Deer Creek Mine Closure Water Pipeline

Hydrology Report (Supplemental)

Prepared by:
Jeff Salow

for:
Ferron-Price Ranger District
Manti-La Sal National Forest

2/28/2017

[Signature]
Date: 2/28/2017
Background
Currently, the Deer Creek Mine, operated by Interwest Mining Company (a wholly-owned subsidiary of PacifiCorp) is no longer in operation and is in the process of final closure. The Mine Safety Health Administration (MSHA) and the Utah Department of Oil Gas and Mining (UDOGM) have restricted any impounding of groundwater within the mine (UDOGM 2016).

Groundwater, sourced from perched aquifers within the overlying Blackhawk Formation is seeping into the mined areas and existing void spaces, flooding the topographical highs and lows within Deer Creek Mine. Once the mine workings are filled, the water in the Southern mine workings will naturally flow out of the Deer Creek Portals, while water from the Northern mine workings will naturally flow to the Rilda Canyon Portals. At present, groundwater is not discharging from the Deer Creek or Rilda Canyon Portals. As the perched aquifers are drained, the flow of groundwater discharging from the mine will gradually diminish. Currently, the gate road areas within the mine are still ventilated, allowing PacifiCorp personnel access areas within the mine to conduct maintenance.

In the future, mine groundwater discharging from the Deer Creek Portals in Deer Creek Canyon, would be managed under a Utah Pollutant Discharge Elimination System Permit (UPDES) permit UT0023604 issued by the Utah Department of Environmental Quality, Division of Water Quality (UDWQ; UDWQ 2015) (Appendix I). Water flowing from the Rilda portals, if discharged locally, would naturally gravity flow east through Rilda Canyon into Huntington Creek. However, a permit cannot be obtained to discharge water from the Rilda Canyon portals into Rilda Canyon, because the water in Rilda Canyon is classified by the state 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)._)

Therefore, management alternatives had to be developed to transport the water to an approved discharge location outside of the Category 1 waters. On January 20, 2017 UDOGM received an application for permit change from PacifiCorp. Pacific Corp applied for a mine permit amendment to add a post-mining water discharge pipeline from the Rilda Canyon Portals and a potential treatment facility area at the Huntington Power Plant (UDOGM 2017).

Proposed Action
The proposal is for a gravity flow pipeline from the Rilda Portals to the Raw Water Pond at the Huntington Creek power plant. The proposed pipeline alignment parallels Rilda Canyon, which drains into Huntington Creek, then parallels Huntington Creek to the Raw Water Pond. The location of the buried pipeline is within the road right-of-way along County Road 306 and Highway 31 bordering these drainages (Appendix I). The water would then be placed into the raw water pond and managed through the power plant cooling operations. 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.
Existing Situation

According to the Utah’s Final 2016 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. Huntington Creek – 2 and 3, which includes Huntington Creek and its tributaries from Highway 10 to the Forest Service boundary, is impaired for dissolved oxygen (DO), Total Dissolved Solids (TDS), temperature, and pH (UDWQ 2016b). Huntington Creek – 1 is down gradient from the proposed pipeline alignment, while the proposed pipeline is located within Huntington Creek – 2 and 3.

Hydrogeological analyses for each federal lease that make up the Deer Creek Mine have been conducted and documented in previous NEPA decisions dating from 1976 up to 2012 (USDA Forest Service 1976, USDI BLM 2012). This work has included the direct, indirect, and cumulative affects to surface waters, which include impacts to springs, seeps, and streams. Protection of these resources is defined in site specific lease stipulations. A Cumulative Hydrologic Impact Assessment (CHIA) is also written by the UDOGM as per Utah Administration Code R645-301-729 prior to permitting a mine plan (UDOGM 2017). Each lease is subject to this hydrologic assessment including Deer Creek Mine.

“The Division will provide an assessment of the probable cumulative hydrologic impacts of the proposed coal mining and reclamation operation and all anticipated coal mining and reclamation operations upon surface- and ground-water systems in the cumulative impact area. The CHIA will be sufficient to determine, for purposes of permit approval whether the proposed coal mining and reclamation operation has been designed to prevent material damage to the hydrologic balance outside the permit area. The Division may allow the applicant to submit data and analyses relevant to the CHIA with the permit application”

The analysis in the multiple environmental assessment documents, including DOI-BLM-UT-G023-2012-0018-EA, conclude that the perched, inactive-zone groundwater systems in the Blackhawk Formation, are not in direct hydraulic communication with overlying shallow, active-zone groundwater systems that support springs and seeps and provide baseflow to streams (USDI BLM 2012). An isotopic review of groundwater within the mine shows a depletion in Tritium and carbon-14 (14C) values, with respect to the values typically associated with modern meteoric waters recharging active aquifers. The lack of Tritium and 14C in water seeping from perched aquifers into the mine indicates that groundwater is not hydrologically connected with surface water, is relatively ancient in origin, and is therefore inactive and not undergoing recharge (Drever 1997) (PacifiCorp 2016a).

Groundwater from perched, inactive-zone groundwater systems was encountered in both the northern mine workings (Rilda Canyon Portals) and the southern mine workings (Deer Creek Portals). Groundwater within the northern mine workings (Rilda Canyon Portals) is not hydrologically connected to groundwater in the southern mine workings (Deer Creek Portals) due to the Flat Canyon Anticline, a geologic structure intercepted by the mine workings (PacifiCorp 2016a).

The southern mine workings of Deer Creek Mine are currently filling with groundwater and are expected to discharge within the mine workings two years after the seal date, April, 2015. This groundwater is not affected by the pyritic split encountered in the northern workings of the mine, therefore elevated iron is not a concern (PacifiCorp 2016a). In the future, groundwater from this portion of the mine will pass through a French drain system and discharge to the surface out of the Deer Creek portals. At present, no groundwater is being discharged from the Deer Creek Canyon portals.

The northern mine workings, are also filling with groundwater. The coal seams in the northern mine workings encountered a pyritic split, and therefore have potentially elevated levels of iron. The 11th West
– 17th West longwall panel district was sealed in April, 2008 and began discharging within the mine workings in the same year at approximately 300 gpm. The total iron content of the groundwater peaked at 4 mg/L, with recent samples having a total iron content of 1.2 mg/L (PacifiCorp 2016a, SGS 2017) (figure 1). The groundwater from these workings is currently being pumped to the southern mine workings.

The northern mine workings 2nd through 7th Left Blind Canyon seam district and the 20th through 27th West Hiawatha seam were sealed in March, 2015 (PacifiCorp 2016a). The groundwater from these areas are expected to have a combined flow rate of approximately 400 gpm, which is expected to diminish over time, due to minimal recharge rate of the perched aquifers. Both coal seams encountered a pyritic split in this part of the mine. The total iron content of the groundwater peaked at 3.5-4 mg/L, and is expected to gradually decline over the next 5-10 years as the pyrite is consumed (PacifiCorp 2016a) (figure 1).

PacifiCorp conducts baseline solute sampling of groundwater seepage in the mine once a month. Water sampling in the northern Mill Fork mine workings (includes: 11th West – 17th West longwall panel district, 2nd through 7th Left Blind Canyon seam district) has shown that pyrite (FeS₂) is exposed to dissolved oxygen through the inflow of groundwater and mine ventilation. The dissolved oxygen and associated microbial activity drives the oxidation of sulfur to sulfate, and ferrous iron to ferric iron. This increases the solubility and concentration of iron within the groundwater and increases hydrogen protonation with the addition of sulfate, the dominant ligand in sulfuric acid (reactions 1 and 2) (SGS 2017). However, these reaction rates are naturally slow and a function of temperature, microbial activity, and the amount of dissolved oxygen and pyrite available for consumption. Increasing concentrations of ferric iron within the groundwater and high levels of microbial activity catalyzes the oxidation of ferrous iron in pyrite, thereby creating a self-propagating feedback cycle, which consumes pyrite mineralization at a greater rate (reaction 3). However, this process is dependent in part, on elevated temperatures suitable for microbial activity, where the heat is generated by the oxidation of pyrite (exothermic reactions: 1500
kJ per mole [120g] of pyrite), pH values less than 3, and the amount of pyrite available for consumption (Alpers et al. 2003). This process is commonly the dominant contributing factor in the production of acid mine drainage. The Deer Creek Mine has water temperatures of approximately 15 degrees Celsius, pH levels neutral to slightly alkaline, and disseminated pyrite contained locally within the coal seams. Therefore, the conditions do not exist that would contribute to the formation of acid mine drainage. Additionally, since the northern Mill Fork and southern mine workings are sealed and unventilated, the levels of dissolved oxygen in the groundwater are diminishing as the oxygen is consumed by the pyrite oxidation reaction. This results in the slowing of both the physical and microbial oxidation rates of pyrite, thereby reducing total hydrogen, sulfate, and iron concentrations in groundwater. It should also be noted, that ferric iron hydroxide solids may also precipitate out of the groundwater at near neutral pH if sufficient dissolved oxygen is present, which would also decrease the amount of total iron in the groundwater within the mine (reaction 4) (figure 2).

1) $2 \text{FeS}_2 (s) + 7 \text{O}_2 + 2 \text{H}_2\text{O} \rightarrow 2 \text{Fe}^{2+} + 4 \text{SO}_4^{2-} + 4 \text{H}^+$ (oxidation of sulfide to sulfate [sulfuric acid generation])

2) $4 \text{Fe}^{2+} + \text{O}_2 + 4 \text{H}^+ \rightarrow 4 \text{Fe}^{3+} + 2 \text{H}_2\text{O}$ (oxidation of ferrous iron [$\text{Fe}^{2+}$]) to ferric iron [$\text{Fe}^{3+}$])

3) $\text{FeS}_2 (s) + 14 \text{Fe}^{3+} + 8 \text{H}_2\text{O} \rightarrow 15 \text{Fe}^{2+} + 2 \text{SO}_4^{2-} + 16 \text{H}^+$ (oxidation of pyrite by way of ferric iron [$\text{Fe}^{3+}$])

4) $\text{Fe}^{3+} + 3\text{H}_2\text{O} \rightarrow \text{Fe(OH)}_3 (\text{v}) + 3\text{H}^+$ (precipitation of iron hydroxides by way of Fe$^{3+}$)

Acid mine drainage conditions are not expected to occur within the Deer Creek Mine (Peterson 2016b). Acid mine drainage is uncommon in coal fields in the western United States, but does exist in the eastern United States (Mayo et al. 2014). This is due to the availability of carbonate minerals in the environment, which are tied to differing rainfall precipitation rates between the eastern and western United States (Peterson 2016b). Any generation of sulfuric acid in the northern Mill Fork mine workings is buffered by carbonate minerals such as calcite found within the host rock and the associated alkaline groundwater. Hydrogen protons are consumed through calcite dissolution in reaction 4. Since there is an unlimited amount of carbonaceous host rock in the mine, the capacity to buffer any acid generation is unlimited.

4) $\text{H}^+ + \text{CaCO}_3 (s) \rightarrow \text{Ca}^{2+} + \text{HCO}_3^-$

Groundwater samples taken in the northern Mill Fork mine workings have a pH of approximately 7.5, which is neutral to slightly alkaline (SGS 2017) (figure 3). The Crandall Canyon Mine, just north of the
Deer Creek Mine, has similar groundwater conditions within similar geology, and discharges water with a pH near neutral to slightly alkaline (Peterson 2016b).

![Figure 3. 11th West – 17th West Sealed Area Water Sampling pH units; sampling 4/1/2012 – 4/1/2016; samples collected by PacifiCorp](image)

Groundwater from the northern Mill Fork mine workings is currently being pumped to the southern mine workings in order to manage the groundwater currently discharging in the mine workings from that part of the mine. Northern Mill Fork groundwater with elevated iron levels then blends with the groundwater in the southern mine workings which are not elevated in iron (PacifiCorp 2016a). This water will eventually discharge to the surface at the Deer Creek portals and is expected to be in compliance UPDES permit limitations.

Upon final closure of the Deer Creek Mine, the underground pumps will be turned off and removed. The combined groundwater flows from 11th – 17th West and from the 20th – 27th West sealed areas will then naturally flow to the Rilda Canyon portals (PacifiCorp 2016a). The combined groundwater would flow from the portals into a 10 inch high-density polyethylene (HDPE) pipe that would provide a conduit for the groundwater to gravity feed 5.5 miles to a clay lined, raw water pond outside the Huntington Power Plant. At present, no groundwater is being discharged from the Rilda Canyon portals.

PacifiCorp’s existing Deer Creek UPDES permit (UT0023604) limitations are currently being used by PacifiCorp as a model for potentially discharging groundwater from the Rilda Canyon portals to Huntington Creek. At present, the company is not permitted to discharge into Huntington Creek. The company has requested a modification to the existing Deer Creek UPDES permit that would include an additional outfall into Huntington Creek, but this has not been approved to date (UDWQ 2016a).
For power plant cooling operations, water is diverted from Huntington Creek to the raw water pond at the same rate it is consumed, typically 7,000 to 10,000 gpm. Discharged groundwater from the Rilda Canyon portals is expected to flow at a rate of 300 to 600 gpm. The concentration of iron and TDS is estimated to be 2.5 mg/L or less and approximately 500 mg/L respectively upon discharge to the raw water pond (PacifiCorp 2016a, SGS 2017). Recent sampling by PacifiCorp on November 3, 2016 at the 11th – 17th West seals shows iron levels have decreased to 0.61 mg/L, suggesting iron levels may be lower than originally anticipated (figure 1). Water brought into the raw water pond from Huntington Creek would be more than ten times the volume of water brought in from Deer Creek Mine, resulting in a dilution factor of at least ten.

Water imported to the raw water pond is sourced from Huntington Creek and also from Deer Creek Mine, and is of higher quality and considerably lower mineral concentrations when compared to other power plant site waters (Water and Environmental Technologies, PC (WET) 2016). Table 1 shows mean constituent concentrations from Huntington Creek at established monitoring sites (Attach. 1), and groundwater constituents from the 11W-17W seals within the mine (SGS 2017). Historical information for these monitoring sites can be found in the Utah Division of Oil, Gas and Mining Water Quality Database (UDOGM 2017; http://linux3.ogm.utah.gov/WebStuff/wwwroot/wqdb.html) (Peterson 2017).

Table 1.

<table>
<thead>
<tr>
<th>Mean Constituent Concentration (mg/L)</th>
<th>Huntington Creek Samples</th>
<th>Intercepted mine water</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCC01 (Up-stream)</td>
<td>HCC02 (Cross-stream)</td>
<td>UPL-9 (Down-stream)</td>
</tr>
<tr>
<td>TDS</td>
<td>240</td>
<td>260</td>
</tr>
<tr>
<td>Bicarb</td>
<td>196</td>
<td>200</td>
</tr>
<tr>
<td>Sulfate</td>
<td>36</td>
<td>45</td>
</tr>
<tr>
<td>Chloride</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>Magnesium</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>Calcium</td>
<td>57</td>
<td>57</td>
</tr>
<tr>
<td>Sodium</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>0.12</td>
<td>0.14</td>
</tr>
<tr>
<td>Boron</td>
<td>&lt;0.50</td>
<td>&lt;0.50</td>
</tr>
<tr>
<td>Iron</td>
<td>0.48</td>
<td>0.50</td>
</tr>
</tbody>
</table>

This table shows slightly lower concentrations in HCC01, as compared to HCC02 and UPL-9. The concentrations recorded at HCC02 and UPL-9 sampling locations were slightly higher than HCC01 even in 1979, thus suggesting a natural explanation for the increasing concentrations in the creek. Historically as well as now, local aquifers transmit dissolved salts derived from the Mancos Shale into Huntington Creek between sample points HCC01 to UPL-9. Groundwater in monitoring wells (NH-1W, NH-2W and NH-4W) along the bottom of the hillside along this stretch have a high salinity naturally, due to the mobilization of salts within the Mancos Shale (WET 2016). Groundwater discharging to Huntington Creek (base flow) is similar to the water chemistry in these wells. Base flow water chemistry may change from one location to another due to mineralogical differences of the aquifer host rock. The salinity (TDS) of water upstream at sample point HCC01 will be lower than the salinity at sample point UPL-9 downstream, because of changes in base flow water chemistry, due in part to the Mancos Shale.
The EPA establishes levels for organic (chemicals, pesticides, etc.), inorganic (arsenic, lead, etc.), and radionuclide (alpha, uranium, etc.) constituents in drinking water as primary drinking water standards. The EPA National Primary Drinking Water Regulations classifies TDS, iron and pH as secondary drinking water standards with a 500 mg/L for TDS, 0.3 mg/L for iron, and a pH ranging from 6.5–8.5. Iron and TDS are the only elevated analytes in the mine groundwater that exceed the EPA standards (Appendices II). The state of Utah’s numeric criteria for aquatic wildlife also shows a 1 mg/L maximum for iron (http://www.rules.utah.gov/publicat/code/r317/r317-002.htm#T9).

PacifiCorp has also collected and had a laboratory analyze intercepted groundwater samples from selected areas within the mine that will gravity flow to the Rilda Canyon portals. The analyses utilized the EPA Priority Pollutant List, which consists of 129 priority pollutants that include organic, inorganic and radionuclides. None of the pollutant parameters were detected (CHEMTECH-FORD 2016).

Direct, Indirect and Cumulative Effects

Approximately 22 acres would be disturbed by implementation of the proposed action. During construction, implementation of the proposed action may locally impact surface water flows, potentially increasing the sediment-load in Huntington Creek due to increased erosion from disturbed soils and pollution from equipment. The majority of construction will take place in the public right of way. 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 (Appendix III). 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 would be sought if needed to comply with the Clean Water Act where work in the stream cannot be avoided.

Implementation of the SWPPP and SPRP would reduce sedimentation and the risk of pollution to surface waters during construction. Any 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 would be installed in ground that is above the water table.

Implementation of the proposed action would 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 Rilda Canyon 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 (Peterson 2016a).

Implementation of the proposed action may affect the quality of water in the raw water pond. Using a maximum flow rate of 600 gpm of piped groundwater and a minimum flow rate of 7,000 gpm diversion water from Huntington Creek and an estimated iron concentration of 2.5 mg/L, the piped groundwater would be diluted to 0.2 mg/L plus the measured average background concentration (HCC01: 0.48 mg/L) (figure 4) of iron in Huntington Creek, minus the precipitation of iron (~0.1 mg/L), due to sediment loading and oxygenated water from the Huntington Creek diversion, yielding approximately 0.5 mg/L in the raw water pond. As the piped groundwater flow decreases and the flow of diversion water increases, the total iron concentration would decrease. Iron concentrated in the groundwater discharged into the raw water pond, will precipitate iron hydroxide and other ferric solids, forming a sludge in the pond. This iron hydroxide precipitate is what stains sediment and rock with orange-rust coloration. Ferric solids are a non-toxic forming precipitate. The volume of the raw water pond is 336.5 acre feet [542,886.7 (yd³)] (Peterson 2017c). It is estimated that 0.4 yd³/year of iron hydroxide will precipitate from groundwater
into the raw water pond, a minor amount when compared to the 367 yd³/year of sediment production to the raw water pond diversion from Huntington Creek (Peterson 2017).

Performing the same calculation for TDS, with a groundwater contribution of 43 mg/L and using the down gradient sampling point along Huntington Creek (UPL-9; 305 [mg/L]) (WET 2016, UDOGM Database) (Attch. 1), yields 348 mg/L total in the raw water pond.
Without dilution in the raw water pond, the discharged groundwater meets EPA primary drinking water standards (Appendix II). Once the groundwater is diluted with Huntington Creek water in the raw water pond, the water in the raw water pond would meet the Utah Numeric Criteria for Aquatic Wildlife (Huntington Creek 3C). The levels of Iron (0.5 mg/L raw water pond) would exceed the EPA National Secondary Drinking Water Standards, which are non-enforceable standards. “They are established only as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color, and odor. These contaminants are not considered to present a risk to human health at the secondary maximum contaminant levels.” [https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals](https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals)

Potential seepage from the raw water pond to the underlying shale bearing aquifer may cause groundwater mounding and dissolution of natural salts within the shale bearing formation, therefore resulting in a natural degradation of groundwater locally (WET 2016). However, a three foot thick compacted clay/silty soils liner, compacted to 98% density (ASTM D1557-70) seals the pond, limiting potential hydrologic communication between the pond and the lower shale bearing aquifer (PacifiCorp. 2016c). Groundwater from Deer Creek Mine to the raw water pond will not contribute to the degradation of the underlying shale aquifer.

Water stored in the raw water pond is used in power plant operations, cooling towers, and boiler vents. Water in the raw water pond is currently managed under a UPDES Ground Water Discharge Permit UGW150002 issued by the UDWQ. The water is recycled through the plant six to seven times. 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 (PacifiCorp 2016a). The water used for irrigation on the research fields is also regulated by the UDWQ by authorization of the same UPDES Ground Water Discharge Permit UGW150002 (UDWQ 2016a). The permit requires that water quality be measured periodically in monitoring wells in order to maintain compliance with the Ground Water Discharge Permit (UGW150002). The PacifiCorp’s groundwater discharge permit is in the renewal process. The public comment period for the groundwater permit renewal closed on January 18, 2017 (UDWQ 2016a)

Groundwater discharged to the raw water pond would make up a small fraction of the water applied to irrigation fields. The addition of groundwater from the mine to the raw water pond will not affect the total volume of diversion water used in plant operations, nor contribute additional water volume to the irrigation storage pond. The total volume of water consumed will remain constant, with or without the addition of mine groundwater (PacifiCorp 2016c). Furthermore, the addition of groundwater from the Deer Creek Mine would not affect the Huntington Power Plants cooling tower circulating water quality, because it is controlled through a water treatment process. The plants water treatment process controls TDS concentrations such that levels do not impair plant operations. Therefore, the addition of TDS from mine groundwater would not affect plant operations nor would there be major additions to the irrigation storage pond (PacifiCorp 2016c)

Conclusion
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). Acid mine drainage conditions are not expected to occur within the Deer Creek Mine (Peterson 2016b). The addition of the discharged groundwater would slightly alter the quality of water in the raw water pond. The level of iron in the water in the raw water pond would increase from 0.48 to 0.5 mg/L, a 4 percent change. Total Dissolved Solids would increase from 305 to 348 mg/L a 14 percent change. This minor modification of water quality would not affect power plant operations, as it still operates with lower mineral concentrations and is of higher quality than other comparable power plant site waters (WET 2016). The discharged groundwater meets the EPA National Primary Drinking Water standards. When the groundwater is mixed with the diversion water in the raw water pond, the water would still meet EPA National Primary Drinking Water standards (appendix II). The projected Iron concentration (0.5 mg/L raw water pond) would exceed the EPA National Secondary Drinking Water Standards, which are non-enforceable standards. “They are established only as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color, and odor. These contaminants are not considered to present a risk to human health at the secondary maximum contaminant levels.”

The state of Utah’s numeric criteria for aquatic wildlife has a 1 mg/L, maximum threshold for iron. The intercepted groundwater is expected to exceed this standard (Appendix I). However, once the groundwater is diluted with Huntington Creek water in the raw water pond, the water in the raw water pond would meet the Utah Numeric Criteria for Aquatic Wildlife (Huntington Creek 3C). Because the water would be within the limits set for aquatic life, no measurable direct effects are expected.

The analysis in the multiple environmental assessment documents including DOI-BLM-UT-G023-2012-0018-EA, conclude that the perched, inactive-zone groundwater systems in the Blackhawk Formation are not in direct hydraulic communication with overlying shallow, active-zone groundwater systems that support springs and seeps and provide baseflow to streams (USDI BLM 2012). Consequently,
dewatering inactive-zone perched aquifers within the Blackhawk Formation, by seeping into the mined areas and void spaces in the mine, should not result in a decrease in water quantity or quality within overlying alluvial aquifers or regional surface waters. The dewatering of intercepted inactive-zone groundwater systems within the lease modification areas, and the discharge of that water to the surface, would make that quantity of water available for use which would otherwise not be available (i.e. the groundwater would not naturally discharge to the surface in any reasonable timeframe) (USDI BLM 2012).

After reviewing the predicted effects on hydrological resources presented in the DOI-BLM-UT-G023-2012-0018-EA, the Forest Service Decision and Finding of No Significant Impact for Deer Creek-Upper Cottonwood Two Lease Modifications to Federal Coal Leases UTU-06039 and UTU-88554 stated that dewatering of this inactive-zone perched groundwater should not result in decreases to water quality and quantity in overlying active zone groundwater systems. It also stated that the intercepted groundwater would be discharged from the Deer Creek Mine through approved Utah Pollution Discharge Elimination System (UPDES) discharge points into Deer Creek.

Based on the available information and analysis, there are minimal direct and indirect effects to the water quality in the raw water pond. In addition, there should be no measurable cumulative effects to the water quality of the irrigation pond or subsequent irrigation practices.

The addition of intercepted groundwater would not change the amount of water stored in the raw water pond, or the amount of water used during cooling operations at the power plant. The addition of the intercepted groundwater would not affect the quality of the remaining 3% of the water that leaves the power plant. The addition of groundwater from the Deer Creek Mine will not affect the Huntington Power Plants cooling tower circulating water quality, because it is controlled through a water treatment process. The plants water treatment process controls TDS concentrations such that levels do not impair plant operations. Therefore, the addition of TDS from mine groundwater will not affect plant operations nor will there be measurable additions to the irrigation storage pond (PacifiCorp 2016c). Because there are no expected changes to the amount of water in the raw water pond, only slight changes in the water chemistry, and a controlled water treatment process in the cooling plant, there are no measurable changes to the amount and quality of water leaving the power plant. Because there are no measurable changes to the water leaving the power plant, there are no measurable effects expected to the water in the irrigation pond or irrigation practices. The power plant will continue its operations into the future, and the water will continue to be disposed of in accordance with their UPDES permits (UDWQ 2016d).

The current groundwater discharge permit No. UGW150002 was issued in 2011 through a public process (UDWQ 2016d). The environmental effects of the water discharge are disclosed in the Groundwater Quality Discharge Permit UGW150002 Draft Statement of Basis document and the Huntington Power Plant Water Quality Analysis 2016 (UDWQ 2016c, WET 2016). The water management from the plant is expected to continue as is until a new groundwater permit is issued. PacifiCorp’s groundwater discharge permit is in the renewal process; the public comment period for renewal closed on January 18, 2017 (UDWQ 2016a). PacifiCorp has chosen to develop an alternative method to dispose of the wastewater streams that are currently land-applied at the Research Farm (UDWQ 2016c). This alternate disposal method shall be in place by the end of this permit term, and development of this alternative shall be a condition of the new permit.
Attachment 1. Huntington Creek Surface Water Quality Sampling points (modified from WET 2016)
Appendix I

Proposed Pipeline Location

Rilda Canyon Portals

Raw Water Pond

Deer Creek Mine UPDES Permit UTU-0023604

Outfall Number 002

Outfall Number 001

Manti-La Sal National Forest
Deer Creek Mine Location Map
January 20, 2017
## Appendix II

<table>
<thead>
<tr>
<th>Analyte (mg/L unless noted otherwise)</th>
<th>Alkalinity ( \text{CaCO}_3 ) (pH 4.3)</th>
<th>Alkalinity ( \text{HCO}_3^- ) as ( \text{CaCO}_3 )</th>
<th>Nitrogen Ammonia</th>
<th>pH Temp. °C</th>
<th>TDS</th>
<th>Nitrate</th>
<th>Nitrite</th>
<th>Chloride</th>
<th>Sulfate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>11W-17W Seals</strong> (SGS water analytical data 12/7/2016)</td>
<td>368</td>
<td>368</td>
<td>1.6</td>
<td>7.49; 11.6</td>
<td>521</td>
<td>0.11</td>
<td>&lt;0.05*</td>
<td>11</td>
<td>93</td>
</tr>
<tr>
<td><em><em>EPA National Primary Drinking Water Regulations (MCL</em>).</em>*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>EPA National Secondary Drinking Water Regulations.</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.5-8.5</td>
<td>500</td>
<td>-</td>
<td>-</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td><strong>Utah NUMERIC CRITERIA FOR AQUATIC WILDLIFE Huntington Creek 3C(µg/L unless noted otherwise) Rule R317-2</strong></td>
<td>-</td>
<td>-</td>
<td>*9a</td>
<td>6.5-9.0</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyte (mg/L unless noted otherwise)</th>
<th>Ortho-Phosphate</th>
<th>Mercury</th>
<th>Aluminum</th>
<th>Arsenic Total</th>
<th>Boron</th>
<th>Cadmium Total</th>
<th>Calcium Total</th>
<th>Chromium Total</th>
<th>Selenium Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>11W-17W Seals</strong> (SGS water analytical data 12/7/2016)</td>
<td>&lt;0.05*</td>
<td>&lt;0.150*</td>
<td>&lt;0.03*</td>
<td>&lt;0.01*</td>
<td>0.20</td>
<td>&lt;0.001*</td>
<td>60.18</td>
<td>0.002</td>
<td>&lt;0.002*</td>
</tr>
<tr>
<td><em><em>EPA National Primary Drinking Water Regulations (MCL</em>).</em>*</td>
<td>-</td>
<td>0.002</td>
<td>-</td>
<td>0.01</td>
<td>-</td>
<td>0.005</td>
<td>-</td>
<td>0.1</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>EPA National Secondary Drinking Water Regulations.</strong></td>
<td>-</td>
<td>-</td>
<td>0.05-0.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Utah NUMERIC CRITERIA FOR AQUATIC WILDLIFE Huntington Creek 3C(µg/L unless noted otherwise) Rule R317-2</strong></td>
<td>-</td>
<td>0.012 (4 day avg.)</td>
<td>87 (4 day avg.)</td>
<td>150 (4 day avg.)</td>
<td>-</td>
<td>0.25 (4 day avg.)</td>
<td>-</td>
<td>Cr⁶⁺ [11 (4 day avg.)]</td>
<td>4.6 (4 day avg.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>750 (1 hour avg.)</td>
<td>340 (1 hour avg.)</td>
<td>2.0 (1 hour avg.)</td>
<td></td>
<td></td>
<td></td>
<td>Cr³⁺ [74 (4 day avg.)]</td>
<td>16.4 (1 hour avg.)</td>
</tr>
</tbody>
</table>
**TT** Treatment technique: a required process intended to reduce the level of a contaminant in drinking water.

*(9a)* The thirty-day average concentration of total ammonia nitrogen (in mg/l as N) does not exceed, more than once every three years on the average, the chronic criterion calculated using the following equations.

- **Fish Early Life Stages are Present:**
  
  \[
  \text{mg/l as N (Chronic)} = \left(\frac{0.0577}{1+10^{7.688-pH}}\right) + \left(\frac{2.487}{1+10^{pH-7.688}}\right) \times \text{MIN}(2.85, 1.45 \times 10^{0.028-(25-T)})
  \]

- **Fish Early Life Stages are Absent:**
  
  \[
  \text{mg/l as N (Chronic)} = \left(\frac{0.0577}{1+10^{7.688-pH}}\right) + \left(\frac{2.487}{1+10^{pH-7.688}}\right) \times \text{MIN}(2.85, 1.45 \times 10^{0.028-(25-MAX(T,7))})
  \]

---

<table>
<thead>
<tr>
<th>Analyte (mg/L unless noted otherwise)</th>
<th>Copper Total</th>
<th>Iron Total</th>
<th>Lead Total</th>
<th>Magnesium</th>
<th>Manganese</th>
<th>Molybdenum</th>
<th>Nickel</th>
<th>Potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>11W-17W Seals</strong> (SGS water analytical data 12/7/2016)</td>
<td>&lt;0.01*</td>
<td>1.36</td>
<td>&lt;0.01*</td>
<td>37.19</td>
<td>0.021</td>
<td>0.008</td>
<td>0.035</td>
<td>10.41</td>
</tr>
<tr>
<td><strong>EPA National Primary Drinking Water Regulations (MCL</strong>*).**</td>
<td>1.3 TT*</td>
<td>-</td>
<td>0.015</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>EPA National Secondary Drinking Water Regulations.</strong></td>
<td>1.0</td>
<td>0.3</td>
<td>-</td>
<td>-</td>
<td>0.05</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Utah NUMERIC CRITERIA FOR AQUATIC WILDLIFE Huntington Creek 3C(µg/L unless noted otherwise) Rule R317-2</strong></td>
<td>9 (4 day avg.)</td>
<td>1000 (maxi-mum)</td>
<td>2.5 (4 day avg.)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>13 (1 hour avg.)</td>
<td>65 (1 hour avg.)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyte (mg/L unless noted otherwise)</th>
<th>Silver Total</th>
<th>Sodium</th>
<th>Zinc Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>11W-17W Seals</strong> (SGS water analytical data 12/7/2016)</td>
<td>&lt;0.002*</td>
<td>63.09</td>
<td>&lt;0.004*</td>
</tr>
<tr>
<td><strong>EPA National Primary Drinking Water Regulations (MCL</strong>*).**</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>EPA National Secondary Drinking Water Regulations.</strong></td>
<td>0.1</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td><strong>Utah NUMERIC CRITERIA FOR AQUATIC WILDLIFE Huntington Creek 3C(µg/L unless noted otherwise) Rule R317-2</strong></td>
<td>1.6 (1 hour avg.)</td>
<td>-</td>
<td>120 (4 day avg.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>120 (1 hour avg.)</td>
</tr>
</tbody>
</table>

---

*TT Treatment technique: a required process intended to reduce the level of a contaminant in drinking water.

*9a* The thirty-day average concentration of total ammonia nitrogen (in mg/l as N) does not exceed, more than once every three years on the average, the chronic criterion calculated using the following equations. Fish Early Life Stages are Present: mg/l as N (Chronic) = ((0.0577/(1+10^{7.688-pH})) + (2.487/(1+10^{pH-7.688}))) \times \text{MIN}(2.85, 1.45 \times 10^{0.028-(25-T)})

Fish Early Life Stages are Absent: mg/l as N (Chronic) = ((0.0577/(1+10^{7.688-pH})) + (2.487/(1+10^{pH-7.688}))) \times \text{MIN}(2.85, 1.45 \times 10^{0.028-(25-MAX(T,7))})

*MCL-Maximum Contaminant Level*

*Reporting limit of instrument (ICP-OES) using method: EPA 200.7*
### Appendix III

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

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.04</td>
<td>REVEGETATION OF SURFACE DISTURBED AREAS</td>
<td>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.</td>
</tr>
<tr>
<td>13.06</td>
<td>SOIL MOISTURE LIMITATIONS FOR TRACTOR OPERATION</td>
<td>During wet conditions, vehicle traffic and equipment operation will be restricted to prevent rutting.</td>
</tr>
<tr>
<td>15.06</td>
<td>MITIGATION OF SURFACE EROSION AND STABILIZATION OF SLOPES</td>
<td>Stabilization techniques are included in the Plan of Development and Stormwater Pollution Prevention Plan (SWPPP).</td>
</tr>
<tr>
<td>5.11</td>
<td>SERVICING AND REFUELING EQUIPMENT</td>
<td>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.</td>
</tr>
<tr>
<td>15.18</td>
<td>DISPOSAL OF RIGHT-OF-WAY AND ROADSIDE DEBRIS</td>
<td>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.</td>
</tr>
</tbody>
</table>
References


2012, Deer Creek – Upper Cottonwood Two Lease Modifications to Federal Coal Leases UTU-06039 and UTU-88554, Emery County, Utah

Utah Division of Oil Gas and Mining. 2005. MEMORANDUM OF UNDERSTANDING BETWEEN UTAH DIVISION OF OIL, GAS AND MINING AND UTAH DIVISION OF WATER RIGHTS FOR COAL MINING OPERATIONS. November 2005

Utah Division of Oil Gas and Mining. 2016. Letter to PacificCorp - Denial of Permit Amendment Volume 12, Chapter 7, Deer Creek Mine, PacifiCorp C/015/0018, Task ID #5060 Letter to PacifiCorp, 4 April 2017.


Utah Division of Water Quality. 2015. Authorization to Discharge under the Utah Pollutant Discharge Elimination System (UPDES) Permit UT0023604, PacifiCorp-Energy West Mining Company-Deer Creek Mine, Huntington, Utah, Permit effective February 1, 2015. State of Utah Department of Environmental Quality Division of Water Quality Utah Water Quality Board Salt Lake City, Utah. 1 February 2015.