

# Lacey's Lake Decommissioning

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## ABSTRACT

Lacey's Lake was created to accept wet fly ash and other wastewater streams, including stormwater. Water was decanted and sent to another facility for further treatment and reuse. On an approximately two week cycle, solids were excavated from the impoundment and hauled by truck to a landfill. Lacey's Lake was an unlined facility and adjacent groundwater was monitored as a condition of a groundwater permit. For many years there was no indication of groundwater impacts but in 2009 increases in boron concentrations resulted in the owner re-evaluating the use of this unlined facility.

URS was contracted in 2010 to evaluate the waste streams and solids inputs to the stream. As a result of this work, URS was tasked to design facilities to:

1. collect and re-route stormwater,
2. collect ash laden water and to return it to the plant for mixing with dry ash,
3. collect high chloride concentrator wastewater and return it to the plant for ash mixing,
4. collect water used for vehicle wash down and re-route it to a treatment facility, and
5. stack and dry wet fly ash from sumps and other sources.

The facilities included two stormwater detention basins, a slurry pump station, a concentrator effluent storage tank and pump station, a stackout pad; and appurtenant piping for each facility. Following re-routing of all waste streams, material in Lacey's Lake was excavated and adjacent soils removed until clean closure was approved by State regulators. The project successfully closed this potential source of groundwater contamination and all waste streams are now efficiently and environmentally managed.

## I. Introduction and Project Purpose

The Huntington Power Plant is located in Utah approximately 11 kilometers (7 miles) west of the town of Huntington, Utah. The Huntington Power Plant is owned and operated by PacifiCorp and was originally commissioned on the 405 hectares (1,000-acres) site in 1974 as a single-unit, 498 megawatt (MW) plant; in 1977, a second 498 MW unit was commissioned. Today, the Huntington Power Plant is capable of

producing approximately 895 megawatts of electricity [1]. The plant consumes approximately three million tons per year of sub-bituminous coal and receives most of its process water from Electric Lake Reservoir 37 kilometers (23 miles) north of the plant; which is also owned and operated by PacifiCorp [2].



**Figure 1 – Huntington Power Plant, Utah**

Mark Rutherford was the Huntington Plant project manager for the Lacey's Lake Decommissioning Project. He has been working for the plant for 12 years and is currently the Performance Engineer. Rick Cox was the design project manager and lead structural engineer for the project. He has been practicing engineering for 32 years and is a senior consultant for AECOM.

Lacey's Lake was created in 1979, after commissioning of the plant, to provide a down gradient settlement basin with a design volume of four acre-feet that would collect coal combustion residuals (CCR) and coal ash from water sources and decant water for disposal. Disposal included evaporation and land application (irrigation of alfalfa). Lacey's Lake was an unlined, incised pond with approximate dimensions of 38 meters by 38 meters (125 feet by 125 feet) that had no well-defined horizontal or vertical limits. Approximately monthly, the CCR would be excavated from the pond and stockpiled on site (on native ground). Once dewatered sufficiently, it would be hauled to the ash landfill. Figure 2 shows the location of Lacey's Lake in relation to the plant. Figure 3 is a photo of the pond under operations.



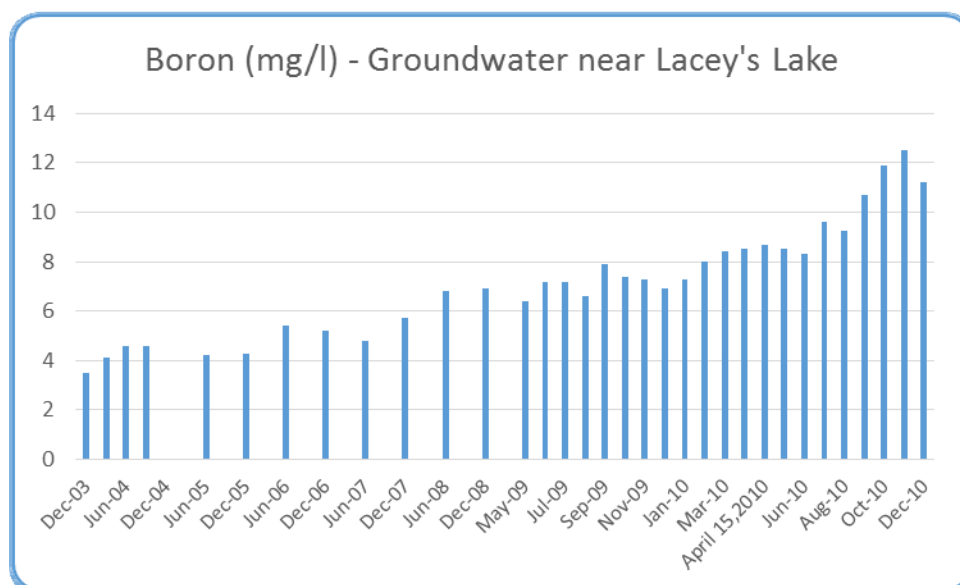
Figure 2 – Site Location within Plant



Figure 3 – Lacey's Lake during Operation

In addition to collecting waste streams from the power plant, Lacey's Lake also received stormwater runoff from the coal pile and the plant yard area.

The Huntington Power Plant holds a groundwater discharge permit [3] from the State of Utah Division of Water Quality. One condition of the permit required monitoring the groundwater quality down gradient from Lacey's Lake. The purpose of this monitoring was to identify any degradation of the groundwater associated with seepage from Lacey's Lake. In 2009 and 2010, the plant staff identified increased levels over a very short time frame for boron and chloride that indicated that Lacey's Lake was finally impacting groundwater quality after more than 32 years of operation. Background boron had been identified in the groundwater permit at 4.5 mg/l. See trending increase of boron concentrations in Figure 4.



**Figure 4 – Boron Concentration in Groundwater near Lacey's Lake**

PacifiCorp management made the decision to decommission Lacey's Lake in late 2010 and contracted with URS to provide designs for its decommissioning. In order to decommission the pond, all waste streams from the plant and all stormwater runoff would need to be re-directed away from Lacey's Lake.

One of the major historical waste streams had been water associated with flue gas desulfurization (FGD). Fortunately, the year prior to decommissioning of the pond, the Plant had constructed a \$25 M dewatering facility that produced a relatively small waste stream in comparison to the historical waste stream to Lacey's Lake.

## **II. Waste Streams**

As part of the Lacey's Lake Decommissioning, the plant staff and the consultant needed to identify all the waste streams entering the pond and develop plans for their re-direction. The waste streams were:

- a. Stormwater runoff from the coal pile
- b. Stormwater and wash down water from various plant area drains
- c. Coal conveyor belt leakage
- d. Waste water from the FGD dewatering facility
- e. RCC concentrator concentrate
- f. Pump seal water
- g. Truck wash down water
- h. Pug mill wash down water, including wastewater from bottom ash

## **III. Stormwater Redirection**

Perhaps the easiest of the wastewater streams to redirect was stormwater runoff. However, there were two types of stormwater runoff. One runoff contained primarily coal dust and another contained limited amounts of CCR. It was decided that conventional stormwater detention basins would be sufficient for the coal pile runoff and for leakage from the coal conveyor. The second type, runoff with ash would require addition settlement treatment.

The final design solution for the coal pile runoff was to construct a new stormwater detention basin near the base of the coal pile and to channel the overflow from this detention basin to an existing stormwater detention basin. Coal conveyor leakage would be collected and commingled in the drainage ditch with coal pile runoff. The existing detention basin overflowed to a third detention basin (Duck Pond) where it was collected and either returned to the plant for process use or pumped to an evaporation pond.

The plant area stormwater had historically been collected and discharged to Lacey's Lake. It contained solid, much of which was CCR. The solution was to reroute the outfall from the stormwater collection system to a pump station that previously had pumped decanted Lacey's Lake water. Coring the existing concrete pump station allowed the re-routed stormwater outfall pipe to penetrate the station. The existing pump was not replaced as part of this project.

#### **IV. FGD Dewatering Wastewater Stream**

The newly constructed FGD dewatering facility had a stream of 7.9 liters per second (120 gpm) that could no longer be discharged to Lacey's Lake. The solution was to construct a pipeline from the FGD Dewatering Facility to the Pug Mill and to mix the wastewater with fly ash and dispose of the wetted ash in the landfill. A 508 mm (20-inch) diameter schedule 80 steel pipeline with insulated cover was designed to convey the water approximately 128 meters (420 feet) attached to an existing overhead conveyor structure. All above ground pipe in the project was insulated because of potential for extreme low winter temperatures. Because of the difficulty of showing three dimensional routing of above ground piping, drawings were supplemented with photographs marked with pipeline placement as shown in Figure 5.



**Figure 5 – Dewatering to Pug Mill Pipeline**

#### **V. Concentrator Discharge**

The RCC concentrator historically discharged 0.3 liters per second (5 gpm) to a sump near a truck wash down area. The sump overflowed to a 610 mm (24-inch) pipeline that connected to the plant area stormwater system, which subsequently discharged to Lacey's Lake.

Besides solids, the concentrator wastewater stream contained 32,000 ppm chlorides. It was decided that the concentrator waste stream could no longer be mixed with other waters that were being reused, as was occurring at Lacey's Lake. It was decided that this water would be collected, stored and mixed with fly ash at the Pug Mill. A dedicated glass lined, 19,000 liters (5,000 gallon) tank was constructed with an agitator supported by structural tubing. The lining is Protecto Flack 800, two 30-mil coats. The tank includes an overflow alarm and ultrasonic level gage. See Figure 6.



Figure 6 – RCC Concentrator Wastewater Tank

The water was then to be pumped at a rate of 1.3 liters per second (20 gpm). The reason this flow rate is greater than the 0.3 liters per second (5 gpm) of inflow is to sustain velocities that will keep solids suspended in the pipeline for a distance of 190 meters (625 feet) in a 38 mm (1.5 inch) diameter steel pipe to a surplus thickener, where the water would be combined with other wastewater streams. These mixed wastewaters would be sent to the Pug Mill for mixing with dry fly ash and then disposed in a landfill.

#### **VI. Pump Seal Water**

A flow of 1.3 liters per second (20 gpm) of water was historically used for pump seal water for 21 pumps. This water was being discharge to Lacey's Lake. Although it was ash water, it contained few solids. Mechanical seals by AESSEAL were installed to eliminate this significant inflow to Lacey's Lake.

#### **VII. Truck Wash-Down Water**

Trucks that haul CCR to the landfill are periodically washed to remove ash. The designated truck wash down area is adjacent to the RCC Concentrator. Water from truck wash down flowed into an existing sump and decant water historically flowed into the storm drain system that discharged to Lacey's Lake.

The solution was to construct a new sump that could collect and store ash and decant water to the storm drain. The storm drain was rerouted to discharge directly to a pump station that takes water to the existing Wastewater Pond.

#### **VIII. Pug Mill Wash Down Water**

Water from the Pug Mill is collected in a sump (Figure 7) with an inclined floor for access. Water that discharges to the sump includes Pug Mill wash down water and wastewater from the bottom ash sumps and produces a waste stream of approximately

3.2 liters per second (50 gpm) at its peak discharge. In 2014, a drag chain was installed in one unit and in the near future a second drag chain will be installed on the second unit, resulting in no bottom ash water associated with the Pug Mill.

Historically, the water from the Pug Mill sump would flow into a drainage ditch and discharge into Lacey's Lake. The sump was periodically cleaned of CCR. With closure of Lacey's Lake the water needed to be redirected.

The solution was construction of a pump station that would receive decanted water from the Pug Mill sump. The pumps would discharge to a buried pipeline to an inactive thickener. It would mix with RCC concentrator water and other wastewater and be returned to the Pug Mill for mixing with dry ash. The mixed ash is hauled to the landfill.



**Figure 7 – Pug Mill Wash Down Settlement Basins**

#### **IX. Clean Closure of Lacey's Lake**

The Division of Water Quality for the State of Utah accepted visually detection of no CCR material as clean closure. Following normal cleaning operations to remove stored CCR, an additional 24,100 metric tons (26,600 tons) of material containing CCR was removed. This effort required construction of ramps into the invert of the pond to provide truck access for hauling. Ramp construction included over 3,058 cubic meters (4,000 cubic yards) of cut and construction of a new gate in the plants perimeter fencing. The resulting over excavation of native soils resulted in a clean closure excavation approximately 6.1 meters (20 feet) below surrounding grade and horizontal excavation approximately 3 meters (10 feet) beyond the historic side walls of the pond. See Figure 8 for a photograph of excavation to clean closure.



In addition to cleaning of the pond, the adjacent natural soils for approximately an acre of ground were removed to eliminate visual detection of CCR.

Once the site was considered cleaned of CCR, the Division of Water Quality was informed and concurred with clean closure. The surface impoundment was closed in December, 2011. A closure report was prepared and approved by the Division of Water Quality.



**Figure 8 – Excavation of Lacey's Lake to Clean Closure**

The excavated hole was backfilled with native soils from a borrow site. The materials specification required it be free from rocks greater than 51-mm (2-inch) diameter, organic matter and trash and that no more than 10 percent passing the No. 200 sieve. It was compacted to 90% density by modified proctor. The final 105 mm (six inches) was topsoil.

#### **X. Drying Pad**

Unrelated to the closing of Lacey's Lake was the construction of a concrete drying pad with push wall at the former site of Lacey's Lake. This concrete drying pad was 27 meters by 30.5 meters (90 feet by 100 feet) pad with 2 meter (6-foot) push walls. It has since been determined to be insufficient for the plant's CCR dewatering needs but was all that could be budgeted in 2011. The pad is being doubled in size in 2015.

#### **XI. Cost of Decommissioning Lacey's Lake**

The cost of decommissioning Lacey's Lake was approximately \$1.3 million. This includes all the ancillary costs associated with design, construction management, re-directing waste streams.

## **XII. Summary and Conclusion**

Since decommissioning of Lacey's Lake in 2011, the boron concentrations and other constituents monitored near the former site have dropped to background levels in 2014. PacifiCorp is satisfied with the results of the Lacey's Lake Decommissioning. The elimination of the environmental liability associated with this unlined surface impoundment was worth the investment in the modifications made.

As a result of CCR rules being published, there will be more Lacey's Lake projects throughout the industry. Decommissioning required consideration of the purposes and uses of the surface impoundment. Few future impoundments will have as many and diverse wastewater streams as Lacey's Lake but it will be important to develop effective methods for managing waste streams in order to close any surface impoundment.

## **XIII. Bibliography**

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