W A T E R Q U A L I T Y
MEMORANDUM
Utah Coal Regulatory Program

March 28, 2019

TO: Internal File

FROM: Steve Christensen Environmental Scientist

RE: 3rd Quarter 2018, Water Monitoring, Consolidation Coal Company, LLC, Emery Deep Mine, C/015/0015, Task ID #5790

The Emery Deep Mine is currently an in-active coalmine. The coal mining operation previously utilized room and pillar mining techniques with the use of a continuous miner machine. The mine went into temporary cessation in late 2010. The coal reserves were fully extracted (thus falling into the planned subsidence category).

The approved Mining and Reclamation Plan (MRP) outlines the water monitoring requirements beginning on page VI-28. Table VI-17, Emery Mine Hydrologic Monitoring Program contains a comprehensive list of all groundwater (springs/seeps), surface water, groundwater monitoring wells and Utah Pollutant Discharge Elimination System (UPDES) outfalls. Plate VI-4, Ground Water Monitoring Well and Surface Water Monitoring Site Location Map depicts the locations of the various ground and surface water monitoring sites (including the UPDES discharge/outfall points).

As part of the approved water monitoring requirements cited above, the Permittee is required to submit an annual groundwater evaluation of the two Emery Town wells (Emery Town Well #1 and Emery Town Well #2). The Emery town well information is submitted with the Emery Deep Mine's annual report. The information is in addition to the quarterly monitoring/sampling that is required at the wells.

Per task #5868, ROW Revision, the Permittee added additional sites to their water monitoring program. Approval of the amendment occurred on March 4th, 2019. As such, the Permittee was directed to collect water monitoring data beginning 2nd quarter 2019. The sites added are monitoring wells USGS 2-1 and T1-U.

1. Was data submitted for all of the MRP required sites? YES ☒ NO ☐

Springs

The MRP outlines the sampling of 5 springs within the permit and adjacent area. Flow and field parameters are sampled quarterly with water quality samples collected in the 2nd and 3rd quarters.

None of the five spring monitoring sites reported a flow this quarter.

Streams

The MRP outlines the sampling of 10 surface water monitoring stations within the permit and adjacent area.

Of the 10 surface water monitoring sites, SWMS-1A and SWMS-4 reported a flow.

Wells

The MRP requires the sampling of 20 ground water monitoring wells within the permit and adjacent area (See Table VI-17) through 1st quarter 2019. As of 2nd quarter 2019, the approved ground water monitoring plan includes 22 wells.

Per task #5868, ROW Revision, the Permittee added additional sites to their water monitoring program. Approval of the amendment occurred on March 4th, 2019. As such, the Permittee was directed to collect water monitoring data beginning 2nd quarter 2019. The sites added are monitoring wells USGS 2-1 and T1-U. Additionally (per task #5868), monitoring well T1-B was added back into Table VI-17. T1-B was inadvertently removed from the table during a previous permitting amendment (sampling continued unabated even though it was not depicted in Table VI-17).

All required data was submitted for the ground water monitoring sites.

UPDES

The Emery Deep Mine's Utah Pollutant Discharge Elimination system (UPDES) Permit, #UT0022616, identifies 8 outfalls (001, 002, 003, 004, 005, 006, 007, and 009). UPDES Outfall 008 is no longer an active water monitoring site. The discharges from each of the outfalls ultimately report to Quitchupah Creek, a tributary of Muddy Creek. The receiving waters are designated according to Utah Administrative Code (UAC) R317-2-13.1 as 2B, 3C and 4. Historically, only Outfalls 001 and 003 have ever recorded a discharge. UPDES Outfall 008 is no longer active.

The Water Quality Board for the Division of Water Quality (DWQ) approved a rule change that allows for a site specific, in-stream standard for the Emery Deep's effluent limitations based on its sulfate (SO4) concentrations (as opposed to previous total dissolved solids-TDS standard). The new standards are identified in the currently approved UPDES permit (effective July 1st, 2012). The modified standard established an allowable TDS concentration of 4,766 ppm (maximum monthly average) and SO4 concentration of 3,366 ppm (maximum monthly average). The currently approved UPDES permit will expire on June 30th, 2017.

UPDES Parameter	Established Limit

TSS	70 ppm (daily maximum)
T-Fe	1.4 ppm
Oil/Grease	10 ppm
pH	6.5-9.0
TDS	4,766 ppm (max. monthly avg)
SO4	3,366 ppm (max. monthly avg)

Outfall 003 produced a discharge beginning in May of 2018 as pumping of the underground mine workings was re-initiated.

Outfall 003 was the only UPDES outfall to produce a flow this quarter.

2. Were all required parameters reported for each site? YES ☒ NO ☐

Spring Monitoring Sites

The Permittee submitted all required water quality data this quarter for the spring water monitoring sites that produced a measurable flow and could be accessed.

Surface Water Monitoring Sites

The Permittee submitted all required water quality data this quarter for the surface water monitoring sites that produced a measurable flow and could be accessed.

Water Monitoring Wells

All required data was reported for the water monitoring wells.

UPDES Monitoring Sites

Historically Outfall 003 is the only UPDES monitoring site that produced a flow. Outfall 003 is the location utilized by the Permittee for mine dewatering. The pumping of encountered in-mine water stopped in October of 2015. Pumping of the underground workings resumed in May of 2018. T

All required parameters were reported for Outfall 003.

3. Were any irregularities found in the data? YES ☒ NO ☐

Wells:

Monitoring well H-U had steadily reported declines in water elevation. However; a significant increase in water level occurred with a reported depth to water of 115.4' (a reduction in depth of 132.9') during the 3rd quarter of 2016. It's unclear what caused such a

dramatic change in water level. A reported depth of 115.3' was reported for 4th quarter 2016. The water level held steady for the 1st quarter of 2017 with a reported depth of 115.3'. Second quarter 2017 reported a depth to water of 114.8'. The 3rd quarter depth to water for 2017 was reported as 113.2'. The reported 4th quarter depth was 115.7'. The water level for 1st quarter 2018 was reported as 116.4'. No significant change in water level was reported for 2nd quarter 2018 (depth to water 116.8') or 3rd quarter (depth to water 116.3').

Kemmerer-L reported an elevated D-Mg concentration was reported for 1st and 2nd quarter 2018. Third quarter 2018 reported an elevated D-K concentration.

The water level for RDA-2 was 2.02 standard deviations from the mean for 1st quarter 2017. The reported water level for 2nd quarter 2017 was within normal range. The D-K concentration was slightly elevated. Field conductivity was slightly lower in 2nd quarter 2017. All parameters reported for 3rd and 4th quarter 2017 and 1st quarter 2018 were within established ranges. Reduced concentrations for field conductivity and D-Ca were reported for 2nd quarter 2018. An elevated D-Mg concentration was reported for 2nd quarter 2018. Depth to water was 2.24 standard deviations from the mean for 3rd quarter 2018 (reported value 24.2', mean 18.08').

Monitoring well RDA-4 reported an elevated D-K concentration 2nd quarter 2017 as well as a slightly reduced field conductivity value. All parameters reported for 3rd and 4th quarter 2017 were within established ranges. First quarter 2018 reported all concentrations within established ranges. Reduced concentrations for Cl and field conductivity were reported for 2nd quarter 2018 along with increased values for depth to water and D-Mn. Depth to water was reported at 3.63 standard deviations from the mean for 3rd quarter 2018 (reported value 26.4', mean 20.07').

Monitoring well RDA-6 reported an elevated concentration for D-K for 1st quarter 2017 (9.99 standard deviations from the mean). The reported depth for 2nd quarter 2017 was 2.07 standard deviations from the mean. The reported depth was 22.8' (15.51 mean). All parameters reported for 3rd and 4th quarter 2017 and 1st quarter 2018 were within established ranges. 2nd quarter 2018 produced a reduced Cl concentration with an increased depth to water. Both values were outside two standard deviations from the mean. Depth to water was reported at 3.63 standard deviations from the mean for 3rd quarter 2018 (reported value 25.6', mean 15.51').

SM1-3 reported reductions in concentration for total hardness, dissolved magnesium and dissolved sodium 1st quarter 2016. These concentrations were within normal ranges for 2nd quarter 2016. An increased concentration for D-Fe was reported 3rd quarter 2016 (2.08 standard deviations from the mean of 131.97 ppm with a reported concentration of 421.31 ppm). Several parameters reported increased concentrations for 4th quarter 2016: D-Na, D-K, D-Fe and SO4. Total hardness was slightly lower than the average of the data set with a reported concentration of 489 mg/l (mean of 7,923.18 mg/l) for 4th quarter 2016. 1st quarter 2017 reported a highly elevated D-K concentration and a slightly elevated value for D-Na. The trend continued into 2nd quarter 2017 for D-K and D-Na. It's unclear what has caused the spikes in concentration for D-K and D-NA in the last two quarters (i.e. 4th quarter 2016, 1st

quarter 2017 and 2nd quarter 2017). An elevated D-K concentration was again reported for the 3rd and 4th quarters of 2017 as well as the 1st quarter of 2018. Additionally, an elevated D-Na concentration was reported for 1st quarter 2018. All reported parameters were within historic ranges for 2nd and 3rd quarter 2018.

Monitoring well T1-B reported an elevated carbonate concentration of 48 ppm (3.93 standard deviations from the mean of 4.0 ppm) in 2nd quarter 2016. The carbonate concentration was within the established range for 3rd quarter 2016. An elevated concentration for total hardness (12,508 mg/l) was reported the 4th quarter of 2016. All required parameters were within their historic ranges for 1st quarter 2017. An elevated concentration for D-K was reported 2nd quarter 2017. An elevated D-K concentration was again reported for the 3rd quarter of 2017 as well as a slightly elevated concentration for field conductivity. D-K concentration was reported within normal range for 4th quarter 2017; however, a reduction in field conductivity was reported. Field conductivity continued a downward trend for 1st and 2nd quarter 2018. A reduced D-Ca concentration was reported for 2nd and 3rd quarter 2018.

Monitoring well TP-U (which could not be accessed 4th quarter 2016) reported elevated concentrations for Cl, SO4, total hardness, TDS, field conductivity, D-Ca, D-K, D-Na and bicarbonate 1st quarter 2017. The trend continued in 2nd quarter 2017 with elevated values for Cl, SO4, TDS, D-Ca, D-K, D-Na and bicarbonate. The trend from 2nd quarter continued into the 3rd quarter with elevated concentrations reported for Cl, SO4, T-Hardness, TDS, D-Ca, D-K, D-Na and Bicarbonate. Field conductivity was reported 2.40 standard deviations lower than the mean. Four quarter 2017 again showed elevated concentrations for CL, SO4, TDS, D-Ca, D-Fe, D-K, D-Na and bicarbonate. The trend continued in 1st quarter 2018 with elevated concentrations reported for chloride, SO4, total hardness, TDS, field conductivity, D-Ca, D-K and D-Na. 2nd and 3rd quarter 2018 reported elevated concentrations for SO4, total hardness, TDS, D-Ca, D-K and D-Na. Reduced concentrations were provided for carbonate and field conductivity 2nd quarter and 3rd quarter 2018.

A lower temperature reading was reported for the Emery #1 well. A temperature of 12.4 degrees C was reported for 4th quarter 2016. A reduced temperature reading was again reported 1st quarter 2017 as well as an elevated D-K concentration. An elevated D-K concentration was reported again in 2nd quarter 2017. A reduction in D-Mg was reported for 2nd quarter. Slightly elevated field pH was also reported 2nd quarter 2017. The concentrations reported for 3rd quarter were a mixed bag of elevated and reduced concentrations. Water temperature was reported as 187.8 degrees C. The mean is 19.63 degrees C so it's assumed that the Operator incorrectly entered the field temperature reading. The reported F-pH value was 2.13 standard deviations above the mean of 7.27 with a reported value of 10.14. A reduction in D-Mg was reported for 3rd quarter 2017, while an elevated D-K value was reported for 3rd quarter 2017. Decreased concentrations for D-Mg and water temperature were reported for 4th quarter 2017. Additionally, F-pH and D-K were elevated for 4th quarter 2017. Elevated concentrations were reported for field pH and D-K were reported 1st quarter 2018. A reduction in D-Mg was also reported for 1st quarter 2018. Reduced concentrations for SO4 and D-Mg were reported for 2nd quarter 2018; while also reporting an increase field pH, D-K and carbonate. Third quarter 2018 reported an elevated pH with reduced values for SO4, total hardness, TDS and D-Mg.

Water levels are recorded at Emery Town Well #2. Prior to the more recent start up of mining activity at the Emery Deep Mine, the Operators discharged encountered mine-water from UPDES Outfall 003. Average pumping volumes were approximately 100 gpm. Upon entering into temporary cessation in the fall of 2015, the in-mine pumps were turned off (October of 2015) and discharge of mine-water at the surface via Outfall 003 stopped. Since that time, the depth to water recorded in Emery Town Well #2 has begun come up. A depth to water of 218.9' was reported in 4th quarter 2017. The water level in the well rose to 216.2' 1st quarter 2018. At the time the in-mine pumps were turned off, the recorded depth to water in December of 2015 was 232.6'; thus the depth to water in the Emery Town Well #2 has decreased. Mine water pumping began in May 2018. The depth to water reported in 2nd quarter was 214' (2.70 standard deviations from the mean of 236.09'). Depth to water for 3rd quarter was slightly less than 2nd quarter (reported value of 212.5').

Springs/Streams:

Only spring SP-10 produced a measurable flow for 1st quarter 2018. SP-10 reported a large increase in flow. A flow of 394.944 gpm was reported which is 3.23 standard deviations from the mean of 49.45 gpm. The field pH reading was 12.05. The mean for the site is 7.28. Several parameters were outside of two standard deviations for 2nd quarter 2018: Cl, SO4, total hardness, total cations, lab pH, D-Ca, D-Mg, D-K and D-Na. Zero flow was reported for 3rd quarter 2018.

Surface water monitoring site SWMS-1A reported relative high concentration increases for T-Fe, T-Ca, T-Mg, TSS and D-Ca the 3rd quarter of 2016. An elevated concentration for T-Ca was reported for the 1st quarter of 2017. Slightly elevated acidity was reported the 2nd quarter of 2017. Acidity levels returned to historic range for the 3rd quarter of 2017. However; elevated concentrations were reported for T-K and D-K 3rd quarter of 2017. All reported concentrations for 4th quarter 2017 were within normal range. A reduced field pH reading was recorded for 1st quarter 2018. All reported parameters were within historic ranges for 2nd quarter 2018. An elevated D-K concentration was reported 3rd quarter 2018.

Surface water monitoring site SWMS-2 reported elevated concentrations for TDS, T-Ca, D-Ca, D-K and bicarbonate (CaCO3) for 4th quarter 2016. First quarter 2017 reported elevated concentrations for T-Ca and TSS. Elevated concentrations for T-K and D-K were reported 2nd quarter 2017. TSS and T-Ca returned to within historic ranges 2nd quarter 2017. Elevated concentrations for T-K and D-K persisted in 3rd quarter 2017. All reported concentrations for 4th quarter 2017 were within normal range. First quarter 2018 reported elevated concentrations for settable solids, T-Fe, T-Mn, T-Ca, T-Mg, T-K, TSS and bicarbonate. The T-Fe concentration was very high. The reported concentration of 129.7 ppm is 7.79 standard deviations from the mean of 7.07 ppm. Second quarter 2018 produced slightly elevated readings for T-K and water temperature. All other reported parameters were within historic ranges for 2nd quarter 2018. Zero flow was reported for 3rd quarter 2018.

Surface water monitoring site SWMS-3 reported an elevated temperature reading of 25.5 degrees C (average 8.90 degrees C) for the 2nd quarter of 2016. The temperature reading for 3rd quarter returned to within normal range. However; elevated concentrations were

reported for T-Fe, T-Ca, T-K and TSS in the 3rd quarter of 2016. All elevated concentrations returned to within historic ranges for 4th quarter 2016. First quarter 2017 reported elevated concentrations for T-Mn, T-Ca, TSS and bicarbonate. Only acidity was reported outside of two standard deviations the 2nd quarter of 2017. Numerous concentrations were reported outside of two standard deviations from the mean for 3rd quarter 2017. Elevated concentrations were reported for: Cl, SO4, T-Hardness, TDS, T-Ca, T-Mg, T-K, T-Na, D-Ca, D-Mg, D-K and D-Na. It's not known what may have produced these elevated concentrations. It's possible that return flows from flood irrigation practices in the area could have produced elevated sediment levels in the stream. Four quarter reported only a slightly elevated concentration for T-Mg. The elevated concentrations reported for 3rd quarter 2017 were within normal range 4th quarter 2017. Elevated concentrations were reported for total hardness, settable solids, T-Fe, T-Mn, T-Ca, T-Mg, T-K, TSS, D-Ca and bicarbonate first quarter 2018. Elevated concentrations were again reported for TDS, T-K, T-Na, D-K and D-Na for 2nd quarter 2018. Zero flow was reported for 3rd quarter 2018.

Surface water monitoring site SWMS-4 reported an elevated temperature reading of 25.2 degrees C (average 9.28 degrees C) for the 2nd quarter of 2016. The temperature reading for 3rd quarter returned to within normal range. However; elevated concentrations were reported for T-Fe, T-Ca and T-Mg during 3rd quarter 2016. No parameters were reported outside of historic ranges for 4th quarter 2016 or 1st quarter 2017. An elevated acidity concentration was reported 2nd quarter 2017. Elevated concentrations for T-K and D-K were reported for 3rd quarter 2017. All reported concentrations for 4th quarter 2017 and 1st quarter 2018 were within normal range. Second quarter 2018 reported elevated concentrations for SO4, T-Na, D-K, D-Na and bicarbonate. Elevated values were reported in 3rd quarter 2018 for TDS, T-Na, D-K, D-Na and bicarbonate.

Surface water monitoring sites SWMS-5 reported elevated temperature readings for the 2nd quarter of 2016. The temperature reading for 3rd quarter returned to within normal range. Elevated concentrations were reported for T-Ca and D-Ca for 3rd quarter 2016. Several parameters produced fairly high concentrations, namely Cl, T-Ca, T-Mg, T-K, T-Na, D-Ca, D-K and bicarbonate for 4th quarter 2016. Elevated concentrations for settable solids, T-Ca and TSS were reported the 1st quarter of 2017. 2nd quarter 2017 reported spikes in concentration for T-Ca, T-Mg, T-K, D-Ca, D-K and acidity. Elevated concentrations were again reported in 3rd quarter 2017 for the following parameters: Cl, SO4, T-Hardness, TDS, T-Ca, T-Mg, T-K, T-Na, D-Ca, D-Mg, D-K, D-Na. These elevated concentrations are similar to those reported at SWMS-3. All reported concentrations for 4th quarter 2017 were within normal range. Elevated concentrations for settable solids, T-Fe, T-0Mn, T-Ca, T-Mg, T-K, TSS and bicarbonate were reported for 1st quarter 2018. An extremely high T-Fe concentration was reported. Elevated concentrations were again reported for 2nd quarter though not to the degree of the previous quarter. Cl, SO4, Total hardness, TDS, T-Ca, T-Mg, T-K, T-Na, water temperature, D-Ca, D-Mg, D-K, D-Na and acidity values were reported outside of two standard deviations from the mean. Zero flow was reported for 3rd quarter 2018.

Surface water monitoring site SWMS-9 reported several parameters during the 1st

quarter of 2016 that were slightly outside of two standard deviations from the mean. Concentrations for chloride, sulfate, TDS, total cations, total anions and total magnesium noted slightly elevated values. SWMS-9 did not report a flow in 2016, 2017 as well as 1st and 2nd quarter 2018. Zero flow was reported for 3rd quarter 2018.

4. On what date does the MRP require a five-year re-sampling of baseline water data.

There is no commitment in the MRP to resample for baseline parameters.

5. Based on your review, what further actions, if any, do you recommend?

NA

6. Does the Mine Operator need to submit more information to fulfill this quarter's monitoring requirements?

YES ☐ **NO** ☒