	TNA 05/12/20
Gold (Au)	0.001	mg/L	1			EPA 231.2	TNA 05/12/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 05/12/20
Sodium (Na)	5.54	mg/L	1	0.137	0.500	SM 3111 B	TMS 05/12/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 05/12/20
Field Test							
Field Conductivity	750	µmhos/cm	1			Field Conductivity	BLL 05/11/20
Field Total Depth	120	ft	1			Field Total Depth	BLL 05/11/20
Field ORP	161	mV	1			Field ORP	BLL 05/11/20
Field Oxygen (O2)	9.09	mg/L	1			Field Oxygen	BLL 05/11/20
Field pH	7.04	S.U.	1			Field pH	BLL 05/11/20
Field Temperature	7.40	° C	1			Field Temp.	BLL 05/11/20

Report Approved By:

Report Approved On: 5/14/2020 2:18:05 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 06/10/20 at 02:35 PM
by Darnell Witte, Steve Podall
Sample Matrix: Water

Lab ID#: 20200612305
Received: 06/11/20 at 09:35 AM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Non-Metallics							
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 06/15/20
Nitrogen, Nitrate (NO3)	10.3	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL 06/12/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 06/12/20
Metals - Dissolved							
Arsenic (As)	0.015	mg/L	10	0.00073	0.005	EPA 200.8	TNA 06/12/20
Field Test							
Field Conductivity	440	µmhos/cm	1			Field Conductivity	BLL 06/11/20
Field Total Depth	120	ft	1			Field Total Depth	BLL 06/11/20
Field ORP	100	mV	1			Field ORP	BLL 06/11/20
Field Oxygen (O2)	8.70	mg/L	1			Field Oxygen	BLL 06/11/20
Field pH	7.05	S.U.	1			Field pH	BLL 06/11/20
Field Temperature	7.60	° C	1			Field Temp.	BLL 06/11/20

Report Approved By:

Report Approved On: 6/16/2020 12:35:39 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 07/09/20 at 03:55 PM by Steve Podall
Sample Matrix: Water

Lab ID#: 20200713206
Received: 07/10/20 at 12:40 PM by Dean Aurand
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Non-Metallics								
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	TMS	07/13/20
Nitrogen, Nitrate (NO3)	10.7	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL	07/13/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	07/13/20
Metals - Dissolved								
Arsenic (As)	0.015	mg/L	10	0.00073	0.005	EPA 200.8	TNA	07/13/20
Field Test								
Field Conductivity	460	µmhos/cm	1			Field Conductivity	BLL	07/10/20
Field Total Depth	120	ft	1			Field Total Depth	BLL	07/10/20
Field ORP	102	mV	1			Field ORP	BLL	07/10/20
Field Oxygen (O2)	8.70	mg/L	1			Field Oxygen	BLL	07/10/20
Field pH	7.19	S.U.	1			Field pH	BLL	07/10/20
Field Temperature	7.80	° C	1			Field Temp.	BLL	07/10/20

Report Approved By:

Report Approved On: 7/14/2020 8:58:31 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 08/04/20 at 10:30 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20200806305
Received: 08/05/20 at 11:45 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	466	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 08/06/20
pH	7.75	S.U.	1			SM 4500-H+ B	JAM 08/07/20
Total Dissolved Solids	267	mg/L	100ml	14.7	50.0	SM 2540 C	JNG 08/06/20
Non-Metallics							
Bicarbonate	224	mg/L	1	0.276	10.0	SM 2320 B	JAM 08/07/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 08/06/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 08/05/20
Fluoride	0.270	mg/L	1	0.010	0.015	SM 4500 F-C	SAA 08/05/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 08/11/20
Nitrogen, Nitrate (NO3)	10.1	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL 08/06/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 08/06/20
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 08/06/20
Metals - Dissolved							
Arsenic (As)	0.010	mg/L	10	0.00073	0.005	EPA 200.8	TNA 08/06/20
Gold (Au)	0.004	mg/L	1			EPA 231.2	TNA 08/06/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 08/06/20
Sodium (Na)	4.66	mg/L	1	0.137	0.500	SM 3111 B	TMS 08/06/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 08/07/20
Field Test							
Field Conductivity	460	µmhos/cm	1			Field Conductivity	BLL 08/05/20
Field Total Depth	120	ft	1			Field Total Depth	BLL 08/05/20
Field ORP	181	mV	1			Field ORP	BLL 08/05/20
Field Oxygen (O2)	8.61	mg/L	1			Field Oxygen	BLL 08/05/20
Field pH	7.26	S.U.	1			Field pH	BLL 08/05/20
Field Temperature	8.30	° C	1			Field Temp.	BLL 08/05/20

Report Approved By:

Report Approved On: 8/12/2020 9:55:56 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 09/16/20 at 09:00 AM by Justin Thorp
Sample Matrix: Water

Lab ID#: 20200918108
Received: 09/17/20 at 10:50 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Non-Metallics								
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM	09/18/20
Nitrogen, Nitrate (NO3)	10.4	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL	09/18/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	09/18/20
Metals - Dissolved								
Arsenic (As)	0.012	mg/L	10	0.00073	0.005	EPA 200.8	TNA	09/18/20
Field Test								
Field Conductivity	450	µmhos/cm	1			Field Conductivity	BLL	09/17/20
Field Total Depth	120	ft	1			Field Total Depth	BLL	09/17/20
Field ORP	190	mV	1			Field ORP	BLL	09/17/20
Field Oxygen (O2)	8.77	mg/L	1			Field Oxygen	BLL	09/17/20
Field pH	7.25	S.U.	1			Field pH	BLL	09/17/20
Field Temperature	7.90	° C	1			Field Temp.	BLL	09/17/20

Report Approved By:

Report Approved On: 9/22/2020 12:53:12 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 10/17/20 at 09:20 AM by Darnell Witte, Steve Podall
Sample Matrix: Water

Lab ID#: 20201021101
Received: 10/20/20 at 11:30 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Non-Metallics							
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 10/21/20
Nitrogen, Nitrate (NO3)	10.0	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL 10/21/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 10/21/20
Metals - Dissolved							
Arsenic (As)	0.012	mg/L	10	0.00073	0.005	EPA 200.8	TNA 10/21/20
Field Test							
Field Conductivity	440	µmhos/cm	1			Field Conductivity	BLL 10/20/20
Field Total Depth	120	ft	1			Field Total Depth	BLL 10/20/20
Field ORP	181	mV	1			Field ORP	BLL 10/20/20
Field Oxygen (O2)	8.64	mg/L	1			Field Oxygen	BLL 10/20/20
Field pH	7.48	S.U.	1			Field pH	BLL 10/20/20
Field Temperature	7.60	° C	1			Field Temp.	BLL 10/20/20

Report Approved By:

Report Approved On: 10/27/2020 1:45:04 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 11/16/20 at 03:00 PM
by Darnell Witte, Steve Podall
Sample Matrix: Water

Lab ID#: 20201119205
Received: 11/17/20 at 03:45 PM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Non-Metallics								
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM	11/20/20
Nitrogen, Nitrate (NO3)	10.8	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL	11/19/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	11/19/20
Metals - Dissolved								
Arsenic (As)	0.012	mg/L	10	0.00073	0.005	EPA 200.8	TNA	11/20/20
Field Test								
Field Conductivity	470	µmhos/cm	1			Field Conductivity	BLL	11/18/20
Field Total Depth	120	ft	1			Field Total Depth	BLL	11/18/20
Field ORP	118	mV	1			Field ORP	BLL	11/18/20
Field Oxygen (O2)	8.76	mg/L	1			Field Oxygen	BLL	11/18/20
Field pH	7.51	S.U.	1			Field pH	BLL	11/18/20
Field Temperature	7.70	° C	1			Field Temp.	BLL	11/18/20

Report Approved By:

Report Approved On: 11/20/2020 4:42:53 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 12/15/20 at 11:40 AM
by Justin Thorp, Darnell Witte
Sample Matrix: Water

Lab ID#: 20201218106
Received: 12/17/20 at 10:30 AM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	459	µmhos/cm	1	0.153	5.00	SM 2510B	JAM 12/18/20
pH	7.69	S.U.	1			SM 4500-H+ B	JAM 12/18/20
Total Dissolved Solids	257	mg/L	100ml	14.7	50.0	SM 2540 C	TMN 12/21/20
Non-Metallics							
Bicarbonate	226	mg/L	1	0.276	10.0	SM 2320 B	JAM 12/18/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 12/18/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 12/18/20
Fluoride	0.269	mg/L	1	0.010	0.015	SM 4500 F-C	TNA 12/22/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 12/21/20
Nitrogen, Nitrate (NO3)	10.1	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL 12/18/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 12/18/20
Sulfate (SO4)	11.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 12/18/20
Metals - Dissolved							
Arsenic (As)	0.011	mg/L	10	0.00073	0.005	EPA 200.8	TNA 12/21/20
Gold (Au)	0.005	mg/L	1			EPA 231.2	TNA 12/21/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 12/21/20
Sodium (Na)	4.95	mg/L	1	0.137	0.500	SM 3111 B	TMS 12/18/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 12/18/20
Field Test							
Field Conductivity	470	µmhos/cm	1			Field Conductivity	BLL 12/17/20
Field Total Depth	120	ft	1			Field Total Depth	BLL 12/17/20
Field ORP	172	mV	1			Field ORP	BLL 12/17/20
Field Oxygen (O2)	8.77	mg/L	1			Field Oxygen	BLL 12/17/20
Field pH	7.40	S.U.	1			Field pH	BLL 12/17/20
Field Temperature	7.50	° C	1			Field Temp.	BLL 12/17/20

Report Approved By:

Report Approved On: 12/23/2020 9:04:47 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 01/02/21 at 11:45 AM
by Sheeder, Podall, Witte
Sample Matrix: Water

Lab ID#: 20210105309
Received: 01/04/21 at 12:20 PM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	465	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	01/05/21
pH	7.59	S.U.	1			SM 4500-H+ B	JAM	01/05/21
Total Dissolved Solids	253	mg/L	100ml	14.7	50.0	SM 2540 C	JNG	01/05/21
Non-Metallics								
Bicarbonate	205	mg/L	1	0.276	10.0	SM 2320 B	JAM	01/05/21
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	DVA	01/05/21
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	DVA	01/05/21
Fluoride	0.249	mg/L	1	0.010	0.015	SM 4500 F-C	SAA	01/05/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM	01/06/21
Nitrogen, Nitrate (NO3)	11.2	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL	01/05/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	01/05/21
Sulfate (SO4)	30.7	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL	01/05/21
Metals - Dissolved								
Arsenic (As)	0.012	mg/L	10	0.00061	0.005	EPA 200.8	TNA	01/05/21
Gold (Au)	0.006	mg/L	1			EPA 231.2	TNA	01/05/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	01/05/21
Sodium (Na)	5.84	mg/L	1	0.137	0.500	SM 3111 B	TMS	01/05/21
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS	01/05/21
Field Test								
Field Conductivity	480	µmhos/cm	1			Field Conductivity	BLL	01/04/21
Field Total Depth	120	ft	1			Field Total Depth	BLL	01/04/21
Field ORP	153	mV	1			Field ORP	BLL	01/04/21
Field Oxygen (O2)	8.61	mg/L	1			Field Oxygen	BLL	01/04/21
Field pH	7.37	S.U.	1			Field pH	BLL	01/04/21
Field Temperature	7.60	° C	1			Field Temp.	BLL	01/04/21

Report Approved By:

Report Approved On: 1/7/2021 12:53:01 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 02/16/21 at 11:30 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20210219102
Received: 02/18/21 at 10:15 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	507	µmhos/cm	1	0.153	5.00	SM 2510B	JAM 02/19/21
pH	7.43	S.U.	1			SM 4500-H+ B	JAM 02/19/21
Total Dissolved Solids	329	mg/L	100ml	13.0	50.0	SM 2540 C	JNG 02/19/21
Non-Metallics							
Bicarbonate	143	mg/L	1	0.276	10.0	SM 2320 B	JAM 02/19/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 02/19/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 02/19/21
Fluoride	0.226	mg/L	1	0.010	0.015	SM 4500 F-C	SAA 02/19/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 02/22/21
Nitrogen, Nitrate (NO3)	13.2	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL 02/18/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 02/18/21
Sulfate (SO4)	86.2	mg/L	2	1.02	20.0	SM 4500-SO4 E	BLL 02/23/21
Metals - Dissolved							
Arsenic (As)	0.012	mg/L	10	0.00061	0.005	EPA 200.8	TNA 02/19/21
Gold (Au)	0.004	mg/L	1			EPA 231.2	TNA 02/19/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA 02/19/21
Sodium (Na)	8.03	mg/L	1	0.137	0.500	SM 3111 B	TMS 02/19/21
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 02/19/21
Field Test							
Field Conductivity	500	µmhos/cm	1			Field Conductivity	BLL 02/18/21
Field Total Depth	130	ft	1			Field Total Depth	BLL 02/18/21
Field ORP	175	mV	1			Field ORP	BLL 02/18/21
Field Oxygen (O2)	8.25	mg/L	1			Field Oxygen	BLL 02/18/21
Field pH	7.12	S.U.	1			Field pH	BLL 02/18/21
Field Temperature	7.70	° C	1			Field Temp.	BLL 02/18/21

Report Approved By:

Report Approved On: 2/23/2021 1:39:20 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 03/01/21 at 03:45 PM by D Witte, S Podall, L Blackman
Sample Matrix: Water

Lab ID#: 20210303211
Received: 03/02/21 at 12:05 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	513	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	03/03/21
pH	7.47	S.U.	1			SM 4500-H+ B	JAM	03/03/21
Total Dissolved Solids	296	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	03/03/21
Non-Metallics								
Bicarbonate	140	mg/L	1	0.276	10.0	SM 2320 B	JAM	03/03/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	03/02/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	03/03/21
Fluoride	0.224	mg/L	1	0.008	0.015	SM 4500 F-C	SAA	03/08/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM	03/04/21
Nitrogen, Nitrate (NO3)	13.9	mg/L	10	0.090	0.500	SM 4500-NO3 F	BLL	03/03/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	03/03/21
Sulfate (SO4)	90.5	mg/L	2	1.02	20.0	SM 4500-SO4 E	BLL	03/04/21
Metals - Dissolved								
Arsenic (As)	0.012	mg/L	10	0.00061	0.005	EPA 200.8	TNA	03/03/21
Gold (Au)	0.003	mg/L	1			EPA 231.2	TNA	03/03/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	03/03/21
Sodium (Na)	8.54	mg/L	1	0.020	0.500	SM 3111 B	TMS	03/03/21
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS	03/03/21
Field Test								
Field Conductivity	510	µmhos/cm	1			Field Conductivity	BLL	03/02/21
Field Total Depth	130	ft	1			Field Total Depth	BLL	03/02/21
Field ORP	102	mV	1			Field ORP	BLL	03/02/21
Field Oxygen (O2)	8.17	mg/L	1			Field Oxygen	BLL	03/02/21
Field pH	7.13	S.U.	1			Field pH	BLL	03/02/21
Field Temperature	7.50	° C	1			Field Temp.	BLL	03/02/21

Report Approved By:

Report Approved On: 3/8/2021 2:47:24 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 04/03/21 at 09:30 AM by LYNN BLACKMAN
Sample Matrix: Water

Lab ID#: 20210407106
Received: 04/05/21 at 12:30 PM by Eric Fuehrer
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	522	µmhos/cm	1	0.153	5.00	SM 2510B	JAM 04/08/21
pH	7.52	S.U.	1			SM 4500-H+ B	JAM 04/09/21
Total Dissolved Solids	321	mg/L	100ml	13.0	50.0	SM 2540 C	JNG 04/07/21
Non-Metallics							
Bicarbonate	127	mg/L	1	0.276	10.0	SM 2320 B	JAM 04/09/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 04/06/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 04/06/21
Fluoride	0.203	mg/L	1	0.008	0.015	SM 4500 F-C	SAA 04/05/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NH3 D	TMS 04/12/21
Nitrogen, Nitrate (NO3)	13.8	mg/L	10	0.079	0.500	SM 4500-NO3 F	BLL 04/07/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 04/07/21
Sulfate (SO4)	101	mg/L	2	0.966	20.0	SM 4500-SO4 E	BLL 04/07/21
Metals - Dissolved							
Arsenic (As)	0.013	mg/L	10	0.00061	0.005	EPA 200.8	TNA 04/07/21
Gold (Au)	0.003	mg/L	1			EPA 231.2	TNA 04/07/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA 04/07/21
Sodium (Na)	8.93	mg/L	1	0.020	0.500	SM 3111 B	TMS 04/07/21
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 04/07/21
Field Test							
Field Conductivity	550	µmhos/cm	1			Field Conductivity	BLL 04/07/21
Field Total Depth	130	ft	1			Field Total Depth	BLL 04/07/21
Field ORP	195	mV	1			Field ORP	BLL 04/07/21
Field Oxygen (O2)	8.15	mg/L	1			Field Oxygen	BLL 04/07/21
Field pH	7.08	S.U.	1			Field pH	BLL 04/07/21
Field Temperature	7.30	° C	1			Field Temp.	BLL 04/07/21

Report Approved By:

Eric Fuehrer

Report Approved On: 4/12/2021 4:05:50 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-19
Sampled: 05/01/21 at 12:40 PM by B Sheeder/D Witte
Sample Matrix: Water

Lab ID#: 20210505109
Received: 05/04/21 at 12:35 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	487	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	05/05/21
pH	7.32	S.U.	1			SM 4500-H+ B	JAM	05/06/21
Total Dissolved Solids	322	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	05/05/21
Non-Metallics								
Bicarbonate	102	mg/L	1	0.276	10.0	SM 2320 B	JAM	05/06/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	05/05/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	05/05/21
Fluoride	0.196	mg/L	1	0.008	0.015	SM 4500 F-C	TMN	05/05/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NH3 D	TMS	05/07/21
Nitrogen, Nitrate (NO3)	13.4	mg/L	10	0.079	0.500	SM 4500-NO3 F	BLL	05/05/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	05/05/21
Sulfate (SO4)	113	mg/L	2	0.966	20.0	SM 4500-SO4 E	BLL	05/05/21
Metals - Dissolved								
Arsenic (As)	0.015	mg/L	10	0.00061	0.005	EPA 200.8	TNA	05/05/21
Gold (Au)	0.002	mg/L	1			EPA 231.2	TNA	05/05/21
Selenium (Se)	0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	05/05/21
Sodium (Na)	9.89	mg/L	1	0.020	0.500	SM 3111 B	TMS	05/05/21
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS	05/05/21
Field Test								
Field Conductivity	530	µmhos/cm	1			Field Conductivity	BLL	05/04/21
Field Total Depth	130	ft	1			Field Total Depth	BLL	05/04/21
Field ORP	173	mV	1			Field ORP	BLL	05/04/21
Field Oxygen (O2)	6.47	mg/L	1			Field Oxygen	BLL	05/04/21
Field pH	7.05	S.U.	1			Field pH	BLL	05/04/21
Field Temperature	7.60	° C	1			Field Temp.	BLL	05/04/21

Report Approved By:

Report Approved On: 5/7/2021 12:55:28 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 01/02/16 at 01:00 PM by ST/Steve Albrecht
Sample Matrix: Water

Lab ID#: 20160106105
Received: 01/05/16 at 11:40 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	354	µmhos/cm	1	0.400	5.00	SM 2510B	JAM 01/06/16
pH	7.85	S.U.	1			SM 4500-H+ B	JAM 01/06/16
Total Dissolved Solids	190	mg/L	100ml	8.28	50.0	SM 2540 C	TMN 01/06/16
Non-Metallics							
Bicarbonate	227	mg/L	1	0.501	10.0	SM 2320 B	JAM 01/06/16
Cyanide, Total	< 0.010	mg/L	1	0.00025	0.010	Kelada 01	TMN 01/07/16
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 01/07/16
Fluoride	0.264	mg/L	1	0.003	0.050	SM 4500 F-C	GRT 01/07/16
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 01/06/16
Nitrogen, Nitrate (NO3)	0.163	mg/L	1	0.010	0.050	SM 4500-NO3 F	BLL 01/06/16
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 01/06/16
Sulfate (SO4)	< 10.0	mg/L	1	0.679	1.00	SM 4500-SO4 E	BLL 01/06/16
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00062	0.005	EPA 200.8	TNA 01/06/16
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 01/06/16
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 01/06/16
Sodium (Na)	4.15	mg/L	1	0.147	0.500	SM 3111 B	GRT 01/06/16
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000024	0.0002	EPA 245.1	GRT 01/06/16
Field Test							
Field Conductivity	360	µmhos/cm	1			Field Conductivity	BLL 01/05/16
Field Total Depth	23	ft	1			Field Total Depth	BLL 01/05/16
Field ORP	21.0	mV	1			Field ORP	BLL 01/05/16
Field Oxygen (O2)	8.53	mg/L	1			Field Oxygen	BLL 01/05/16
Field pH	7.92	S.U.	1			Field pH	BLL 01/05/16
Field Temperature	8.30	° C	1			Field Temp.	BLL 01/05/16

Report Approved By:

Report Approved On: 1/11/2016 12:46:21 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 04/03/16 at 03:45 PM by Steve Albrecht
Sample Matrix: Water

Lab ID#: 20160406307
Received: 04/05/16 at 10:50 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	358	µmhos/cm	1	0.400	5.00	SM 2510B	JAM 04/06/16
pH	7.90	S.U.	1			SM 4500-H+ B	JAM 04/08/16
Total Dissolved Solids	200	mg/L	100ml	23.2	50.0	SM 2540 C	TMN 04/06/16
Non-Metallics							
Bicarbonate	232	mg/L	1	0.327	10.0	SM 2320 B	JAM 04/08/16
Cyanide, Total	< 0.010	mg/L	1	0.00043	0.010	Kelada 01	TMN 04/07/16
Cyanide, WAD	< 0.010	mg/L	1	0.00068	0.010	Kelada 01	TMN 04/07/16
Fluoride	0.275	mg/L	1	0.003	0.050	SM 4500 F-C	GRT 04/06/16
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 04/06/16
Nitrogen, Nitrate (NO3)	0.154	mg/L	1	0.019	0.050	SM 4500-NO3 F	BLL 04/06/16
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 04/06/16
Sulfate (SO4)	< 10.0	mg/L	1	0.301	1.00	SM 4500-SO4 E	BLL 04/06/16
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00087	0.005	EPA 200.8	TNA 04/06/16
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 04/06/16
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 04/06/16
Sodium (Na)	4.33	mg/L	1	0.141	0.500	SM 3111 B	TMS 04/06/16
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000024	0.0002	EPA 245.1	TMS 04/06/16
Field Test							
Field Conductivity	330	µmhos/cm	1			Field Conductivity	BLL 04/05/16
Field Total Depth	21	ft	1			Field Total Depth	BLL 04/05/16
Field ORP	60.0	mV	1			Field ORP	BLL 04/05/16
Field Oxygen (O2)	8.90	mg/L	1			Field Oxygen	BLL 04/05/16
Field pH	7.90	S.U.	1			Field pH	BLL 04/05/16
Field Temperature	8.90	° C	1			Field Temp.	BLL 04/05/16

Report Approved By:

Report Approved On: 4/8/2016 1:38:53 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 05/09/16 at 04:00 PM
by D Witte/S Albrecht/J Thorp
Sample Matrix: Water

Lab ID#: 20160511210
Received: 05/10/16 at 11:20 AM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	354	µmhos/cm	1	0.400	5.00	SM 2510B	JAM 05/11/16
pH	7.88	S.U.	1			SM 4500-H+ B	JAM 05/13/16
Total Dissolved Solids	178	mg/L	100ml	23.2	50.0	SM 2540 C	TMN 05/11/16
Non-Metallics							
Bicarbonate	231	mg/L	1	0.327	10.0	SM 2320 B	JAM 05/13/16
Cyanide, Total	< 0.010	mg/L	1	0.00043	0.010	Kelada 01	TMN 05/11/16
Cyanide, WAD	< 0.010	mg/L	1	0.00068	0.010	Kelada 01	TMN 05/11/16
Fluoride	0.249	mg/L	1	0.003	0.050	SM 4500 F-C	TNA 05/11/16
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 05/13/16
Nitrogen, Nitrate (NO3)	0.150	mg/L	1	0.019	0.050	SM 4500-NO3 F	BLL 05/11/16
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 05/11/16
Sulfate (SO4)	< 10.0	mg/L	1	0.301	1.00	SM 4500-SO4 E	BLL 05/11/16
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00087	0.005	EPA 200.8	TNA 05/11/16
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 05/11/16
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 05/11/16
Sodium (Na)	4.07	mg/L	1	0.141	0.500	SM 3111 B	TMS 05/11/16
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000024	0.0002	EPA 245.1	TMS 05/11/16
Field Test							
Field Conductivity	360	µmhos/cm	1			Field Conductivity	BLL 05/10/16
Field Total Depth	21	ft	1			Field Total Depth	BLL 05/10/16
Field ORP	142	mV	1			Field ORP	BLL 05/10/16
Field Oxygen (O2)	10.7	mg/L	1			Field Oxygen	BLL 05/10/16
Field pH	8.03	S.U.	1			Field pH	BLL 05/10/16
Field Temperature	9.00	° C	1			Field Temp.	BLL 05/10/16

Report Approved By:

Report Approved On: 5/17/2016 7:29:23 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 08/08/16 at 11:25 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20160810203
Received: 08/09/16 at 10:10 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	354	µmhos/cm	1	0.400	5.00	SM 2510B	JAM 08/10/16
pH	7.82	S.U.	1			SM 4500-H+ B	JAM 08/10/16
Total Dissolved Solids	178	mg/L	100ml	23.2	50.0	SM 2540 C	ELR 08/10/16
Non-Metallics							
Bicarbonate	228	mg/L	1	0.327	10.0	SM 2320 B	JAM 08/10/16
Cyanide, Total	< 0.010	mg/L	1	0.00043	0.010	Kelada 01	TMN 08/11/16
Cyanide, WAD	< 0.010	mg/L	1	0.00068	0.010	Kelada 01	TMN 08/11/16
Fluoride	0.296	mg/L	1	0.003	0.050	SM 4500 F-C	ELR 08/10/16
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 08/11/16
Nitrogen, Nitrate (NO3)	0.163	mg/L	1	0.019	0.050	SM 4500-NO3 F	BLL 08/10/16
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 08/10/16
Sulfate (SO4)	< 10.0	mg/L	1	0.301	1.00	SM 4500-SO4 E	BLL 08/10/16
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00087	0.005	EPA 200.8	TNA 08/10/16
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 08/10/16
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 08/10/16
Sodium (Na)	4.56	mg/L	1	0.141	0.500	SM 3111 B	TMS 08/10/16
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 08/10/16
Field Test							
Field Conductivity	370	µmhos/cm	1			Field Conductivity	BLL 08/10/16
Field Total Depth	22	ft	1			Field Total Depth	BLL 08/10/16
Field ORP	196	mV	1			Field ORP	BLL 08/10/16
Field Oxygen (O2)	10.6	mg/L	1			Field Oxygen	BLL 08/10/16
Field pH	7.72	S.U.	1			Field pH	BLL 08/10/16
Field Temperature	15.3	° C	1			Field Temp.	BLL 08/10/16

Report Approved By:

Report Approved On: 8/15/2016 1:52:29 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 01/11/17 at 10:20 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20170113301
Received: 01/12/17 at 11:40 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	357	µmhos/cm	1	0.382	5.00	SM 2510B	JAM 01/13/17
pH	7.93	S.U.	1			SM 4500-H+ B	JAM 01/13/17
Total Dissolved Solids	189	mg/L	100ml	23.2	50.0	SM 2540 C	TMN 01/15/17
Non-Metallics							
Bicarbonate	235	mg/L	1	0.327	10.0	SM 2320 B	JAM 01/13/17
Cyanide, Total	< 0.010	mg/L	1	0.00043	0.010	Kelada 01	TMN 01/12/17
Cyanide, WAD	< 0.010	mg/L	1	0.00068	0.010	Kelada 01	TMN 01/12/17
Fluoride	0.307	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 01/13/17
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 01/16/17
Nitrogen, Nitrate (NO3)	0.124	mg/L	1	0.019	0.050	SM 4500-NO3 F	BLL 01/13/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 01/13/17
Sulfate (SO4)	< 10.0	mg/L	1	0.301	1.00	SM 4500-SO4 E	BLL 01/13/17
Metals - Dissolved							
Arsenic (As)	0.009	mg/L	10	0.00087	0.005	EPA 200.8	TNA 01/13/17
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 01/13/17
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 01/13/17
Sodium (Na)	3.75	mg/L	1	0.141	0.500	SM 3111 B	TMS 01/13/17
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 01/13/17
Field Test							
Field Conductivity	360	µmhos/cm	1			Field Conductivity	BLL 01/12/17
Field Total Depth	130	ft	1			Field Total Depth	BLL 01/12/17
Field ORP	119	mV	1			Field ORP	BLL 01/12/17
Field Oxygen (O2)	11.7	mg/L	1			Field Oxygen	BLL 01/12/17
Field pH	8.23	S.U.	1			Field pH	BLL 01/12/17
Field Temperature	5.50	° C	1			Field Temp.	BLL 01/12/17

Report Approved By:

Report Approved On: 1/18/2017 2:32:42 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 04/02/17 at 01:30 PM by Steve Albrecht
Sample Matrix: Water

Lab ID#: 20170405209
Received: 04/04/17 at 12:15 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	356	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 04/05/17
pH	7.81	S.U.	1			SM 4500-H+ B	JAM 04/05/17
Total Dissolved Solids	189	mg/L	100ml	18.1	50.0	SM 2540 C	ELR 04/05/17
Non-Metallics							
Bicarbonate	233	mg/L	1	0.618	10.0	SM 2320 B	JAM 04/05/17
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 04/06/17
Cyanide, WAD	< 0.010	mg/L	1	0.0007	0.010	Kelada 01	TMN 04/06/17
Fluoride	0.292	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 04/05/17
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 04/05/17
Nitrogen, Nitrate (NO3)	0.208	mg/L	1	0.019	0.050	SM 4500-NO3 F	BLL 04/05/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 04/05/17
Sulfate (SO4)	< 10.0	mg/L	1	0.301	1.00	SM 4500-SO4 E	BLL 04/06/17
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00087	0.005	EPA 200.8	TNA 04/05/17
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 04/06/17
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 04/05/17
Sodium (Na)	3.95	mg/L	1	0.151	0.500	SM 3111 B	TMS 04/05/17
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 04/05/17
Field Test							
Field Conductivity	350	µmhos/cm	1			Field Conductivity	BLL 04/04/17
Field Total Depth	24	ft	1			Field Total Depth	BLL 04/04/17
Field ORP	107	mV	1			Field ORP	BLL 04/04/17
Field Oxygen (O2)	10.1	mg/L	1			Field Oxygen	BLL 04/04/17
Field pH	7.88	S.U.	1			Field pH	BLL 04/04/17
Field Temperature	8.30	° C	1			Field Temp.	BLL 04/04/17

Report Approved By:

Report Approved On: 4/7/2017 2:42:49 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 05/10/17 at 08:30 AM by Steve Albrecht
Sample Matrix: Water

Lab ID#: 20170512207
Received: 05/11/17 at 11:10 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	356	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 05/12/17
pH	7.87	S.U.	1			SM 4500-H+ B	JAM 05/12/17
Total Dissolved Solids	175	mg/L	100ml	18.1	50.0	SM 2540 C	ELR 05/12/17
Non-Metallics							
Bicarbonate	234	mg/L	1	0.618	10.0	SM 2320 B	JAM 05/12/17
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 05/12/17
Cyanide, WAD	< 0.010	mg/L	1	0.0007	0.010	Kelada 01	TMN 05/12/17
Fluoride	0.285	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 05/15/17
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 05/12/17
Nitrogen, Nitrate (NO3)	0.121	mg/L	1	0.019	0.050	SM 4500-NO3 F	BLL 05/12/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NO2 B	BLL 05/12/17
Sulfate (SO4)	< 10.0	mg/L	1	0.301	1.00	SM 4500-SO4 E	BLL 05/12/17
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00087	0.005	EPA 200.8	TNA 05/12/17
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 05/12/17
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 05/12/17
Sodium (Na)	3.98	mg/L	1	0.151	0.500	SM 3111 B	TMS 05/12/17
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 05/12/17
Field Test							
Field Conductivity	370	µmhos/cm	1			Field Conductivity	BLL 05/11/17
Field Total Depth	24	ft	1			Field Total Depth	BLL 05/11/17
Field ORP	199	mV	1			Field ORP	BLL 05/11/17
Field Oxygen (O2)	10.3	mg/L	1			Field Oxygen	BLL 05/11/17
Field pH	7.82	S.U.	1			Field pH	BLL 05/11/17
Field Temperature	8.80	° C	1			Field Temp.	BLL 05/11/17

Report Approved By:

Report Approved On: 5/16/2017 1:10:16 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 08/07/17 at 09:45 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20170809103
Received: 08/08/17 at 12:20 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	353	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 08/09/17
pH	7.94	S.U.	1			SM 4500-H+ B	JAM 08/09/17
Total Dissolved Solids	172	mg/L	100ml	18.1	50.0	SM 2540 C	ELR 08/09/17
Non-Metallics							
Bicarbonate	229	mg/L	1	0.618	10.0	SM 2320 B	JAM 08/09/17
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 08/09/17
Cyanide, WAD	< 0.010	mg/L	1	0.0007	0.010	Kelada 01	TMN 08/09/17
Fluoride	0.259	mg/L	1	0.003	0.050	SM 4500 F-C	BAA 08/09/17
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 08/10/17
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL 08/09/17
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL 08/09/17
Sulfate (SO4)	< 10.0	mg/L	1	0.531	1.00	SM 4500-SO4 E	BLL 08/09/17
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00047	0.005	EPA 200.8	TNA 08/09/17
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 08/09/17
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 08/09/17
Sodium (Na)	4.49	mg/L	1	0.053	0.500	SM 3111 B	TMS 08/09/17
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000012	0.0002	EPA 245.1	TMS 08/09/17
Field Test							
Field Conductivity	340	µmhos/cm	1			Field Conductivity	BLL 08/10/17
Field Total Depth	26	ft	1			Field Total Depth	BLL 08/10/17
Field ORP	154	mV	1			Field ORP	BLL 08/10/17
Field Oxygen (O2)	8.45	mg/L	1			Field Oxygen	BLL 08/10/17
Field pH	7.80	S.U.	1			Field pH	BLL 08/10/17
Field Temperature	8.90	° C	1			Field Temp.	BLL 08/10/17

Report Approved By:

Report Approved On: 8/15/2017 6:44:36 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 01/15/18 at 11:45 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20180118106
Received: 01/16/18 at 10:45 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	363	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 01/19/18
pH	7.96	S.U.	1			SM 4500-H+ B	JAM 01/19/18
Total Dissolved Solids	179	mg/L	100ml	18.1	50.0	SM 2540 C	TMN 01/18/18
Non-Metallics							
Bicarbonate	234	mg/L	1	0.618	10.0	SM 2320 B	JAM 01/19/18
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 01/19/18
Cyanide, WAD	< 0.010	mg/L	1	0.0007	0.010	Kelada 01	TMN 01/19/18
Fluoride	0.326	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 01/22/18
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 01/18/18
Nitrogen, Nitrate (NO3)	0.240	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL 01/18/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO2 B	BLL 01/18/18
Sulfate (SO4)	< 10.0	mg/L	1	0.531	1.00	SM 4500-SO4 E	BLL 01/19/18
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00047	0.005	EPA 200.8	TNA 01/18/18
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 01/18/18
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 01/18/18
Sodium (Na)	4.61	mg/L	1	0.053	0.500	SM 3111 B	TMS 01/18/18
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000012	0.0002	EPA 245.1	TMS 01/18/18
Field Test							
Field Conductivity	390	µmhos/cm	1			Field Conductivity	BLL 01/17/18
Field Total Depth	27	ft	1			Field Total Depth	BLL 01/17/18
Field ORP	83.0	mV	1			Field ORP	BLL 01/17/18
Field Oxygen (O2)	7.90	mg/L	1			Field Oxygen	BLL 01/17/18
Field pH	7.86	S.U.	1			Field pH	BLL 01/17/18
Field Temperature	2.70	° C	1			Field Temp.	BLL 01/17/18

Report Approved By:

Report Approved On: 1/25/2018 3:32:14 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 04/07/18 at 03:00 PM
by Lyn Weaver/Steve Albrecht
Sample Matrix: Water

Lab ID#: 20180410302
Received: 04/09/18 at 12:40 PM
by Tasha Swanson
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	362	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 04/10/18
pH	7.85	S.U.	1			SM 4500-H+ B	JAM 04/10/18
Total Dissolved Solids	182	mg/L	100ml	17.4	50.0	SM 2540 C	TMN 04/11/18
Non-Metallics							
Bicarbonate	234	mg/L	1	0.618	10.0	SM 2320 B	JAM 04/10/18
Cyanide, Total	< 0.010	mg/L	1	0.00045	0.010	Kelada 01	TMN 04/11/18
Cyanide, WAD	< 0.010	mg/L	1	0.00077	0.010	Kelada 01	TMN 04/11/18
Fluoride	0.294	mg/L	1	0.003	0.050	SM 4500 F-C	TNA 04/10/18
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 04/11/18
Nitrogen, Nitrate (NO3)	0.137	mg/L	1	0.017	0.050	SM 4500-NO3 F	BLL 04/10/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.006	0.050	SM 4500-NO2 B	BLL 04/10/18
Sulfate (SO4)	< 10.0	mg/L	1	0.477	1.00	SM 4500-SO4 E	BLL 04/11/18
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.000527	0.005	EPA 200.8	TNA 04/10/18
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 04/11/18
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 04/10/18
Sodium (Na)	3.89	mg/L	1	0.045	0.500	SM 3111 B	TMS 04/10/18
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000014	0.0002	EPA 245.1	TMS 04/10/18
Field Test							
Field Conductivity	350	µmhos/cm	1			Field Conductivity	BLL 04/10/18
Field Total Depth	27	ft	1			Field Total Depth	BLL 04/10/18
Field ORP	70.0	mV	1			Field ORP	BLL 04/10/18
Field Oxygen (O2)	8.66	mg/L	1			Field Oxygen	BLL 04/10/18
Field pH	7.78	S.U.	1			Field pH	BLL 04/10/18
Field Temperature	7.20	° C	1			Field Temp.	BLL 04/10/18

Report Approved By:

Report Approved On: 4/12/2018 12:20:31 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 05/03/18 at 09:30 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20180511102
Received: 05/10/18 at 10:45 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	359	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 05/11/18
pH	8.03	S.U.	1			SM 4500-H+ B	JAM 05/15/18
Total Dissolved Solids	189	mg/L	100ml	17.4	50.0	SM 2540 C	TMN 05/14/18
Non-Metallics							
Bicarbonate	232	mg/L	1	0.618	10.0	SM 2320 B	JAM 05/15/18
Cyanide, Total	< 0.010	mg/L	1	0.00045	0.010	Kelada 01	TMN 05/15/18
Cyanide, WAD	< 0.010	mg/L	1	0.00077	0.010	Kelada 01	TMN 05/15/18
Fluoride	0.334	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 05/14/18
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 05/11/18
Nitrogen, Nitrate (NO3)	0.147	mg/L	1	0.017	0.050	SM 4500-NO3 F	BLL 05/11/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.006	0.050	SM 4500-NO2 B	BLL 05/11/18
Sulfate (SO4)	< 10.0	mg/L	1	0.477	1.00	SM 4500-SO4 E	BLL 05/11/18
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.000527	0.005	EPA 200.8	TNA 05/11/18
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 05/14/18
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	TNA 05/11/18
Sodium (Na)	4.05	mg/L	1	0.045	0.500	SM 3111 B	TMS 05/11/18
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000014	0.0002	EPA 245.1	TMS 05/11/18
Field Test							
Field Conductivity	360	µmhos/cm	1			Field Conductivity	BLL 05/10/18
Field Total Depth	26	ft	1			Field Total Depth	BLL 05/10/18
Field ORP	138	mV	1			Field ORP	BLL 05/10/18
Field Oxygen (O2)	7.58	mg/L	1			Field Oxygen	BLL 05/10/18
Field pH	7.48	S.U.	1			Field pH	BLL 05/10/18
Field Temperature	8.40	° C	1			Field Temp.	BLL 05/10/18

Report Approved By:

Report Approved On: 5/16/2018 10:12:55 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 08/05/18 at 04:15 PM
by Darnell W/Steve P/Brett S
Sample Matrix: Water

Lab ID#: 20180808305
Received: 08/07/18 at 01:00 PM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	360	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 08/08/18
pH	7.91	S.U.	1			SM 4500-H+ B	JAM 08/08/18
Total Dissolved Solids	193	mg/L	100ml	17.4	50.0	SM 2540 C	TMN 08/09/18
Non-Metallics							
Bicarbonate	238	mg/L	1	0.618	10.0	SM 2320 B	JAM 08/08/18
Cyanide, Total	< 0.010	mg/L	1	0.00045	0.010	Kelada 01	TMN 08/09/18
Cyanide, WAD	< 0.010	mg/L	1	0.00077	0.010	Kelada 01	TMN 08/09/18
Fluoride	0.330	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 08/10/18
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 08/09/18
Nitrogen, Nitrate (NO3)	0.134	mg/L	1	0.017	0.050	SM 4500-NO3 F	BLL 08/08/18
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.006	0.050	SM 4500-NO2 B	BLL 08/08/18
Sulfate (SO4)	< 10.0	mg/L	1	0.477	1.00	SM 4500-SO4 E	BLL 08/08/18
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.000527	0.005	EPA 200.8	TNA 08/08/18
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 08/08/18
Selenium (Se)	< 0.005	mg/L	10	0.00047	0.005	EPA 200.8	TNA 08/08/18
Sodium (Na)	4.10	mg/L	1	0.045	0.500	SM 3111 B	TMS 08/08/18
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000014	0.0002	EPA 245.1	TMS 08/08/18
Field Test							
Field Conductivity	360	µmhos/cm	1			Field Conductivity	BLL 08/07/18
Field Total Depth	25	ft	1			Field Total Depth	BLL 08/07/18
Field ORP	148	mV	1			Field ORP	BLL 08/07/18
Field Oxygen (O2)	8.53	mg/L	1			Field Oxygen	BLL 08/07/18
Field pH	7.54	S.U.	1			Field pH	BLL 08/07/18
Field Temperature	9.30	° C	1			Field Temp.	BLL 08/07/18

Report Approved By:

Report Approved On: 8/13/2018 7:53:48 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 01/03/19 at 11:10 AM
by Brett S, Steve P, Darnell W
Sample Matrix: Water

Lab ID#: 20190109206
Received: 01/08/19 at 03:25 PM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	360	µmhos/cm	1	0.470	5.00	SM 2510B	JAM 01/09/19
pH	8.05	S.U.	1			SM 4500-H+ B	JAM 01/15/19
Total Dissolved Solids	162	mg/L	100ml	17.4	50.0	SM 2540 C	TMN 01/09/19
Non-Metallics							
Bicarbonate	234	mg/L	1	0.618	10.0	SM 2320 B	JAM 01/15/19
Cyanide, Total	< 0.010	mg/L	1	0.00045	0.010	Kelada 01	TMN 01/11/19
Cyanide, WAD	< 0.010	mg/L	1	0.00077	0.010	Kelada 01	TMN 01/09/19
Fluoride	0.282	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 01/09/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 01/10/19
Nitrogen, Nitrate (NO3)	0.121	mg/L	1	0.017	0.050	SM 4500-NO3 F	BLL 01/09/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.006	0.050	SM 4500-NO2 B	BLL 01/09/19
Sulfate (SO4)	< 10.0	mg/L	1	0.477	1.00	SM 4500-SO4 E	BLL 01/09/19
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.000385	0.005	EPA 200.8	TNA 01/10/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 01/09/19
Selenium (Se)	< 0.005	mg/L	10	0.00047	0.005	EPA 200.8	TNA 01/10/19
Sodium (Na)	4.64	mg/L	1	0.045	0.500	SM 3111 B	TMS 01/09/19
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.000014	0.0002	EPA 245.1	TMS 01/09/19
Field Test							
Field Conductivity	380	µmhos/cm	1			Field Conductivity	BLL 01/08/19
Field Total Depth	30	ft	1			Field Total Depth	BLL 01/08/19
Field ORP	41.0	mV	1			Field ORP	BLL 01/08/19
Field Oxygen (O2)	8.13	mg/L	1			Field Oxygen	BLL 01/08/19
Field pH	7.66	S.U.	1			Field pH	BLL 01/08/19
Field Temperature	4.90	° C	1			Field Temp.	BLL 01/08/19

Report Approved By:

Report Approved On: 1/16/2019 3:46:42 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 04/04/19 at 08:50 AM by Brett S
Sample Matrix: Water

Lab ID#: 20190410201
Received: 04/09/19 at 12:10 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	360	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 04/12/19
pH	7.96	S.U.	1			SM 4500-H+ B	JAM 04/12/19
Total Dissolved Solids	187	mg/L	100ml	21.0	50.0	SM 2540 C	TMN 04/10/19
Non-Metallics							
Bicarbonate	238	mg/L	1	0.288	10.0	SM 2320 B	JAM 04/12/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 04/11/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 04/11/19
Fluoride	0.309	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 04/10/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	TMS 04/11/19
Nitrogen, Nitrate (NO3)	0.126	mg/L	1	0.017	0.050	SM 4500-NO3 F	BLL 04/10/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 04/10/19
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL 04/11/19
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.000385	0.005	EPA 200.8	TNA 04/10/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 04/10/19
Selenium (Se)	< 0.005	mg/L	10	0.00047	0.005	EPA 200.8	TNA 04/10/19
Sodium (Na)	4.19	mg/L	1	0.124	0.500	SM 3111 B	TMS 04/10/19
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS 04/10/19
Field Test							
Field Conductivity	350	µmhos/cm	1			Field Conductivity	BLL 04/09/19
Field Total Depth	25	ft	1			Field Total Depth	BLL 04/09/19
Field ORP	227	mV	1			Field ORP	BLL 04/09/19
Field Oxygen (O2)	7.59	mg/L	1			Field Oxygen	BLL 04/09/19
Field pH	7.27	S.U.	1			Field pH	BLL 04/09/19
Field Temperature	5.50	° C	1			Field Temp.	BLL 04/09/19

Report Approved By:

Report Approved On: 4/12/2019 2:35:44 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 05/03/19 at 08:40 AM by Brett S, Darnell W
Sample Matrix: Water

Lab ID#: 20190508106
Received: 05/07/19 at 12:25 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	361	µmhos/cm	1	0.237	5.00	SM 2510B	HBK 05/09/19
pH	8.05	S.U.	1			SM 4500-H+ B	SAA 05/10/19
Total Dissolved Solids	133	mg/L	100ml	21.0	50.0	SM 2540 C	TMN 05/08/19
Non-Metallics							
Bicarbonate	224	mg/L	1	0.288	10.0	SM 2320 B	SAA 05/10/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 05/07/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 05/07/19
Fluoride	0.310	mg/L	1	0.003	0.050	SM 4500 F-C	KDS 05/08/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM 05/08/19
Nitrogen, Nitrate (NO3)	0.138	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 05/08/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 05/08/19
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL 05/08/19
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.000385	0.005	EPA 200.8	TNA 05/08/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 05/08/19
Selenium (Se)	< 0.005	mg/L	10	0.00047	0.005	EPA 200.8	TNA 05/08/19
Sodium (Na)	3.73	mg/L	1	0.124	0.500	SM 3111 B	TMS 05/08/19
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS 05/08/19
Field Test							
Field Conductivity	350	µmhos/cm	1			Field Conductivity	BLL 05/07/19
Field Total Depth	22	ft	1			Field Total Depth	BLL 05/07/19
Field ORP	222	mV	1			Field ORP	BLL 05/07/19
Field Oxygen (O2)	8.48	mg/L	1			Field Oxygen	BLL 05/07/19
Field pH	7.67	S.U.	1			Field pH	BLL 05/07/19
Field Temperature	5.80	° C	1			Field Temp.	BLL 05/07/19

Report Approved By:

Report Approved On: 5/10/2019 2:17:39 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 08/07/19 at 08:20 AM by Darnell Witte / Steve Podall
Sample Matrix: Water

Lab ID#: 20190809203
Received: 08/08/19 at 12:20 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	359	µmhos/cm	1	0.237	5.00	SM 2510B	HBK 08/09/19
pH	7.95	S.U.	1			SM 4500-H+ B	TMS 08/09/19
Total Dissolved Solids	189	mg/L	100ml	21.0	50.0	SM 2540 C	SAA 08/09/19
Non-Metallics							
Bicarbonate	231	mg/L	1	0.288	10.0	SM 2320 B	TMS 08/09/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 08/13/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 08/13/19
Fluoride	0.304	mg/L	1	0.013	0.050	SM 4500 F-C	KDS 08/08/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	KDS 08/09/19
Nitrogen, Nitrate (NO3)	0.186	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 08/09/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 08/09/19
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL 08/09/19
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.000385	0.005	EPA 200.8	TNA 08/09/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 08/09/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA 08/09/19
Sodium (Na)	3.32	mg/L	1	0.124	0.500	SM 3111 B	TMS 08/09/19
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS 08/09/19
Field Test							
Field Conductivity	360	µmhos/cm	1			Field Conductivity	BLL 08/08/19
Field Total Depth	22	ft	1			Field Total Depth	BLL 08/08/19
Field ORP	227	mV	1			Field ORP	BLL 08/08/19
Field Oxygen (O2)	8.39	mg/L	1			Field Oxygen	BLL 08/08/19
Field pH	7.79	S.U.	1			Field pH	BLL 08/08/19
Field Temperature	9.20	° C	1			Field Temp.	BLL 08/08/19

Report Approved By:

Report Approved On: 8/15/2019 3:07:46 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 01/05/20 at 12:50 PM by Darnell Witte, Steve Podall
Sample Matrix: Water

Lab ID#: 20200108107
Received: 01/06/20 at 12:20 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	355	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 01/09/20
pH	7.92	S.U.	1			SM 4500-H+ B	JAM 01/10/20
Total Dissolved Solids	183	mg/L	100ml	21.0	50.0	SM 2540 C	TMN 01/08/20
Non-Metallics							
Bicarbonate	240	mg/L	1	0.288	10.0	SM 2320 B	JAM 01/10/20
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 01/08/20
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 01/08/20
Fluoride	0.276	mg/L	1	0.013	0.050	SM 4500 F-C	SAA 01/08/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM 01/13/20
Nitrogen, Nitrate (NO3)	0.151	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 01/08/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 01/08/20
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL 01/08/20
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00073	0.005	EPA 200.8	TNA 01/09/20
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 01/09/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 01/09/20
Sodium (Na)	3.80	mg/L	1	0.124	0.500	SM 3111 B	TMS 01/08/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS 01/08/20
Field Test							
Field Conductivity	340	µmhos/cm	1			Field Conductivity	BLL 01/07/20
Field Total Depth	24	ft	1			Field Total Depth	BLL 01/07/20
Field ORP	138	mV	1			Field ORP	BLL 01/07/20
Field Oxygen (O2)	8.87	mg/L	1			Field Oxygen	BLL 01/07/20
Field pH	7.76	S.U.	1			Field pH	BLL 01/07/20
Field Temperature	4.30	° C	1			Field Temp.	BLL 01/07/20

Report Approved By:

Report Approved On: 1/14/2020 2:28:19 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 04/04/20 at 09:30 AM by Darnell Witte, Brett Sheeder
Sample Matrix: Water

Lab ID#: 20200407307
Received: 04/06/20 at 12:30 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	362	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 04/07/20
pH	7.90	S.U.	1			SM 4500-H+ B	JAM 04/07/20
Total Dissolved Solids	191	mg/L	100ml	14.7	50.0	SM 2540 C	TMN 04/08/20
Non-Metallics							
Bicarbonate	235	mg/L	1	0.288	10.0	SM 2320 B	JAM 04/07/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 04/07/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 04/07/20
Fluoride	0.299	mg/L	1	0.010	0.015	SM 4500 F-C	SAA 04/07/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	TMS 04/07/20
Nitrogen, Nitrate (NO3)	0.153	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 04/07/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 04/07/20
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL 04/07/20
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00073	0.005	EPA 200.8	TNA 04/07/20
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 04/07/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 04/07/20
Sodium (Na)	4.23	mg/L	1	0.124	0.500	SM 3111 B	TMS 04/07/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 04/07/20
Field Test							
Field Conductivity	390	µmhos/cm	1			Field Conductivity	BLL 04/06/20
Field Total Depth	22	ft	1			Field Total Depth	BLL 04/06/20
Field ORP	224	mV	1			Field ORP	BLL 04/06/20
Field Oxygen (O2)	7.94	mg/L	1			Field Oxygen	BLL 04/06/20
Field pH	7.32	S.U.	1			Field pH	BLL 04/06/20
Field Temperature	4.70	° C	1			Field Temp.	BLL 04/06/20

Report Approved By:

Report Approved On: 4/8/2020 1:49:41 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 05/10/20 at 11:20 AM by Lynn Blackman
Sample Matrix: Water

Lab ID#: 20200512107
Received: 05/11/20 at 12:30 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	358	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 05/13/20
pH	7.98	S.U.	1			SM 4500-H+ B	JAM 05/13/20
Total Dissolved Solids	193	mg/L	100ml	14.7	50.0	SM 2540 C	TMN 05/12/20
Non-Metallics							
Bicarbonate	234	mg/L	1	0.288	10.0	SM 2320 B	JAM 05/13/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 05/12/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 05/12/20
Fluoride	0.286	mg/L	1	0.010	0.015	SM 4500 F-C	SAA 05/12/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	TMS 05/14/20
Nitrogen, Nitrate (NO3)	0.176	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 05/12/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 05/12/20
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 05/12/20
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00073	0.005	EPA 200.8	TNA 05/12/20
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 05/12/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 05/12/20
Sodium (Na)	3.65	mg/L	1	0.137	0.500	SM 3111 B	TMS 05/12/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 05/12/20
Field Test							
Field Conductivity	390	µmhos/cm	1			Field Conductivity	BLL 05/11/20
Field Total Depth	1900	ft	1			Field Total Depth	BLL 05/11/20
Field ORP	230	mV	1			Field ORP	BLL 05/11/20
Field Oxygen (O2)	7.91	mg/L	1			Field Oxygen	BLL 05/11/20
Field pH	7.53	S.U.	1			Field pH	BLL 05/11/20
Field Temperature	5.40	° C	1			Field Temp.	BLL 05/11/20

Report Approved By:

Report Approved On: 5/14/2020 2:18:05 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 08/04/20 at 08:50 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20200806302
Received: 08/05/20 at 11:45 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	361	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 08/06/20
pH	7.93	S.U.	1			SM 4500-H+ B	JAM 08/07/20
Total Dissolved Solids	160	mg/L	100ml	14.7	50.0	SM 2540 C	JNG 08/06/20
Non-Metallics							
Bicarbonate	234	mg/L	1	0.276	10.0	SM 2320 B	JAM 08/07/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 08/06/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 08/05/20
Fluoride	0.275	mg/L	1	0.010	0.015	SM 4500 F-C	SAA 08/05/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 08/11/20
Nitrogen, Nitrate (NO3)	0.138	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 08/06/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 08/06/20
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 08/06/20
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00073	0.005	EPA 200.8	TNA 08/06/20
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 08/06/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 08/06/20
Sodium (Na)	3.64	mg/L	1	0.137	0.500	SM 3111 B	TMS 08/06/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 08/07/20
Field Test							
Field Conductivity	340	µmhos/cm	1			Field Conductivity	BLL 08/05/20
Field Total Depth	22	ft	1			Field Total Depth	BLL 08/05/20
Field ORP	202	mV	1			Field ORP	BLL 08/05/20
Field Oxygen (O2)	7.92	mg/L	1			Field Oxygen	BLL 08/05/20
Field pH	7.78	S.U.	1			Field pH	BLL 08/05/20
Field Temperature	11.0	° C	1			Field Temp.	BLL 08/05/20

Report Approved By:

Report Approved On: 8/24/2020 10:39:35 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 12/15/20 at 10:50 AM
by Justin Thorp, Darnell Witte
Sample Matrix: Water

Lab ID#: 20201218105
Received: 12/17/20 at 10:30 AM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	357	µmhos/cm	1	0.153	5.00	SM 2510B	JAM 12/18/20
pH	7.89	S.U.	1			SM 4500-H+ B	JAM 12/18/20
Total Dissolved Solids	175	mg/L	100ml	14.7	50.0	SM 2540 C	TMN 12/21/20
Non-Metallics							
Bicarbonate	236	mg/L	1	0.276	10.0	SM 2320 B	JAM 12/18/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 12/18/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 12/18/20
Fluoride	0.264	mg/L	1	0.010	0.015	SM 4500 F-C	TNA 12/22/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 12/21/20
Nitrogen, Nitrate (NO3)	0.120	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 12/18/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 12/18/20
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 12/18/20
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00073	0.005	EPA 200.8	TNA 12/21/20
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 12/21/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 12/21/20
Sodium (Na)	3.95	mg/L	1	0.137	0.500	SM 3111 B	TMS 12/18/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 12/18/20
Field Test							
Field Conductivity	360	µmhos/cm	1			Field Conductivity	BLL 12/17/20
Field Total Depth	24	ft	1			Field Total Depth	BLL 12/17/20
Field ORP	225	mV	1			Field ORP	BLL 12/17/20
Field Oxygen (O2)	8.42	mg/L	1			Field Oxygen	BLL 12/17/20
Field pH	7.66	S.U.	1			Field pH	BLL 12/17/20
Field Temperature	5.60	° C	1			Field Temp.	BLL 12/17/20

Report Approved By:

Report Approved On: 12/23/2020 9:04:47 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 01/02/21 at 12:45 PM
by Sheeder, Podall, Witte
Sample Matrix: Water

Lab ID#: 20210105312
Received: 01/04/21 at 12:20 PM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	349	µmhos/cm	1	0.153	5.00	SM 2510B	JAM 01/05/21
pH	7.89	S.U.	1			SM 4500-H+ B	JAM 01/05/21
Total Dissolved Solids	172	mg/L	100ml	14.7	50.0	SM 2540 C	JNG 01/05/21
Non-Metallics							
Bicarbonate	227	mg/L	1	0.276	10.0	SM 2320 B	JAM 01/05/21
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	DVA 01/05/21
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	DVA 01/05/21
Fluoride	0.268	mg/L	1	0.010	0.015	SM 4500 F-C	SAA 01/05/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 01/06/21
Nitrogen, Nitrate (NO3)	0.165	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 01/05/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 01/05/21
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 01/05/21
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00061	0.005	EPA 200.8	TNA 01/05/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 01/05/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA 01/05/21
Sodium (Na)	3.82	mg/L	1	0.137	0.500	SM 3111 B	TMS 01/05/21
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 01/05/21
Field Test							
Field Conductivity	350	µmhos/cm	1			Field Conductivity	BLL 01/04/21
Field Total Depth	24	ft	1			Field Total Depth	BLL 01/04/21
Field ORP	111	mV	1			Field ORP	BLL 01/04/21
Field Oxygen (O2)	9.25	mg/L	1			Field Oxygen	BLL 01/04/21
Field pH	7.88	S.U.	1			Field pH	BLL 01/04/21
Field Temperature	5.10	° C	1			Field Temp.	BLL 01/04/21

Report Approved By:

Report Approved On: 1/7/2021 12:53:01 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 02/16/21 at 10:40 AM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20210219101
Received: 02/18/21 at 10:15 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	361	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	02/19/21
pH	7.89	S.U.	1			SM 4500-H+ B	JAM	02/19/21
Total Dissolved Solids	173	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	02/19/21
Non-Metallics								
Bicarbonate	230	mg/L	1	0.276	10.0	SM 2320 B	JAM	02/19/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	02/19/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	02/19/21
Fluoride	0.276	mg/L	1	0.010	0.015	SM 4500 F-C	SAA	02/19/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM	02/22/21
Nitrogen, Nitrate (NO3)	0.158	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL	02/18/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	02/18/21
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL	02/23/21
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.00061	0.005	EPA 200.8	TNA	02/19/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	02/19/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	02/19/21
Sodium (Na)	3.60	mg/L	1	0.137	0.500	SM 3111 B	TMS	02/19/21
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS	02/19/21
Field Test								
Field Conductivity	350	µmhos/cm	1			Field Conductivity	BLL	02/18/21
Field Total Depth	24	ft	1			Field Total Depth	BLL	02/18/21
Field ORP	249	mV	1			Field ORP	BLL	02/18/21
Field Oxygen (O2)	8.05	mg/L	1			Field Oxygen	BLL	02/18/21
Field pH	7.70	S.U.	1			Field pH	BLL	02/18/21
Field Temperature	6.10	° C	1			Field Temp.	BLL	02/18/21

Report Approved By:

Report Approved On: 2/23/2021 1:39:20 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 03/02/21 at 03:00 PM by Steve Podall
Sample Matrix: Water

Lab ID#: 20210305106
Received: 03/04/21 at 09:45 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	359	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	03/05/21
pH	7.95	S.U.	1			SM 4500-H+ B	JAM	03/05/21
Total Dissolved Solids	163	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	03/04/21
Non-Metallics								
Bicarbonate	232	mg/L	1	0.276	10.0	SM 2320 B	JAM	03/05/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	03/05/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	03/05/21
Fluoride	0.277	mg/L	1	0.008	0.015	SM 4500 F-C	SAA	03/08/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM	03/08/21
Nitrogen, Nitrate (NO3)	0.162	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL	03/05/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	03/05/21
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL	03/08/21
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.00061	0.005	EPA 200.8	TNA	03/05/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	03/08/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	03/05/21
Sodium (Na)	3.59	mg/L	1	0.020	0.500	SM 3111 B	TMS	03/05/21
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS	03/05/21
Field Test								
Field Conductivity	350	µmhos/cm	1			Field Conductivity	BLL	03/04/21
Field Total Depth	24	ft	1			Field Total Depth	BLL	03/04/21
Field ORP	87.0	mV	1			Field ORP	BLL	03/04/21
Field Oxygen (O2)	8.81	mg/L	1			Field Oxygen	BLL	03/04/21
Field pH	7.80	S.U.	1			Field pH	BLL	03/04/21
Field Temperature	7.00	° C	1			Field Temp.	BLL	03/04/21

Report Approved By:

Report Approved On: 3/9/2021 9:09:21 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 04/03/21 at 07:20 AM by LYNN BLACKMAN
Sample Matrix: Water

Lab ID#: 20210407101
Received: 04/05/21 at 12:30 PM by Eric Fuehrer
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	362	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	04/08/21
pH	8.02	S.U.	1			SM 4500-H+ B	JAM	04/09/21
Total Dissolved Solids	164	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	04/07/21
Non-Metallics								
Bicarbonate	237	mg/L	1	0.276	10.0	SM 2320 B	JAM	04/09/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	04/06/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	04/06/21
Fluoride	0.263	mg/L	1	0.008	0.015	SM 4500 F-C	SAA	04/05/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NH3 D	TMS	04/12/21
Nitrogen, Nitrate (NO3)	0.127	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	04/07/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	04/07/21
Sulfate (SO4)	< 10.0	mg/L	1	0.483	10.0	SM 4500-SO4 E	BLL	04/07/21
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.00061	0.005	EPA 200.8	TNA	04/07/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	04/07/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	04/07/21
Sodium (Na)	3.54	mg/L	1	0.020	0.500	SM 3111 B	TMS	04/07/21
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS	04/07/21
Field Test								
Field Conductivity	370	µmhos/cm	1			Field Conductivity	BLL	04/07/21
Field Total Depth	24	ft	1			Field Total Depth	BLL	04/07/21
Field ORP	210	mV	1			Field ORP	BLL	04/07/21
Field Oxygen (O2)	8.49	mg/L	1			Field Oxygen	BLL	04/07/21
Field pH	8.16	S.U.	1			Field pH	BLL	04/07/21
Field Temperature	6.60	° C	1			Field Temp.	BLL	04/07/21

Report Approved By:

Eric Fuehrer

Report Approved On: 4/12/2021 4:05:49 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-33
Sampled: 05/01/21 at 10:45 AM by B Sheeder/D Witte
Sample Matrix: Water

Lab ID#: 20210505105
Received: 05/04/21 at 12:35 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	356	µmhos/cm	1	0.153	5.00	SM 2510B	JAM 05/05/21
pH	7.97	S.U.	1			SM 4500-H+ B	JAM 05/05/21
Total Dissolved Solids	154	mg/L	100ml	13.0	50.0	SM 2540 C	JNG 05/05/21
Non-Metallics							
Bicarbonate	235	mg/L	1	0.276	10.0	SM 2320 B	JAM 05/05/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 05/05/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 05/05/21
Fluoride	0.257	mg/L	1	0.008	0.015	SM 4500 F-C	TMN 05/05/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NH3 D	TMS 05/07/21
Nitrogen, Nitrate (NO3)	0.166	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL 05/05/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 05/05/21
Sulfate (SO4)	< 10.0	mg/L	1	0.483	10.0	SM 4500-SO4 E	BLL 05/05/21
Metals - Dissolved							
Arsenic (As)	< 0.005	mg/L	10	0.00061	0.005	EPA 200.8	TNA 05/05/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 05/05/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA 05/05/21
Sodium (Na)	3.79	mg/L	1	0.020	0.500	SM 3111 B	TMS 05/05/21
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 05/05/21
Field Test							
Field Conductivity	370	µmhos/cm	1			Field Conductivity	BLL 05/04/21
Field Total Depth	24	ft	1			Field Total Depth	BLL 05/04/21
Field ORP	218	mV	1			Field ORP	BLL 05/04/21
Field Oxygen (O2)	8.73	mg/L	1			Field Oxygen	BLL 05/04/21
Field pH	7.65	S.U.	1			Field pH	BLL 05/04/21
Field Temperature	9.40	° C	1			Field Temp.	BLL 05/04/21

Report Approved By:

Report Approved On: 5/7/2021 12:55:28 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 07/08/19 at 08:00 AM by Brett Sheer
Sample Matrix: Water

Lab ID#: 20190709209
Received: 07/08/19 at 12:45 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	249	µmhos/cm	1	0.237	5.00	SM 2510B	SAA 07/10/19
Hardness	92.9	mg/L	1			SM 2340 B	EJF 07/15/19
pH	8.15	S.U.	1			SM 4500-H+ B	SAA 07/09/19
Total Dissolved Solids	163	mg/L	100ml	21.0	50.0	SM 2540 C	TMN 07/09/19
Non-Metallics							
Bicarbonate	136	mg/L	1	0.288	10.0	SM 2320 B	SAA 07/09/19
Carbonate	0.00	mg/L	1	0.118	5.00	SM 2320 B	SAA 07/09/19
Chloride (Cl-)	3.90	mg/L	1	0.204	0.500	SM 4500-Cl E	BLL 07/10/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 07/09/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 07/09/19
Fluoride	0.620	mg/L	1	0.013	0.050	SM 4500 F-C	KDS 07/08/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM 07/09/19
Nitrogen, Nitrate (NO3)	1.14	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 07/09/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 07/09/19
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL 07/10/19
Metals - Dissolved							
Aluminum (Al)	0.016	mg/L	10	0.002	0.010	EPA 200.8	TNA 07/10/19
Arsenic (As)	0.025	mg/L	10	0.000385	0.005	EPA 200.8	TNA 07/10/19
Barium (Ba)	0.033	mg/L	10	0.000147	0.005	EPA 200.8	TNA 07/10/19
Cadmium (Cd)	< 0.001	mg/L	10	0.000177	0.001	EPA 200.8	TNA 07/10/19
Calcium (Ca)	20.5	mg/L	1	0.040	1.00	SM 3111 B	TMS 07/09/19
Chromium (Cr)	< 0.001	mg/L	10	0.000052	0.001	EPA 200.8 DRC	TNA 07/10/19
Cobalt (Co)	< 0.001	mg/L	10	0.000033	0.001	EPA 200.8	TNA 07/10/19
Copper (Cu)	< 0.005	mg/L	10	0.00039	0.005	EPA 200.8	TNA 07/10/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 07/11/19
Iron (Fe)	< 0.050	mg/L	10	0.000506	0.050	EPA 200.8	TNA 07/10/19
Lead (Pb)	< 0.001	mg/L	10	0.000101	0.001	EPA 200.8	TNA 07/10/19
Magnesium (Mg)	10.1	mg/L	1	0.026	0.500	SM 3111 B	TMS 07/09/19
Manganese (Mn)	< 0.010	mg/L	10	0.000089	0.001	EPA 200.8	TNA 07/10/19
Molybdenum (Mo)	0.002	mg/L	10	0.000075	0.001	EPA 200.8	TNA 07/10/19
Nickel (Ni)	< 0.005	mg/L	10	0.000087	0.005	EPA 200.8	TNA 07/10/19
Potassium (K)	1.33	mg/L	1	0.012	0.500	SM 3111 B	TMS 07/09/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA 07/10/19

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Metals - Dissolved							
Silicon (Si)	12.5	mg/L	1	0.117	1.00	SM 3111 D	TMS 07/10/19
Silver (Ag)	< 0.001	mg/L	10	0.000096	0.001	EPA 200.8	TNA 07/10/19
Sodium (Na)	13.3	mg/L	1	0.124	0.500	SM 3111 B	TMS 07/09/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA 07/10/19
Metals - Total							
Aluminum (Al)	2.69	mg/L	100	0.022	0.100	EPA 200.8	TNA 07/10/19
Arsenic (As)	0.022	mg/L	10	0.000385	0.005	EPA 200.8	TNA 07/10/19
Barium (Ba)	0.048	mg/L	10	0.000147	0.005	EPA 200.8	TNA 07/10/19
Cadmium (Cd)	< 0.001	mg/L	10	0.000177	0.001	EPA 200.8	TNA 07/10/19
Chromium (Cr)	0.002	mg/L	10	0.000052	0.001	EPA 200.8 DRC	TNA 07/10/19
Cobalt (Co)	< 0.001	mg/L	10	0.000033	0.001	EPA 200.8	TNA 07/10/19
Copper (Cu)	< 0.005	mg/L	10	0.00039	0.005	EPA 200.8	TNA 07/10/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 07/11/19
Iron (Fe)	1.18	mg/L	10	0.000506	0.050	EPA 200.8	TNA 07/10/19
Lead (Pb)	0.002	mg/L	10	0.000101	0.001	EPA 200.8	TNA 07/10/19
Manganese (Mn)	0.027	mg/L	10	0.000089	0.001	EPA 200.8	TNA 07/10/19
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS 07/09/19
Molybdenum (Mo)	0.002	mg/L	10	0.000075	0.001	EPA 200.8	TNA 07/10/19
Nickel (Ni)	< 0.005	mg/L	10	0.000087	0.005	EPA 200.8	TNA 07/10/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA 07/10/19
Silicon (Si)	16.3	mg/L	1	0.117	1.00	SM 3111 D	TMS 07/10/19
Silver (Ag)	< 0.001	mg/L	10	0.000096	0.001	EPA 200.8	TNA 07/10/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA 07/10/19
Anion - Cation Balance							
Anions	2.45	meq/L	1			Calculation	EJF 07/15/19
Anion - Cation Balance	0.268	%	1			Calculation	EJF 07/15/19
Cations	2.47	meq/L	1			Calculation	EJF 07/15/19
Field Test							
Field Conductivity	260	µmhos/cm	1			Field Conductivity	BLL 07/08/19
Field Total Depth	290	ft	1			Field Total Depth	BLL 07/08/19
Field ORP	198	mV	1			Field ORP	BLL 07/08/19
Field Oxygen (O2)	7.94	mg/L	1			Field Oxygen	BLL 07/08/19
Field pH	8.14	S.U.	1			Field pH	BLL 07/08/19
Field Temperature	7.00	° C	1			Field Temp.	BLL 07/08/19

Report Approved By:

Eric Fuehrer

Report Approved On: 7/15/2019 10:09:08 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 08/16/19 at 03:15 PM by Darnell Witte / Steve Podall
Sample Matrix: Water

Lab ID#: 20190820308
Received: 08/19/19 at 11:15 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	246	µmhos/cm	1	0.237	5.00	SM 2510B	SAA	08/21/19
pH	8.08	S.U.	1			SM 4500-H+ B	JAM	08/21/19
Total Dissolved Solids	146	mg/L	100ml	21.0	50.0	SM 2540 C	TMN	08/20/19
Non-Metallics								
Acidity (CaCO3)	< 10.0	mg/L	1	3.36	10.0	SM 2310 B	TNA	08/26/19
Alkalinity (CaCO3)	112	mg/L	1	0.236	10.0	SM 2320 B	JAM	08/21/19
Bicarbonate	136	mg/L	1	0.288	10.0	SM 2320 B	JAM	08/21/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	08/23/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	08/23/19
Fluoride	0.549	mg/L	1	0.013	0.050	SM 4500 F-C	KDS	08/21/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	TMS	08/21/19
Nitrogen, Nitrate (NO3)	1.17	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL	08/20/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL	08/20/19
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL	08/20/19
Metals - Dissolved								
Arsenic (As)	0.024	mg/L	10	0.000385	0.005	EPA 200.8	TNA	08/20/19
Barium (Ba)	0.034	mg/L	10	0.000147	0.005	EPA 200.8	TNA	08/20/19
Cadmium (Cd)	< 0.001	mg/L	10	0.000177	0.001	EPA 200.8	TNA	08/20/19
Calcium (Ca)	25.1	mg/L	1	0.040	1.00	SM 3111 B	TMS	08/20/19
Chromium (Cr)	< 0.001	mg/L	10	0.000052	0.001	EPA 200.8 DRC	TNA	08/20/19
Copper (Cu)	< 0.005	mg/L	10	0.00039	0.005	EPA 200.8	TNA	08/20/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	08/20/19
Lead (Pb)	< 0.001	mg/L	10	0.000101	0.001	EPA 200.8	TNA	08/20/19
Magnesium (Mg)	10.2	mg/L	1	0.026	0.500	SM 3111 B	TMS	08/20/19
Potassium (K)	1.10	mg/L	1	0.012	0.500	SM 3111 B	TMS	08/20/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA	08/20/19
Silver (Ag)	< 0.001	mg/L	10	0.000096	0.001	EPA 200.8	TNA	08/20/19
Sodium (Na)	10.7	mg/L	1	0.124	0.500	SM 3111 B	TMS	08/20/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA	08/20/19
Metals - Total								
Arsenic (As)	0.025	mg/L	10	0.000385	0.005	EPA 200.8	TNA	08/20/19
Barium (Ba)	0.040	mg/L	10	0.000147	0.005	EPA 200.8	TNA	08/20/19

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Metals - Total								
Cadmium (Cd)	< 0.001	mg/L	10	0.000177	0.001	EPA 200.8	TNA	08/20/19
Chromium (Cr)	< 0.001	mg/L	10	0.000052	0.001	EPA 200.8 DRC	TNA	08/20/19
Copper (Cu)	< 0.005	mg/L	10	0.00039	0.005	EPA 200.8	TNA	08/20/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	08/20/19
Lead (Pb)	< 0.001	mg/L	10	0.000101	0.001	EPA 200.8	TNA	08/20/19
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS	08/20/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA	08/20/19
Silver (Ag)	< 0.001	mg/L	10	0.000096	0.001	EPA 200.8	TNA	08/20/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA	08/20/19
Field Test								
Field Conductivity	250	µmhos/cm	1			Field Conductivity	BLL	08/19/19
Field Total Depth	290	ft	1			Field Total Depth	BLL	08/19/19
Field ORP	113	mV	1			Field ORP	BLL	08/19/19
Field Oxygen (O2)	8.18	mg/L	1			Field Oxygen	BLL	08/19/19
Field pH	8.14	S.U.	1			Field pH	BLL	08/19/19
Field Temperature	7.10	° C	1			Field Temp.	BLL	08/19/19

Report Approved By:

Report Approved On: 8/27/2019 8:11:48 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 09/14/19 at 02:30 PM
Sample Matrix: Water

Lab ID#: 20190917110
Received: 09/16/19 at 11:40 AM
by Tasha Swanson
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	244	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 09/18/19
pH	8.11	S.U.	1			SM 4500-H+ B	JAM 09/18/19
Total Dissolved Solids	113	mg/L	100ml	21.0	50.0	SM 2540 C	TMN 09/17/19
Non-Metallics							
Acidity (CaCO3)	< 10.0	mg/L	1	3.36	10.0	SM 2310 B	TNA 09/19/19
Alkalinity (CaCO3)	109	mg/L	1	0.236	10.0	SM 2320 B	JAM 09/18/19
Bicarbonate	133	mg/L	1	0.288	10.0	SM 2320 B	JAM 09/18/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 09/17/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 09/17/19
Fluoride	0.559	mg/L	1	0.013	0.050	SM 4500 F-C	KDS 09/16/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM 09/17/19
Nitrogen, Nitrate (NO3)	1.21	mg/L	1	0.009	0.050	SM 4500-NO3 F	GRT 09/17/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	GRT 09/17/19
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	GRT 09/17/19
Metals - Dissolved							
Arsenic (As)	0.024	mg/L	10	0.000385	0.005	EPA 200.8	TNA 09/17/19
Barium (Ba)	0.033	mg/L	10	0.000147	0.005	EPA 200.8	TNA 09/17/19
Cadmium (Cd)	< 0.001	mg/L	10	0.000177	0.001	EPA 200.8	TNA 09/17/19
Calcium (Ca)	23.3	mg/L	1	0.040	1.00	SM 3111 B	TMS 09/17/19
Chromium (Cr)	< 0.001	mg/L	10	0.000052	0.001	EPA 200.8 DRC	TNA 09/17/19
Copper (Cu)	< 0.005	mg/L	10	0.00039	0.005	EPA 200.8	TNA 09/17/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 09/18/19
Lead (Pb)	< 0.001	mg/L	10	0.000101	0.001	EPA 200.8	TNA 09/17/19
Magnesium (Mg)	10.9	mg/L	1	0.026	0.500	SM 3111 B	TMS 09/17/19
Potassium (K)	0.980	mg/L	1	0.012	0.500	SM 3111 B	TMS 09/17/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA 09/17/19
Silver (Ag)	< 0.001	mg/L	10	0.000096	0.001	EPA 200.8	TNA 09/17/19
Sodium (Na)	10.8	mg/L	1	0.124	0.500	SM 3111 B	TMS 09/17/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA 09/17/19
Metals - Total							
Arsenic (As)	0.024	mg/L	10	0.000385	0.005	EPA 200.8	TNA 09/18/19
Barium (Ba)	0.034	mg/L	10	0.000147	0.005	EPA 200.8	TNA 09/18/19

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Metals - Total								
Cadmium (Cd)	< 0.001	mg/L	10	0.000177	0.001	EPA 200.8	TNA	09/18/19
Chromium (Cr)	< 0.001	mg/L	10	0.000052	0.001	EPA 200.8 DRC	TNA	09/18/19
Copper (Cu)	< 0.005	mg/L	10	0.00039	0.005	EPA 200.8	TNA	09/18/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	09/18/19
Lead (Pb)	< 0.001	mg/L	10	0.000101	0.001	EPA 200.8	TNA	09/18/19
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS	09/18/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA	09/18/19
Silver (Ag)	< 0.001	mg/L	10	0.000096	0.001	EPA 200.8	TNA	09/18/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA	09/18/19
Field Test								
Field Conductivity	240	µmhos/cm	1			Field Conductivity	JMH	09/16/19
Field Total Depth	290	ft	1			Field Total Depth	JMH	09/16/19
Field ORP	148	mV	1			Field ORP	JMH	09/16/19
Field Oxygen (O2)	6.85	mg/L	1			Field Oxygen	JMH	09/16/19
Field pH	7.95	S.U.	1			Field pH	JMH	09/16/19
Field Temperature	7.10	° C	1			Field Temp.	JMH	09/16/19

Report Approved By:

Report Approved On: 9/20/2019 9:41:28 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 10/06/19 at 03:55 PM by Steve P, Brett S
Sample Matrix: Water

Lab ID#: 20191010107
Received: 10/08/19 at 03:20 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	241	µmhos/cm	1	0.237	5.00	SM 2510B	JAM	10/10/19
pH	7.97	S.U.	1			SM 4500-H+ B	JAM	10/10/19
Total Dissolved Solids	65.0	mg/L	100ml	21.0	50.0	SM 2540 C	TMN	10/10/19
Non-Metallics								
Acidity (CaCO3)	< 10.0	mg/L	1	3.36	10.0	SM 2310 B	TNA	10/10/19
Alkalinity (CaCO3)	108	mg/L	1	0.236	10.0	SM 2320 B	JAM	10/10/19
Bicarbonate	132	mg/L	1	0.288	10.0	SM 2320 B	JAM	10/10/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	10/11/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	10/11/19
Fluoride	0.524	mg/L	1	0.013	0.050	SM 4500 F-C	KDS	10/11/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM	10/11/19
Nitrogen, Nitrate (NO3)	1.12	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL	10/10/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL	10/10/19
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL	10/10/19
Metals - Dissolved								
Arsenic (As)	0.023	mg/L	10	0.000385	0.005	EPA 200.8	TNA	10/10/19
Barium (Ba)	0.033	mg/L	10	0.000147	0.005	EPA 200.8	TNA	10/10/19
Cadmium (Cd)	< 0.001	mg/L	10	0.000177	0.001	EPA 200.8	TNA	10/10/19
Calcium (Ca)	21.9	mg/L	1	0.040	1.00	SM 3111 B	TMS	10/10/19
Chromium (Cr)	< 0.001	mg/L	10	0.000052	0.001	EPA 200.8 DRC	TNA	10/10/19
Copper (Cu)	< 0.005	mg/L	10	0.00039	0.005	EPA 200.8	TNA	10/10/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	10/10/19
Lead (Pb)	< 0.001	mg/L	10	0.000101	0.001	EPA 200.8	TNA	10/10/19
Magnesium (Mg)	10.0	mg/L	1	0.026	0.500	SM 3111 B	TMS	10/10/19
Potassium (K)	0.760	mg/L	1	0.012	0.500	SM 3111 B	TMS	10/10/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA	10/10/19
Silver (Ag)	< 0.001	mg/L	10	0.000096	0.001	EPA 200.8	TNA	10/10/19
Sodium (Na)	10.7	mg/L	1	0.124	0.500	SM 3111 B	TMS	10/10/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA	10/10/19
Metals - Total								
Arsenic (As)	0.023	mg/L	10	0.000385	0.005	EPA 200.8	TNA	10/10/19
Barium (Ba)	0.035	mg/L	10	0.000147	0.005	EPA 200.8	TNA	10/10/19

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Metals - Total							
Cadmium (Cd)	< 0.001	mg/L	10	0.000177	0.001	EPA 200.8	TNA 10/10/19
Copper (Cu)	< 0.005	mg/L	10	0.00039	0.005	EPA 200.8	TNA 10/10/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 10/10/19
Lead (Pb)	< 0.001	mg/L	10	0.000101	0.001	EPA 200.8	TNA 10/10/19
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS 10/10/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA 10/10/19
Silver (Ag)	< 0.001	mg/L	10	0.000096	0.001	EPA 200.8	TNA 10/10/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA 10/10/19
Field Test							
Field Conductivity	240	µmhos/cm	1			Field Conductivity	BLL 10/09/19
Field Total Depth	290	ft	1			Field Total Depth	BLL 10/09/19
Field ORP	- 12.0	mV	1			Field ORP	BLL 10/09/19
Field Oxygen (O2)	7.82	mg/L	1			Field Oxygen	BLL 10/09/19
Field pH	8.13	S.U.	1			Field pH	BLL 10/09/19
Field Temperature	6.80	° C	1			Field Temp.	BLL 10/09/19

Report Approved By:

Report Approved On: 10/15/2019 10:06:09 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 11/23/19 at 03:10 PM by Brett S
Sample Matrix: Water

Lab ID#: 20191127207
Received: 11/26/19 at 12:43 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	255	µmhos/cm	1	0.237	5.00	SM 2510B	JAM	11/27/19
pH	8.01	S.U.	1			SM 4500-H+ B	JAM	11/27/19
Total Dissolved Solids	67.0	mg/L	100ml	21.0	50.0	SM 2540 C	TMN	11/27/19
Non-Metallics								
Bicarbonate	135	mg/L	1	0.288	10.0	SM 2320 B	JAM	11/27/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	12/02/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	12/02/19
Fluoride	0.495	mg/L	1	0.013	0.050	SM 4500 F-C	SAA	12/02/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	TMS	11/27/19
Nitrogen, Nitrate (NO3)	1.32	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL	11/27/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL	11/27/19
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL	11/27/19
Metals - Dissolved								
Arsenic (As)	0.025	mg/L	10	0.000385	0.005	EPA 200.8	TNA	11/29/19
Barium (Ba)	0.033	mg/L	10	0.000147	0.005	EPA 200.8	TNA	11/29/19
Cadmium (Cd)	< 0.001	mg/L	10	0.000177	0.001	EPA 200.8	TNA	11/29/19
Calcium (Ca)	21.5	mg/L	1	0.040	1.00	SM 3111 B	TMS	11/27/19
Chromium (Cr)	< 0.001	mg/L	10	0.000052	0.001	EPA 200.8 DRC	TNA	11/29/19
Copper (Cu)	< 0.005	mg/L	10	0.00039	0.005	EPA 200.8	TNA	11/29/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	11/29/19
Lead (Pb)	< 0.001	mg/L	10	0.000101	0.001	EPA 200.8	TNA	11/29/19
Magnesium (Mg)	11.2	mg/L	1	0.026	0.500	SM 3111 B	TMS	11/27/19
Potassium (K)	1.05	mg/L	1	0.012	0.500	SM 3111 B	TMS	11/27/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA	11/29/19
Silver (Ag)	< 0.001	mg/L	10	0.000096	0.001	EPA 200.8	TNA	11/29/19
Sodium (Na)	10.7	mg/L	1	0.124	0.500	SM 3111 B	TMS	11/27/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA	11/29/19
Metals - Total								
Arsenic (As)	0.025	mg/L	10	0.000385	0.005	EPA 200.8	TNA	11/29/19
Barium (Ba)	0.039	mg/L	10	0.000147	0.005	EPA 200.8	TNA	11/29/19
Cadmium (Cd)	< 0.001	mg/L	10	0.000177	0.001	EPA 200.8	TNA	11/29/19
Chromium (Cr)	0.001	mg/L	10	0.000052	0.001	EPA 200.8 DRC	TNA	11/29/19

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Metals - Total								
Copper (Cu)	< 0.005	mg/L	10	0.00039	0.005	EPA 200.8	TNA	11/29/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	11/29/19
Lead (Pb)	< 0.001	mg/L	10	0.000101	0.001	EPA 200.8	TNA	11/29/19
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS	11/27/19
Selenium (Se)	< 0.005	mg/L	10	0.000735	0.005	EPA 200.8	TNA	11/29/19
Silver (Ag)	< 0.001	mg/L	10	0.000096	0.001	EPA 200.8	TNA	11/29/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA	11/29/19
Field Test								
Field Conductivity	230	µmhos/cm	1			Field Conductivity	BLL	11/26/19
Field Total Depth	290	ft	1			Field Total Depth	BLL	11/26/19
Field ORP	- 18.0	mV	1			Field ORP	BLL	11/26/19
Field Oxygen (O2)	6.69	mg/L	1			Field Oxygen	BLL	11/26/19
Field pH	8.05	S.U.	1			Field pH	BLL	11/26/19
Field Temperature	6.80	° C	1			Field Temp.	BLL	11/26/19

Report Approved By:

Report Approved On: 12/4/2019 8:48:07 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 12/21/19 at 12:00 PM by Brett S
Sample Matrix: Water

Lab ID#: 20191224108
Received: 12/23/19 at 11:55 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	255	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 12/24/19
pH	8.07	S.U.	1			SM 4500-H+ B	JAM 12/24/19
Total Dissolved Solids	139	mg/L	100ml	21.0	50.0	SM 2540 C	SAA 12/24/19
Non-Metallics							
Acidity (CaCO3)	< 10.0	mg/L	1	3.36	10.0	SM 2310 B	TNA 12/24/19
Alkalinity (CaCO3)	109	mg/L	1	0.236	10.0	SM 2320 B	JAM 12/30/19
Bicarbonate	133	mg/L	1	0.288	10.0	SM 2320 B	JAM 12/30/19
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 12/31/19
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 12/31/19
Fluoride	0.510	mg/L	1	0.013	0.050	SM 4500 F-C	SAA 12/26/19
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM 12/27/19
Nitrogen, Nitrate (NO3)	1.32	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 12/24/19
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 12/24/19
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL 12/24/19
Metals - Dissolved							
Arsenic (As)	0.026	mg/L	10	0.00073	0.005	EPA 200.8	TNA 12/30/19
Barium (Ba)	0.035	mg/L	10	0.000249	0.005	EPA 200.8	TNA 12/30/19
Cadmium (Cd)	< 0.001	mg/L	10	0.00019	0.001	EPA 200.8	TNA 12/30/19
Calcium (Ca)	21.9	mg/L	1	0.040	1.00	SM 3111 B	TMS 12/24/19
Chromium (Cr)	< 0.001	mg/L	10	0.000082	0.001	EPA 200.8 DRC	TNA 12/30/19
Copper (Cu)	< 0.005	mg/L	10	0.00011	0.005	EPA 200.8	TNA 12/30/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 12/24/19
Lead (Pb)	< 0.001	mg/L	10	0.000101	0.001	EPA 200.8	TNA 12/30/19
Magnesium (Mg)	11.4	mg/L	1	0.026	0.500	SM 3111 B	TMS 12/24/19
Potassium (K)	1.11	mg/L	1	0.012	0.500	SM 3111 B	TMS 12/24/19
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 12/30/19
Silver (Ag)	< 0.001	mg/L	10	0.000139	0.001	EPA 200.8	TNA 12/30/19
Sodium (Na)	10.6	mg/L	1	0.124	0.500	SM 3111 B	TMS 12/24/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA 12/30/19
Metals - Total							
Arsenic (As)	0.027	mg/L	10	0.00073	0.005	EPA 200.8	TNA 12/30/19
Barium (Ba)	0.039	mg/L	10	0.000249	0.005	EPA 200.8	TNA 12/30/19

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Metals - Total								
Cadmium (Cd)	< 0.001	mg/L	10	0.00019	0.001	EPA 200.8	TNA	12/30/19
Chromium (Cr)	0.001	mg/L	10	0.000082	0.001	EPA 200.8 DRC	TNA	12/30/19
Copper (Cu)	< 0.005	mg/L	10	0.00011	0.005	EPA 200.8	TNA	12/30/19
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	12/24/19
Lead (Pb)	< 0.001	mg/L	10	0.000101	0.001	EPA 200.8	TNA	12/30/19
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS	12/24/19
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA	12/30/19
Silver (Ag)	< 0.001	mg/L	10	0.000139	0.001	EPA 200.8	TNA	12/30/19
Zinc (Zn)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	TNA	12/30/19
Field Test								
Field Conductivity	250	µmhos/cm	1			Field Conductivity	BLL	12/23/19
Field Total Depth	290	ft	1			Field Total Depth	BLL	12/23/19
Field ORP	10.0	mV	1			Field ORP	BLL	12/23/19
Field Oxygen (O2)	6.58	mg/L	1			Field Oxygen	BLL	12/23/19
Field pH	7.95	S.U.	1			Field pH	BLL	12/23/19
Field Temperature	6.80	° C	1			Field Temp.	BLL	12/23/19

Report Approved By:

Report Approved On: 12/31/2019 12:44:56 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 01/12/20 at 02:30 PM
by Justin T, Darnell W, Brett S
Sample Matrix: Water

Lab ID#: 20200114213
Received: 01/13/20 at 12:10 PM
by System Account
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	253	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 01/14/20
pH	8.03	S.U.	1			SM 4500-H+ B	JAM 01/15/20
Total Dissolved Solids	119	mg/L	100ml	21.0	50.0	SM 2540 C	TMN 01/14/20
Non-Metallics							
Bicarbonate	135	mg/L	1	0.288	10.0	SM 2320 B	JAM 01/15/20
Cyanide, Total	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN 01/14/20
Cyanide, WAD	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN 01/14/20
Fluoride	0.501	mg/L	1	0.013	0.050	SM 4500 F-C	SAA 01/15/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	TMS 01/14/20
Nitrogen, Nitrate (NO3)	1.24	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 01/15/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 01/14/20
Sulfate (SO4)	< 10.0	mg/L	1	0.297	1.00	SM 4500-SO4 E	BLL 01/14/20
Metals - Dissolved							
Arsenic (As)	0.027	mg/L	10	0.00073	0.005	EPA 200.8	TNA 01/14/20
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 01/14/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 01/14/20
Sodium (Na)	10.3	mg/L	1	0.124	0.500	SM 3111 B	TMS 01/14/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00003	0.0002	EPA 245.1	TMS 01/14/20
Field Test							
Field Conductivity	250	µmhos/cm	1			Field Conductivity	BLL 01/14/20
Field Total Depth	290	ft	1			Field Total Depth	BLL 01/14/20
Field ORP	116	mV	1			Field ORP	BLL 01/14/20
Field Oxygen (O2)	6.91	mg/L	1			Field Oxygen	BLL 01/14/20
Field pH	8.04	S.U.	1			Field pH	BLL 01/14/20
Field Temperature	6.80	° C	1			Field Temp.	BLL 01/14/20

Report Approved By:

Report Approved On: 1/16/2020 3:01:28 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 04/10/20 at 03:25 PM by S Podall, J Thorp, B Sheeder
Sample Matrix: Water

Lab ID#: 20200415114
Received: 04/14/20 at 12:40 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	255	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 04/15/20
pH	8.06	S.U.	1			SM 4500-H+ B	JAM 04/15/20
Total Dissolved Solids	135	mg/L	100ml	14.7	50.0	SM 2540 C	TMN 04/16/20
Non-Metallics							
Bicarbonate	136	mg/L	1	0.288	10.0	SM 2320 B	JAM 04/15/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 04/16/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 04/16/20
Fluoride	0.463	mg/L	1	0.010	0.015	SM 4500 F-C	SAA 04/15/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM 04/16/20
Nitrogen, Nitrate (NO3)	1.31	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 04/15/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 04/15/20
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 04/15/20
Metals - Dissolved							
Arsenic (As)	0.027	mg/L	10	0.00073	0.005	EPA 200.8	TNA 04/15/20
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 04/15/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 04/15/20
Sodium (Na)	10.6	mg/L	1	0.137	0.500	SM 3111 B	TMS 04/15/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 04/15/20
Field Test							
Field Conductivity	270	µmhos/cm	1			Field Conductivity	BLL 04/14/20
Field Flow Rate	4.62	gal/min	1			Field Flow	BLL 04/14/20
Field ORP	263	mV	1			Field ORP	BLL 04/14/20
Field Oxygen (O2)	4.62	mg/L	1			Field Oxygen	BLL 04/14/20
Field pH	7.43	S.U.	1			Field pH	BLL 04/14/20
Field Temperature	6.20	° C	1			Field Temp.	BLL 04/14/20

Report Approved By:

Report Approved On: 4/17/2020 10:02:21 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 05/01/20 at 01:45 PM by Darnell Witte
Sample Matrix: Water

Lab ID#: 20200505304
Received: 05/04/20 at 03:10 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	248	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 05/05/20
pH	7.76	S.U.	1			SM 4500-H+ B	JAM 05/05/20
Total Dissolved Solids	133	mg/L	100ml	14.7	50.0	SM 2540 C	TMN 05/05/20
Non-Metallics							
Bicarbonate	134	mg/L	1	0.288	10.0	SM 2320 B	JAM 05/05/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 05/05/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 05/05/20
Fluoride	0.457	mg/L	1	0.010	0.015	SM 4500 F-C	SAA 05/05/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NH3 D	JAM 05/07/20
Nitrogen, Nitrate (NO3)	1.26	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 05/05/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 05/05/20
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 05/05/20
Metals - Dissolved							
Arsenic (As)	0.028	mg/L	10	0.00073	0.005	EPA 200.8	TNA 05/05/20
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 05/06/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 05/05/20
Sodium (Na)	10.1	mg/L	1	0.137	0.500	SM 3111 B	TMS 05/05/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 05/05/20
Field Test							
Field Conductivity	260	µmhos/cm	1			Field Conductivity	BLL 05/04/20
Field Total Depth	290	ft	1			Field Total Depth	BLL 05/04/20
Field ORP	59.0	mV	1			Field ORP	BLL 05/04/20
Field Oxygen (O2)	7.43	mg/L	1			Field Oxygen	BLL 05/04/20
Field pH	8.00	S.U.	1			Field pH	BLL 05/04/20
Field Temperature	6.90	° C	1			Field Temp.	BLL 05/04/20

Report Approved By:

Report Approved On: 5/8/2020 12:50:17 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 08/15/20 at 11:30 AM
by Darnell Witte, Steve Podall
Sample Matrix: Water

Lab ID#: 20200818309
Received: 08/17/20 at 12:30 PM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	250	µmhos/cm	1	0.237	5.00	SM 2510B	JAM 08/19/20
pH	8.16	S.U.	1			SM 4500-H+ B	JAM 08/19/20
Total Dissolved Solids	94.0	mg/L	100ml	14.7	50.0	SM 2540 C	JNG 08/17/20
Non-Metallics							
Bicarbonate	135	mg/L	1	0.276	10.0	SM 2320 B	JAM 08/19/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 08/17/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 08/17/20
Fluoride	0.478	mg/L	1	0.010	0.015	SM 4500 F-C	SAA 08/17/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	TMS 08/18/20
Nitrogen, Nitrate (NO3)	1.22	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 08/18/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 08/18/20
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 08/18/20
Metals - Dissolved							
Arsenic (As)	0.029	mg/L	10	0.00073	0.005	EPA 200.8	TNA 08/18/20
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 08/18/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 08/18/20
Sodium (Na)	9.85	mg/L	1	0.137	0.500	SM 3111 B	TMS 08/18/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 08/18/20
Field Test							
Field Conductivity	230	µmhos/cm	1			Field Conductivity	BLL 08/17/20
Field Total Depth	290	ft	1			Field Total Depth	BLL 08/17/20
Field ORP	162	mV	1			Field ORP	BLL 08/17/20
Field Oxygen (O2)	7.56	mg/L	1			Field Oxygen	BLL 08/17/20
Field pH	8.06	S.U.	1			Field pH	BLL 08/17/20
Field Temperature	7.30	° C	1			Field Temp.	BLL 08/17/20

Report Approved By:

Report Approved On: 8/20/2020 12:20:15 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 12/04/20 at 01:25 PM by Justin Thorp
Sample Matrix: Water

Lab ID#: 20201210105
Received: 12/09/20 at 12:30 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	242	µmhos/cm	1	0.153	5.00	SM 2510B	JAM 12/09/20
pH	8.10	S.U.	1			SM 4500-H+ B	JAM 12/11/20
Total Dissolved Solids	128	mg/L	100ml	14.7	50.0	SM 2540 C	TMN 12/10/20
Non-Metallics							
Bicarbonate	133	mg/L	1	0.276	10.0	SM 2320 B	JAM 12/11/20
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 12/10/20
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 12/10/20
Fluoride	0.423	mg/L	1	0.010	0.015	SM 4500 F-C	TMN 12/10/20
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 12/10/20
Nitrogen, Nitrate (NO3)	1.17	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 12/10/20
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 12/10/20
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 12/10/20
Metals - Dissolved							
Arsenic (As)	0.027	mg/L	10	0.00073	0.005	EPA 200.8	TNA 12/10/20
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 12/10/20
Selenium (Se)	< 0.005	mg/L	10	0.000845	0.005	EPA 200.8	TNA 12/10/20
Sodium (Na)	10.8	mg/L	1	0.137	0.500	SM 3111 B	TMS 12/10/20
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 12/10/20
Field Test							
Field Conductivity	240	µmhos/cm	1			Field Conductivity	BLL 12/09/20
Field Total Depth	290	ft	1			Field Total Depth	BLL 12/09/20
Field ORP	50.0	mV	1			Field ORP	BLL 12/09/20
Field Oxygen (O2)	7.30	mg/L	1			Field Oxygen	BLL 12/09/20
Field pH	8.07	S.U.	1			Field pH	BLL 12/09/20
Field Temperature	7.20	° C	1			Field Temp.	BLL 12/09/20

Report Approved By:

Report Approved On: 12/14/2020 12:05:53 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 01/26/21 at 11:15 AM by Brett Sheeder
Sample Matrix: Water

Lab ID#: 20210128106
Received: 01/27/21 at 12:15 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	248	µmhos/cm	1	0.153	5.00	SM 2510B	JNG	01/28/21
pH	8.10	S.U.	1			SM 4500-H+ B	JAM	01/29/21
Total Dissolved Solids	113	mg/L	100ml	14.7	50.0	SM 2540 C	JNG	01/28/21
Non-Metallics								
Bicarbonate	136	mg/L	1	0.276	10.0	SM 2320 B	JAM	01/29/21
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN	01/28/21
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN	01/28/21
Fluoride	0.426	mg/L	1	0.010	0.015	SM 4500 F-C	SAA	01/28/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	TMS	01/28/21
Nitrogen, Nitrate (NO3)	1.21	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL	01/28/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	01/28/21
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL	01/28/21
Metals - Dissolved								
Arsenic (As)	0.027	mg/L	10	0.00061	0.005	EPA 200.8	TNA	01/28/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	02/01/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	01/28/21
Sodium (Na)	10.3	mg/L	1	0.137	0.500	SM 3111 B	TMS	01/28/21
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS	01/28/21
Field Test								
Field Conductivity	250	µmhos/cm	1			Field Conductivity	BLL	01/27/21
Field Total Depth	290	ft	1			Field Total Depth	BLL	01/27/21
Field ORP	160	mV	1			Field ORP	BLL	01/27/21
Field Oxygen (O2)	6.97	mg/L	1			Field Oxygen	BLL	01/27/21
Field pH	8.09	S.U.	1			Field pH	BLL	01/27/21
Field Temperature	7.20	° C	1			Field Temp.	BLL	01/27/21

Report Approved By:

Report Approved On: 2/4/2021 11:30:43 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 02/02/21 at 01:30 PM by Steve Podall
Sample Matrix: Water

Lab ID#: 20210205108
Received: 02/04/21 at 10:50 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	250	µmhos/cm	1	0.153	5.00	SM 2510B	JAM 02/05/21
pH	8.05	S.U.	1			SM 4500-H+ B	JAM 02/04/21
Total Dissolved Solids	128	mg/L	100ml	14.7	50.0	SM 2540 C	JNG 02/05/21
Non-Metallics							
Bicarbonate	132	mg/L	1	0.276	10.0	SM 2320 B	JAM 02/04/21
Cyanide, Total	< 0.010	mg/L	1	0.00052	0.010	Kelada 01	TMN 02/05/21
Cyanide, WAD	< 0.010	mg/L	1	0.00032	0.010	Kelada 01	TMN 02/05/21
Fluoride	0.467	mg/L	1	0.010	0.015	SM 4500 F-C	AAS 02/04/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM 02/05/21
Nitrogen, Nitrate (NO3)	1.22	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL 02/05/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 02/05/21
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL 02/05/21
Metals - Dissolved							
Arsenic (As)	0.027	mg/L	10	0.00061	0.005	EPA 200.8	TNA 02/05/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 02/05/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA 02/05/21
Sodium (Na)	9.79	mg/L	1	0.137	0.500	SM 3111 B	TMS 02/05/21
Metals - Total							
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 02/05/21
Field Test							
Field Conductivity	250	µmhos/cm	1			Field Conductivity	BLL 02/05/21
Field Total Depth	300	ft	1			Field Total Depth	BLL 02/05/21
Field ORP	54.0	mV	1			Field ORP	BLL 02/05/21
Field Oxygen (O2)	7.25	mg/L	1			Field Oxygen	BLL 02/05/21
Field pH	8.06	S.U.	1			Field pH	BLL 02/05/21
Field Temperature	7.20	° C	1			Field Temp.	BLL 02/05/21

Report Approved By:

Report Approved On: 2/8/2021 2:42:18 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 03/12/21 at 03:10 PM by B Sheeder, D Witte
Sample Matrix: Water

Lab ID#: 20210317202
Received: 03/16/21 at 03:35 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	250	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	03/17/21
pH	8.22	S.U.	1			SM 4500-H+ B	JAM	03/17/21
Total Dissolved Solids	130	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	03/17/21
Non-Metallics								
Bicarbonate	133	mg/L	1	0.276	10.0	SM 2320 B	JAM	03/18/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	03/17/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	03/17/21
Fluoride	0.382	mg/L	1	0.008	0.015	SM 4500 F-C	TMN	03/17/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.003	0.050	SM 4500-NH3 D	JAM	03/17/21
Nitrogen, Nitrate (NO3)	1.24	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL	03/17/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	03/17/21
Sulfate (SO4)	< 10.0	mg/L	1	0.508	10.0	SM 4500-SO4 E	BLL	03/17/21
Metals - Dissolved								
Arsenic (As)	0.027	mg/L	10	0.00061	0.005	EPA 200.8	TNA	03/17/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	03/17/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	03/17/21
Sodium (Na)	9.62	mg/L	1	0.020	0.500	SM 3111 B	TMS	03/17/21
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS	03/17/21
Field Test								
Field Conductivity	250	µmhos/cm	1			Field Conductivity	BLL	03/16/21
Field Total Depth	300	ft	1			Field Total Depth	BLL	03/16/21
Field ORP	137	mV	1			Field ORP	BLL	03/16/21
Field Oxygen (O2)	6.98	mg/L	1			Field Oxygen	BLL	03/16/21
Field pH	8.24	S.U.	1			Field pH	BLL	03/16/21
Field Temperature	7.10	° C	1			Field Temp.	BLL	03/16/21

Report Approved By:

Report Approved On: 3/22/2021 11:32:30 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 04/03/21 at 02:10 PM by LYNN BLACKMAN
Sample Matrix: Water

Lab ID#: 20210406202
Received: 04/05/21 at 12:30 PM by Eric Fuehrer
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	251	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	04/07/21
pH	8.15	S.U.	1			SM 4500-H+ B	JAM	04/07/21
Total Dissolved Solids	140	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	04/06/21
Non-Metallics								
Bicarbonate	134	mg/L	1	0.276	10.0	SM 2320 B	JAM	04/07/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	04/06/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	04/06/21
Fluoride	0.440	mg/L	1	0.008	0.015	SM 4500 F-C	SAA	04/05/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.002	0.050	SM 4500-NH3 D	TMS	04/08/21
Nitrogen, Nitrate (NO3)	1.22	mg/L	1	0.008	0.050	SM 4500-NO3 F	GRT	04/06/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	GRT	04/06/21
Sulfate (SO4)	< 10.0	mg/L	1	0.483	10.0	SM 4500-SO4 E	BLL	04/07/21
Metals - Dissolved								
Arsenic (As)	0.028	mg/L	10	0.00061	0.005	EPA 200.8	TNA	04/06/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	04/06/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	04/06/21
Sodium (Na)	10.1	mg/L	1	0.020	0.500	SM 3111 B	TMS	04/06/21
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS	04/06/21
Field Test								
Field Conductivity	240	µmhos/cm	1			Field Conductivity	BLL	04/07/21
Field Total Depth	290	ft	1			Field Total Depth	BLL	04/07/21
Field ORP	57.0	mV	1			Field ORP	BLL	04/07/21
Field Oxygen (O2)	6.85	mg/L	1			Field Oxygen	BLL	04/07/21
Field pH	7.99	S.U.	1			Field pH	BLL	04/07/21
Field Temperature	7.20	° C	1			Field Temp.	BLL	04/07/21

Report Approved By:

Report Approved On: 4/9/2021 11:25:29 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 05/08/21 at 02:10 PM by Brett Sheeder
Sample Matrix: Water

Lab ID#: 20210512110
Received: 05/10/21 at 12:35 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	243	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	05/12/21
pH	8.22	S.U.	1			SM 4500-H+ B	JAM	05/13/21
Total Dissolved Solids	141	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	05/12/21
Non-Metallics								
Bicarbonate	133	mg/L	1	0.276	10.0	SM 2320 B	JAM	05/13/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	05/11/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	05/12/21
Fluoride	0.421	mg/L	1	0.008	0.015	SM 4500 F-C	TMN	05/13/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NH3 D	TMS	05/13/21
Nitrogen, Nitrate (NO3)	1.17	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	05/12/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	05/12/21
Sulfate (SO4)	< 10.0	mg/L	1	0.483	10.0	SM 4500-SO4 E	BLL	05/12/21
Metals - Dissolved								
Arsenic (As)	0.026	mg/L	10	0.00061	0.005	EPA 200.8	TNA	05/12/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	05/12/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	05/12/21
Sodium (Na)	10.1	mg/L	1	0.020	0.500	SM 3111 B	TMS	05/12/21
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS	05/12/21
Field Test								
Field Conductivity	250	µmhos/cm	1			Field Conductivity	BLL	05/11/21
Field Total Depth	290	ft	1			Field Total Depth	BLL	05/11/21
Field ORP	277	mV	1			Field ORP	BLL	05/11/21
Field Oxygen (O2)	6.83	mg/L	1			Field Oxygen	BLL	05/11/21
Field pH	8.23	S.U.	1			Field pH	BLL	05/11/21
Field Temperature	7.20	° C	1			Field Temp.	BLL	05/11/21

Report Approved By:

Report Approved On: 5/14/2021 8:31:36 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 05/27/21 at 02:30 PM
by B Sheeder, D Witte
Sample Matrix: Water

Lab ID#: 20210602101
Received: 06/01/21 at 11:30 AM
by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	247	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	06/02/21
Hardness	98.5	mg/L	1			SM 2340 B	GAM	06/07/21
pH	8.24	S.U.	1			SM 4500-H+ B	JAM	06/02/21
Total Dissolved Solids	138	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	06/02/21
Non-Metallics								
Acidity (CaCO3)	< 10.0	mg/L	1			SM 2310 B	TNA	06/04/21
Alkalinity (CaCO3)	111	mg/L	1	0.226	10.0	SM 2320 B	JAM	06/02/21
Bicarbonate	135	mg/L	1	0.276	10.0	SM 2320 B	JAM	06/02/21
Chloride (Cl-)	3.73	mg/L	1	0.186	0.500	SM 4500-Cl E	BLL	06/02/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	06/02/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	06/02/21
Fluoride	0.459	mg/L	1	0.008	0.015	SM 4500 F-C	TMN	06/02/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NH3 D	TMS	06/07/21
Nitrogen, Nitrate (NO3)	1.06	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	06/02/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	06/02/21
Sulfate (SO4)	< 10.0	mg/L	1	0.483	10.0	SM 4500-SO4 E	BLL	06/02/21
Metals - Dissolved								
Aluminum (Al)	< 0.010	mg/L	10	0.00035	0.010	EPA 200.8	TNA	06/02/21
Arsenic (As)	0.028	mg/L	10	0.00061	0.005	EPA 200.8	TNA	06/02/21
Barium (Ba)	0.032	mg/L	10	0.00014	0.005	EPA 200.8	TNA	06/02/21
Cadmium (Cd)	< 0.001	mg/L	10	0.00024	0.001	EPA 200.8	TNA	06/02/21
Calcium (Ca)	21.5	mg/L	1	0.070	1.00	SM 3111 B	TMS	06/02/21
Chromium (Cr)	< 0.001	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA	06/02/21
Copper (Cu)	< 0.005	mg/L	10	0.00016	0.005	EPA 200.8	TNA	06/02/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	BLL	06/02/21
Iron (Fe)	< 0.050	mg/L	10	0.00093	0.050	EPA 200.8	TNA	06/02/21
Lead (Pb)	< 0.001	mg/L	10	0.00019	0.001	EPA 200.8	TNA	06/02/21
Magnesium (Mg)	10.9	mg/L	1	0.036	0.500	SM 3111 B	TMS	06/02/21
Manganese (Mn)	< 0.010	mg/L	10	0.00006	0.010	EPA 200.8	TNA	06/02/21
Nickel (Ni)	< 0.005	mg/L	10	0.00008	0.005	EPA 200.8	TNA	06/02/21
Potassium (K)	1.07	mg/L	1	0.040	0.500	SM 3111 B	TMS	06/02/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	06/02/21
Silver (Ag)	< 0.001	mg/L	10	0.00008	0.001	EPA 200.8	TNA	06/02/21

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Metals - Dissolved							
Sodium (Na)	9.70	mg/L	1	0.020	0.500	SM 3111 B	TMS 06/02/21
Zinc (Zn)	< 0.050	mg/L	10	0.00044	0.050	EPA 200.8	TNA 06/02/21
Metals - Total							
Aluminum (Al)	0.057	mg/L	10	0.00035	0.010	EPA 200.8	TNA 06/02/21
Arsenic (As)	0.029	mg/L	10	0.00061	0.005	EPA 200.8	TNA 06/02/21
Barium (Ba)	0.035	mg/L	10	0.00014	0.005	EPA 200.8	TNA 06/02/21
Cadmium (Cd)	< 0.001	mg/L	10	0.00024	0.001	EPA 200.8	TNA 06/02/21
Chromium (Cr)	< 0.001	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA 06/02/21
Copper (Cu)	< 0.005	mg/L	10	0.00016	0.005	EPA 200.8	TNA 06/02/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA 06/02/21
Iron (Fe)	< 0.050	mg/L	10	0.00093	0.050	EPA 200.8	TNA 06/02/21
Lead (Pb)	< 0.001	mg/L	10	0.00019	0.001	EPA 200.8	TNA 06/02/21
Manganese (Mn)	< 0.010	mg/L	10	0.00006	0.010	EPA 200.8	TNA 06/02/21
Mercury (Hg)	< 0.0002	mg/L	1	0.00005	0.0002	EPA 245.1	TMS 06/02/21
Nickel (Ni)	< 0.005	mg/L	10	0.00008	0.005	EPA 200.8	TNA 06/02/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA 06/02/21
Silver (Ag)	< 0.001	mg/L	10	0.00008	0.001	EPA 200.8	TNA 06/02/21
Zinc (Zn)	< 0.050	mg/L	10	0.00044	0.050	EPA 200.8	TNA 06/02/21
Anion - Cation Balance							
Anions	2.42	meq/L	1			Calculation	GAM 06/07/21
Anion - Cation Balance	-0.058	%	1			Calculation	GAM 06/07/21
Cations	2.42	meq/L	1			Calculation	GAM 06/07/21
Field Test							
Field Conductivity	260	µmhos/cm	1			Field Conductivity	BLL 06/01/21
Field Total Depth	290	ft	1			Field Total Depth	BLL 06/01/21
Field ORP	97.0	mV	1			Field ORP	BLL 06/01/21
Field Oxygen (O2)	7.04	mg/L	1			Field Oxygen	BLL 06/01/21
Field pH	8.26	S.U.	1			Field pH	BLL 06/01/21
Field Temperature	7.20	° C	1			Field Temp.	BLL 06/01/21

Report Approved By:

Report Approved On: 6/8/2021 8:54:46 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 07/17/21 at 11:30 AM by Darnell Witte, Steve Podall
Sample Matrix: Water

Lab ID#: 20210721204
Received: 07/20/21 at 04:05 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
Physical Properties								
Electrical Conductivity	249	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	07/21/21
Hardness	101	mg/L	1			SM 2340 B	GAM	07/27/21
pH	8.24	S.U.	1			SM 4500-H+ B	JAM	07/21/21
Total Dissolved Solids	98.0	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	07/21/21
Non-Metallics								
Acidity (CaCO3)	< 10.0	mg/L	1			SM 2310 B	TNA	07/23/21
Alkalinity (CaCO3)	109	mg/L	1	0.248	10.0	SM 2320 B	JAM	07/21/21
Bicarbonate	133	mg/L	1	0.303	10.0	SM 2320 B	JAM	07/21/21
Chloride (Cl-)	3.95	mg/L	1	0.186	0.500	SM 4500-Cl E	BLL	07/21/21
Cyanide, Total	< 0.010	mg/L	1	0.00035	0.010	Kelada 01	TMN	07/21/21
Cyanide, WAD	< 0.010	mg/L	1	0.00054	0.010	Kelada 01	TMN	07/22/21
Fluoride	0.430	mg/L	1	0.008	0.050	SM 4500 F-C	TMN	07/21/21
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NH3 D	JAM	07/22/21
Nitrogen, Nitrate (NO3)	1.25	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	07/21/21
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	07/21/21
Sulfate (SO4)	< 10.0	mg/L	1	0.483	10.0	SM 4500-SO4 E	BLL	07/21/21
Metals - Dissolved								
Aluminum (Al)	< 0.010	mg/L	10	0.00035	0.010	EPA 200.8	TNA	07/21/21
Arsenic (As)	0.029	mg/L	10	0.00061	0.005	EPA 200.8	TNA	07/21/21
Barium (Ba)	0.034	mg/L	10	0.00014	0.005	EPA 200.8	TNA	07/21/21
Cadmium (Cd)	< 0.001	mg/L	10	0.00024	0.001	EPA 200.8	TNA	07/21/21
Calcium (Ca)	21.0	mg/L	1	0.070	1.00	SM 3111 B	GRT	07/21/21
Chromium (Cr)	< 0.001	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA	07/21/21
Copper (Cu)	< 0.005	mg/L	10	0.00016	0.005	EPA 200.8	TNA	07/21/21
Gold (Au)	< 0.001	mg/L	1			EPA 231.2	TNA	07/21/21
Iron (Fe)	< 0.050	mg/L	10	0.00093	0.050	EPA 200.8	TNA	07/21/21
Lead (Pb)	< 0.001	mg/L	10	0.00019	0.001	EPA 200.8	TNA	07/21/21
Magnesium (Mg)	11.8	mg/L	1	0.036	0.500	SM 3111 B	GRT	07/21/21
Manganese (Mn)	< 0.010	mg/L	10	0.00006	0.010	EPA 200.8	TNA	07/21/21
Nickel (Ni)	< 0.005	mg/L	10	0.00008	0.005	EPA 200.8	TNA	07/21/21
Potassium (K)	1.23	mg/L	1	0.040	0.500	SM 3111 B	GRT	07/21/21
Selenium (Se)	< 0.005	mg/L	10	0.00077	0.005	EPA 200.8	TNA	07/21/21
Silver (Ag)	< 0.001	mg/L	10	0.00008	0.001	EPA 200.8	TNA	07/21/21

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Metals - Dissolved							
Sodium (Na)	**10.7**	mg/L	1	0.020	0.500	SM 3111 B	GRT 07/21/21
Zinc (Zn)	**< 0.050**	mg/L	10	0.00044	0.050	EPA 200.8	TNA 07/21/21
Metals - Total							
Aluminum (Al)	**0.045**	mg/L	10	0.00035	0.010	EPA 200.8	TNA 07/21/21
Arsenic (As)	**0.028**	mg/L	10	0.00061	0.005	EPA 200.8	TNA 07/21/21
Barium (Ba)	**0.036**	mg/L	10	0.00014	0.005	EPA 200.8	TNA 07/21/21
Cadmium (Cd)	**< 0.001**	mg/L	10	0.00024	0.001	EPA 200.8	TNA 07/21/21
Chromium (Cr)	**< 0.001**	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA 07/21/21
Copper (Cu)	**< 0.005**	mg/L	10	0.00016	0.005	EPA 200.8	TNA 07/21/21
Gold (Au)	**< 0.001**	mg/L	1			EPA 231.2	TNA 07/21/21
Iron (Fe)	**< 0.050**	mg/L	10	0.00093	0.050	EPA 200.8	TNA 07/21/21
Lead (Pb)	**< 0.001**	mg/L	10	0.00019	0.001	EPA 200.8	TNA 07/21/21
Manganese (Mn)	**< 0.010**	mg/L	10	0.00006	0.010	EPA 200.8	TNA 07/21/21
Mercury (Hg)	**< 0.0002**	mg/L	1	0.00005	0.0002	EPA 245.1	GRT 07/21/21
Nickel (Ni)	**< 0.005**	mg/L	10	0.00008	0.005	EPA 200.8	TNA 07/21/21
Selenium (Se)	**< 0.005**	mg/L	10	0.00077	0.005	EPA 200.8	TNA 07/21/21
Silver (Ag)	**< 0.001**	mg/L	10	0.00008	0.001	EPA 200.8	TNA 07/21/21
Zinc (Zn)	**< 0.050**	mg/L	10	0.00044	0.050	EPA 200.8	TNA 07/21/21
Anion - Cation Balance							
Anions	**2.40**	meq/L	1			Calculation	GAM 07/27/21
Anion - Cation Balance	**2.26**	%	1			Calculation	GAM 07/27/21
Cations	**2.52**	meq/L	1			Calculation	GAM 07/27/21
Field Test							
Field Conductivity	**250**	µmhos/cm	1			Field Conductivity	BLL 07/20/21
Field Total Depth	**290**	ft	1			Field Total Depth	BLL 07/20/21
Field ORP	**127**	mV	1			Field ORP	BLL 07/20/21
Field Oxygen (O2)	**6.99**	mg/L	1			Field Oxygen	BLL 07/20/21
Field pH	**8.26**	S.U.	1			Field pH	BLL 07/20/21
Field Temperature	**7.30**	° C	1			Field Temp.	BLL 07/20/21

Report Approved By:

Report Approved On: 7/27/2021 11:58:59 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 08/01/21 at 02:10 PM by Brett Sheeder
Sample Matrix: Water

Lab ID#: 20210804112
Received: 08/03/21 at 12:20 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	**249**	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	08/04/21
Hardness	**102**	mg/L	1			SM 2340 B	GAM	08/05/21
pH	**8.16**	S.U.	1			SM 4500-H+ B	JAM	08/04/21
Total Dissolved Solids	**121**	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	08/04/21
Non-Metallics								
Acidity (CaCO3)	**< 10.0**	mg/L	1			SM 2310 B	TNA	08/09/21
Alkalinity (CaCO3)	**110**	mg/L	1	0.248	10.0	SM 2320 B	JAM	08/04/21
Bicarbonate	**134**	mg/L	1	0.303	10.0	SM 2320 B	JAM	08/04/21
Chloride (Cl-)	**3.29**	mg/L	1	0.186	0.500	SM 4500-Cl E	BLL	08/04/21
Cyanide, Total	**< 0.010**	mg/L	1	0.00035	0.010	Kelada 01	TMN	08/04/21
Cyanide, WAD	**< 0.010**	mg/L	1	0.00054	0.010	Kelada 01	TMN	08/04/21
Fluoride	**0.418**	mg/L	1	0.008	0.050	SM 4500 F-C	TMN	08/04/21
Nitrogen, Ammonia (NH3)	**< 0.050**	mg/L	1	0.009	0.050	SM 4500-NH3 D	EJF	08/05/21
Nitrogen, Nitrate (NO3)	**1.18**	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	08/04/21
Nitrogen, Nitrite (NO2)	**< 0.050**	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	08/04/21
Sulfate (SO4)	**< 10.0**	mg/L	1	0.483	10.0	SM 4500-SO4 E	BLL	08/04/21
Metals - Dissolved								
Aluminum (Al)	**< 0.010**	mg/L	10	0.00035	0.010	EPA 200.8	TNA	08/04/21
Arsenic (As)	**0.025**	mg/L	10	0.00061	0.005	EPA 200.8	TNA	08/04/21
Barium (Ba)	**0.032**	mg/L	10	0.00014	0.005	EPA 200.8	TNA	08/04/21
Cadmium (Cd)	**< 0.001**	mg/L	10	0.00024	0.001	EPA 200.8	TNA	08/04/21
Calcium (Ca)	**21.4**	mg/L	1	0.070	1.00	SM 3111 B	GRT	08/04/21
Chromium (Cr)	**< 0.001**	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA	08/04/21
Copper (Cu)	**< 0.005**	mg/L	10	0.00016	0.005	EPA 200.8	TNA	08/04/21
Gold (Au)	**< 0.001**	mg/L	1			EPA 231.2	TNA	08/04/21
Iron (Fe)	**< 0.050**	mg/L	10	0.00093	0.050	EPA 200.8	TNA	08/04/21
Lead (Pb)	**< 0.001**	mg/L	10	0.00019	0.001	EPA 200.8	TNA	08/04/21
Magnesium (Mg)	**11.7**	mg/L	1	0.036	0.500	SM 3111 B	GRT	08/04/21
Manganese (Mn)	**< 0.010**	mg/L	10	0.00006	0.010	EPA 200.8	TNA	08/04/21
Nickel (Ni)	**< 0.005**	mg/L	10	0.00008	0.005	EPA 200.8	TNA	08/04/21
Potassium (K)	**1.21**	mg/L	1	0.040	0.500	SM 3111 B	GRT	08/04/21
Selenium (Se)	**< 0.005**	mg/L	10	0.00077	0.005	EPA 200.8	TNA	08/04/21
Silver (Ag)	**< 0.001**	mg/L	10	0.00008	0.001	EPA 200.8	TNA	08/04/21

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Metals - Dissolved							
Sodium (Na)	**10.6**	mg/L	1	0.020	0.500	SM 3111 B	GRT 08/04/21
Zinc (Zn)	**< 0.050**	mg/L	10	0.00044	0.050	EPA 200.8	TNA 08/04/21
Metals - Total							
Aluminum (Al)	**0.028**	mg/L	10	0.00035	0.010	EPA 200.8	TNA 08/04/21
Arsenic (As)	**0.026**	mg/L	10	0.00061	0.005	EPA 200.8	TNA 08/04/21
Barium (Ba)	**0.036**	mg/L	10	0.00014	0.005	EPA 200.8	TNA 08/04/21
Cadmium (Cd)	**< 0.001**	mg/L	10	0.00024	0.001	EPA 200.8	TNA 08/04/21
Chromium (Cr)	**< 0.001**	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA 08/04/21
Copper (Cu)	**< 0.005**	mg/L	10	0.00016	0.005	EPA 200.8	TNA 08/04/21
Gold (Au)	**< 0.001**	mg/L	1			EPA 231.2	TNA 08/04/21
Iron (Fe)	**< 0.050**	mg/L	10	0.00093	0.050	EPA 200.8	TNA 08/04/21
Lead (Pb)	**< 0.001**	mg/L	10	0.00019	0.001	EPA 200.8	TNA 08/04/21
Manganese (Mn)	**< 0.010**	mg/L	10	0.00006	0.010	EPA 200.8	TNA 08/04/21
Mercury (Hg)	**< 0.0002**	mg/L	1	0.00005	0.0002	EPA 245.1	GRT 08/04/21
Nickel (Ni)	**< 0.005**	mg/L	10	0.00008	0.005	EPA 200.8	TNA 08/04/21
Selenium (Se)	**< 0.005**	mg/L	10	0.00077	0.005	EPA 200.8	TNA 08/04/21
Silver (Ag)	**< 0.001**	mg/L	10	0.00008	0.001	EPA 200.8	TNA 08/04/21
Zinc (Zn)	**< 0.050**	mg/L	10	0.00044	0.050	EPA 200.8	TNA 08/04/21
Anion - Cation Balance							
Anions	**2.40**	meq/L	1			Calculation	GAM 08/06/21
Anion - Cation Balance	**2.61**	%	1			Calculation	GAM 08/06/21
Cations	**2.53**	meq/L	1			Calculation	GAM 08/06/21
Field Test							
Field Conductivity	**250**	µmhos/cm	1			Field Conductivity	BLL 08/03/21
Field Total Depth	**290**	ft	1			Field Total Depth	BLL 08/03/21
Field ORP	**100**	mV	1			Field ORP	BLL 08/03/21
Field Oxygen (O2)	**6.99**	mg/L	1			Field Oxygen	BLL 08/03/21
Field pH	**8.20**	S.U.	1			Field pH	BLL 08/03/21
Field Temperature	**7.40**	° C	1			Field Temp.	BLL 08/03/21

Report Approved By:

Report Approved On: 8/9/2021 2:40:49 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 09/05/21 at 02:15 PM by S Podall, B Scheeder
Sample Matrix: Water

Lab ID#: 20210909208
Received: 09/07/21 at 11:50 AM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	**250**	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	09/09/21
Hardness	**98.8**	mg/L	1			SM 2340 B	GAM	09/16/21
pH	**8.18**	S.U.	1			SM 4500-H+ B	JAM	09/09/21
Total Dissolved Solids	**116**	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	09/09/21
Non-Metallics								
Acidity (CaCO3)	**< 10.0**	mg/L	1			SM 2310 B	TNA	09/13/21
Alkalinity (CaCO3)	**108**	mg/L	1	0.248	10.0	SM 2320 B	JAM	09/09/21
Bicarbonate	**132**	mg/L	1	0.303	10.0	SM 2320 B	JAM	09/09/21
Chloride (Cl-)	**4.04**	mg/L	1	0.186	0.500	SM 4500-Cl E	BLL	09/09/21
Cyanide, Total	**< 0.010**	mg/L	1	0.00035	0.010	Kelada 01	TMN	09/09/21
Cyanide, WAD	**< 0.010**	mg/L	1	0.00054	0.010	Kelada 01	TMN	09/09/21
Fluoride	**0.408**	mg/L	1	0.008	0.050	SM 4500 F-C	TMN	09/09/21
Nitrogen, Ammonia (NH3)	**< 0.050**	mg/L	1	0.009	0.050	SM 4500-NH3 D	JAM	09/10/21
Nitrogen, Nitrate (NO3)	**1.26**	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	09/10/21
Nitrogen, Nitrite (NO2)	**< 0.050**	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	09/09/21
Sulfate (SO4)	**< 10.0**	mg/L	1	0.483	10.0	SM 4500-SO4 E	BLL	09/09/21
Metals - Dissolved								
Aluminum (Al)	**0.016**	mg/L	10	0.00035	0.010	EPA 200.8	TNA	09/09/21
Arsenic (As)	**0.028**	mg/L	10	0.00061	0.005	EPA 200.8	TNA	09/09/21
Barium (Ba)	**0.033**	mg/L	10	0.00014	0.005	EPA 200.8	TNA	09/09/21
Cadmium (Cd)	**< 0.001**	mg/L	10	0.00024	0.001	EPA 200.8	TNA	09/09/21
Calcium (Ca)	**21.0**	mg/L	1	0.070	1.00	SM 3111 B	GRT	09/10/21
Chromium (Cr)	**< 0.001**	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA	09/09/21
Copper (Cu)	**< 0.005**	mg/L	10	0.00016	0.005	EPA 200.8	TNA	09/09/21
Gold (Au)	**< 0.001**	mg/L	1			EPA 231.2	TNA	09/09/21
Iron (Fe)	**< 0.050**	mg/L	10	0.00093	0.050	EPA 200.8	TNA	09/09/21
Lead (Pb)	**< 0.001**	mg/L	10	0.00019	0.001	EPA 200.8	TNA	09/09/21
Magnesium (Mg)	**11.3**	mg/L	1	0.036	0.500	SM 3111 B	GRT	09/10/21
Manganese (Mn)	**< 0.010**	mg/L	10	0.00006	0.010	EPA 200.8	TNA	09/09/21
Nickel (Ni)	**< 0.005**	mg/L	10	0.00008	0.005	EPA 200.8	TNA	09/09/21
Potassium (K)	**1.14**	mg/L	1	0.040	0.500	SM 3111 B	GRT	09/10/21
Selenium (Se)	**< 0.005**	mg/L	10	0.00077	0.005	EPA 200.8	TNA	09/09/21
Silver (Ag)	**< 0.001**	mg/L	10	0.00008	0.001	EPA 200.8	TNA	09/09/21

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Metals - Dissolved							
Sodium (Na)	**10.5**	mg/L	1	0.020	0.500	SM 3111 B	GRT 09/10/21
Zinc (Zn)	**< 0.050**	mg/L	10	0.00044	0.050	EPA 200.8	TNA 09/09/21
Metals - Total							
Aluminum (Al)	**0.082**	mg/L	10	0.00035	0.010	EPA 200.8	TNA 09/09/21
Arsenic (As)	**0.029**	mg/L	10	0.00061	0.005	EPA 200.8	TNA 09/09/21
Barium (Ba)	**0.037**	mg/L	10	0.00014	0.005	EPA 200.8	TNA 09/09/21
Cadmium (Cd)	**< 0.001**	mg/L	10	0.00024	0.001	EPA 200.8	TNA 09/09/21
Chromium (Cr)	**< 0.001**	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA 09/09/21
Copper (Cu)	**< 0.005**	mg/L	10	0.00016	0.005	EPA 200.8	TNA 09/09/21
Gold (Au)	**< 0.001**	mg/L	1			EPA 231.2	TNA 09/09/21
Iron (Fe)	**0.056**	mg/L	10	0.00093	0.050	EPA 200.8	TNA 09/09/21
Lead (Pb)	**< 0.001**	mg/L	10	0.00019	0.001	EPA 200.8	TNA 09/09/21
Manganese (Mn)	**< 0.010**	mg/L	10	0.00006	0.010	EPA 200.8	TNA 09/09/21
Mercury (Hg)	**< 0.0002**	mg/L	1	0.00005	0.0002	EPA 245.1	GRT 09/09/21
Nickel (Ni)	**< 0.005**	mg/L	10	0.00008	0.005	EPA 200.8	TNA 09/09/21
Selenium (Se)	**< 0.005**	mg/L	10	0.00077	0.005	EPA 200.8	TNA 09/09/21
Silver (Ag)	**< 0.001**	mg/L	10	0.00008	0.001	EPA 200.8	TNA 09/09/21
Zinc (Zn)	**< 0.050**	mg/L	10	0.00044	0.050	EPA 200.8	TNA 09/09/21
Anion - Cation Balance							
Anions	**2.39**	meq/L	1			Calculation	GAM 09/16/21
Anion - Cation Balance	**1.47**	%	1			Calculation	GAM 09/16/21
Cations	**2.46**	meq/L	1			Calculation	GAM 09/16/21
Field Test							
Field Conductivity	**250**	µmhos/cm	1			Field Conductivity	BLL 09/08/21
Field Total Depth	**260**	ft	1			Field Total Depth	BLL 09/08/21
Field ORP	**143**	mV	1			Field ORP	BLL 09/08/21
Field Oxygen (O2)	**7.02**	mg/L	1			Field Oxygen	BLL 09/08/21
Field pH	**8.19**	S.U.	1			Field pH	BLL 09/08/21
Field Temperature	**7.10**	° C	1			Field Temp.	BLL 09/08/21

Report Approved By:

Report Approved On: 9/17/2021 11:45:16 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

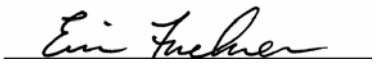
Sample Site: MW-66
Sampled: 09/22/21 at 11:45 AM by Lynn Blackman
Sample Matrix: Water

Lab ID#: 20210924203
Received: 09/23/21 at 12:20 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	**248**	µmhos/cm	1	0.153	5.00	SM 2510B	JAM 09/24/21
pH	**8.07**	S.U.	1			SM 4500-H+ B	JAM 09/27/21
Total Dissolved Solids	**132**	mg/L	100ml	13.0	50.0	SM 2540 C	JNG 09/24/21
Non-Metallics							
Bicarbonate	**131**	mg/L	1	0.303	10.0	SM 2320 B	JAM 09/27/21
Cyanide, Total	**< 0.010**	mg/L	1	0.00035	0.010	Kelada 01	TMN 09/27/21
Cyanide, WAD	**< 0.010**	mg/L	1	0.00054	0.010	Kelada 01	TMN 09/27/21
Fluoride	**0.397**	mg/L	1	0.008	0.050	SM 4500 F-C	TMN 09/27/21
Nitrogen, Ammonia (NH3)	**< 0.050**	mg/L	1	0.009	0.050	SM 4500-NH3 D	EJF 09/24/21
Nitrogen, Nitrate (NO3)	**1.15**	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL 09/24/21
Nitrogen, Nitrite (NO2)	**< 0.050**	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL 09/24/21
Sulfate (SO4)	**< 10.0**	mg/L	1	0.483	10.0	SM 4500-SO4 E	BLL 09/24/21
Metals - Dissolved							
Arsenic (As)	**0.024**	mg/L	10	0.00061	0.005	EPA 200.8	TNA 09/24/21
Gold (Au)	**< 0.001**	mg/L	1			EPA 231.2	TNA 09/24/21
Selenium (Se)	**< 0.005**	mg/L	10	0.00077	0.005	EPA 200.8	TNA 09/24/21
Sodium (Na)	**10.9**	mg/L	1	0.020	0.500	SM 3111 B	GRT 09/24/21
Metals - Total							
Mercury (Hg)	**< 0.0002**	mg/L	1	0.00005	0.0002	EPA 245.1	GRT 09/27/21
Field Test							
Field Conductivity	**240**	µmhos/cm	1			Field Conductivity	BLL 09/23/21
Field Total Depth	**300**	ft	1			Field Total Depth	BLL 09/23/21
Field ORP	**172**	mV	1			Field ORP	BLL 09/23/21
Field Oxygen (O2)	**7.27**	mg/L	1			Field Oxygen	BLL 09/23/21
Field pH	**8.20**	S.U.	1			Field pH	BLL 09/23/21
Field Temperature	**6.90**	° C	1			Field Temp.	BLL 09/23/21

Report Approved By:



Report Approved On: 10/28/2021 11:40:42 AM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 10/10/21 at 03:30 PM by Steve Podall, Darnell Witte
Sample Matrix: Water

Lab ID#: 20211015209
Received: 10/14/21 at 04:00 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

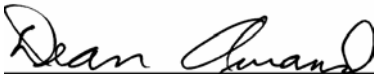
Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Electrical Conductivity	**248**	µmhos/cm	1	0.153	5.00	SM 2510B	JAM 10/15/21
Hardness	**101**	mg/L	1			SM 2340 B	EJF 10/20/21

pH	**8.06**	S.U.	1			SM 4500-H+ B	JAM	10/15/21
Total Dissolved Solids	**122**	mg/L	100ml	13.0	50.0	SM 2540 C	JNG	10/15/21
Non-Metallics								
Acidity (CaCO3)	**< 10.0**	mg/L	1			SM 2310 B	EJF	10/21/21
Alkalinity (CaCO3)	**109**	mg/L	1	0.248	10.0	SM 2320 B	JAM	10/15/21
Bicarbonate	**133**	mg/L	1	0.303	10.0	SM 2320 B	JAM	10/15/21
Chloride (Cl-)	**4.64**	mg/L	1	0.186	0.500	SM 4500-Cl E	BLL	10/15/21
Cyanide, Total	**< 0.010**	mg/L	1	0.00035	0.010	Kelada 01	TMN	10/19/21
Cyanide, WAD	**< 0.010**	mg/L	1	0.00054	0.010	Kelada 01	TMN	10/19/21
Fluoride	**0.399**	mg/L	1	0.008	0.050	SM 4500 F-C	TMN	10/15/21
Nitrogen, Ammonia (NH3)	**< 0.050**	mg/L	1	0.009	0.050	SM 4500-NH3 D	JAM	10/18/21
Nitrogen, Nitrate (NO3)	**1.25**	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	10/15/21
Nitrogen, Nitrite (NO2)	**< 0.050**	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	10/15/21
Sulfate (SO4)	**< 10.0**	mg/L	1	0.483	10.0	SM 4500-SO4 E	BLL	10/15/21
Metals - Dissolved								
Aluminum (Al)	**< 0.010**	mg/L	10	0.00035	0.010	EPA 200.8	TNA	10/15/21
Arsenic (As)	**0.029**	mg/L	10	0.00061	0.005	EPA 200.8	TNA	10/15/21
Barium (Ba)	**0.035**	mg/L	10	0.00014	0.005	EPA 200.8	TNA	10/15/21
Cadmium (Cd)	**< 0.001**	mg/L	10	0.00024	0.001	EPA 200.8	TNA	10/15/21
Calcium (Ca)	**20.5**	mg/L	1	0.070	1.00	SM 3111 B	GRT	10/15/21
Chromium (Cr)	**< 0.001**	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA	10/15/21
Copper (Cu)	**< 0.005**	mg/L	10	0.00016	0.005	EPA 200.8	TNA	10/15/21
Gold (Au)	**< 0.001**	mg/L	1			EPA 231.2	TNA	10/19/21
Iron (Fe)	**< 0.050**	mg/L	10	0.00093	0.050	EPA 200.8	TNA	10/15/21
Lead (Pb)	**< 0.001**	mg/L	10	0.00019	0.001	EPA 200.8	TNA	10/15/21
Magnesium (Mg)	**12.0**	mg/L	1	0.036	0.500	SM 3111 B	GRT	10/15/21
Manganese (Mn)	**< 0.010**	mg/L	10	0.00006	0.010	EPA 200.8	TNA	10/15/21
Nickel (Ni)	**< 0.005**	mg/L	10	0.00008	0.005	EPA 200.8	TNA	10/15/21
Potassium (K)	**1.11**	mg/L	1	0.040	0.500	SM 3111 B	GRT	10/15/21
Selenium (Se)	**< 0.005**	mg/L	10	0.00077	0.005	EPA 200.8	TNA	10/15/21
Silver (Ag)	**< 0.001**	mg/L	10	0.00008	0.001	EPA 200.8	TNA	10/15/21

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Metals - Dissolved							
Sodium (Na)	**11.1**	mg/L	1	0.020	0.500	SM 3111 B	GRT 10/15/21
Zinc (Zn)	**< 0.050**	mg/L	10	0.00044	0.050	EPA 200.8	TNA 10/15/21
Metals - Total							
Aluminum (Al)	**0.118**	mg/L	10	0.00035	0.010	EPA 200.8	TNA 10/15/21
Arsenic (As)	**0.030**	mg/L	10	0.00061	0.005	EPA 200.8	TNA 10/15/21
Barium (Ba)	**0.037**	mg/L	10	0.00014	0.005	EPA 200.8	TNA 10/15/21
Cadmium (Cd)	**< 0.001**	mg/L	10	0.00024	0.001	EPA 200.8	TNA 10/15/21
Chromium (Cr)	**< 0.001**	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA 10/15/21
Copper (Cu)	**< 0.005**	mg/L	10	0.00016	0.005	EPA 200.8	TNA 10/15/21
Gold (Au)	**< 0.001**	mg/L	1			EPA 231.2	TNA 10/19/21
Iron (Fe)	**0.092**	mg/L	10	0.00093	0.050	EPA 200.8	TNA 10/15/21
Lead (Pb)	**< 0.001**	mg/L	10	0.00019	0.001	EPA 200.8	TNA 10/15/21
Manganese (Mn)	**< 0.010**	mg/L	10	0.00006	0.010	EPA 200.8	TNA 10/15/21
Mercury (Hg)	**< 0.0002**	mg/L	1	0.00005	0.0002	EPA 245.1	GRT 10/15/21
Nickel (Ni)	**< 0.005**	mg/L	10	0.00008	0.005	EPA 200.8	TNA 10/15/21
Selenium (Se)	**< 0.005**	mg/L	10	0.00077	0.005	EPA 200.8	TNA 10/25/21
Silver (Ag)	**< 0.001**	mg/L	10	0.00008	0.001	EPA 200.8	TNA 10/15/21
Zinc (Zn)	**< 0.050**	mg/L	10	0.00044	0.050	EPA 200.8	TNA 10/15/21
Anion - Cation Balance							
Anions	**2.42**	meq/L	1			Calculation	EJF 10/20/21
Anion - Cation Balance	**1.92**	%	1			Calculation	EJF 10/20/21
Cations	**2.52**	meq/L	1			Calculation	EJF 10/20/21
Field Test							
Field Conductivity	**202**	µmhos/cm	1			Field Conductivity	BLL 10/14/21
Field Total Depth	**300**	ft	1			Field Total Depth	BLL 10/14/21
Field ORP	**240**	mV	1			Field ORP	BLL 10/14/21
Field Oxygen (O2)	**7.06**	mg/L	1			Field Oxygen	BLL 10/14/21
Field pH	**8.12**	S.U.	1			Field pH	BLL 10/14/21
Field Temperature	**6.90**	° C	1			Field Temp.	BLL 10/14/21

Report Approved By:



Report Approved On: 11/9/2021 1:31:35 PM

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: MW-66
Sampled: 11/14/21 at 01:15 PM by D Witte, S Podall
Sample Matrix: Water

Lab ID#: 20211117301
Received: 11/16/21 at 03:40 PM by Bobbie Laurenz
Account: W1002 - WHARF RESOURCES(USA),INC

MATT ZIETLOW
WHARF RESOURCES(USA),INC.
10928 WHARF ROAD
LEAD, SD 577549710

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	**248**	µmhos/cm	1	0.153	5.00	SM 2510B	JAM	11/17/21
Hardness	**103**	mg/L	1			SM 2340 B	EJF	11/23/21
pH	**7.97**	S.U.	1			SM 4500-H+ B	JAM	11/17/21
Total Dissolved Solids	**101**	mg/L	100ml	13.5	50.0	SM 2540 C	JNG	11/17/21
Non-Metallics								
Acidity (CaCO3)	**< 10.0**	mg/L	1			SM 2310 B	TNA	11/19/21
Alkalinity (CaCO3)	**109**	mg/L	1	0.248	10.0	SM 2320 B	JAM	11/17/21
Bicarbonate	**133**	mg/L	1	0.303	10.0	SM 2320 B	JAM	11/17/21
Chloride (Cl-)	**4.15**	mg/L	1	0.186	0.500	SM 4500-Cl E	BLL	11/17/21
Cyanide, Total	**< 0.010**	mg/L	1	0.00035	0.010	Kelada 01	TMN	11/29/21
Cyanide, WAD	**< 0.010**	mg/L	1	0.00054	0.010	Kelada 01	TMN	11/17/21
Fluoride	**0.419**	mg/L	1	0.008	0.050	SM 4500 F-C	TMN	11/17/21
Nitrogen, Ammonia (NH3)	**< 0.050**	mg/L	1	0.009	0.050	SM 4500-NH3 D	JAM	11/22/21
Nitrogen, Nitrate (NO3)	**1.19**	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	11/17/21
Nitrogen, Nitrite (NO2)	**< 0.050**	mg/L	1	0.005	0.050	SM 4500-NO2 B	BLL	11/17/21
Sulfate (SO4)	**< 10.0**	mg/L	1	0.483	10.0	SM 4500-SO4 E	BLL	11/17/21
Metals - Dissolved								
Aluminum (Al)	**< 0.010**	mg/L	10	0.00035	0.010	EPA 200.8	TNA	11/17/21
Arsenic (As)	**0.029**	mg/L	10	0.00061	0.005	EPA 200.8	TNA	11/17/21
Barium (Ba)	**0.037**	mg/L	10	0.00014	0.005	EPA 200.8	TNA	11/17/21
Cadmium (Cd)	**< 0.001**	mg/L	10	0.00024	0.001	EPA 200.8	TNA	11/17/21
Calcium (Ca)	**22.8**	mg/L	1	0.070	1.00	SM 3111 B	GRT	11/17/21
Chromium (Cr)	**< 0.001**	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA	11/17/21
Copper (Cu)	**< 0.005**	mg/L	10	0.00016	0.005	EPA 200.8	TNA	11/17/21
Gold (Au)	**< 0.001**	mg/L	1			EPA 231.2	BLL	11/18/21
Iron (Fe)	**< 0.050**	mg/L	10	0.00093	0.050	EPA 200.8	TNA	11/17/21
Lead (Pb)	**< 0.001**	mg/L	10	0.00019	0.001	EPA 200.8	TNA	11/17/21
Magnesium (Mg)	**11.2**	mg/L	1	0.036	0.500	SM 3111 B	GRT	11/17/21
Manganese (Mn)	**< 0.010**	mg/L	10	0.00006	0.010	EPA 200.8	TNA	11/17/21
Nickel (Ni)	**< 0.005**	mg/L	10	0.00008	0.005	EPA 200.8	TNA	11/17/21
Potassium (K)	**0.930**	mg/L	1	0.040	0.500	SM 3111 B	GRT	11/17/21
Selenium (Se)	**< 0.005**	mg/L	10	0.00077	0.005	EPA 200.8	TNA	11/17/21
Silver (Ag)	**< 0.001**	mg/L	10	0.00008	0.001	EPA 200.8	TNA	11/17/21

Report of Analysis for: **WHARF RESOURCES(USA),INC** Sample Site: **MW-66**

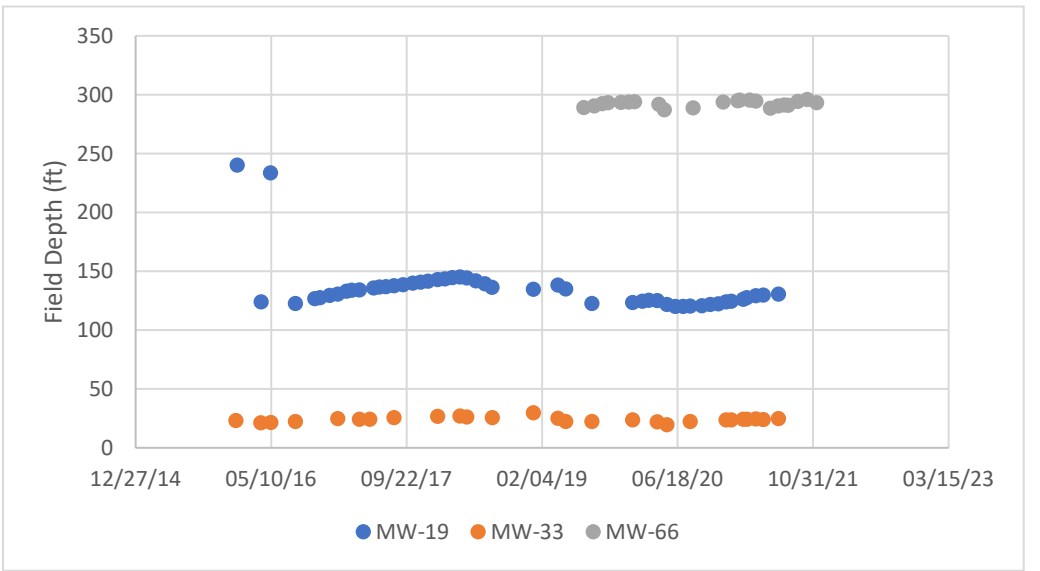
Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Metals - Dissolved							
Sodium (Na)	**11.9**	mg/L	1	0.020	0.500	SM 3111 B	GRT 11/17/21
Zinc (Zn)	**< 0.050**	mg/L	10	0.00044	0.050	EPA 200.8	TNA 11/17/21
Metals - Total							
Aluminum (Al)	**0.080**	mg/L	10	0.00035	0.010	EPA 200.8	TNA 11/17/21
Arsenic (As)	**0.032**	mg/L	10	0.00061	0.005	EPA 200.8	TNA 11/17/21
Barium (Ba)	**0.040**	mg/L	10	0.00014	0.005	EPA 200.8	TNA 11/17/21
Cadmium (Cd)	**< 0.001**	mg/L	10	0.00024	0.001	EPA 200.8	TNA 11/17/21
Chromium (Cr)	**< 0.001**	mg/L	10	0.00012	0.001	EPA 200.8 DRC	TNA 11/17/21
Copper (Cu)	**< 0.005**	mg/L	10	0.00016	0.005	EPA 200.8	TNA 11/17/21
Gold (Au)	**< 0.001**	mg/L	1			EPA 231.2	TNA 11/18/21
Iron (Fe)	**0.072**	mg/L	10	0.00093	0.050	EPA 200.8	TNA 11/17/21
Lead (Pb)	**< 0.001**	mg/L	10	0.00019	0.001	EPA 200.8	TNA 11/17/21
Manganese (Mn)	**< 0.010**	mg/L	10	0.00006	0.010	EPA 200.8	TNA 11/17/21
Mercury (Hg)	**< 0.0002**	mg/L	1	0.00005	0.0002	EPA 245.1	GRT 11/18/21
Nickel (Ni)	**< 0.005**	mg/L	10	0.00008	0.005	EPA 200.8	TNA 11/17/21
Selenium (Se)	**< 0.005**	mg/L	10	0.00077	0.005	EPA 200.8	TNA 11/17/21
Silver (Ag)	**< 0.001**	mg/L	10	0.00008	0.001	EPA 200.8	TNA 11/17/21
Zinc (Zn)	**< 0.050**	mg/L	10	0.00044	0.050	EPA 200.8	TNA 11/17/21
Anion - Cation Balance							
Anions	**2.41**	meq/L	1			Calculation	GAM 12/06/21
Anion - Cation Balance	**3.78**	%	1			Calculation	GAM 12/06/21
Cations	**2.59**	meq/L	1			Calculation	GAM 12/06/21
Field Test							
Field Conductivity	**230**	µmhos/cm	1			Field Conductivity	BLL 11/16/21
Field Total Depth	**290**	ft	1			Field Total Depth	BLL 11/16/21
Field ORP	**196**	mV	1			Field ORP	BLL 11/16/21
Field Oxygen (O2)	**6.98**	mg/L	1			Field Oxygen	BLL 11/16/21
Field pH	**8.06**	S.U.	1			Field pH	BLL 11/16/21
Field Temperature	**6.90**	° C	1			Field Temp.	BLL 11/16/21

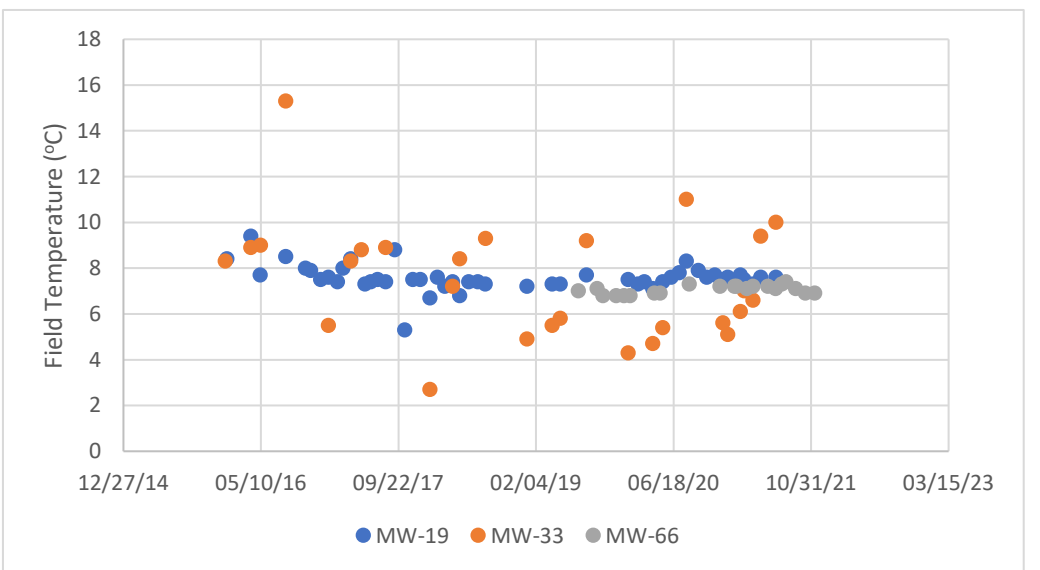
Report Approved By:

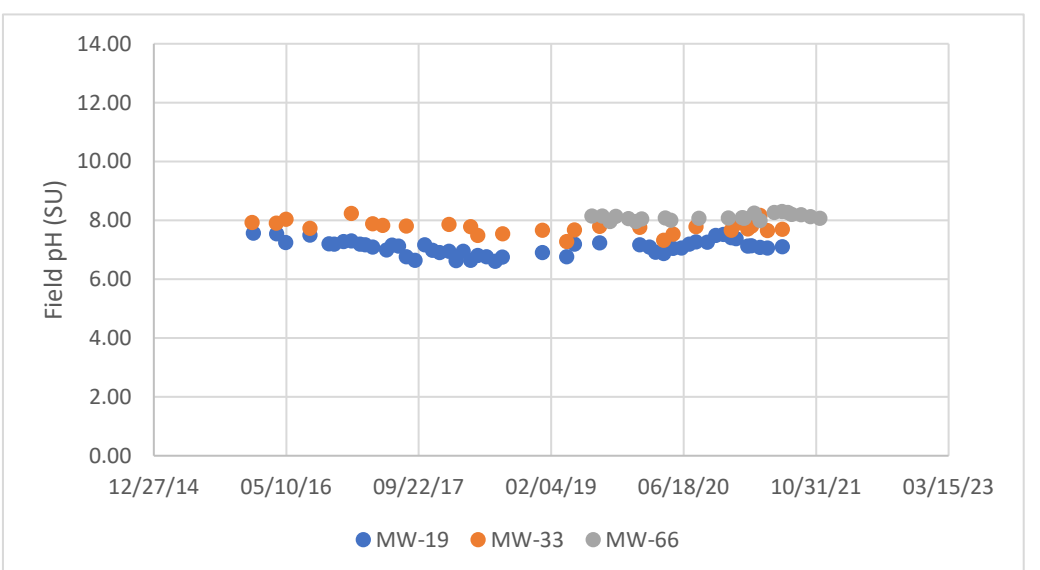
Report Approved On: 12/6/2021 10:16:12 AM

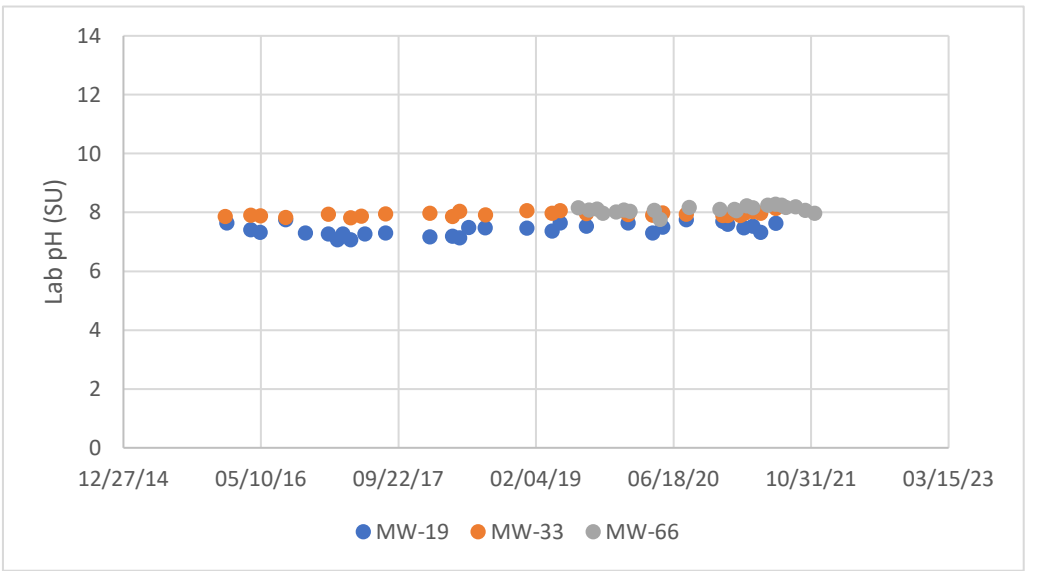
APPENDIX F

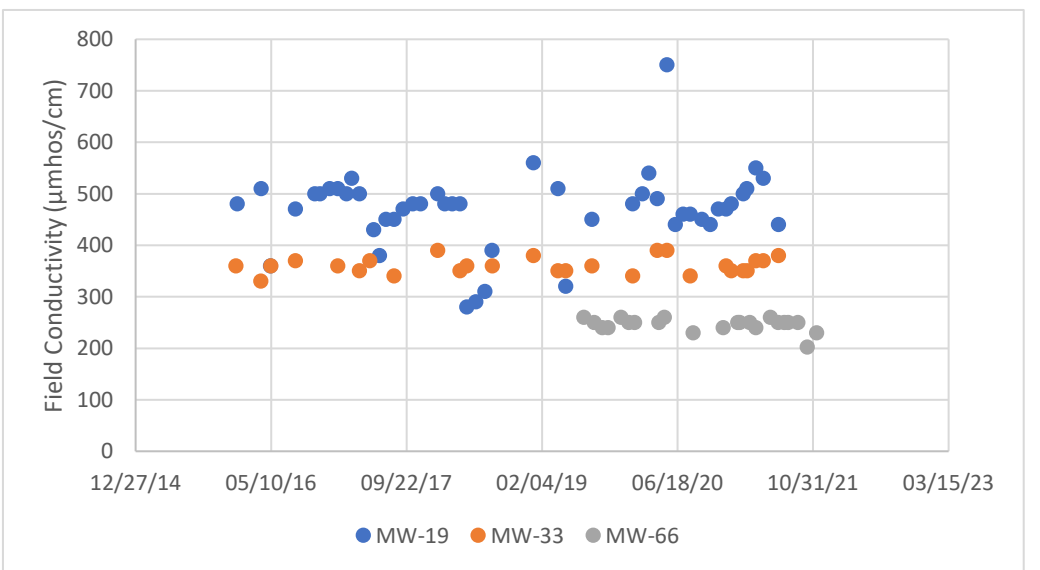
TIME-SERIES GRAPHS

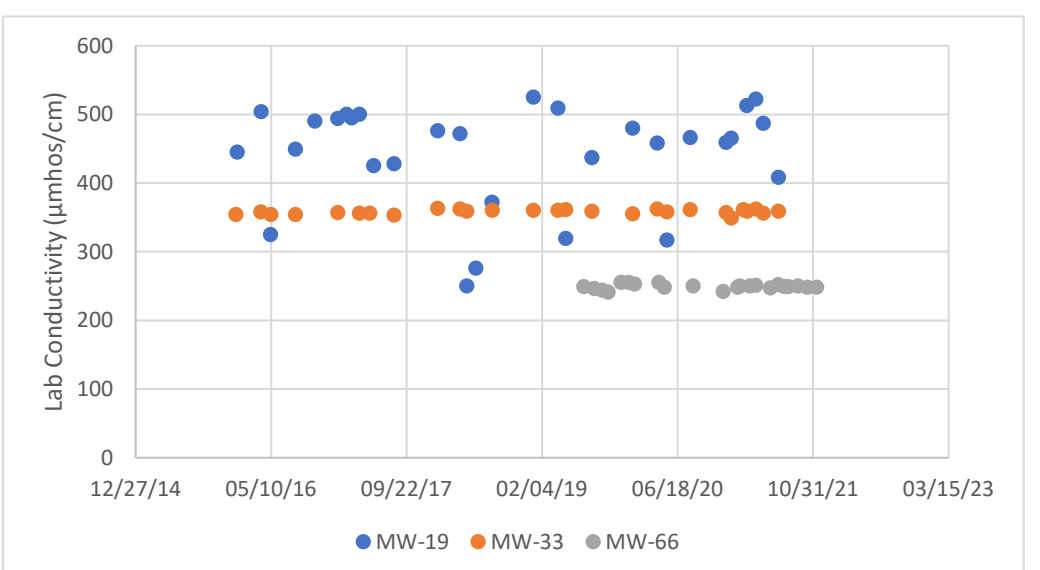

Field Depth (ft)
350
300
250
200
150
100
50
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

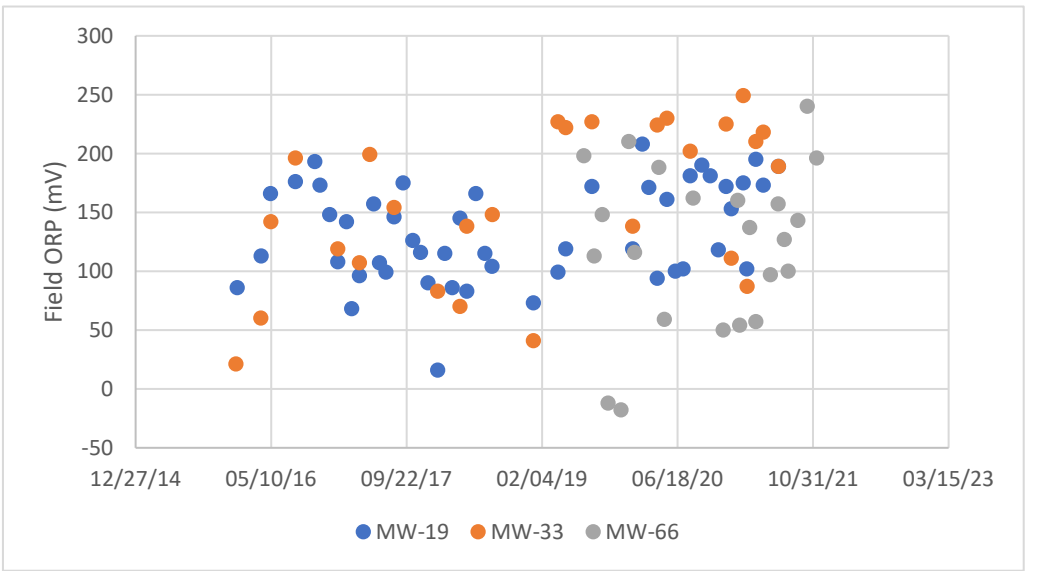

Field Temperature (°C)
18
16
14
12
10
8
6
4
2
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

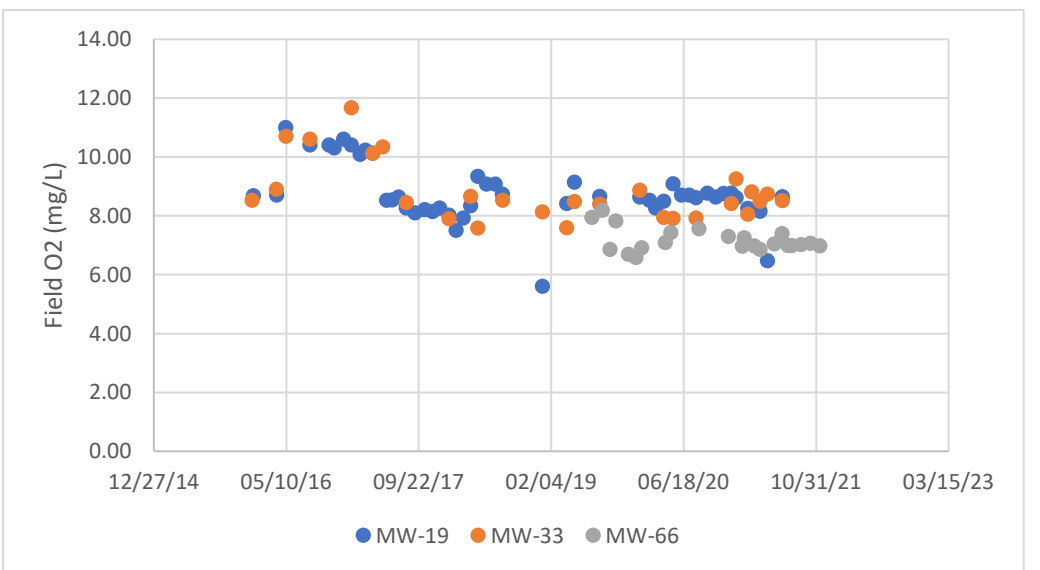

Field pH (SU)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

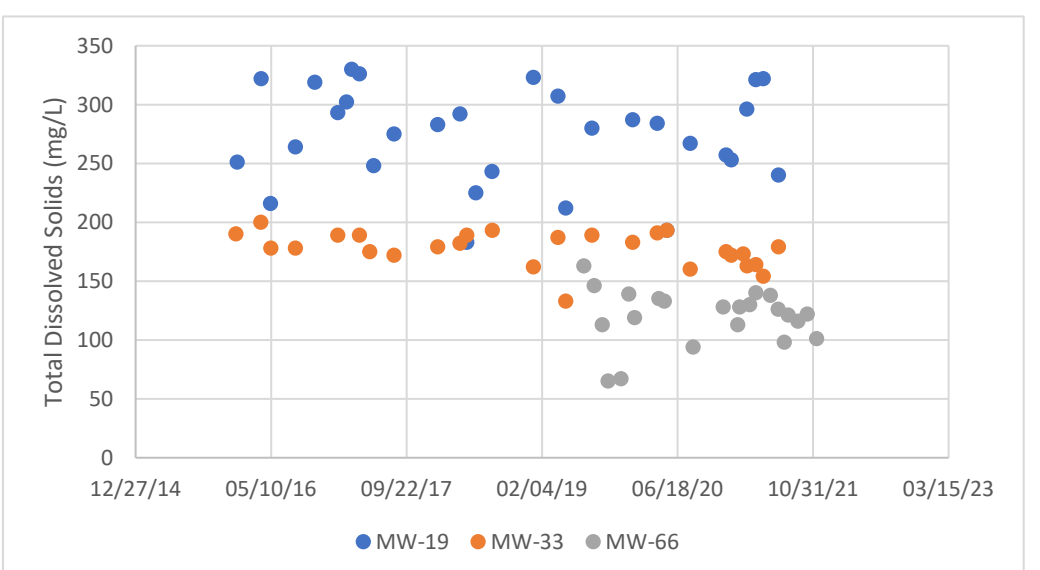

Lab pH (SU)
14
12
10
8
6
4
2
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

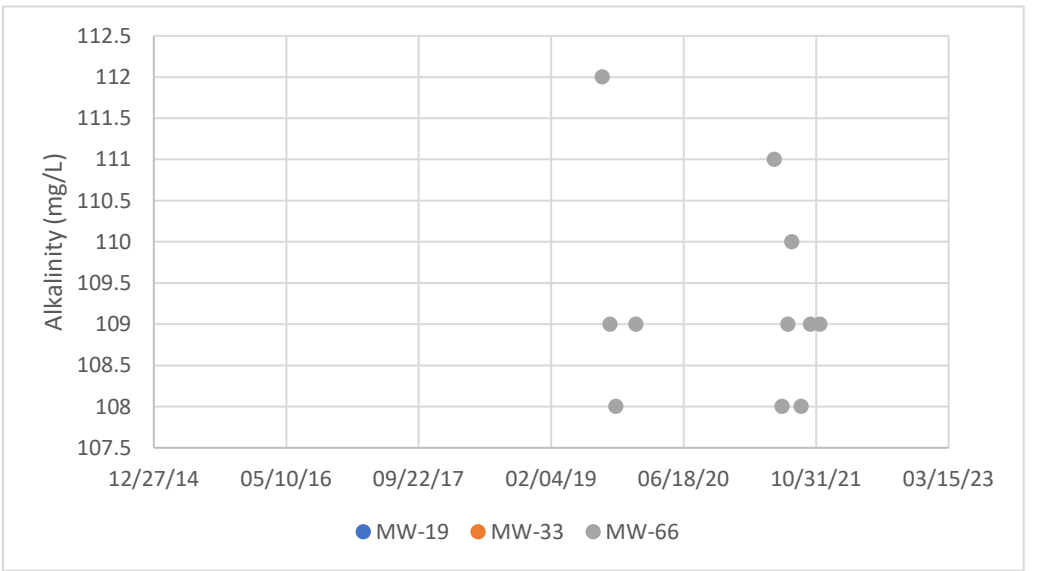

Field Conductivity (µmhos/cm)
800
700
600
500
400
300
200
100
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

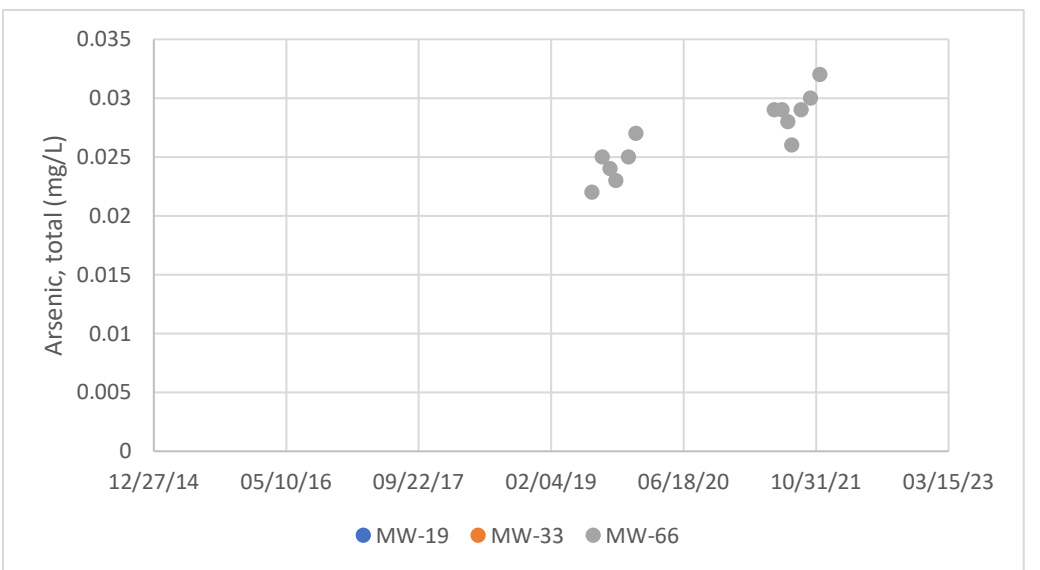

Lab Conductivity (µmhos/cm)
600
500
400
300
200
100
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

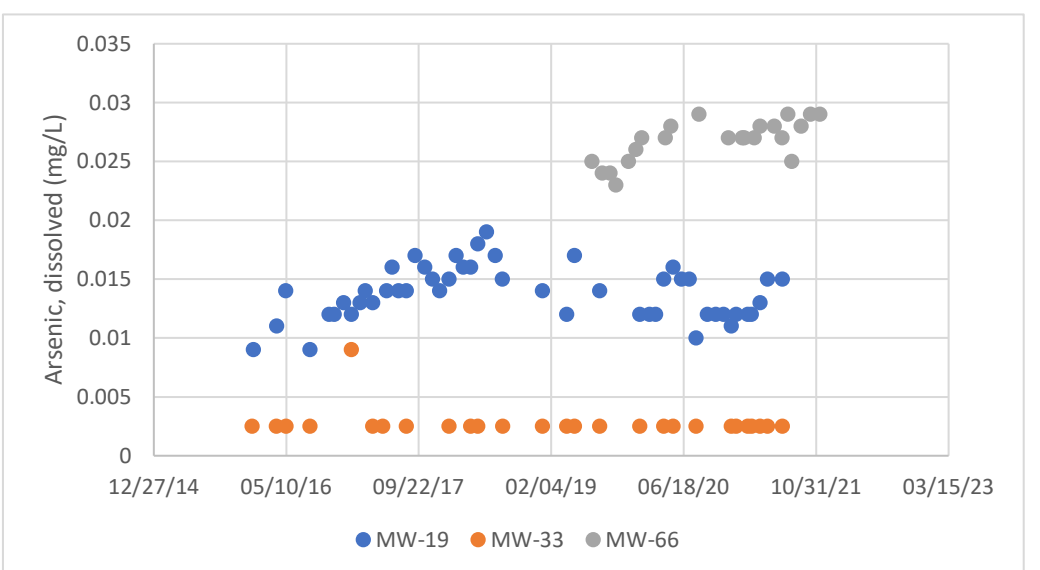

Field ORP (mV)
300
250
200
150
100
50
0
-50
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

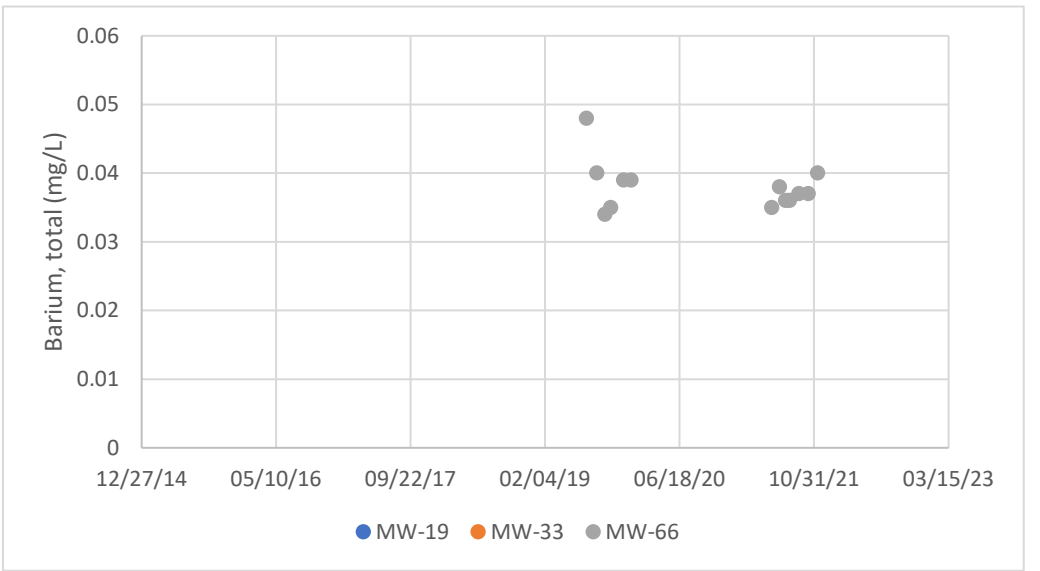

Field O2 (mg/L)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

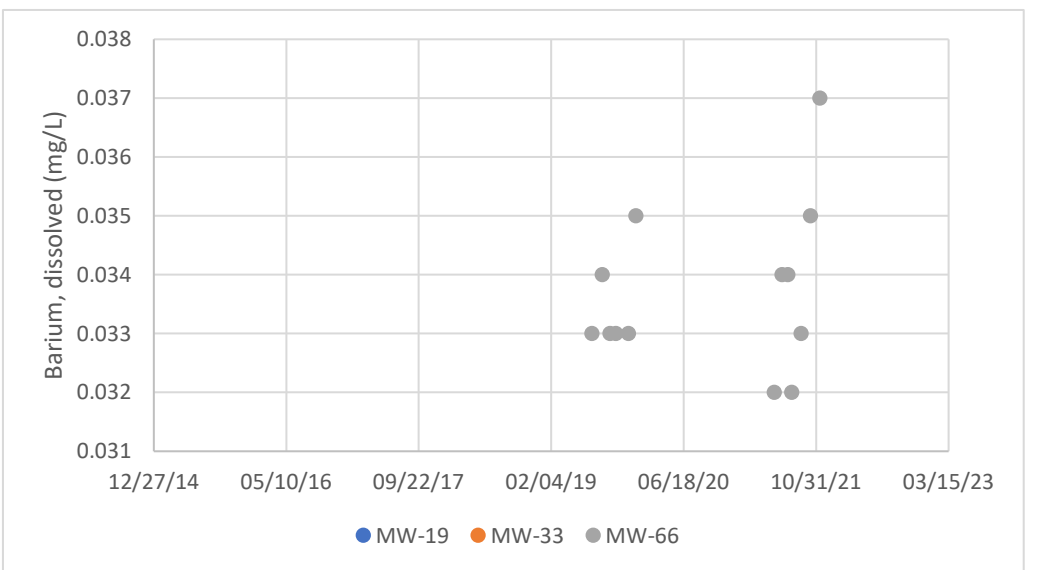

Total Dissolved Solids (mg/L)
350
300
250
200
150
100
50
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66


112.5
112
111.5
111
110.5
110
109.5
109
108.5
108
107.5
Alkalinity (mg/L)
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66


0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Arsenic, total (mg/L)
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66


0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Arsenic, dissolved (mg/L)
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66


Barium, total (mg/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66


Barium, dissolved (mg/L)
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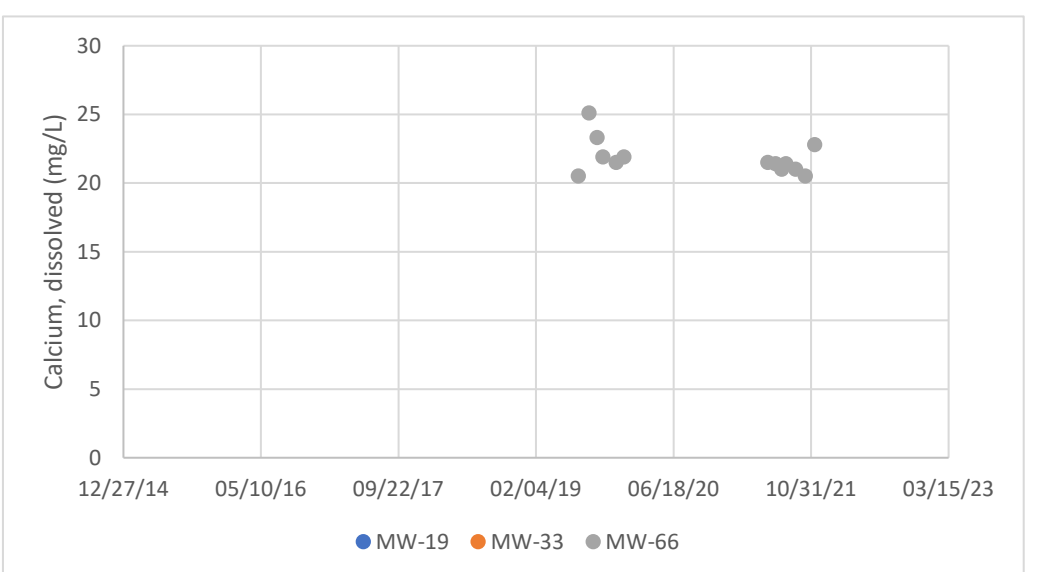
0.037
0.036
0.035
0.034
0.033
0.032
0.031
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66


Calcium, dissolved (mg/L)
30
25
20
15
10
5
0
12/27/14
05/10/16
09/22/17
02/04/19
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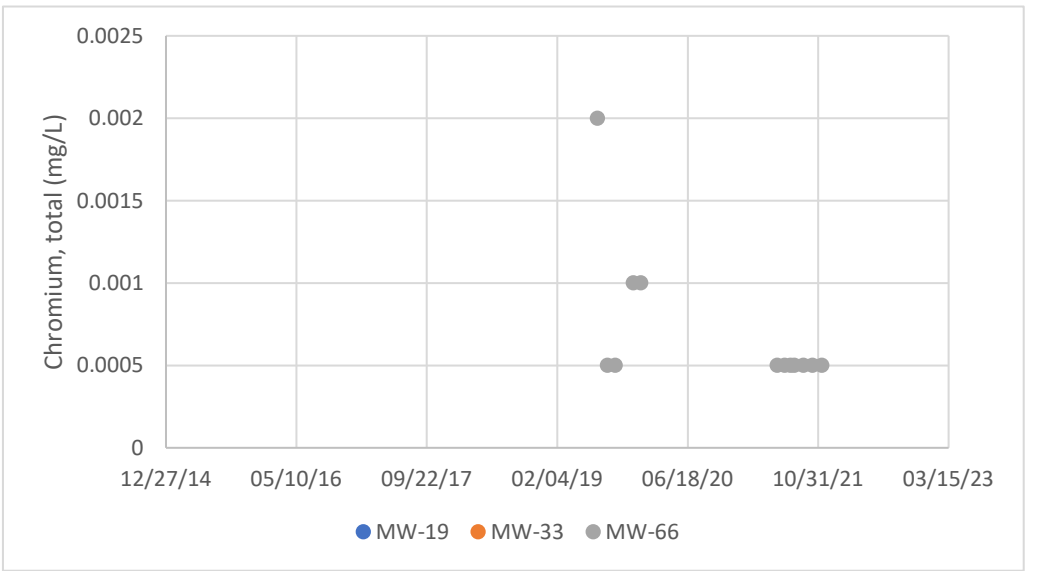
10/31/21
03/15/23
MW-19
MW-33
MW-66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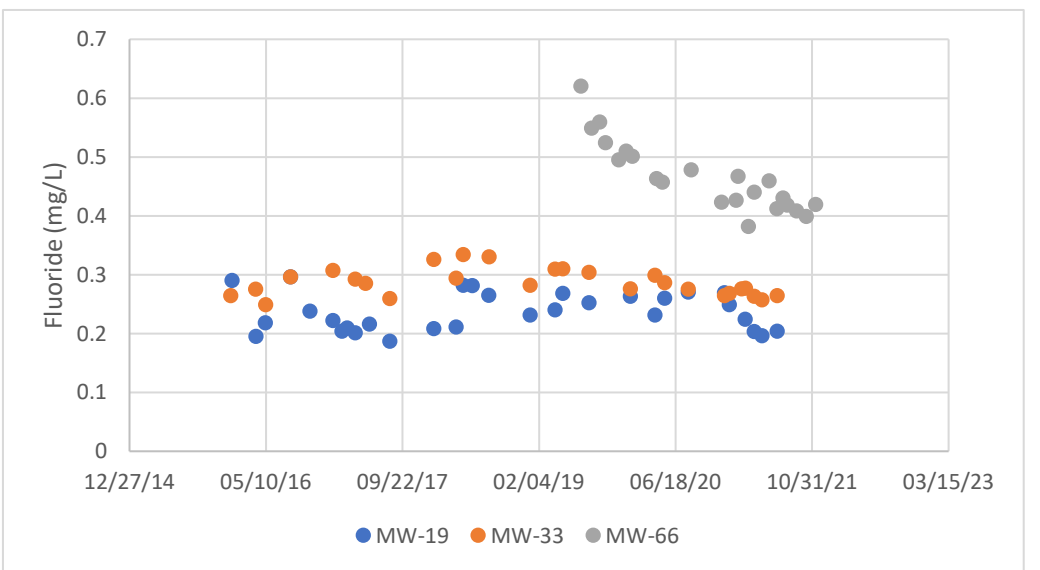
0.002
0.0015
0.001
0.0005
0
Chromium, total (mg/L)
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66


0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Fluoride (mg/L)
12/27/14
05/10/16
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02/04/19
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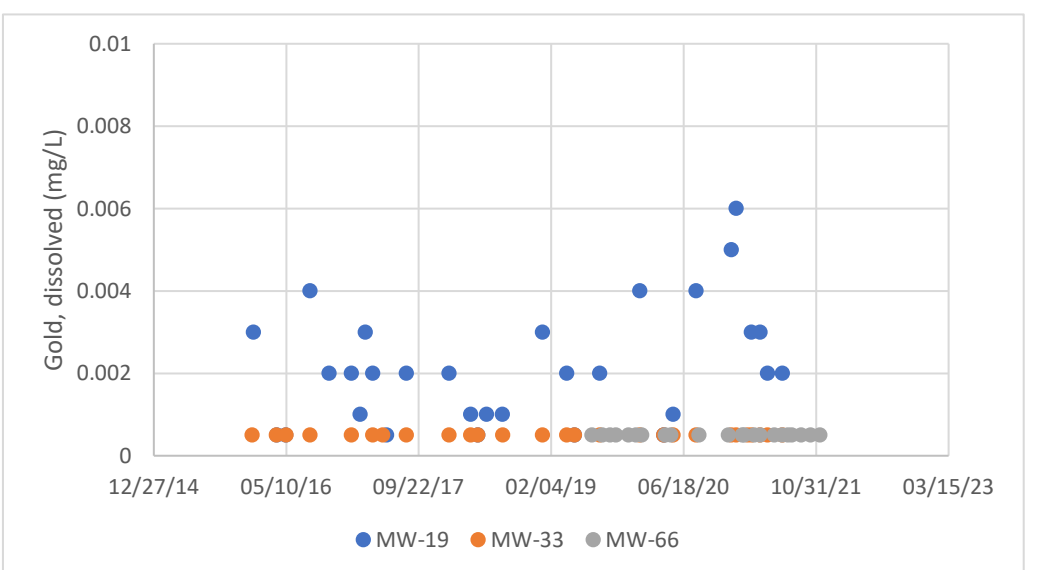
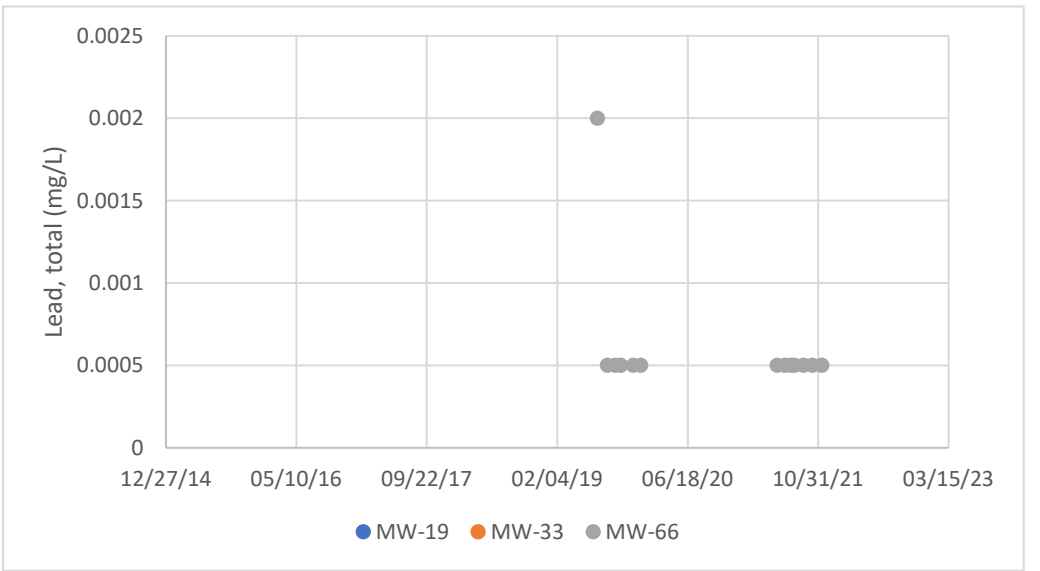
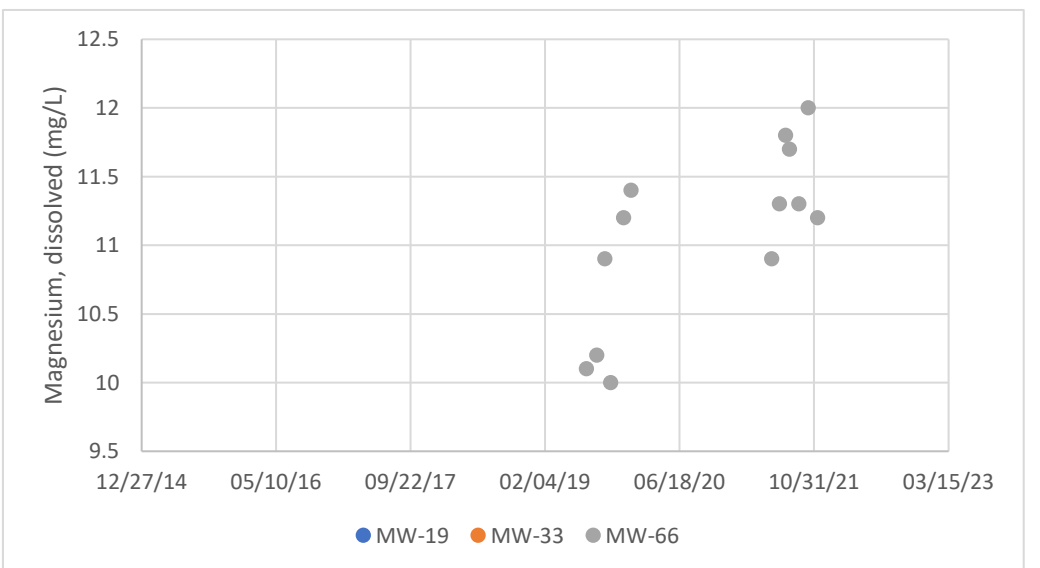
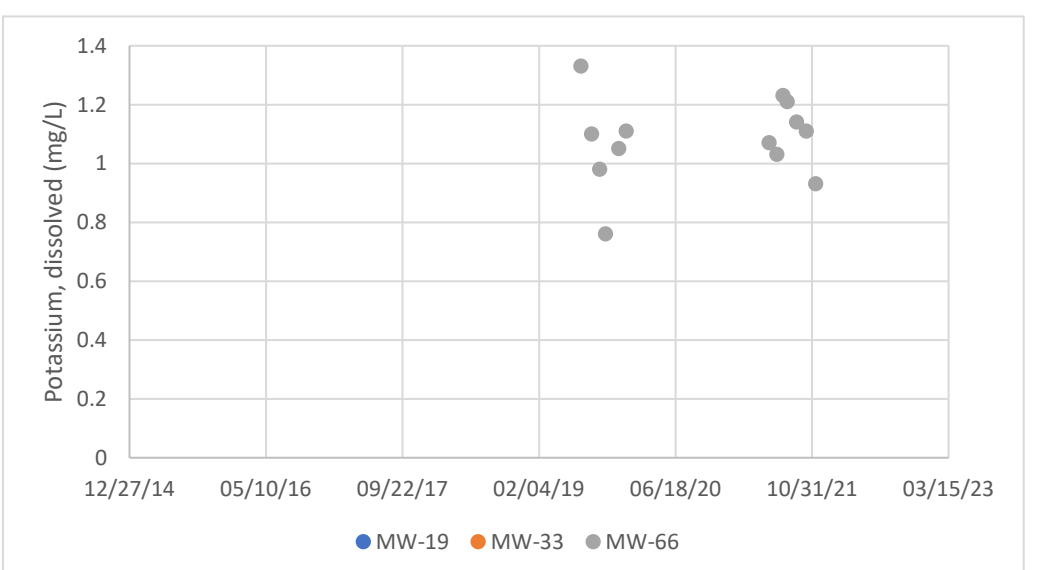
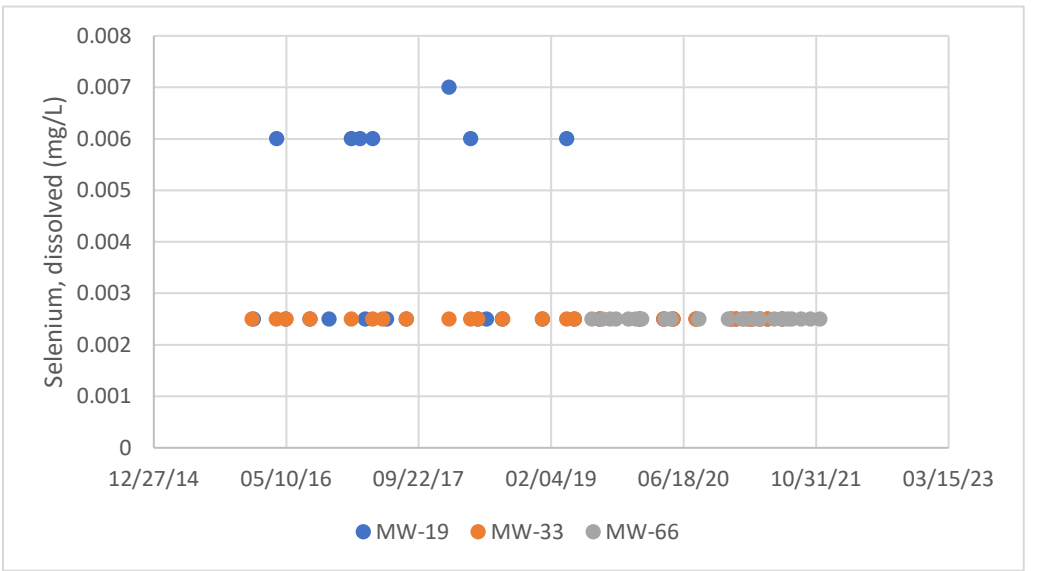
10/31/21
03/15/23
MW-19
MW-33
MW-66

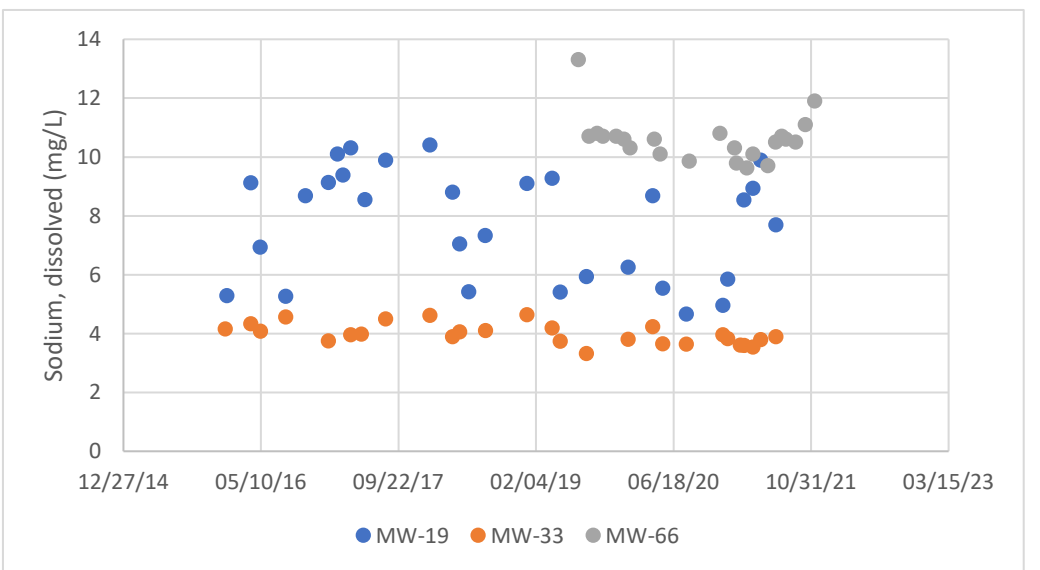

0.01
0.008
0.006
0.004
0.002
0
Gold, dissolved (mg/L)
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

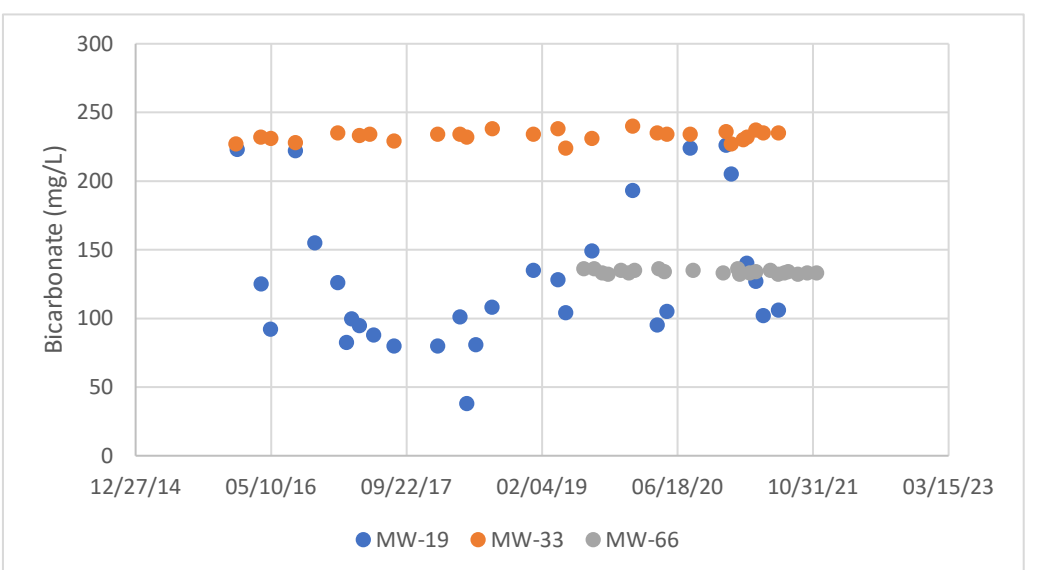

0.0025
0.002
0.0015
0.001
0.0005
0
Lead, total (mg/L)
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

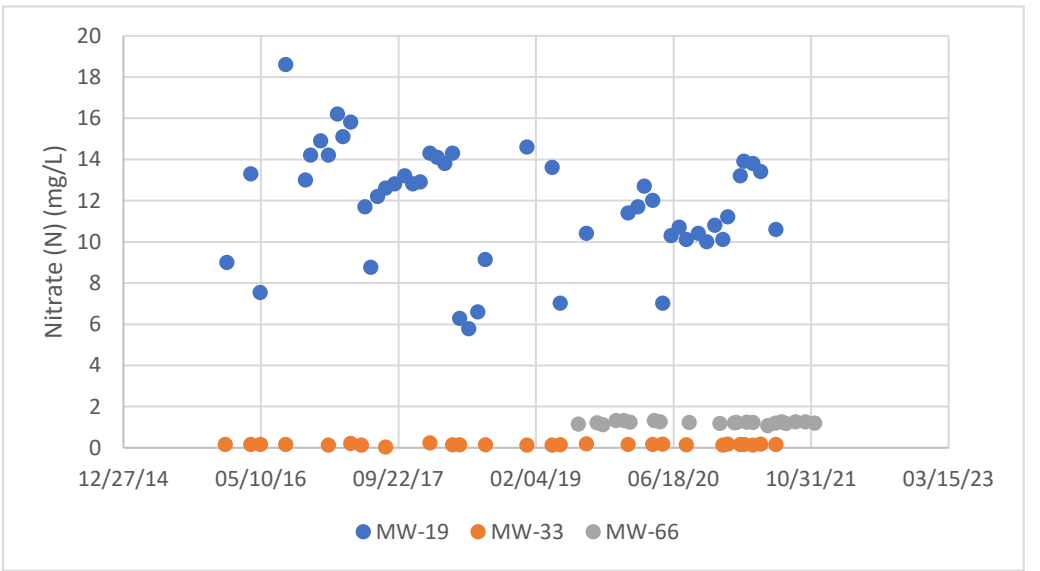

12.5
12
11.5
11
10.5
10
9.5
Magnesium, dissolved (mg/L)
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

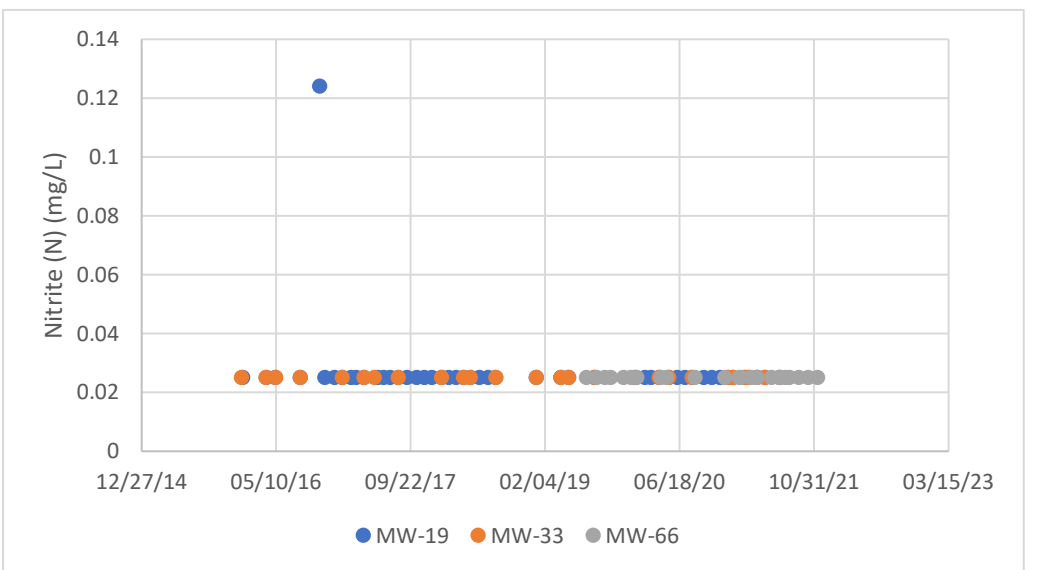

1.4
1.2
1
0.8
0.6
0.4
0.2
0
Potassium, dissolved (mg/L)
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

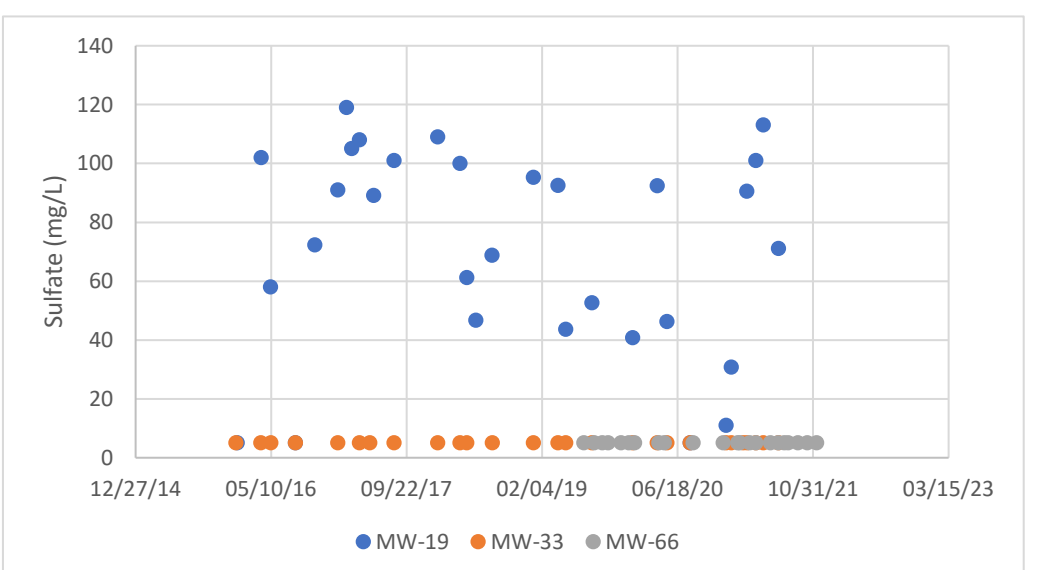

Selenium, dissolved (mg/L)
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66


Sodium, dissolved (mg/L)
14
12
10
8
6
4
2
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66


Bicarbonate (mg/L)
300
250
200
150
100
50
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66


Nitrate (N) (mg/L)
20
18
16
14
12
10
8
6
4
2
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

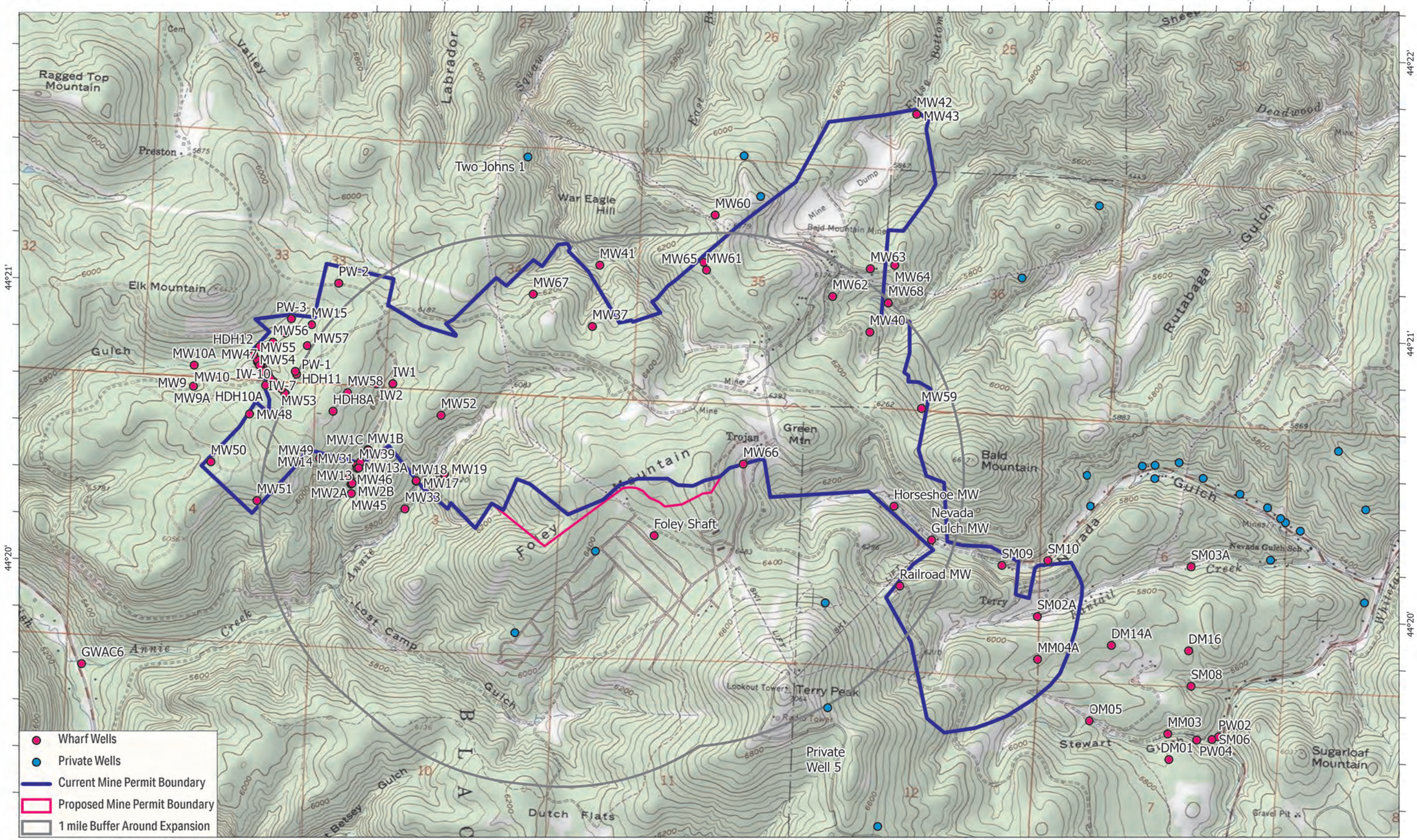

Nitrite (N) (mg/L)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66


Sulfate (mg/L)
140
120
100
80
60
40
20
0
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
10/31/21
03/15/23
MW-19
MW-33
MW-66

APPENDIX G

WELL LOCATION INVENTORY MAP

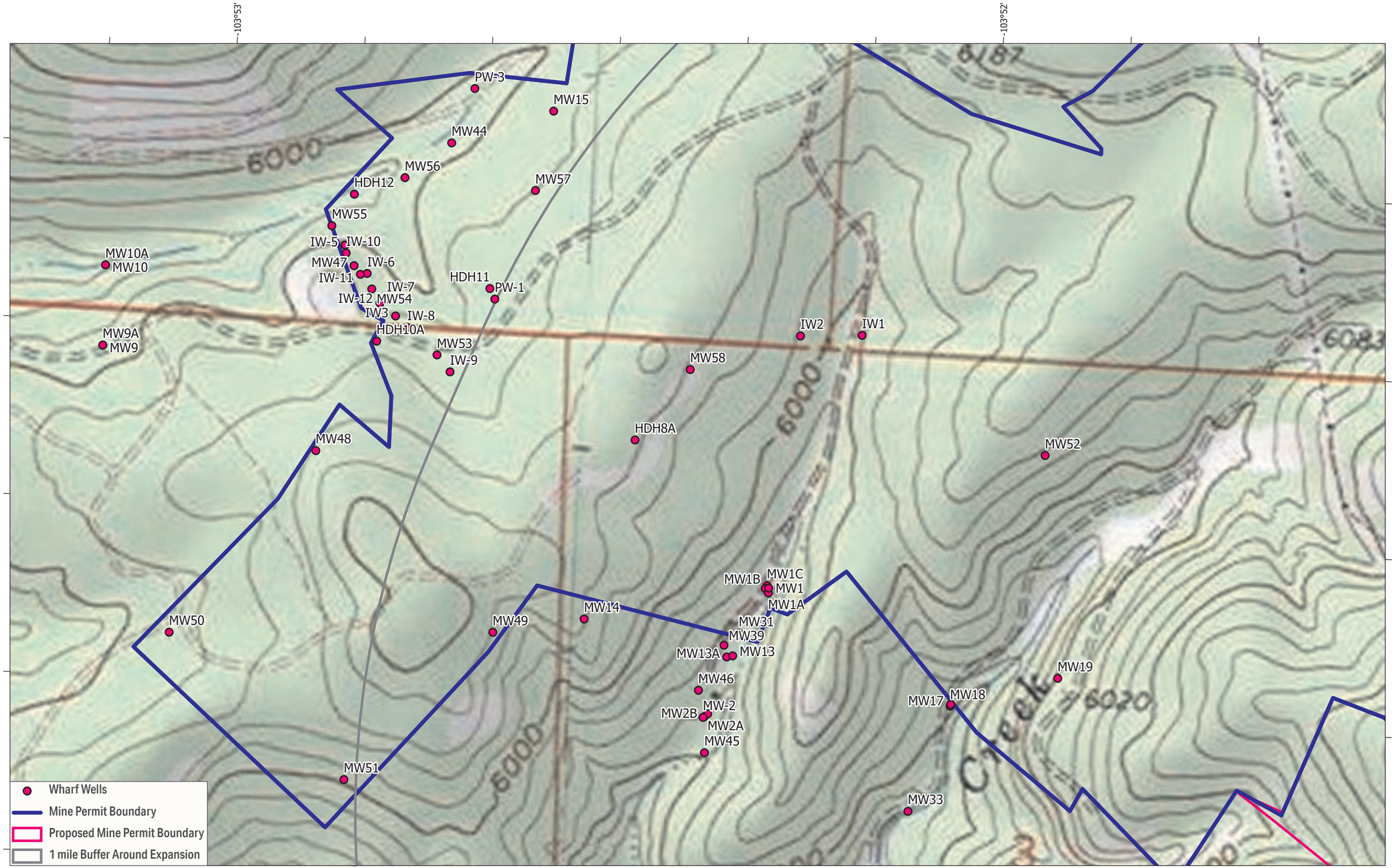
Wharf Monitoring and Private Wells



Prepared By:
Wells 5/16/2022 crystal.hocking

Applicant: Wharf Resources (USA), Inc.

0 0.5 1
Miles


103°53'
103°52'
6187
6000
6083
6020
Creek
PW-3
MW15
MW44
MW56
MW57
HDH12
MW55
IW-5
IW-10
MW10A
MW10
MW47
IW-6
IW-11
IW-7
IW-12
MW54
IW3
IW-8
HDH10A
HDH11
PW-1
MW9A
MW9
MW53
IW-9
IW2
IW1
MW58
HDH8A
MW52
MW48
MW50
MW49
MW14
MW1B
MW1C
MW1
MW1A
MW31
MW39
MW13A
MW13
MW46
MW-2
MW2B
MW2A
MW45
MW19
MW17
MW18
MW51
MW33
Wharf Wells
Mine Permit Boundary
Proposed Mine Permit Boundary
1 mile Buffer Around Expansion

APPENDIX H
WATER RIGHTS

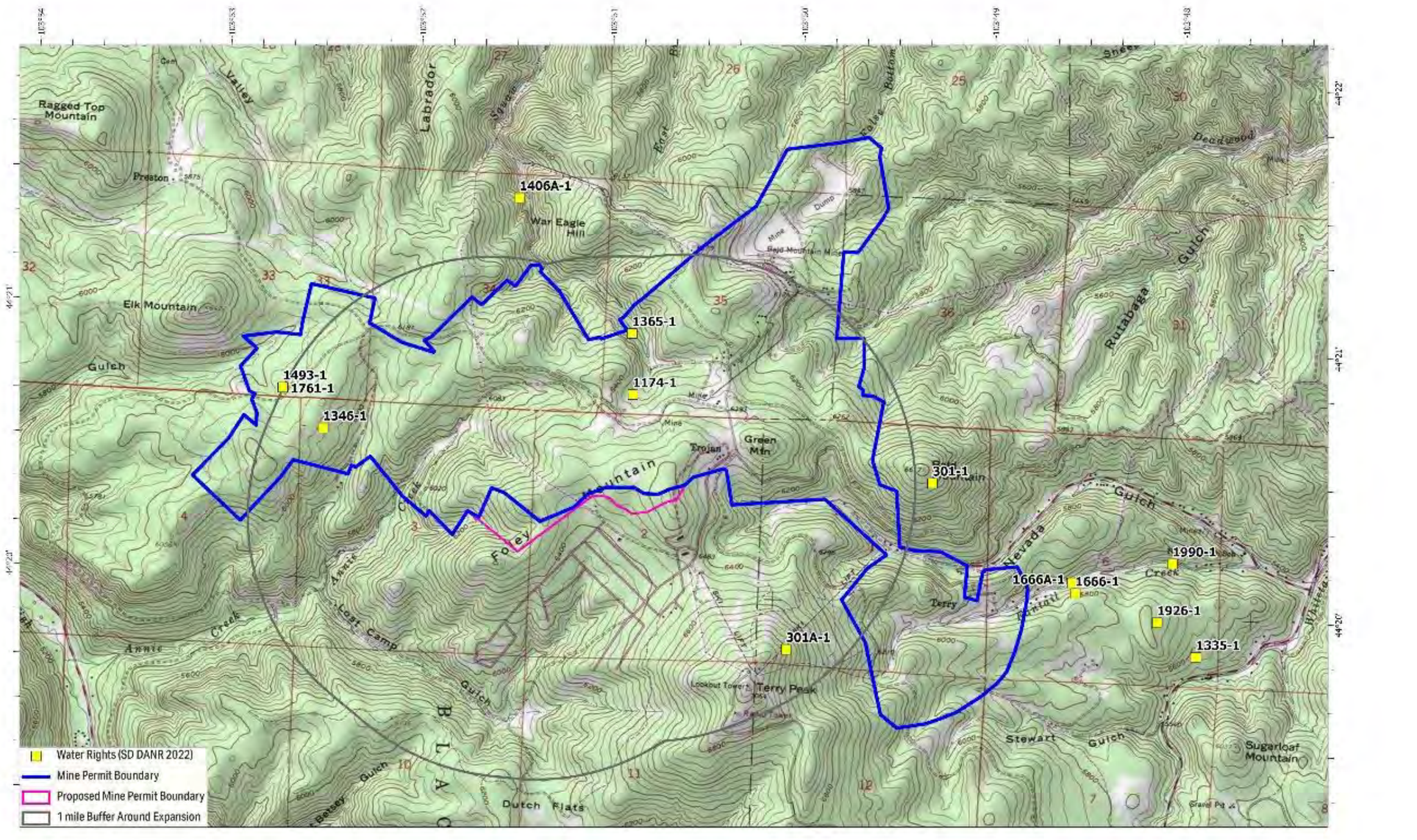


Figure H-1. Map of Water Rights in the Vicinity of the Boston Expansion.

Table H-1. Wharf and Golden Reward Mining Company Water Rights (Page 1 of 2)

Permit No.	Status	Name/ Business	Type of Use	Priority Date	Pump Rate (cfs)	Legal Description	Source
			Wharf				
1173-1	License	Wharf Resources (USA) Inc.	Commercial, Municipal	01/01/1914	0.20	NW1/4NW1/4 Sec.3 T4N-R2E	Spring
1174-1	License	Wharf Resources (USA) Inc.	Commercial, Municipal	01/01/1900	0.67	SW1/4SW1/4 Sec.35 T5N-R2E	Squaw Creek Shaft, Pump Station
1346-1	License	Wharf Resources (USA) Inc.	Domestic	11/02/1985	0.22	NW1/4NW1/4 Sec.3 T4N-R2E	Groundwater
1365-1	License	Wharf Resources (USA) Inc.	Industrial, Domestic	09/15/1986	0.16	NW1/4SW1/4 Sec.35 T5N-R2E	Groundwater, Annie Creek Mine Operation
1437-1	License	Wharf Resources (USA) Inc.	Industrial	04/05/1988	0.00	NW1/4NW1/4 Sec.3 T4N-R2E	Runoff
1493-1	Incorporated	Wharf Resources (USA) Inc.	Industrial	05/21/1990	0.356	SW1/4SE1/4 Sec.33 T5N-R2E	Groundwater
1667-1	License	Wharf Resources (USA) Inc.	Industrial	04/02/1998	0.89	SE1/4NW1/4 Sec.3 T4N-R2E	Annie Creek
1761-1	License	Wharf Resources (USA) Inc.	Industrial	12/24/2001	0.67	SW1/4SE1/4 Sec.33 T5N-R2E	Groundwater
1278-1	Incorporated	Wharf Resources Inc.	Industrial	05/20/1983	0.07	SW1/4SE1/4 Sec.33 T5N-R2E	Groundwater
1288-1	Incorporated	Wharf Resources Inc.	Industrial	08/10/1983	0.07	SE1/4SW1/4 Sec.33 T5N-R2E	Groundwater
1406-1	Incorporated	Wharf Resources Inc.	Industrial	07/29/1987	0.56	NW1/4NW1/4 Sec.34 T5N-R2E	Groundwater

Table H-1. Wharf and Golden Reward Mining Company Water Rights (Page 2 of 2)

Permit No.	Status	Name/ Business	Type of Use	Priority Date	Pump Rate (cfs)	Legal Description	Source
Wharf (Continued)							
1460-1	Cancelled	Wharf Resources Inc.	Suburban Housing Development, Rural Water System	05/31/1989	0.10	SW1/4SW1/4 Sec.35 T5N-R2E	Groundwater
1514-1	Cancelled	Wharf Resources Inc.	Industrial	02/25/1991	0.90	SE1/4NW1/4 Sec.3 T4N-R2E	Annie Creek
Golden Reward							
1666-1	Incorporated	Golden Reward Mining Company LP	Industrial	03/17/1998	1.83	NE1/4SW1/4 Sec.6 T4N-R3E	Groundwater
1666A-1	License	Golden Reward Mining Company LP	Commercial, Industrial, Domestic	04/11/1988	0.83	NE1/4SW1/4 Sec.7 T4N-R3E	Groundwater, Runoff
1441-1	Denied	Golden Reward Mining Company LP	Industrial, Domestic		0.22	NW1/4NE1/4 Sec.7 T4N-R3E	Groundwater
0425-1	Cancelled	Golden Reward Mining Company LP	Irrigation	07/20/1906	0.00	NE1/4 Sec. 0 T0S-R0E	Whitewood Creek
1438-1	Incorporated	Golden Reward Mining Company LP	Industrial, Domestic	04/11/1988	0.67	SW1/4SE1/4 Sec.7 T4N-R3E	Groundwater
1439-1	Incorporated	Golden Reward Mining Company LP	Industrial, Domestic	04/11/1988	0.33	NW1/4SE1/4 Sec.7 T4N-R3E	Groundwater
1440-1	Incorporated	Golden Reward Mining Company LP	Industrial	04/11/1988	0.28	NW1/4NE1/4 Sec.7 T4N-R3E	Runoff
1447-1	Cancelled	Golden Reward Mining Company LP	Industrial, Domestic	07/28/1988	0.22	NW1/4NE1/4 Sec.7 T4N-R3E	Groundwater, Bertha Mine Workings

Each entry listed in the above table is located in Lawrence County, SD and is associated with the Belle Fourche River Basin. Each entry also is noted as having 0.00 irrigation acres.

cfs = cubic feet per second

APPENDIX I

FOLEY SHAFT GROUNDWATER MEMORANDUM

LIFECYCLEGEO

DATE April 28, 2021 **TECHNICAL SUMMARY**
TO Matt Zietlow
Coeur Wharf / Wharf Resources

CC
FROM D. Morgan Warren & Tom Meuzelaar **EMAIL** tom@lifecyclegeo.com

RE: FOLEY SHAFT WATER QUALITY EVALUATION – WHARF MINE

At the request of Coeur Wharf / Wharf Resources (Coeur), Life Cycle Geo, LLC. (LCG) has prepared this technical memorandum that summarizes the evaluation of historic water quality within the Foley Shaft at the Wharf Mine near Lead, South Dakota. This evaluation includes a comparison with other Wharf mine water quality from various groundwater, surface water, and process water sources. The goal of this evaluation is to assess whether the water within Foley Shaft can be used as future compliance point at the Wharf mine.

1.0 WATER QUALITY DATA

LCG evaluated water quality data collected from approximately 100 locations at the Wharf mine (see location map, Attachment A) between December 1997 and February 2021. Water samples missing major ion chemistry were removed from the analysis because the primary tool used in this evaluation, the Piper plot (Piper, 1944), requires analysis of six major ions: calcium, magnesium, sodium, chloride, sulfate, and bicarbonate. The resulting dataset comprised 1,670 unique samples from 42 locations which represented groundwater, surface water, and process water locations.

To simplify the comparison, samples were grouped into five categories based broadly on their geographic location and water type, except for Foley Shaft which was given its own category to facilitate direct comparison between Foley Shaft water and water from the rest of Wharf mine. The five categories were:

- East Groundwater (monitoring wells east of, and including, MW-67)
- West Groundwater (monitoring wells west of MW-67)
- Surface Water
- Process Water
- Foley Shaft

2.0 ANALYSIS

The primary tool used to infer the similarity (or dissimilarity) of the water in Foley Shaft relative to the rest of the water at the Wharf mine was the Piper plot. A Piper plot consists of three regions (i.e., two triangles and a diamond) showing the relative proportion of a sample's anions (right triangle), cations (left triangle), and combined anion + cation composition (center diamond) in milliequivalents (meq)[1]. A Piper plot of the 1,670 samples is presented in Figure 1.

[1] It is very important to note that a Piper diagram presents proportions of major ions but does not give an indication of the actual concentrations; in other words, a water with high concentrations of the three major anions and four major cations will plot in the same place on the diagram as a dilute water with low

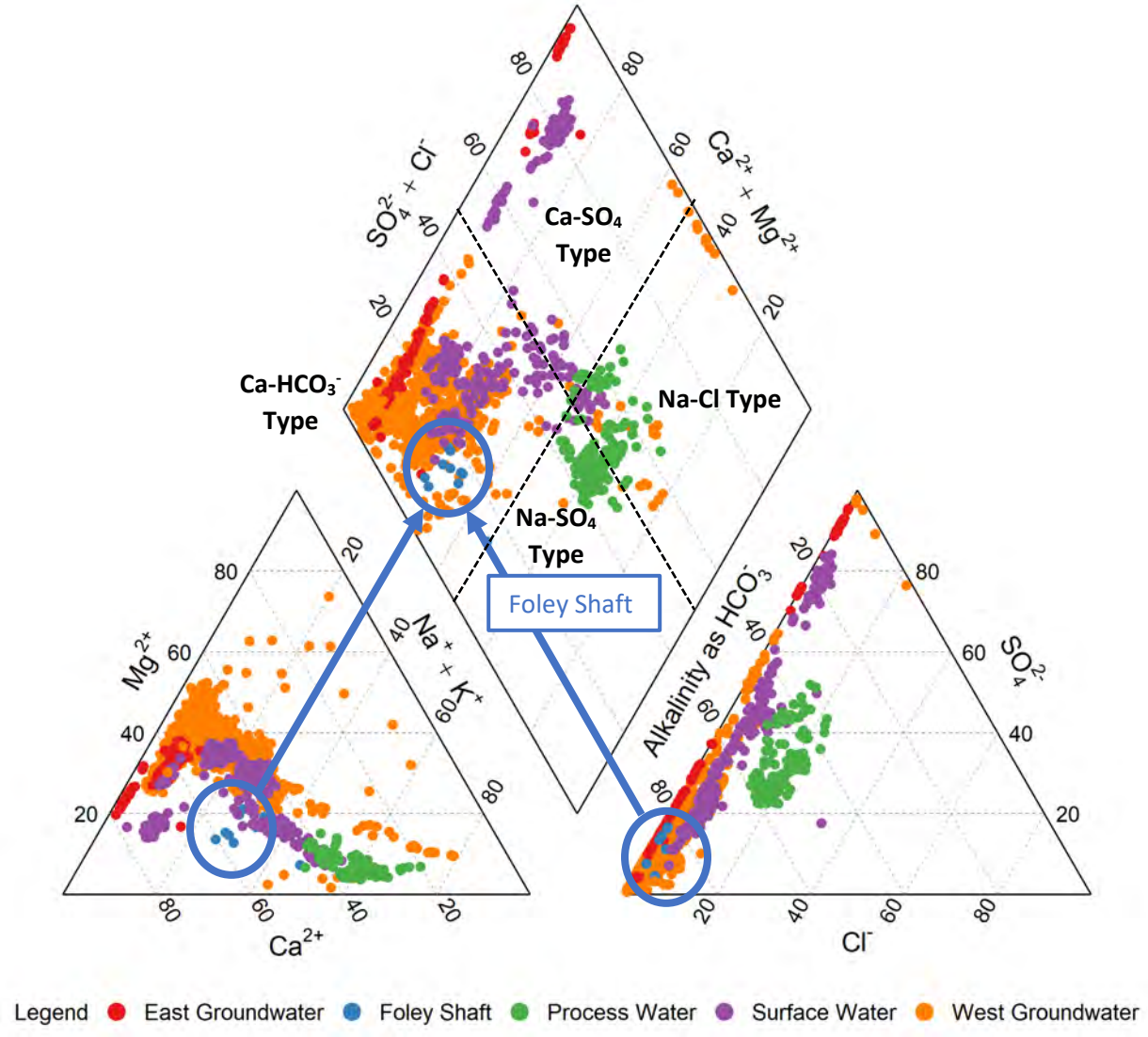


***Figure 1**: Piper plot of Wharf water chemistry*

The center diamond is often used to classify water samples into different hydrochemical facies, defined as a compositionally distinct zone of water (Freeze & Cherry, 1979). This facilitates interpretation of a water's origin according to its major ion proportions. A diagram illustrating the four main hydrochemical facies is superimposed on Figure 1 with dashed lines. The Foley Shaft

concentrations in the same proportion. It is theoretically possible to plot sample size proportional to total dissolved concentrations (TDS) but not practical given the large sample size.

samples are identified by blue circles and delineated by a larger blue circle in each of the three regions in Figure 1.

The Piper plot presented in Figure 1 shows major ion proportions in Wharf mine groundwater (east and west), surface water, and process water samples. The five sample groups plot mostly within focused areas of the diagram with few exceptions. Groundwater generally plots within the calcium/magnesium-bicarbonate hydrochemical facies, which is consistent with the fact that groundwater is hosted by underlying fractured carbonate aquifer (and/or calcite bearing igneous rocks). Most surface water samples plot in either the calcium/magnesium-bicarbonate or the sodium-sulfate hydrochemical facies, in between groundwater and process water samples. As expected, process water samples have a higher proportion of both sodium and sulfate than other samples, and plot in both the sodium-sulfate and sodium-chloride facies.

The purpose of this evaluation is to assess whether or not water quality in the Foley Shaft could be used as future monitoring point to establish ongoing mine compliance. This would imply that water in the shaft is hydraulically connected to area groundwater. Evaluation of Figure 1 suggests that Foley Shaft water is neither mine influenced nor hydraulically connected:

- Foley Shaft major ion proportions are dissimilar from those of both East and West groundwater samples at Wharf, as indicated by the fact that they plot uniquely in Figure 1. Generally speaking, Foley Shaft water has lower magnesium and somewhat higher calcium proportions than Wharf area groundwater.
- Mine influenced water will have a combined process water and background water (i.e., groundwater and/or surface water) signature, and should plot in between these two sample populations on Figure 1. This does not appear to be the case.

Additional lines of evidence provided by evaluation of trace elements and both two variable and multi-variable statistical correlation confirms the uniqueness of Foley Shaft water, as well as the fact that it is not currently mine impacted. Furthermore, Foley Shaft is an open shaft, which indicates that influence from surface water (e.g., direct recharge, or surface water that has had time to equilibrate with surficial soils) is likely.

Given the fact that it cannot be established using geochemical techniques that water in the Foley Shaft is hydraulically connected to area aquifers and that it appears compositionally unique, LCG does not recommend that Foley Shaft water be used for future compliance.

3.0 CLOSURE

This tech memo was prepared by Mr. Morgan Warren and Dr. Tom Meuzelaar. Please contact the undersigned with any questions or comments.

D. Morgan Warren, P.G.
Senior Geochemist

Tom Meuzelaar, Ph.D.
Principal Consultant

4.0 REFERENCES

Freeze, R.A. and J.A. Cherry, 1979, Groundwater, Prentice Hall, Englewood Cliffs, New Jersey, 604 pp

Piper, A.M., 1944, A Graphic Procedure in the Geochemical Interpretation of Water-Analyses. Eos, Transactions American Geophysical Union, 25, 914-928.

APPENDIX J

LOST CAMP SPRING SURVEY MEMORANDUM

EXTERNAL MEMORANDUM

To: Amy Allen
Sr. Environmental Compliance Coordinator
Coeur Wharf
10928 Wharf Rd.
Lead, SD 57754

cc: Crystal Hocking, PE, PG, RESPEC
Project Central File M0025.21001

From: Nicholas Marnach, PE
Staff Engineer
RESPEC
P.O. Box 725
Rapid City, SD 57709

Date: June 8, 2022

Subject: Lost Camp Creek Spring Survey

A spring survey was completed on Lost Camp Creek on May 24 and 25, 2022, to identify and inventory springs and seeps upstream of the Lost Camp Creek surface-water sampling site. This project was completed by RESPEC Company, LLC (RESPEC) hydrologists for Coeur Wharf (Wharf) in support of permitting efforts for the proposed Boston Expansion and ongoing hydrologic site investigations. No springs or seeps are located within the proposed Boston Expansion Area.

As part of the Boston Expansion project, Wharf conducted a field inventory for springs along Lost Camp Creek in May 2021. The inventory involved searching for a source of water by walking up the Lost Camp Creek drainage from its confluence with Annie Creek to the Lost Camp Creek headwaters. In May 2021, the Lost Camp Creek headwaters spring was sampled while flowing, but the site has been dry since the initial sampling. The field inventory also identified a stormwater outfall from the Lost Camp Creek subdivision, which was contributing flow to the drainage but was not sampled because of uncertainty in its source. In May 2022, RESPEC conducted a spring survey to identify additional sources of flow within the drainage.

At the time of the survey, local streams and creeks had higher flow than observed in 2021, which was likely a result of spring melt and runoff from recent precipitation events. RESPEC observed localized saturated portions of the road surface leading to the Wharf Mine, which confirmed precipitation during the night of May 23. Weather during the spring survey was partly cloudy to sunny with a temperature ranging from 40 to 65 degrees Fahrenheit (°F). Light rain fell for approximately 30 minutes during the afternoon hours of May 24, and May 25 was partly cloudy to sunny.

3824 JET DRIVE
RAPID CITY, SD 57703
P.O. BOX 725 // RAPID CITY, SD 57709
605.394.6400

METHODOLOGY

To identify springs and seeps in the Lost Camp Creek drainage, RESPEC traversed the entire creek length and conducted a visual investigation that involved recording streamflow measurements and collecting data with a multiparameter sonde. Recorded sonde data included temperature, dissolved oxygen, conductivity, and pH. RESPEC also recorded visual seeps or springs and incoming side flow channels into the channel being studied.

RESPEC attempted to maintain consistent stationing of cross-section locations through pacing, but physical streambed characteristics and channel morphology generally dictated the cross-section and measurement station location. RESPEC accessed the entire length of each contributing creek except for one area, approximately 500 feet (ft) along Lost Camp Creek, where the channel became inaccessible because of steep terrain and dense vegetation.

The headwater springs identified by Wharf in 2021 and observed during this study were the only springs where traditional streamflow measurements could be collected outside the main channel. All other springs and seeps observed were either too shallow, too narrow, or too disparate to collect flow measurements with a top-setting wading rod; therefore, flow measurements were collected directly within the Lost Camp Creek channel where the shallowest portion of the cross section possessed a depth greater than 0.2 ft.

Side seeps and springs along each reach were not sampled using the multiparameter sonde because they had shallow depths less than 0.5 inch. Greater depths from a spring or seep were caused by confinement and ponding, not a concentration of flow from the spring or seep; therefore, data collected with the sonde were restricted to within the main Lost Camp Creek channel.

RESPEC used a thermal imaging camera in the study. Results showed observable temperature differences when measuring the relative temperature of side seeps and springs compared to the main channel. RESPEC attempted to identify springs and seeps within the channel using the thermal camera, but the turbulent nature of the flow within the channel was not conducive to observing a gradual mixing of different temperatures. Spring and seep temperatures were cooler than the main channel, but RESPEC assumed that the temperature difference was not great enough to measure with the capabilities of the thermal camera. The colorimetric scale of the thermal camera is relative and temperature readings were found not to be precise in this application compared to sonde temperature measurements. On thermal images, red and yellow colors are relatively warmer temperatures and blue and purple colors represent relatively cooler temperatures.

RESULTS

Twenty total potential spring or seep locations were identified along Lost Camp Creek during the May 2022 spring survey. Sites typically consisted of a single seep or spring, although a few locations consisted of two or more visibly separate springs or seeps. The springs and seeps identified along Lost Camp Creek are listed in Table 1 and shown in Figure 1. Flow measurements and physical data measurements within Lost Camp Creek are listed in Table 2. Representative photographs of springs and seeps along Lost Camp Creek are shown in Figures 2 through 11.

Table 1. Lost Camp Creek Springs and Seep Locations and Physical Data Measurements

Spring I.D.	Description	Latitude	Longitude	Elevation (ft)	Temperature (°F)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
S-1	Spring	44.33238719	103.873252	5,480.2	39.9	11.46	155.4	8.09
S-2	Seep/spring	44.33021711	103.8705156	5,532.3	–	–	–	–
S-3	Two seeps	44.32893814	103.8683654	5,593.2	–	–	–	–
S-4	Seep	44.32862722	103.8674344	5,607.9	–	–	–	–
S-5	Seep	44.328562	103.8671931	5,622.2	–	–	–	–
S-6	Seep	44.32814869	103.865536	5,636.2	–	–	–	–
S-7	Spring/seep	44.32828892	103.8647688	5,629.3	–	–	–	–
S-8	Seep	44.32741644	103.862188	5,688.2	–	–	–	–
S-9	Two seeps	44.32672786	103.862188	5,726.7	–	–	–	–
S-10	Spring	44.32654903	103.8603031	5,726.7	–	–	–	–
S-11	Seep	44.32422664	103.8547772	5,851.5	41.8	10.23	57.1	7.41
S-12	Series of seeps and springs	44.32548275	103.8530282	5,892.3	41.4	10.66	74.9	7.50
S-13	Series of seeps and springs	44.32549886	103.8538909	5,913.2	–	–	–	–
C-14	Confluence	44.32533247	103.8561044	5,811.7	–	–	–	–
S-15	Out welling/ old spring	44.32611442	103.8567752	5,829.8	–	–	–	–
S-16	Spring	coordinate not obtained			–	–	–	–
S-17	Spring/ out welling	44.32732883	103.8560688	5,879.2	40.2	8.23	213.0	7.34
S-18	Spring/ out welling	44.32793783	103.8556806	5,882.3	40.2	8.27	214.7	7.00
S-19	Seep	44.32834425	103.8549457	5,917.2	41.7	9.77	227.7	7.29
S-20	Spring	44.33018117	103.8515424	6,024.5	40.8	9.06	226.8	6.84
S-21	Stream headwater/ spring	44.33220436	103.8473905	6,231.5	39.7	10.70	231.8	8.15

µS/cm = microsiemens per centimeter

mg/L = milligrams per liter

RESPEC walked from the Lost Camp Creek downstream confluence with Annie Creek upstream to its confluence with the eastern tributary of Lost Camp Creek at C-14 shown in Figure 1 on May 24, 2022. On May 25, the upper branch of Lost Camp Creek was inspected from its headwater at S-21 (Figure 1) downstream to C-14. An approximate 500-ft length of stream between spring S-7 and cross-section

measurement station M-6 was inaccessible because of heavy vegetation and steep terrain during the time of the survey.

Figures 2 through 8 show seeps/springs S-2, S-3, S-5, S-6, and S-7. Thermal imaging of side seep/spring S-2 is shown in Figure 3 and was taken from the same frame of seep/spring S-2 shown in Figure 2. Inspection of the thermal gradient shown in Figure 2 yields a discrete temperature difference between the seep/spring and the adjacent Lost Camp Creek.

Table 2. Lost Camp Creek Cross-Section Streamflow and Physical Data Measurements

Stream Cross-Section ID	Latitude	Longitude	Elevation (ft)	Streamflow (cfs)	Temperature (°F)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
M-1	44.33245917	103.8733672	5,503.3	4.06	39.0	11.6	271.3	8.57
M-2	44.33156325	103.8722928	5,515.3	1.51	41.4	11.3	154.5	8.06
M-3	44.33036347	103.8708574	5,556.0	1.35	42.4	11.1	153.0	8.08
M-4	44.32922417	103.8689321	5,566.0	1.83	42.1	10.6	149.4	8.08
M-5	44.32822747	103.8664294	5,634.6	1.83	42.7	10.4	146.5	8.07
M-6	44.32741644	103.862188	5,688.2	2.24	42.0	10.6	144.8	7.95
M-7	44.3251015	103.8580149	5,812.0	1.91	40.9	10.7	140.7	7.66
M-8	44.33220436	103.8473905	6,231.5	0.38	39.7	10.7	231.8	8.15

cfs = cubic feet per second

Between cross-section measurement stations M-6 and M-7, spring S-10 was located on a small terrace approximately 20 ft above the Lost Camp Creek water surface. This spring produced a large marshy area on the terrace with several springs presented in an approximate 150-ft radius. Flow from spring S-10 concentrated on the unimproved road surface adjacent to Lost Camp Creek where it picked up sediment from the road and flowed into the creek at the road crossing. No active traffic was observed at the time of the survey, but the road appears to be used and the clearing above spring S-10 has been disturbed by all-terrain vehicles (ATVs); runoff from such ATV disturbance is finding its way down the ruts created by vehicles.

Several tributaries and springs are present in the clearing at the end of False Bottom Road as identified by S-12 and S-13, which concentrate at the confluence at C-14. As shown in Figure 1, east of the confluence at C-14, an additional tributary at the south side of the clearing located at the end of False Bottom Road flows into Lost Camp Creek from S-11 approximately 300 ft downstream of the confluence at C-14. An effort was made to trace the tributary running upstream of S-11 but was abandoned because of lack of flow.

Streamflow became subterranean several hundred feet downstream of the headwater spring at S-21 and did not return to the surface until S-20 (see Figure 11). From S-20 downstream to C-14, flow measurements were unreliable because of channel conditions (e.g. cobles, braided flow channels with depths less than 0.2 ft, and ponded locations). Traditional runs were minimal; therefore, only sonde data were collected.

Table 2 presents the cross-section streamflow and physical data measurements collected along the length of Lost Camp Creek. The cross-section measurement stations M-1 through M-8 numerically increase from downstream to upstream. Cross-section measurement station M-1 was recorded downstream of the confluence to Annie Creek and includes streamflow from Annie Creek and Lost Camp Creek. Streamflow rates generally increase when traveling upstream from cross-section measurement stations M-2 to M-8, except for M-6. Flow from spring S-10 is likely being realized in the streamflow measurement at cross-section measurement station M-6; however, a greater degree of inaccuracy is likely to result when comparing small stream flow values.

DISCUSSION

Twenty potential spring or seep locations were identified along Lost Camp Creek during the May 2022 spring survey. Sites consisted of single or multiple seeps that often formed shallow marshy areas, which made measuring individual spring flow challenging during this initial survey. Based on RESPEC's understanding of the local surface-water hydrology, most of these springs and seeps are likely to be intermittent; springs are more likely to be dry during late summer and fall and more significant following precipitation events.

CMH:akm

Figure 1. Lost Camp Creek – Springs, Seeps, and Measurement Cross Sections.

Figure 2. Side Seep/Spring S-2 Along Lost Camp Creek.

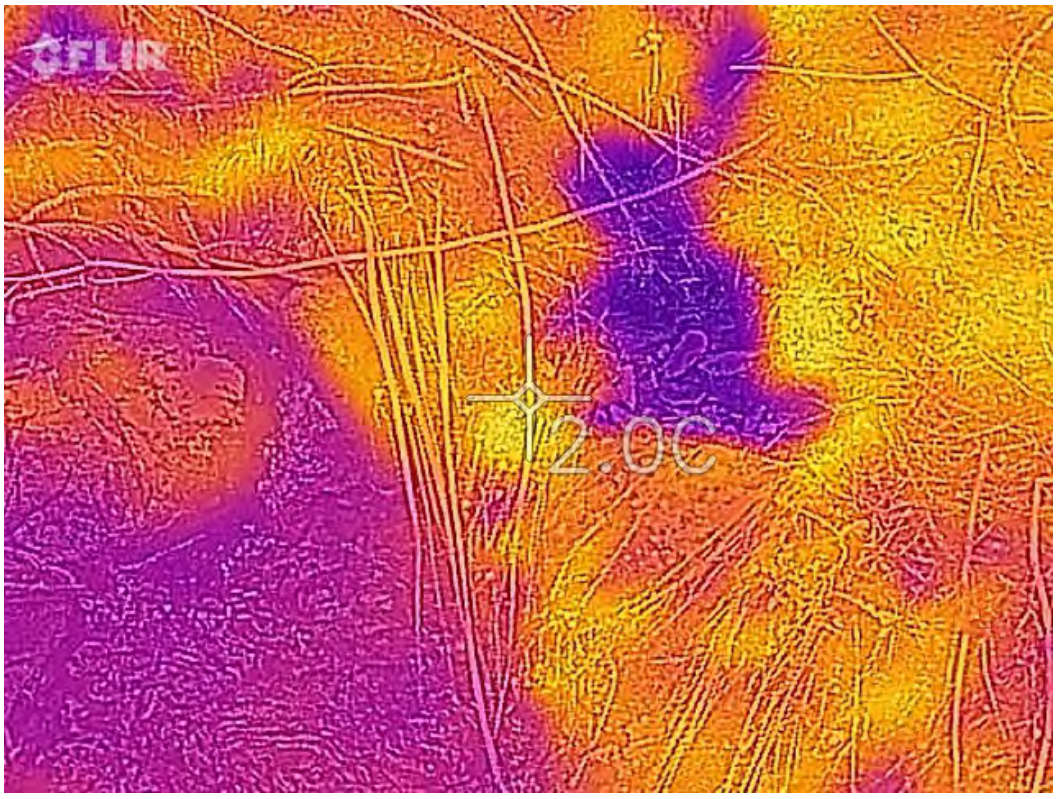


Figure 3. Thermal Imagery of Side Seep/Spring S-2 Along Lost Camp Creek.

Figure 4. Two Side Seeps at S-3 Along Lost Camp Creek.

Figure 5. Side Seep S-5 Along Lost Camp Creek.

Figure 6. Side Seep/Spring S-6 Looking Downstream Toward Lost Camp Creek.

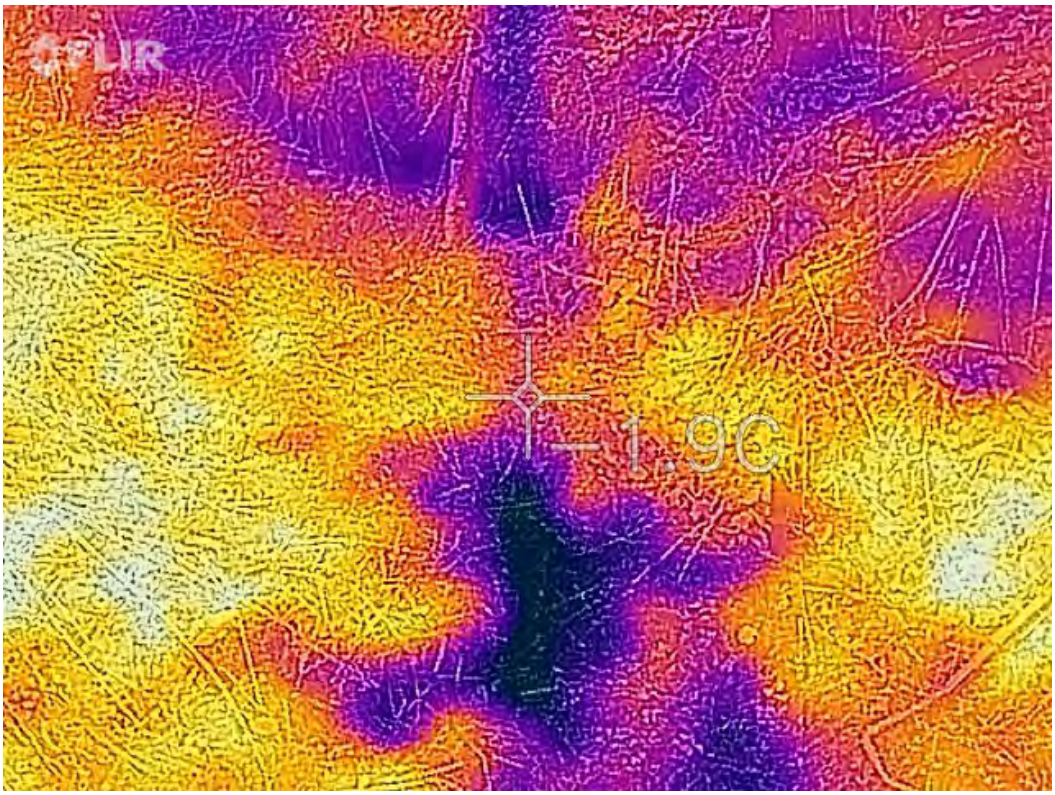


Figure 7. Thermal Imagery of Side Seep/Spring S-6 Along Lost Camp Creek.

Figure 8. Side Seep/Spring S-7 50 Feet to the North of Lost Camp Creek.

Figure 9. Spring S-15.

Figure 10. Spring S-18.

Figure 11. Spring S-20.