Deer Creek Mine Closure Water Pipeline

Hydrology Report

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The proposed pipeline alignment parallels Huntington Creek and the bottom of Rilda Canyon, which drains into Huntington Creek. A majority of the project area is within the Miller Fork Canyon-Huntington Creek 6th field Hydrologic Unit Code (HUC; 140600090105). The last mile of the project is within the Huntington Lake-Huntington Creek 6th field HUC (140600090107). Water from the Rilda portals would naturally gravity flow east through Rilda Canyon into Huntington Creek. A permit cannot be obtained to discharge mine groundwater at the portals because the water in Rilda Canyon is classified as category 1 waters: *Waters whose existing quality is better than the established standards for the designated uses will be maintained at high quality unless it is determined by the Director, after appropriate intergovernmental coordination and public participation in concert with the Utah continuing planning process, allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located* (Utah Administrative Code R317-2-3. Antidegradation Policy).

According to the 2016 DRAFT integrated report, Huntington Creek – 1, which includes Huntington Creek and its tributaries from the confluence with Cottonwood Creek to Highway 10 is on the 303d list due to impairment for elevated selenium (UDEQ 2016). Huntington Creek – 2 and 3, which includes Huntington Creek and its tributaries from Highway 10 to the USFS boundary is impaired for dissolved oxygen (DO), Total Dissolved Solids (TDS), temperature and pH (UDEQ 2016). Huntington Creek – 1 is down gradient from the proposed pipeline alignment. The proposed pipeline is within Huntington Creek – 2 and 3.

Locations within Huntington Creek-2 were sampled for Total Dissolved Solids (TDS), Iron, pH and selenium to establish initial baseline analysis in the 80's and 90's for PacifiCorp's Plant groundwater discharge permit (UGW150002). The average TDS concentration was 244 mg/L, the average iron concentration was 0.48 mg/L, the average pH value was 8.4, and selenium levels were less than 0.002 mg/l (Table 1). The Environmental Protection Agency (EPA) classifies TDS, iron and pH as secondary drinking water standards with a 500 mg/L for TDS a 0.3 mg/L threshold for iron and a pH ranging from 6.5–8.5. The maximum contaminant level (MCL) for selenium in drinking water defined by the EPA is 0.05 mg/L.

Table 1

	TDS	Iron	pH	Selenium
EPA standard	500 mg/L	0.3 mg/L	6.5-8.5	0.05 mg/L
1980-1990's Huntington Creek 2 and 3 Average values	244 mg/L	0.48 mg/L	8.4	<.002mg/L

Water from Huntington Creek is diverted into the settling pond at 7,000 to 10,000 gpm. Water from the settling pond is used for plant operations, cooling towers and boiler vents. The water is diverted from Huntington Creek at the same rate that it is used in the operations of the plant. Of the 7,000-11,000 gpm of water used in plant operations, approximately 97% of the water is evaporated off. The remaining 3% is transferred to the irrigation storage reservoir and used on crop research fields (Correspondence with PacifiCorp). The water used for irrigation on the research fields is regulated by the Utah Department of Environmental Quality, Division of Water Quality by authorization of a Ground Water Discharge Permit. The permit requires that water quality be measured periodically in monitoring wells in order to maintain compliance with the Ground Water Discharge Permit (UGW150002).

In addition to the Power Plant, Castle Valley Special Service District and the North Emery Water Users Special Service District use water in Huntington Canyon. Both these springs are a source of drinking water for adjacent municipalities and have source protection plans on file with the Utah Division of Drinking Water.

PacifiCorp has collected and had a laboratory analyze the intercepted groundwater samples from areas within the mine that will gravity flow to the Rilda Canyon portals utilizing the EPA Priority Pollutant List, which consists of 129 priority pollutants. None of the pollutant parameters were detected. PacifiCorp conducts baseline solute sampling of groundwater seepage in the mine once a month. Groundwater seepage in the mine is estimated to initially have a total iron concentration is 2-2.5 mg/L and an estimated TDS concentration of 500 mg/L. The elevated levels of iron in the groundwater is from the oxidation of the mineral pyrite in areas of the mine that contain pyrite mineralization within the coal seam. The gradual decrease in the concentration of iron is predicted to occur over the next 5 to 10 years as the surface area of exposed pyrite is consumed and available oxygen diminishes (memo PacifiCorp 2016). The concentration of iron is the only elevated analyte in the mines groundwater that exceeds water quality standards for PacifiCorp's Deer Creek Canyon discharge permit (UT0023604). All other chemical parameters are within permit limitations. The current discharge permit standard for iron is 1 mg/L. TDS less than 500 mg/L are allowed to be discharged, if concentrations exceed 500 mg/L, offset salinity credits to the State of Utah will be paid. The measured average pH of water within the mine is 7.5. The host rock has a high content of carbonate minerals which results in naturally high alkalinity levels in the ground water.

Intercepted groundwater has the potential to flow out of the Rilda Portals at an initial estimated flow rate of about 500-600 gpm (Correspondence with PacifiCorp). The amount of flow is expected to decrease with time because there is no active recharge from perched aquifers. Perched aquifers are isolated lenses of sandstone trapped between shales and mudstones. Groundwater seeps from these aquifers into the empty space of the Deer Creek mine (Correspondence with PacifiCorp). Once the perched aquifers reservoirs are emptied, the flow of groundwater coming from the mine will diminish. An isotopic review of groundwater within the mine has shown a deficiency in Tritium and carbon-14 (^{14}C), typically associated with meteoric waters recharging active aquifers. The lack of Tritium and ^{14}C in water seeping from perched aquifers into the mine indicates that groundwater is not hydrologically connected with surface water, is relatively ancient in origin, inactive and is not undergoing recharge (pg 322, Drever).

Implementation of the proposed action would manage the intercepted water in accordance to water quality permits. In addition, the installation of the pipeline will protect the municipal water sources at the Upper and Lower springs in Rilda Canyon, which are approximately 0.25 miles from the Deer Creek Mine 1st Right Portals. Birch Spring in Huntington Canyon is a bed rock spring that seeps from the Star Point Sandstone. It is unlikely the construction will affect the spring flow or water quality because it is topographically above the Highway 31 right-of-way.

If implemented the groundwater piped from the 1st right portals (piped water) would mix with diversion water from Huntington Creek in the settling pond. Diversion water entering the settling pond at a rate of 7,000-11,000 gpm from Huntington Creek will be composed of similar concentrations of iron and TDS as measured at the sampling point in Huntington Creek (table 2). At a maximum flow rate of 600 gpm of piped water and a minimum flow rate of 7,000 gpm diversion water, piped water would be diluted by a factor of greater than ten times the volume of water entering the settling pond from the Huntington Creek diversion. Using these flow rates and the high estimated iron concentration of 2.5 mg/L, the piped water would be diluted to 0.2 mg/L plus the measured average background concentration (0.48 mg/L) of iron in Huntington Creek, minus the precipitation of iron (~1 mg/L), due to sediment loading from the Huntington Creek diversion, will yield approximately 0.5 mg/L. As the flow of

diversion water increases and the piped water flow decreases, the total iron concentration will decrease. The intercepted groundwater discharged into the settling pond at the power plant may precipitate iron hydroxide and other ferric solids, which would stain sediment and rock with orange-rust coloration on private land. No hazardous effects are expected, elevated levels greater than .3 mg/L of iron may cause discoloration or unpleasant taste (EPA website for secondary drinking water). The National Recommended Water Quality Criteria for Aquatic Life indicates that 1 mg/L Fe Criterion Continuous Concentration is the highest concentration of Iron in water that is not expected to pose a significant risk to the majority of species in a given environment (EPA website).

In the event the Power Plant shuts down and groundwater still has potential to come out of the 1st Rilda Right Portals, piped groundwater would be discharged into Huntington Creek, if it meets the Utah Division of Water Quality standards. If the water does not meet set standards, then the water will be treated prior to discharging.

Table 2

Huntington Plant UPDES Groundwater Permit UGW150002				
Water Quality Parameter	Huntington Creek mg/L	Groundwater seepage in mine mg/L	Raw Pond Water mg/L	UPDES UGW150002 Groundwater Permit (Huntington Plant, including research farm) Protection Levels
Selenium	<0.002[See Note 1]	<0.02[See Note 2]	<0.002[See Note 1]	----
Iron	0.48[See Note 3]	Projected at 2.0-2.5[See Note 4]	<0.5[See Note 5]	----
TDS	244	500	248-262	[See Note 6]
pH	8.4[See Note 1]	7.5	8.4	

Note 1: Based on samples collected by PacifiCorp on Huntington Creek above the plant, Emery County Road 304/Huntington Creek bridge crossing.
Note 2: Based on samples collected by PacifiCorp on in-mine groundwater projected to gravity flow from the Rilda Canyon 1st Right Portals. Value limited by the reporting criteria of the analyzing equipment.
Note 3: Based on samples collected by PacifiCorp on Huntington Creek above the plant, Emery County Road 304/Huntington Creek bridge crossing. Total iron value influenced by sediment load in Huntington Creek. Projected total iron in the Plant settling pond.
Note 4: Total iron from the mine will dissipate over time, projected at <1.5 mg/L in less than four years.
Note 5: Total iron of the settling pond influenced by sediment load in Huntington Creek. Sampling of the settling pond by PacifiCorp indicates precipitation of the sediment reduces the total iron to <0.1 mg/L.
Note 6: Protection levels for individual wells based on historical sampling results (nitrates and TDS)

Implementation of the proposed action could impact surface water flows and potentially increase the sediment-load due to increased erosion from disturbed soils and pollution from equipment during construction. Approximately 22 acres would be disturbed by implementation of the proposed action. The majority of construction will take place in the public right of way where possible. This disturbance could lead to increased erosion or sedimentation of the disturbed soils into Huntington Creek. To reduce or prevent adverse impacts to water quality, a Stormwater Pollution Prevention Plan (SWPPP) and Spill Prevention and Response Plan (SPRP) would be prepared prior to initiation of ground disturbance. These plans would detail the best management practices and site-specific measures to prevent sediment and other pollutants from discharging into the creek during construction. Additionally a stream alteration permit will be sought if needed to comply with the Clean Water Act if work in the Rilda Canyon stream cannot be avoided.

Implementation of the SWPPP and SPRP would reduce sedimentation and the risk of pollution to surface waters during construction. Potential adverse impacts to water resources would be short-term

(during construction). Installation of the pipeline would also not affect shallow aquifers, because the pipeline will be installed in ground that is above the water table.

Implementation of the proposed action would not adversely affect water quality in the long-term, nor contribute to the existing water quality impairments defined by the Utah Department of Environmental Quality (UDEQ). The impairment from selenium levels in Huntington Creek -1 is thought to be from the dissolution of highly soluble selenium-bearing salts and gypsum in the Mancos Shale, possibly due to agricultural irrigation practices according to a study conducted in the Uncompahgre River Basin, Colorado (Mast et al 2014) (correspondence UDWQ). The impairment of DO, TDS, temperature and pH in Huntington Creek 2 and 3 is thought to be from the Seeley wild fire in the upper portions of Huntington Canyon that occurred in 2012, which may have altered base flow conditions along Huntington Creek and its tributaries (correspondence with UDWQ). Implementation of the proposed action will not create acid mine drainage conditions, because the alkalinity in the groundwater and carbonate buffers in the host rock neutralize any acid generation, due to the oxidation of pyrite. Installation of the pipeline would provide a means of managing water that would otherwise discharge from the mine portal in compliance with water quality standards.

Intercepted groundwater from the mine used in the Huntington Power Plant will also not affect its ability to operate. Water is reused six to seven times during power plant operations until TDS levels reach approximately 1,200 mg/L, at which point the water is transferred to the irrigation storage reservoir and fresh water is transferred from the settling pond in order to continue plant operations (correspondence with PacifiCorp). The power plant cycles water, concentrating TDS through the evaporation of water in the form of steam as a regular part of plant operations. The steam or water vapor will not affect air quality.

Implementation of the proposed action would not adversely affect water quantity. The volume of the settling pond will contain all water coming from the mine portals, provided the flow rate of water entering the settling pond remains in a steady-state with plant operational use; additional water storage is not a concern. Additionally, water from the mine will replace approximately 300-600 gpm normally withdrawn from Huntington Creek, therefore increasing the volume of water for domestic use downstream

SWCPS from the Soil and Water Conservation Handbook (FSH 2509.22) that are applied in the POD

13.04	REVEGETATION OF SURFACE DISTURBED AREAS - To protect soil productivity and water quality by minimizing soil erosion	Topsoil and subsoil will be segregated and stockpiled separately adjacent to the trench. The stockpiled subsoil will be used to backfill the trench, and the topsoil will be replaced on the surface and graded to pre-disturbance contours. All disturbed areas will be seeded with seed mixtures developed for the project. The seed will be certified weed and noxious weed free. If seeding cannot be completed prior to winter freezing, hydromulch with tackifier will be applied where appropriate.
13.06	SOIL MOISTURE LIMITATIONS FOR TRACTOR OPERATION - To minimize soil compaction, puddling, rutting, and gullying with	During wet conditions, vehicle traffic and equipment operation will be restricted to prevent rutting.

	resultant sediment production and loss of soil productivity. Note that this SWCP applies to all heavy equipment operations.	
15.06	MITIGATION OF SURFACE EROSION AND STABILIZATION OF SLOPES - To minimize soil erosion from road cut slopes, fill slopes, and travel ways.	Stabilization techniques are included in the Plan of Development and Stormwater Pollution Prevention Plan (SWPPP).
5.11	SERVICING AND REFUELING EQUIPMENT - To prevent contamination of waters from accidental spills of fuels, lubricants, bitumens, and other harmful materials.	Refueling areas will be a minimum of 300 feet from perennial and intermittent stream channels, seeps and springs, wetlands, lakes and reservoirs, stock water developments, and other water features. All projects will adhere to the Spill Prevention and Response Plan (SPRP) in case of accidents.
15.18	DISPOSAL OF RIGHT-OF-WAY AND ROADSIDE DEBRIS - To insure debris generated during road construction is kept out of streams and prevent slash and debris from subsequently obstructing channels.	Clearing and grading will be minimized to only the extents necessary to dig the trench for the pipeline itself. Debris will not be placed in stream channels. The ground surface will be graded back to original contours as the pipeline is installed.

References

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