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FILED

JAN 10 2019

SECRETARY, BOARD OF
OIL, GAS & MINING

BEFORE THE BOARD OF OIL, GAS, AND MINING

STATE OF UTAH

IN THE MATTER OF THE PETITION OF GENWAL RESOURCES, INC., FOR REVIEW OF DIVISION ORDER 10-A	**SUBMISSION OF UPDATED HYDROLOGIC REPORT DATED JANUARY 9, 2019** Docket No. 2010-026 Cause No. C/015/0032

Genwal Resources, Inc. by and through its counsel of record hereby submits the Crandall Canyon Mine Hydrologic Update Report dated January 9, 2019, prepared by Petersen Hydrologic, attached as Exhibit A.

RESPECTFULLY SUBMITTED this 10th day of January, 2019.

Snell & Wilmer, L.L.P.

Denise A. Dragoo
James P. Allen
ATTORNEYS FOR GENWAL RESOURCES, INC.

4823-4878-8357

CERTIFICATE OF SERVICE

I hereby certify that the original of the foregoing **SUBMISSION OF UPDATED HYDROLOGIC REPORT DATED JANUARY 9, 2019** was hand delivered to the Board of Oil, Gas and Mining and a true and correct copy was served via e-mailed on January 10, 2019, to the following:

Steve Alder, Esq.
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EXHIBIT A

PH

PETERSEN HYDROLOGIC

9 January 2019

Ms. Denise Dragoo
Snell & Wilmer, L.L.P.
15 West South Temple, Suite 1200
Beneficial Tower
Salt Lake City, Utah 84101

Denise,

At your request, we have evaluated recent total iron concentrations in the Genwal Resources, Inc. Crandall Canyon Mine discharge water for the eight-month period from May 2018 through December 2018 (the most recent period for which laboratory total iron data are available from the analytical laboratories). The findings of our evaluation are presented in this letter report. The reader is referred to our previous report entitled *Investigation of Iron Concentrations in the Genwal Resources, Inc. Crandall Canyon Mine Discharge Water*, dated 7 November 2011, and also to our 10 January 2013, 11 July 2013, 16 December 2013, 9 June 2014, 15 January 2015, 9 July 2015, 7 January 2016, 7 July 2016, 9 January 2017, 7 July 2017, 10 January 2018, and 11 June 2018 update reports for additional supporting information in this regard.

Results of UPDES Monitoring Activities

Total and dissolved iron concentrations measured in both the untreated (PRE-002) and treated (UPDES 002) Crandall Canyon Mine discharge waters are presented in Table 1. Dissolved sulfate concentrations are also listed in Table 1. Plots of total iron concentrations in Crandall Canyon Mine discharge waters through December 2018 are presented in Figure 1. A plot of monthly average total iron concentrations in untreated mine discharge water is presented in Figure 2. A plot of dissolved iron concentrations in untreated Crandall Canyon Mine discharge waters is presented in Figure 3. Sulfate concentrations in the untreated mine discharge water are plotted in Figure 4. Yearly average mine-water discharge rates at the Crandall Canyon Mine are plotted in Figure 5. A plot of the annual average pounds per day of iron produced from the Crandall Canyon Mine discharge water is presented in Figure 6. A plot of TDS concentrations in the Crandall Canyon Mine discharge water is presented in Figure 7. As specified in the Mining and Reclamation Plan for the Crandall Canyon Mine (C0150032), the results of all required monitoring parameters have been regularly provided to the Utah Division of Oil, Gas and Mining. Historical UPDES discharge monitoring data are available from the Division of Oil, Gas and Mining on-line coal water quality database at: http://linux3.ogm.utah.gov/WebStuff/wwwroot/wqdb.html

Total Iron Concentration Trends

During the eight-month period from May 2018 through December 2018 the total iron concentrations in the mine discharge water were low (Table 1). Total iron concentrations measured in all samples collected during this period ranged from 0.88 to 1.07 mg/L, with an average concentration of 0.98 mg/L. For all of 2018, the average total iron concentration was 1.01 mg/L, with a minimum value of 0.88 mg/L and a maximum value of 1.17 mg/L. Thus, total iron concentrations measured in the untreated Crandall Canyon Mine discharge water were continuously compliant with the UPDES limit during 2018. It is noteworthy that total iron concentrations measured in the untreated mine discharge water by the Utah Public Health Laboratory have been less than the UPDES discharge limit for each of the previous 20 months (1.7 years), and exceeded the limitation on only one occasion in 31 previous monthly monitoring events (2.6 years).

As noted in our previous reports, the underground mine iron geochemical regime is reactant limited. Therefore, over time, declines in total iron concentrations in the mine discharge water (such as have been observed) are anticipated. The observed behavior of the iron geochemistry in the untreated Crandall Canyon Mine discharge water (i.e. declining total and dissolved iron concentrations over time) are supportive of the correctness of the geochemical model we presented to the Division of Oil, Gas and Mining in February, 2010.

A plot of the annual average daily total iron production from the Crandall Canyon Mine discharge water is provided in Figure 6. The average daily iron production rate is calculated using the yearly average mine water discharge rate and the yearly average total iron concentration of the mine discharge water. From this information, the average amount of total iron that is produced daily in the mine discharge water has been calculated for each of the past nine years. It should be noted that the iron produced from the mine is removed from the water at the treatment facility and it is not discharged in appreciable quantities to Crandall Creek. The average daily iron production from the mine during 2018 (3.30 pounds per day) is six and a half times less than the amount produced in 2010 (21.6 pounds per day).

It is noteworthy that, because of both the generally decreasing total iron concentrations and the generally decreasing mine-water discharge rates at the Crandall Canyon Mine, the average iron production during 2013-2018 was less than that calculated for a UPDES compliant discharge of 1.24 mg/L at a mine-water discharge rate of 477 gpm (the average discharge rate for year the UPDES permit was issued). What this means is that if the average Crandall Canyon Mine discharge water during this period had been allowed to flow untreated into Crandall Canyon Creek, the total iron loading to the creek would have been less than the amount allowed under the UPDES permit stipulation calculations at the time the UPDES permit was issued (i.e. a UPDES compliant water at 2011 mine water discharge rates).

There were no upward spikes in the total iron concentrations measured in the untreated Crandall Canyon Mine discharge water during 2018. Rather, the concentrations remained low with a general decreasing trend during 2018 (Figure 1).

Other Chemical Trends

During the period from January 2018 through November 2018, dissolved iron concentrations in the Crandall Canyon Mine pre-treatment water were low. During each of these months, the dissolved iron concentrations were below the laboratory detection limit of 0.03 mg/L (Table 1; Figure 3). It is noted that the dissolved iron laboratory result for the December 2018 sample of mine discharge water is not yet available from the analytical laboratory.

During the period May 2018 to December 2018 sulfate concentrations in the Crandall Canyon Mine discharge water remained low, with concentrations ranging from 121 to 133 mg/L, averaging 129 mg/L (Table 1). Sulfate concentrations measured during this reporting period generally trended downward, with concentrations becoming nearer to those measured in the mine discharge water prior to the beginning of gravity discharge from the mine workings (Figure 4).

During the period May 2018 to December 2018, TDS concentrations in the mine discharge water continued to decline. As shown on Figure 7, total dissolved solids (TDS) concentrations of the Crandall Canyon Mine discharge water have declined markedly since the initial onset of gravity discharge from the mine in late 2007/early 2008. TDS concentrations spiked sharply with the onset of gravity discharge from the mine, likely in response to increased rates of chemical reactions with minerals in the mine environment that were brought into contact with mine waters in newly flooded portions of the mine (including iron-producing pyrite mineral oxidation and related cascading reactions). As reactants were consumed and the reaction products were flushed from the mine by the flowing mine waters, TDS concentrations declined markedly (Figure 7). Recent TDS concentrations are now equal to or lower than those observed in the mine discharge waters during operational conditions immediately prior to the mine collapse event of August 2007 and the cessation of mine water pumping in September 2007. The plot of declining TDS concentrations in Figure 7 shows that the chemical quality of the water emerging from the mine has improved in an orderly manner over time (i.e. a well-defined exponential decay curve). This observation provides support to the reactant-limited geochemical model presented previously to the Board, which predicts declines in total iron concentrations.

Mine Water Discharge Rates

An updated plot of average yearly mine-water discharge rates from the Crandall Canyon Mine is presented as a bar graph in Figure 5. It is apparent from Figure 5 that, after peaking at 1,016 gpm in 2001, the rate of mine water discharge from the Crandall Canyon Mine has been gradually decreasing. The average mine-water discharge rate for the May 2018 through December 2018 reporting period was 279.5 gpm, which is 10% lower than the average flow for 2017 (309.9 gpm) and was similar to the annual flow for 2016 (275 gpm). The effects of climatic variability (i.e. droughts and wet spells) are not apparent in the plot (Figure 5).

Operations at the Crandall Canyon Mine Iron Treatment Facility

The Crandall Canyon Mine iron treatment facility operated normally during the first half of 2018. Historically, the mine-water treatment has been successful at reducing total iron concentrations to levels below the 1.24 mg/L limit of the mine's UPDES discharge permit (see Table 1 and Figure 1). However, beginning in late June of 2018 due to uncontrollable conditions related to the Trail Mountain wildfire that severely impacted the Crandall Canyon area, normal operations at the iron treatment facility were interrupted. It is notable that during this evaluation period (May 2018 through December 2018), in spite of the intermittent operation of the iron treatment facility, total iron concentrations measured in mine discharge waters that were discharged to Crandall Creek during that period (UPDES 002) did not exceed the UPDES limit for total iron (Table 1; Figure 1).

Future Total Iron Declines

Total iron concentrations measured in the untreated Crandall Canyon Mine discharge water were uniformly low throughout 2018 (Table 1). The samples of the mine discharge water collected by DOGM personnel and analyzed by the Utah Public Health Laboratory of Taylorsville, Utah (UPHL) and also the samples collected by Genwal Resources personnel and analyzed at SGS laboratory were below the 1.24 mg/L UPDES limit for all monitoring events during 2018. Measured total iron concentrations of all samples of untreated mine discharge water analyzed for total iron during the May 2018 through December 2018 reporting period ranged from 0.88 to 1.07 mg/L, averaging 0.99 mg/L. Based on the total iron concentrations reported by the UPHL the untreated Crandall Canyon Mine discharge water has been in continuous compliance with the UPDES discharge limit for each of the past 20 months.

The information presented in this update continues to support our conclusions that the observed decreasing trends in total iron concentrations are likely a result of 1) the decreasing rate of production of aqueous dissolved iron from pyrite oxidation reactions in the underground mine environment as chemical reactants are consumed, and 2) the gradual flushing of solid iron hydroxide particulate matter from the mine which is transported away from source areas by the current in actively flushing portions of the mine. It is anticipated that continuing declines in total iron concentrations in the mine discharge will occur in the future by these same mechanisms.

Based on extrapolation of historical long-term trends in the total iron concentrations and the reactant-limited geochemical model of the geochemical environment, it is considered likely that total iron concentrations will remain low in the mine discharge water over the long term. While occasional upward spikes in total iron concentrations in the untreated mine discharge have been observed in previous years (Figure 1) (and some spiking could potentially continue to occur in the future), it is apparent that such upward spikes are decreasing in both frequency and magnitude. Based on the recent lack of upward concentration spikes and the continuing declines in total iron concentrations observed during this reporting period (which are currently at low levels), it seems probable that essentially continuous compliance with the UPDES limits will continue into the future.

We recommend that monitoring of total iron concentrations in the mine discharge water be continued to verify that future concentrations remain low.

Conclusions

Total iron concentrations in the untreated Crandall Canyon Mine discharge water were low throughout the May 2018 to December 2018 reporting period (Table 1). The total iron concentrations of all samples of the mine discharge water collected during 2018 (both Genwal and DOGM replicate samples) were below the UPDES limit, indicating continuous compliance throughout 2018. Samples collected by DOGM personnel and analyzed by the UPHL were below the 1.24 mg/L UPDES limits for each of the 20 previous months (1.7 years). Both the frequency and magnitudes of the periodic upward spikes in total iron concentrations observed occasionally during previous years diminished during 2018 (Figure 1).

Total dissolved solids (TDS), dissolved iron, and sulfate concentrations (which may reflect geochemical conditions within the underground mine environment) have all trended downward during the May 2018 through December 2018 reporting period. The observed chemical compositions and the documented temporal variability in the geochemistry of the mine discharge water are consistent with the hydrogeochemical - hydrogeologic model that describes the source and fate of the total iron in the Crandall Canyon Mine discharge water that we presented in February of 2010.

As stated in our previous reports and testimony before the Board, it remains my professional opinion that perpetual discharge of mine water containing elevated total iron concentrations at the Crandall Canyon Mine will not occur. Rather, continuing future declines from current levels are anticipated to occur in the future. This conclusion is supported by the combined evidence of the essential absence of dissolved iron, the continuing decline/stabilization of sulfate and TDS concentrations in the water, the declining total iron production from the mine, and the previously discussed general absence of elevated total iron concentrations in gravity discharges of mine water from other coal mines in the region.

Genwal Resources, Inc. currently has a three-year bond in place for the future operation of the Crandall Canyon Mine treatment facility. In my professional opinion, based on the information presented in this report, there is a strong probability that total iron concentrations will remain low in the untreated mine discharge water such that essentially continuous compliance with UPDES limitations for total iron concentrations will likely continue into the future.

To verify this conclusion, Genwal Resources, Inc. will continue to collect and analyze hydrologic data relating to the Crandall Canyon Mine discharge as required.

Please feel free to contact me should you have any questions in this regard.

Sincerely,

Erik C. Petersen, P.G.
Principal Hydrogeologist
Utah PG #5373615-2250

LICENSED PROFESSIONAL GEOLOGIST
ERIK CARL PETERSEN
No. 5373615-2250
STATE OF UTAH

PETERSEN HYDROLOGIC, LLC

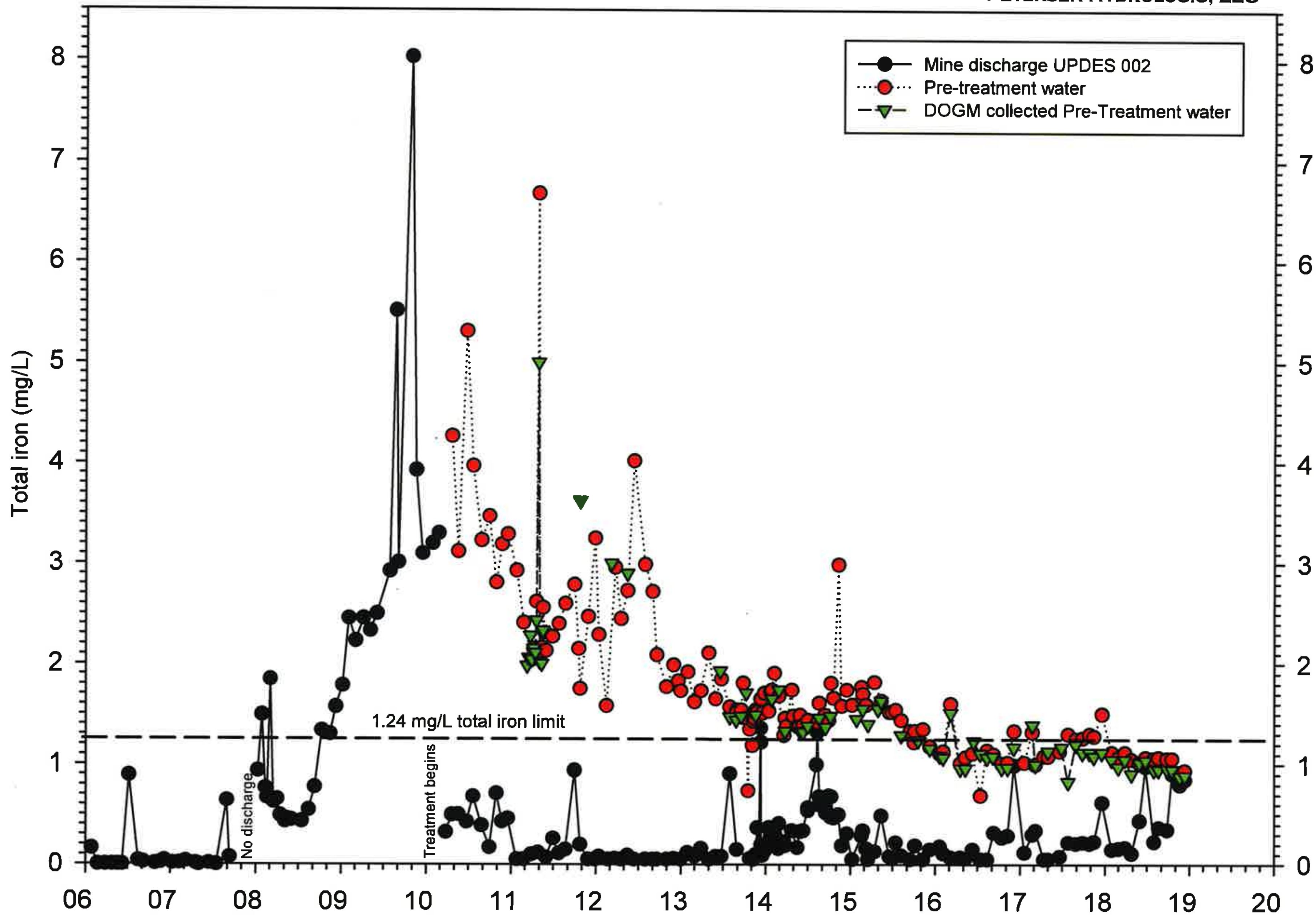


Figure 1 Plots of total iron concentrations in Crandall Canyon Mine discharge water and treated mine discharge water.

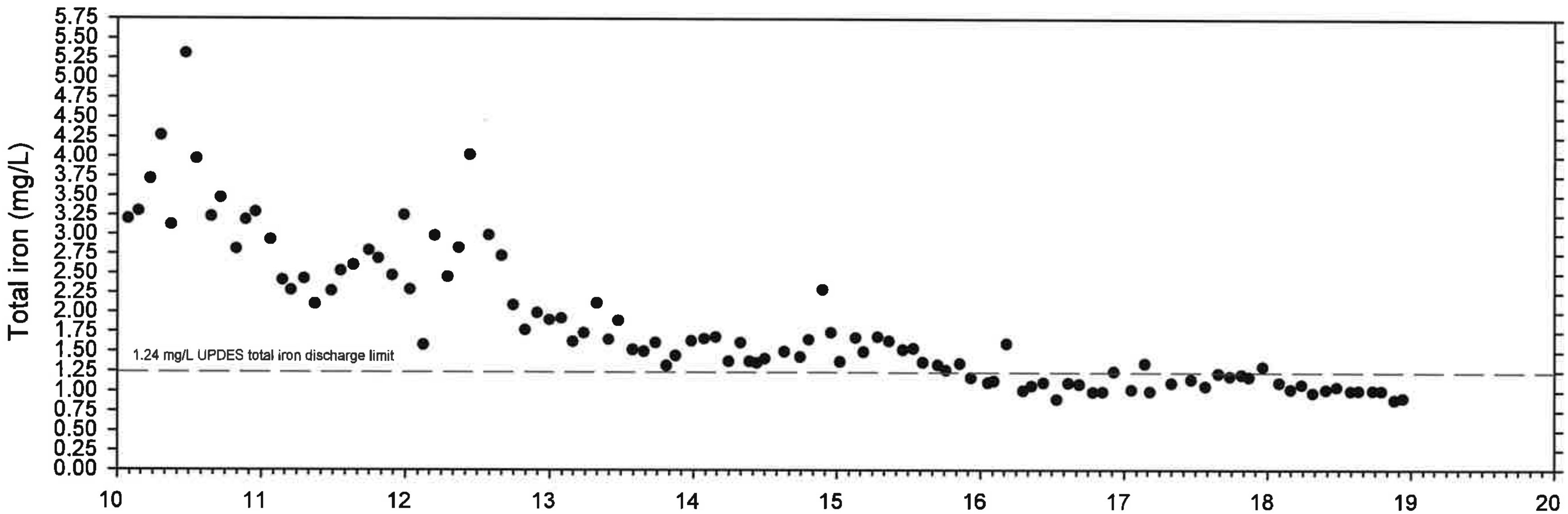
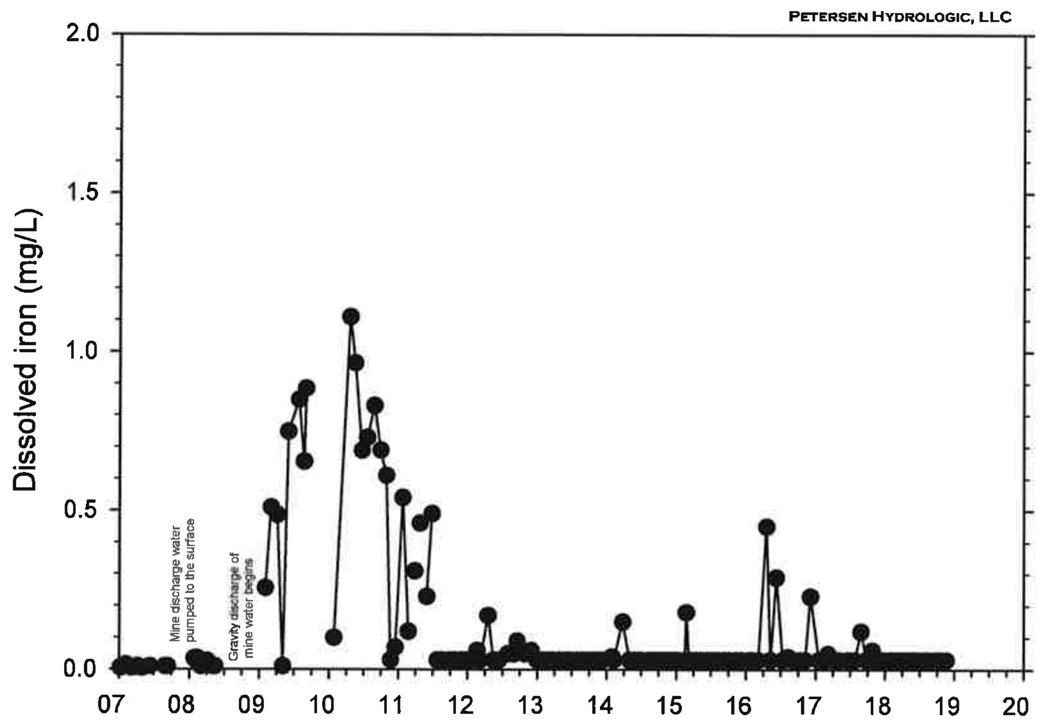


Figure 2 Plot of untreated Crandall Canyon Mine discharge water total iron concentrations (monthly averages) at PRE-002.



Note: The lower laboratory detection limits (plotted on this graph when "less than" results are reported by the analytical laboratory) have varied over time.

Figure 3 Dissolved iron concentrations in Crandall Canyon Mine pre-treatment discharge water, 2007-2018.

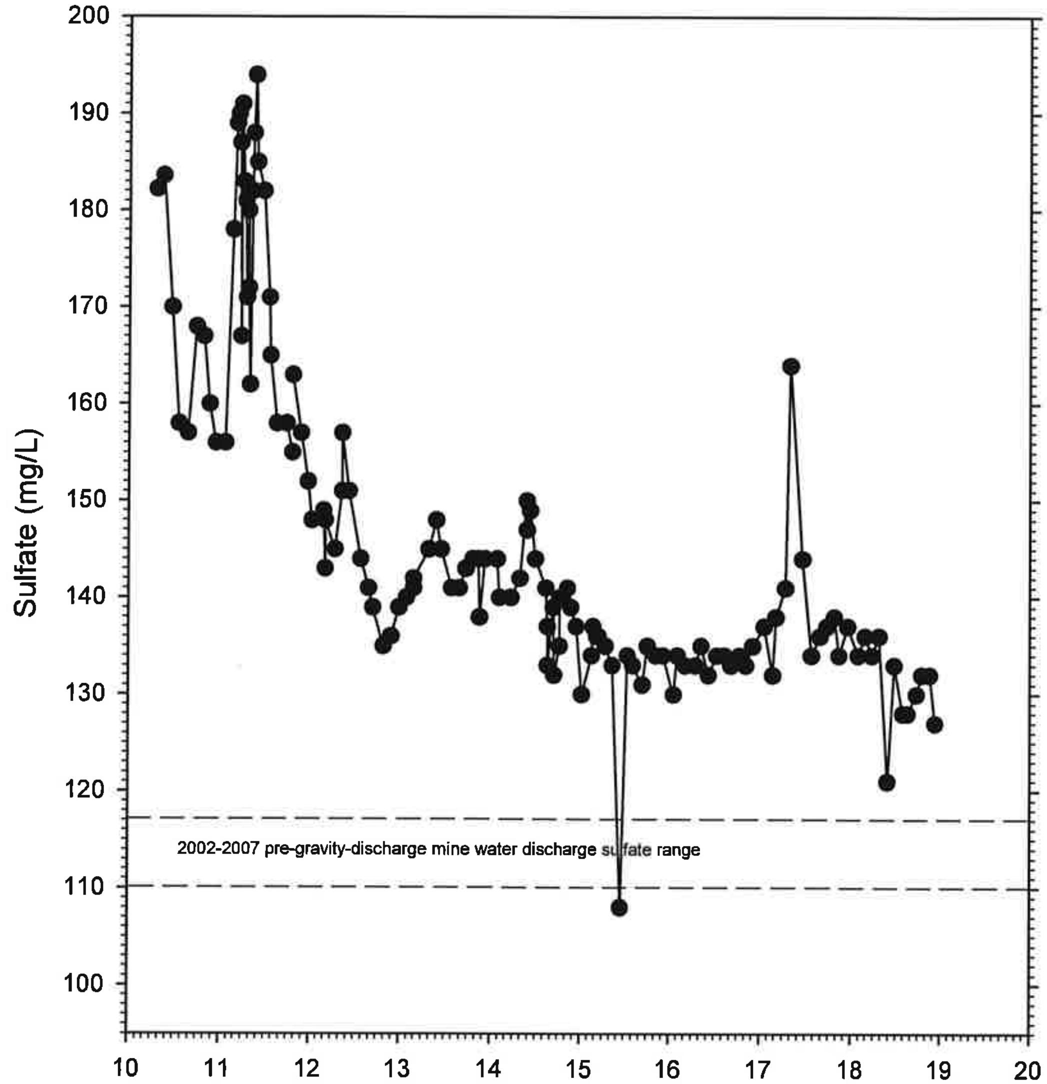
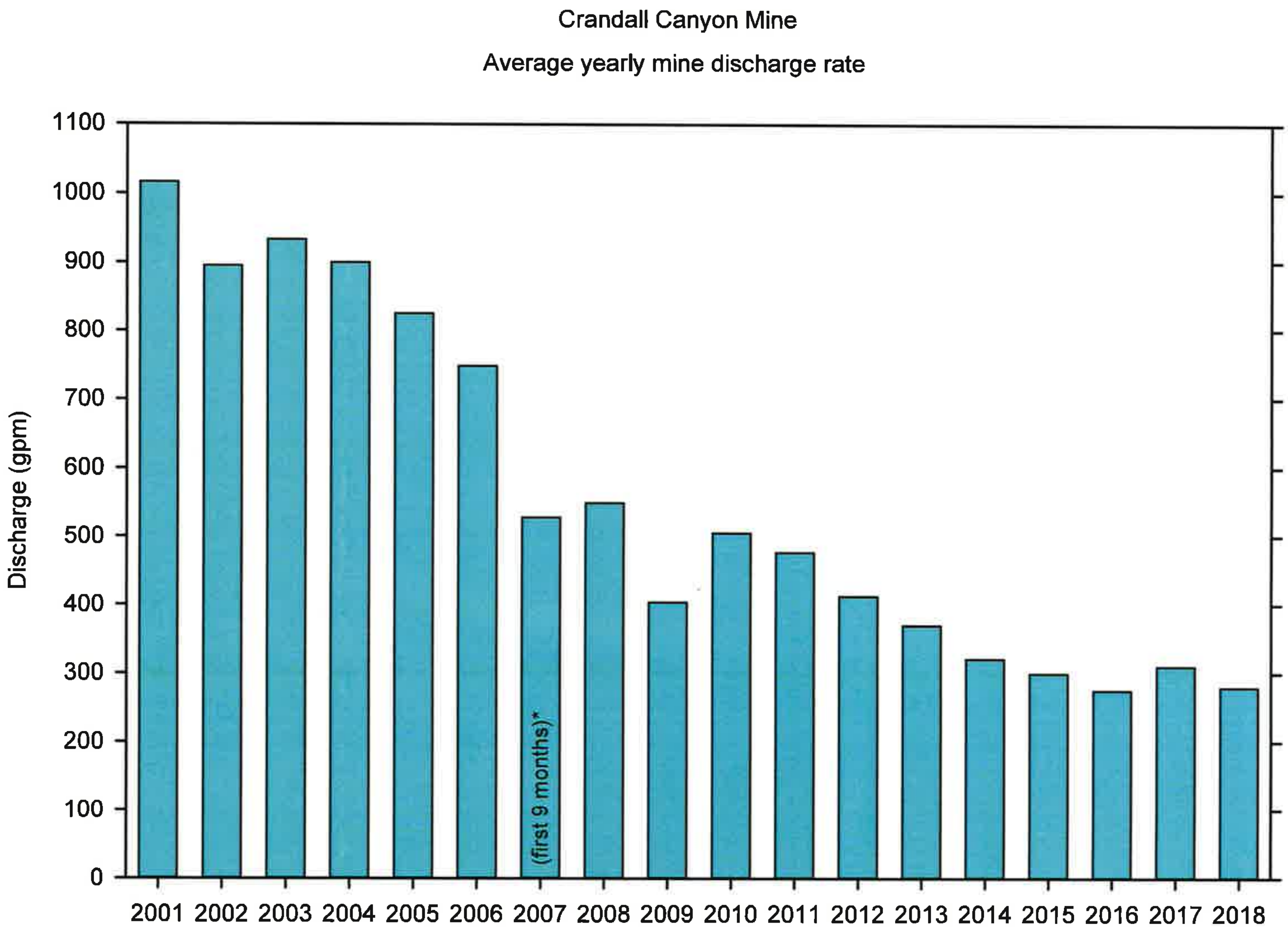


Figure 4 Sulfate concentrations in the Crandall Canyon Mine discharge water (site Pre-002).



*The average discharge rate for the first 9 months of 2007 is plotted because during the last 3 months of 2007 the mine pumps had been shut off but gravity discharge of mine water to the surface had not yet occurred.

Figure 5 Average yearly mine water discharge rates for the Crandall Canyon Mine.

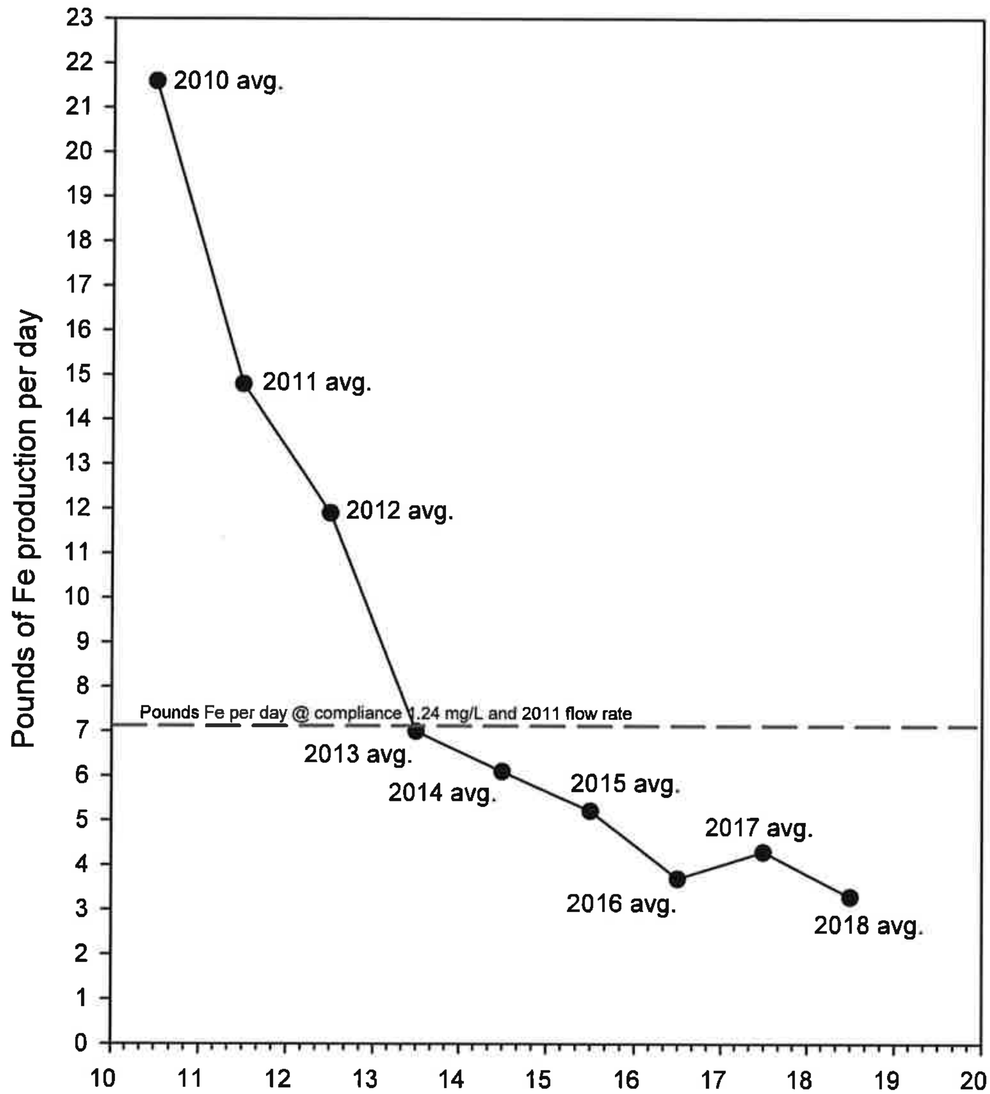


Figure 6 Daily quantity of iron produced by the Crandall Canyon Mine discharge water (calculated from annual average total iron concentration and average annual mine water discharge rate).

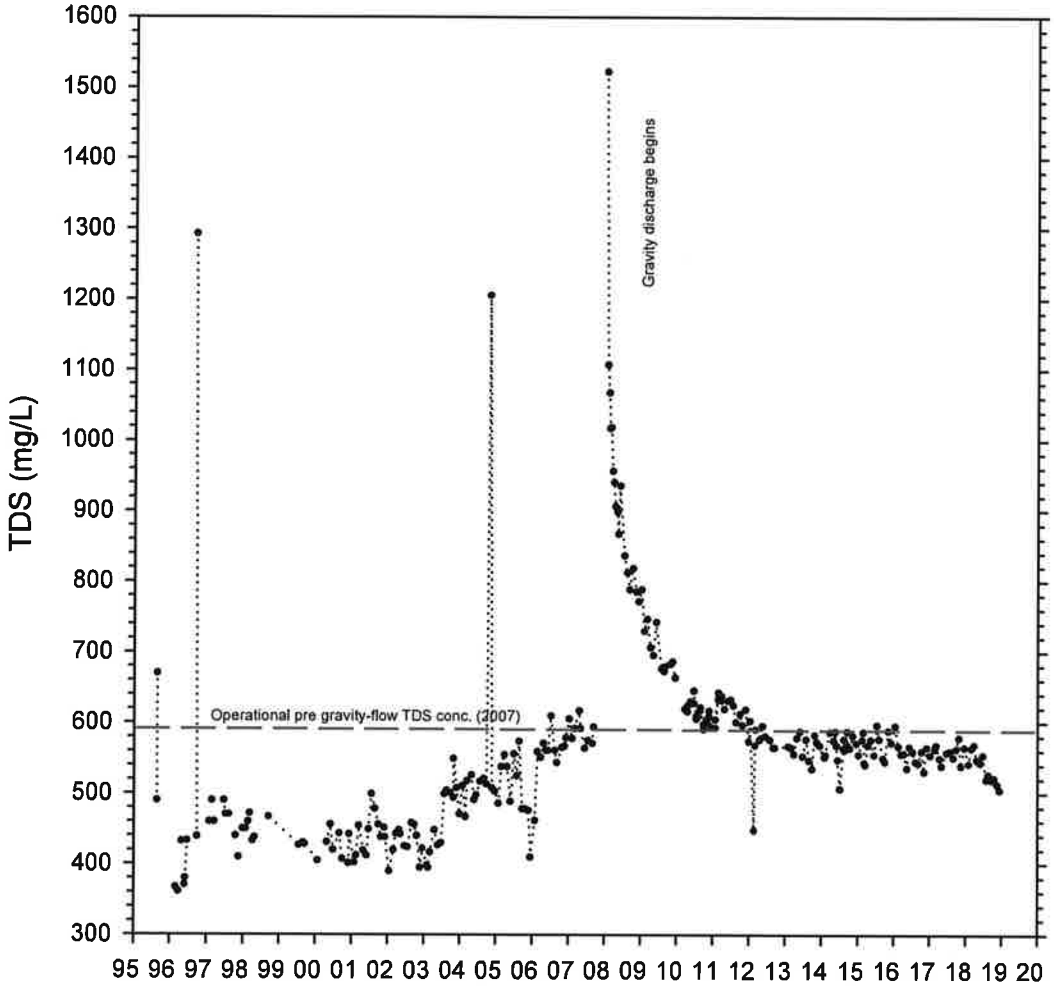


Figure 7 TDS concentrations of Crandall Canyon Mine discharge water.

Table 1 Total iron, dissolved iron, and sulfate concentrations in Crandall Canyon Mine discharge water.

UPDES 002

treated mine water discharged to Crandall Creek

	Fe (total) mg/L	Fe (dissolved) mg/L
1/8/2015	<0.05	0.12
1/27/2015*	0.28	—
2/17/2015	0.29	<0.03
3/17/2015	<0.05	<0.03
3/17/2015*	0.28	—
4/14/2015	0.13	<0.03
4/30/2015*	0.29	—
5/13/2015	0.49	<0.03
5/13/2015*	0.33	—
6/17/2015	0.08	<0.03
6/29/2015	0.06	—
7/14/2015	0.22	<0.03
8/7/2015	0.09	<0.03
8/7/2015*	0.12	—
9/14/2015	<0.05	<0.05
10/5/2015	0.19	<0.03
10/20/2015*	0.05	—
11/19/2015	<0.05	<0.03
12/8/2015	0.15	—
12/8/2015*	0.16	—
1/20/2016	0.18	<0.03
1/20/2016*	0.18	—
2/4/2016	0.11	<0.03
2/4/2016*	0.12	—
3/7/2016	0.07	<0.03
3/7/2016*	0.07	—
4/18/2016	0.07	<0.03
4/18/2016*	0.06	—
5/10/2016	0.06	<0.03
5/10/2016*	0.21	—
6/9/2016	0.15	<0.03
6/15/2016*	0.15	—
7/13/2016	<0.05	<0.03
7/13/2016*	<0.02	—
8/11/2016	<0.05	<0.03
8/11/2016*	<0.02	—
9/8/2016*	0.40	—
9/8/2016	0.32	<0.03
10/13/2016	0.27	<0.03
10/13/2016*	0.23	—
11/7/2016	0.29	<0.03
11/7/2016*	0.24	—
12/5/2016	0.99	<0.03
1/19/2017	0.12	<0.03
1/19/2017*	0.07	—
2/22/2017	0.3	<0.03
2/22/2107*	0.26	—
3/7/2017	0.34	0.08
3/7/2017*	0.3	—
4/13/2017	<0.05	<0.03
5/1/2017	<0.05	<0.03
5/1/2017*	<0.03	—
6/20/2017	0.08	0.03
6/28/2017*	0.32	—
7/26/2017	0.22	<0.03
7/26/2017*	0.18	—
8/28/2017	0.21	<0.03
8/28/2017*	0.70	—
9/26/2017	0.22	<0.03
9/26/2017*	0.17	—
10/26/2017	0.21	<0.03
10/26/2017*	0.17	—
11/14/2017	0.23	<0.03
11/14/2017*	0.22	—
12/19/2017	0.62	<0.03
12/19/2017*	0.2	—
1/30/2018	0.15	<0.03
1/30/2018*	<0.03	—
2/28/2018	0.16	<0.03
2/28/2018*	0.13	—
3/28/2018	0.17	<0.03
3/28/2018*	0.17	—
4/25/2018	0.11	<0.03
4/25/2018*	0.10	—
5/29/2018	0.44	<0.03
5/29/2019*	0.44	—
6/25/2018	0.98	<0.03
6/25/2018*	0.94	—
7/31/2018	0.23	<0.03
7/31/2018*	0.16	—
8/20/2018	0.37	<0.03
8/20/2018*	0.26	—
9/25/2018	0.35	<0.03
9/25/2018*	0.28	—
10/17/2018	0.91	<0.03
10/17/2018*	0.87	—
11/19/2018	0.8	<0.03
11/19/2018*	0.76	—
12/11/2018	0.85	Final result pending
12/11/2018*	0.85	—

PRE-002

untreated mine discharge water

	Fe (total) mg/L	Fe (dissolved) mg/L	Sulfate mg/L
1/27/2015*	1.45	—	—
2/17/2015	1.77	<0.03	134
2/23/2015	1.70	0.18	137
4/14/2015	1.82	<0.03	135
4/30/2015*	1.55	—	—
5/13/2015	1.63	<0.03	133
5/13/2015*	1.63	—	—
6/17/2015	1.52	<0.03	108
6/29/2015	1.52	—	—
7/14/2015	1.54	<0.03	134
8/7/2015	1.44	<0.03	133
8/7/2015*	1.29	—	—
9/14/2015	1.33	<0.03	131
10/1/2015	1.22	—	—
10/5/2015	1.33	<0.03	135
10/20/2015*	1.24	—	—
11/9/2015	1.45	<0.03	134
12/8/2015	1.18	<0.03	134
12/8/2015*	1.16	—	—
1/20/2016	1.11	<0.03	130
120/2016*	1.09	—	—
2/4/2016	1.13	<0.03	134
2/4/2016*	1.07	—	—
3/7/2016	1.60	<0.03	133
3/7/2016*	1.51	—	—
4/18/2016	1.01	0.45	133
4/18/2016*	0.961	—	—
5/10/2016	1.07	<0.03	135
5/10/2016*	0.963	—	—
6/9/2016	1.11	0.29	132
6/15/201*	1.23	—	—
7/13/2016	0.69	<0.03	134
7/13/2016*	1.11	—	—
8/11/2016	1.14	0.04	134
8/11/2016*	1.07	—	—
9/8/2016*	1.08	—	—
9/8/2016	1.10	<0.03	133
10/13/2016	1.01	<0.03	134
10/13/2016*	0.97	—	—
11/7/2016	1.02	<0.03	133
11/7/2016*	0.97	—	—
12/5/2016	1.33	0.23	135
12/5/2016*	1.17	—	—
1/19/2017	1.02	<0.03	137
2/22/2017	1.32	<0.03	132
2/22/2017*	1.38	—	—
3/7/2017	1.00	0.05	138
3/7/2017*	1.00	—	—
4/13/2017	1.08	<0.03	141
4/13/2017*	1.06	—	—
5/1/2017	1.08	<0.03	164
5/1/2017*	1.13	—	—
6/20/2017	1.13	<0.03	144
6/28/2017*	1.17	—	—
7/26/2017	1.30	<0.03	134
7/26/2017*	0.83	—	—
8/28/2017	1.25	0.12	136
8/28/2017*	1.20	—	—
9/26/2017	1.26	<0.03	137
9/26/2017*	1.12	—	—
10/26/2017	1.30	0.06	138
10/26/2017*	1.12	—	—
11/14/2017	1.28	<0.03	134
11/14/2017*	1.08	—	—
12/19/2017	1.50	<0.03	137
12/19/2017*	1.12	—	—
1/30/2018	1.17	<0.03	134
1/30/2018*	1.05	—	—
2/28/2018	1.07	<0.03	136
2/28/2018*	0.978	—	—
3/28/2018	1.12	<0.03	134
3/28/2018*	1.05	—	—
4/25/2018	1.05	<0.03	136
4/25/2018*	0.91	—	—
5/29/2018	1.02	<0.03	121
5/29/2019*	1.02	—	—
6/25/2018	1.07	<0.03	133
6/25/2018*	1.04	—	—
7/31/2018	1.06	<0.03	128
7/31/2018*	0.95	—	—
8/20/2018	1.07	<0.03	128
8/20/2018*	0.95	—	—
9/25/2018	1.06	<0.03	130
9/25/2018*	0.96	—	—
10/17/2018	1.06	<0.03	132
10/17/2018*	0.95	—	—
11/19/2018	0.9	<0.03	132
11/19/2018*	0.88	—	—
12/11/2018	0.94	Final result pending	127
12/11/2018*	0.89	—	—

* Sample collected by the Utah Division of Oil, Gas and Mining and analyzed by Utah State Department of Health laboratory