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GROUND WATER QUALITY DISCHARGE PERMIT UGW150002

STATEMENT OF BASIS

PacifiCorp Huntington Power Plant
Huntington, Utah

November, 2016

Basis for Permit Renewal

This permit is being renewed, upon application of the permittee, in accordance with R317-6-6.8 which states that a permit may be terminated or a renewal denied if any one of the four items below applies:

- A. Noncompliance by the permittee with any condition the permit where the permittee has failed to take appropriate action in a timely manner to remedy the permit violation;
- B. The permittee's failure in the application or during the permit approval process to disclose fully all significant relevant facts at any time;
- C. A determination that the permitted facility endangers human health or the environment and can only be regulated to acceptable levels by plan modification or termination; or
- D. The permittee requests termination of the permit.

In addition to renewal the following changes are being made to the previous permit.

1. Change 1: Three ponds formerly regulated under this permit have been closed either in response to ground water monitoring or to comply with the new Federal Coal Combustion Residual regulations. These are Lacey's Lake, the wastewater holding basin and the scrubber pond. Wells associated with these facilities will continue to be monitored for this permit term.
2. Change 2: To provide better monitoring of the interface between the Research Farm and Huntington Creek, two new monitor wells have been constructed along the creek. One well, NH-9W, on the same side of the stream as the Research Farm, will be used as a compliance monitoring point and protection levels will be established for it following background monitoring. The monitoring schedule for wells between the Research Farm and Huntington Creek will be increased from semi-annually to quarterly.
3. Change 3: The existing active coal combustion waste landfill and monitor wells associated with it, formerly regulated under this permit, will be regulated under the new Coal Combustion Residual regulations by the Division of Waste Management and Radiation Control. The closed coal combustion waste landfill will continue to be

- regulated under this permit.
4. Change 4: Land application at the Research Farm will be phased out by the end of this permit term. PacifiCorp shall develop plans for alternative wastewater disposal within two years of the effective date of this permit. The plans will be fully implemented by the end of this permit term. Before any new facilities or practices for alternative wastewater disposal are put into place, this permit shall be either modified or renewed, and the new version of the permit shall be subject to public comment. Any new construction needed for the alternative wastewater disposal shall be subject to the Best Available Technology requirements of UAC R317-6-6.4A(3). Wells associated with the Research Farm will continue to be monitored after its closure.
 5. Change 5: Dissolved selenium has been added to the surface water parameters monitored in Huntington Creek, because the stream has exceeded limits for that parameter downstream of the Utah Highway 10 crossing.
 6. Change 6: Three appendices that were included in the 2011 permit are not included in this version. One deleted appendix deals with closure of the Lacey's Lake wastewater pond which has been accomplished already; a second is criteria for ending land application at the Research Farm, which is moot, because this version of the permit sets a definite date for that; and a third was a contingency plan outlining actions to be taken in the event of unanticipated ground water impacts, which DWQ does not feel is flexible enough to deal with potential unanticipated events; rather, such incidents will be addressed on a case-by-case basis according to UAC R317-6-6.15.

Currently, neither modification to existing facilities nor new facility construction is authorized in this renewed permit. For this renewal, the authorized waste stream inflow materials have not changed. Since the permittee has requested renewal as well as met the applicable criteria for A-C above including the requested changes, the permit is being renewed for another five year term.

Background

Permit History

The two units of Huntington Power Plant were put into service in 1974 and 1977. As a means to dispose of non-contact cooling water and other waste streams, the plant's owners, Utah Power and Light Co., proposed beneficial re-use of them by irrigating a tract of crop land on the Huntington Creek alluvial plain, known as the Research Farm. Wastewater was to be applied seasonally, according to a plan that maximizes evapotranspiration by the crops. Wastewater is produced year-round, and would be collected in a reservoir for use during the growing season.

The Division of Water Quality's (DWQ) predecessor agency, the Bureau of Water Pollution Control (BWPC) approved this plan in 1977. A series of monitor wells was installed at the Research Farm site in 1979, and ground water monitoring data was reported to BWPC. These wells, however, were not constructed to standards that would allow for collection of ground water samples that are scientifically valid and legally defensible. At DWQ's request, these wells were

replaced in 1997 with new wells constructed according to contemporary monitor well standards. The Ground Water Quality Protection Regulations, UAC R317-6, were adopted in 1990. Under these regulations, the Huntington Power Plant was defined as an “existing facility”. Existing facilities were required to report on the nature of their discharge to ground water. BWPC, which became DWQ in 1991, ranked these facilities according to their potential to impact ground water quality. During the 1990s, these facilities were evaluated one by one, according to rank, and those that posed a serious threat to ground water quality were required to apply for a ground water discharge permit. DWQ did not require Huntington Power Plant to apply for a permit.

In 2003, PacifiCorp, which had merged with Utah Power and Light in 1989, voluntarily requested to obtain a ground water discharge permit for the Huntington Power Plant from DWQ. During the next three years, PacifiCorp conducted site investigations and gathered background water quality data, under DWQ’s guidance, to provide information needed to develop permit conditions.

Permit No. UGW150002 was first issued in 2006. Discharge minimization technology for the permit, required for existing facilities under UAC R317-6-6.4C(3), consisted of corrective action for ground water impacted by the plant’s combustion waste landfills and best management practices for land application of wastewater at the Research Farm as well as several other areas and facilities at the plant site that had the potential to affect ground water. Ground water and surface water monitoring is the primary compliance monitoring method for the permitted facilities, although experience since 2006 has shown that in many cases, ground water monitoring is complicated by site factors and is not straightforward, as described below. Corrective measures were implemented for ground water affected by the combustion waste landfills in 2009. The permit was renewed in 2011. Several plant facilities have been closed or reconstructed to minimize the potential for ground water contamination.

Facility Description

The PacifiCorp Huntington Power Plant is a coal-fired steam electric generating facility. The power plant operates the Huntington Research Farm for land application of non-contact cooling water, boiler blowdown water, treated domestic wastewater and other process wastewaters described in 40 CFR Part 423.11, including cooling tower blowdown, low-volume sources of wastewater and metal cleaning wastewaters. The power plant also operates an active landfill for the disposal of coal combustion wastes, including fly ash, bottom ash, slaker grits, pyrites and scrubber sludge, and manages an older, closed landfill that was used for disposal of these same wastes.

The Huntington Research Farm consists of 255 acres of farmland located southeast of the power plant. Wastewater is stored in a clay-lined evaporation pond throughout the year and is used to irrigate the Research Farm from April through October. Irrigation water is applied at a rate to minimize surface water runoff and infiltration to ground water. Wastewater applied at the Research Farm contains elevated and variable levels of total dissolved solids (TDS), nitrate, and boron. Highest concentrations of these wastewater contaminants measured between 1980 and 2003 were 4,652 mg/l TDS, 29.6 mg/l nitrate, and 14.3 mg/l boron. Land application has been done at the Lower Farm since 1977 and at the Upper Farm since 1983. With continued application of wastewater on the Research Farm site, at some point in the future, salt accumulation in the soil will inhibit crop growth and another means of wastewater disposal will need to be implemented.

From the late 1970s to 2002, PacifiCorp disposed of combustion wastes at a landfill site south of the power plant. Currently, an 8-acre Class IIIB Solid Waste Landfill for industrial wastes is located on top of the old combustion waste landfill. A new combustion waste landfill is located

directly east of the old landfill. Disposal of combustion wastes in the new landfill began in January 2002. The landfill was designed for a 30-year life with a disposal capacity of 430,000 cubic yards per year. Historically, scrubber sludge was disposed of in a pond constructed on top of the landfill. Monitoring since 2003 indicated that ground water downgradient of these landfills, including some ground water under the Research Farm, has been impacted by water from the scrubber sludge. In response to a Notice of Deficiency from DWQ regarding PacifiCorp's first permit application in 2004¹, and as a later condition of the 2006 ground water permit, PacifiCorp implemented operational changes to eliminate free liquids from being placed in the landfill and constructed drains that intercept ground water in the drainage below the landfills, and convey it to the Unit 2 FGD mist eliminator sprays. When the Unit 2 FGD mist eliminator sprays are not available, the intercepted ground water is pumped to the reservoir and mixed with the other wastewater that is applied at the Research Farm.

Other potential ground water discharge sources at the plant site were identified and regulated under the ground water discharge permit. These include the coal pile and blending facility, equipment maintenance, waste handling and other activities at the power plant site itself, and a pond to hold wastewater before it is land-applied at the Research Farm.

Site Hydrogeology

Bedrock at the plant site is Mancos Shale, which contains large amounts of soluble salts (primarily sodium, chloride, sulfate and bicarbonate) that leach into ground and surface water. Precipitation falling on the site, or surface water from Huntington Creek, dissolves more soluble minerals from the Mancos Shale the longer it has been in contact with the formation. Natural degradation of water quality by contact with the Mancos Shale in the Emery County area has been documented in the literature^{2,3,4}.

As a result of this natural degradation, ground water quality varies considerably at the site, making it difficult or impossible to distinguish between naturally-occurring changes in water quality from changes due to activities and facilities related to the power plant. Most plant facilities are built on alluvium or talus deposited on top of the Mancos Shale. Ground water in the alluvial deposits is generally better quality than ground water in the Mancos Shale. Because of these factors, comparison of ground water quality upgradient and downgradient of various facilities cannot be used to definitively determine compliance with the Ground Water Quality Protection Rules (UAC R317-6).

The Research Farm is located over an alluvial aquifer adjacent to Huntington Creek. This shallow alluvial aquifer is comprised of unconsolidated fluvial deposits of clay, silt, sand and gravel, and ground water occurs at 5 to 45 feet below ground surface. Water levels in monitor wells show that ground water under the Research Farm moves generally from northwest to southeast, parallel to the creek. Ground water velocities in the alluvial aquifer are estimated at 5 to 20 feet per day. Monitor wells near the creek indicate ground water with TDS generally less than 1,000 mg/l that was probably partially recharged from the creek. On the southwest side of the alluvial plain, research farm monitor wells indicate poorer quality ground water with TDS greater than 3,000 mg/l (Class III Limited Use Ground Water), which is probably due to contact with the Mancos Shale exposed on the side of the valley. The drainage that contains both the old and new combustion waste landfills flows onto the alluvial plain at the northwest edge of the Research Farm. Ground and surface water sampling at this point and to the southeast along the

¹ DWQ, Huntington Power Plant Ground Water Discharge Application Notice of Deficiency; DWQ-2004-002121.

² DWQ, Price River, San Rafael River, Muddy Creek TMDLs, 2004; DWQ-2016-015595.

³ USGS Water Supply Paper 2068, 1981; DWQ-2016-013631.

⁴ Environmental Sciences Laboratory, Natural Contamination from the Mancos Shale, 2011; DWQ-2016-013632.

edge of the alluvial plain indicates that ground water quality has likely been influenced historically by discharge of seepage from the landfills.

Ground water in the alluvial aquifer under the Research Farm is of limited extent and generally poor quality, at least partly due to natural conditions, except in wells adjacent to Huntington Creek. However, ground water discharging from this aquifer into Huntington Creek has the potential to affect surface water quality in the creek. Because of the poor quality of ground water away from the creek and residual impacts from the landfills in the Duck Pond drainage, wells on the southwest side of the farm and in its central area are not used for compliance monitoring, but they are monitored for informational purposes and to document the effectiveness of the remedial actions for the landfills. A deterioration of ground water quality in the wells adjacent to Huntington Creek would indicate migration of poor-quality water from under the Research Farm to locations where it would soon discharge into Huntington Creek. These wells will continue to be used for compliance monitoring to insure continued protection of the creek.

Most other plant facilities that have a potential to affect ground water quality are located on alluvium overlying Mancos Shale. Ground water under these locations is generally located in small, discontinuous zones of saturation perched above the contact between alluvium and the Mancos Shale. Samples from monitor wells completed in these zones have TDS concentrations ranging from approximately 1,000 to 6,000 mg/l.

Basis for Original Permit Issuance and Subsequent Renewal (2011)

Ground water protection levels for monitor wells at the Research Farm were established in the 2006 permit and were based on background data collected before this permit was first issued in 2006. Protection levels for other compliance wells at the site were based on background data collected before permit renewal in 2011. The protection levels for Total Dissolved Solids and nitrate + nitrite were calculated from the statistical mean of this background data plus two times the standard deviation. In a data set with a normal statistical distribution, it is highly unlikely that data from any new sampling event will fall outside this limit. In accordance with UAC R317-6, the protection levels were established to detect possible ground water impacts from plant operations and to enable corrective actions to be implemented in a timely manner to ensure ground water quality is protected.

Since 2006, there have been numerous incidents when protection levels in compliance monitoring wells have been exceeded, at the Research Farm, combustion waste landfills and plant site facilities. However, in many cases it is not possible to discern if the exceedances were caused by PacifiCorp's activities or from other causes for the following reasons:

- Plant activities which could have affected ground water quality had been ongoing at the site for approximately 25 years before this permit was first issued, or any attempt to define baseline conditions was made;
- For the most part, discharges and potential discharges from the power plant's activities contain dissolved constituents that are already naturally present in the site's ground water;
- The plant site is an area where natural degradation of ground water quality is taking place, as water from precipitation or from Huntington Creek comes into contact with the Mancos Shale, which contains many soluble salts;
- Intercepting ground water flow from the Duck Pond drainage, in response to the compliance schedule in the 2006 permit may have changed ground water flow in the Research Farm alluvial aquifer downgradient from that drainage. Ground water flow

may also have been affected by down-cutting of the Huntington Creek stream channel following upstream debris flows caused by the Seeley fire in 2012;

- Ground water quality varies significantly over short distances at the Huntington site, and natural ground water flow, unaffected by PacifiCorp's activities, could potentially cause changes in water quality at a monitor well;
- The period of background sampling used to determine permit protection levels may not reflect longer-term variability caused by these or other factors.
- A study of stable oxygen and hydrogen isotopes in ground water sampled by Research Farm monitor wells, and other sources that could affect them⁵, [5] indicates that some Research Farm monitor wells sample ground water that was affected by evaporation, but that evaporation could be due either to influence from the wastewater or from the irrigation process, which disposes of water by evapotranspiration.

Given the natural degradation of ground water quality at the site and the other variables cited above, regulation of the various permitted facilities will have the following basis:

Research Farm

As described above, ground water quality at the Research Farm varies naturally depending on whether the site of any particular monitor well is influenced by recharge from Huntington Creek or by flow from the Mancos Shale. Any influence that may have been caused by land application of wastewater is superimposed on this natural variation. There may also be residual ground water impacts, originating from the combustion waste landfills in the Duck Pond drainage that still affects the alluvial aquifer. (This source was cut off when interceptor drains were constructed in 2008-2009.) Ground water under the alluvial plain at the Research Farm site is not used for culinary or drinking water purposes. The main potential threat that this site poses to beneficial uses of water is discharge of contaminants into Huntington Creek. To evaluate whether PacifiCorp's activities are affecting water quality in Huntington Creek, surface water is sampled in Huntington Creek above and below PacifiCorp's facilities. It should be noted that surface water quality standards have never been exceeded at the downstream monitoring point⁶. [6]

Even with the uncertainties in interpreting ground water data as cited above, it is clear that TDS and nitrate concentrations have, on many occasions, exceeded the protection levels (which were determined as described above) at two wells adjacent to Huntington Creek. The recent isotope study⁷ also indicates that ground water at the Research Farm site has been affected by evaporation and it is likely that some applied wastewater has percolated to ground water rather than being entirely taken up by evapotranspiration, as envisioned in the Land Application Plan. In addition, there has been a general increase in dissolved solids concentration in wastewater applied to the Research Farm since the 4th quarter, 2007⁸, with a sample analyzed at 5020 mg/l taken on May 3, 2016⁹. Nevertheless, beneficial uses of ground water have not been affected, and human health and the environment have not been endangered by the Research Farm's operation.

Considering the level of uncertainty about whether the current land application is affecting ground water quality that is caused by the site's complex hydrogeology and other factors, and also considering that the operational life of the Research Farm will eventually come to an end, PacifiCorp has chosen to develop an alternative method to dispose of the wastewater streams that

⁵ PacifiCorp, Huntington Research Farm Isotope Analysis; DWQ-2016-013570.

⁶ PacifiCorp, Ground Water Data .xls, Monitoring point UPL-9; DWQ-2016-013629.

⁷ PacifiCorp, Huntington Research Farm Isotope Analysis; DWQ-2016-013570.

⁸ PacifiCorp, Ground Water Data .xls, Monitoring point UPL-13; DWQ-2016-013629.

⁹ PacifiCorp, UPL-13 Water Quality Analysis; DWQ-2016-013629.

are currently land-applied at the Research Farm. 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 this permit.

As a condition of the 2016 permit renewal, PacifiCorp has installed a new monitor well adjacent to Huntington Creek, to collect additional ground water data from an area between existing wells NH-3W and NH-6W. Eight samples will be taken over one year period from this well to define background ground water quality and to enable protection levels to be derived from it.

Monitoring of Research Farm wells will continue after closure of the Research Farm, to insure salts remaining in the soil there do not affect ground water quality. Surface water in Huntington Creek will also continue to be monitored.

Coal Combustion Waste Landfills

The currently-active coal combustion waste landfill and associated monitor wells will be regulated under the Federal Coal Combustion Residual (CCR) regulations implemented by the EPA in late 2015 and administered by the Division of Waste Management and Radiation Control (DWMRC). Until the DWMRC permit is in place, regulation of that landfill will continue under this permit.

The historic closed combustion waste landfill and associated monitor wells will continue to be regulated under this permit. PacifiCorp installed a new evapotranspiration cap on this landfill in 2007 to minimize infiltration of precipitation and formation of leachate. The flow of impacted ground water from the landfills in the Duck Pond drainage has been intercepted by drains since 2009 in accordance with DWQ direction. Residual ground water impacts from the previous operation of this landfill will be remediated by natural attenuation and PacifiCorp will continue to monitor the existing wells. Any ground water that may be intercepted by the drain is one of the waste streams that will not be permitted to be land-applied at the Research Farm after the five-year term of this permit. The existing industrial solid waste landfill that has been developed on top of the historic combustion waste landfill will continue to be regulated by DWMRC.

Other Plant Facilities

Several facilities around the plant site could potentially result in a discharge of dissolved constituents to ground water, and are regulated under this permit. These facilities include the main power plant site, the coal storage area, and the wastewater evaporation pond which contains plant process water that is applied at the Research Farm. PacifiCorp shall follow the Best Management Practices for these facilities contained in Appendix B of the permit. Monitor wells were installed to evaluate any impacts these facilities may have on ground water, and protection levels were developed for the 2011 version of this permit.

In response to monitor well HSW-1 having previously exceeded permit protection levels, PacifiCorp closed an unlined impoundment called Lacey's Lake, in 2011, which was used to contain stormwater and several other waste streams. To prevent any further discharge of constituents from this source, PacifiCorp diverted waste streams to other means of disposal, dredged accumulated solids from the pond and re-graded the site to promote drainage away from the former pond¹⁰. Monitored natural attenuation of ground water that was affected by this discharge will continue at well HSW-1 for this permit term.

Starting in October, 2012, monitor well HWW-4 began to exceed permit protection levels. This well is located downgradient from the wastewater holding basin which collects all wastewater

¹⁰ PacifiCorp, Closure Report, Lacey's Lake Pond Area, December 9, 2011; DWQ-2011-008903.

streams from the power plant. To prevent further contaminant discharges from this source and to comply with the new CCR rules, PacifiCorp closed this basin and built concrete waste water decanting basins, under a construction permit from DWQ dated February 27, 2014¹¹. Monitored natural attenuation of ground water that was affected by this discharge will continue at well HWW-4 for this permit term.

PacifiCorp closed the Scrubber Pond, historically used to store scrubber wastes, in 2015 to comply with CCR regulations¹². The pond was lined with asphalt and a flexible membrane liner and it was monitored by well HCP-6. Monitoring of that well will continue for this permit term, to evaluate any potential constituent discharges that may originate from the site of this closed pond, and from the coal storage pile.

Basis for Specific Permit Conditions

Water Quality Monitoring

Because of the potential for discharge of contaminated ground water to surface water, compliance with surface water standards will be evaluated at upstream and downstream monitoring points in Huntington Creek (H-1, H-2 and UPL-9). To evaluate any impacts of diffuse discharge from the alluvial aquifer, these points of compliance will be sampled semi-annually in spring and fall to evaluate conditions under high and low seasonal stages of stream flow. Additional surface water monitoring may be required if there is evidence of impacted discharge from ground water to surface water.

Ground water monitoring will be performed at the existing Research Farm, old combustion waste landfill and plant facility monitor wells using the protection levels established in the 2011 version of this permit. Protection levels for the new Research Farm monitor well will be established following background sampling, under the provisions of UAC R317-6-4. Because of the uncertainties in evaluating impacts from plant operations from monitoring data as described above, exceedance of protection levels in a monitor well will not automatically trigger a requirement to take compliance actions. After a protection level exceedance in a compliance monitoring well, sampling will be performed monthly for at least two months or until the well is below protection levels again. Compliance actions will be required if monitoring shows clearly that PacifiCorp's activities have caused protection levels to be exceeded, or if evaluation of all available lines of evidence shows the exceedance is due to PacifiCorp's operations.

Monitoring frequency at the Research Farm monitor wells adjacent to Huntington Creek will be increased to quarterly. Semiannual monitoring of the other existing monitor wells will continue under this permit. Monitoring of wells not specifically designated for compliance will be for informational purposes only and ground water protection levels will not be developed or enforced for these wells.

Discharge Minimization Technology

Because the power plant is an "existing facility" under UAC R317-6, PacifiCorp shall use Discharge Minimization Technology to protect waters of the state. For the purposes of this permit, this technology will include:

¹¹ URS, Confirmation of CCR Removal Efforts for the Huntington Power Plant Wastewater Pond, October 21, 2015; DWQ-2016-013110.

¹² PacifiCorp, Confirmation of CCR Removal Efforts for the Huntington Power Plant Historic Scrubber Pond, January 14, 2016; DWQ-2016-013108.

1. Procedures to be used for land application at the Research Farm, including the Wastewater Land Application Plan contained in Appendix A.
2. Best Management Practices for the old and new coal combustion waste landfills, and other plant facilities and ponds that could potentially cause a discharge of constituents to waters of the state contained in Appendix B.

Best Available Technology

New facilities constructed at the plant site that will be regulated under this permit shall comply with the Best Available Technology requirements of UAC R317-6.

References

- [1] DWQ, Huntington Power Plant Ground Water Discharge Application Notice of Deficiency; DWQ-2004-002121
- [2] DWQ, Price River, San Rafael River, Muddy Creek TMDLs, 2004; DWQ-2016-015595
- [3] USGS Water Supply Paper 2068, 1981; DWQ-2016-013631
- [4] Environmental Sciences Laboratory, Natural Contamination from the Mancos Shale, 2011); DWQ-2016-013632
- [5] PacifiCorp, Huntington Research Farm Isotope Analysis; DWQ-2016-013570
- [6] PacifiCorp, Ground Water Data .xls, Monitoring point UPL-9; DWQ-2016-013629
- [7] PacifiCorp, Ground Water Data .xls, Monitoring point UPL-13; DWQ-2016-013629
- [8] PacifiCorp, UPL-13 Water Quality Analysis; DWQ-2016-013634
- [9] PacifiCorp, Closure Report, Lacey's Lake Pond Area, December 9, 2011; DWQ-2011-008903
- [10] URS, Confirmation of CCR Removal Efforts for the Huntington Power Plant Wastewater Pond, October 21, 2015; DWQ-2016-013110
- [11] PacifiCorp, Confirmation of CCR Removal Efforts for the Huntington Power Plant Historic Scrubber Pond, January 14, 2016; DWQ-2016-013108