GROUND WATER QUALITY DISCHARGE PERMIT

STATEMENT OF BASIS
June 2011
Kennecott Utah Power Plant and historic North Concentrator

Description of Facility and Background Information

The North Concentrator facilities are comprised of the Power Plant (PP), and Magna process water containment and pumping facilities that route process water for Kennecott Copper operations. All other facilities at the North Concentrator, including the Bonneville Crushing Mill and Magna Flotation Mill and Filter Plant, have been demolished and reclaimed. North Concentrator facilities began processing copper ore from the Bingham Canyon Mine in 1908, ceased operations in 2001 and were demolished with reclamation completed in 2007.

The Power Plant is a four unit 175 megawatt capacity plant operated with either coal or natural gas. Excluding the Smelter power plant, which supplies 70% of it's own power requirement, the Power Plant can supply up to 100% of the electrical power required for all Kennecott Utah Copper Corporation Facilities during the months of March through October.

The Magna Reservoir, located in the North Concentrator facilities area, acts as central hub for process waters. Flows from the No. 1 and No. 4 Pump Stations into the reservoir (approximately 35,000 gpm) are routed to the Copperton Concentrator via Pump Station 3A and 3B, and to the Power Plant via Pump Station 3.

Site Hydrogeology

The North Concentrator facilities are located on bedrock of the Oquirrh Mountains. Immediately to the east and north of the site lie basin-fill sediments. Three aquifer systems exist in the vicinity of the North Concentrator: the Bedrock Aquifer system associated with the Oquirrh Mountains, the confined Principal Aquifer, and the unconfined Shallow Aquifer. The Kennecott Tailings Impoundment is directly north of the North Concentrator facilities and is a significant feature in the hydrogeology of the area.

The Bedrock Aquifer beneath the facility is comprised of Paleozoic shale, quartzite, limestone, and dolomite. Recharge to the Bedrock Aquifer system is principally from precipitation on the mountains to the south. The flow-path through this aquifer moves from the bedrock system into the Principal and Shallow Aquifers or is discharged as spring water along bedrock contacts at the base of the mountains. Water quality of the Bedrock Aquifer is generally good with Total Dissolved Solids (TDS) values typically less than 2000 mg/l.

The Principal Aquifer is a confined system which includes a gravel zone and lacustrine deposits. The gravel zone was most likely derived from the mountains during an extensive low lake cycle. Many high yield water supply wells near the Oquirrh Mountains are completed in the gravel zone of the Principal Aquifer. The lacustrine zone consists of clay, silt and interbedded fine sand. Principal ground water flow direction for this aquifer is north to northwest. Except directly beneath the existing Tailings Impoundment, measured water levels in the Principal Aquifer are above ground level at locations north of Highway 201 indicating an upward gradient throughout the vicinity of the existing Tailings Impoundment. A ground water mound with downward vertical gradients exists directly beneath the existing Tailings Impoundment, although the gradients have not been well documented at this time. Water quality in this aquifer is generally better than the Shallow Aquifer with TDS values ranging from 700 to 40,000 mg/l. The higher TDS values correlate with proximity to the Great Salt Lake. Metals values for arsenic, selenium, and cadmium in excess of state Ground Water Quality Standards have been observed in the Principal Aquifer.

The Shallow Aquifer system consists of interbedded lacustrine Bonneville clay, silt, and fine sand. The exact depth of this system varies but is approximately the upper 35 to 50 feet of saturated sediments. The potentiometric surface for the Shallow Aquifer system depicts lateral flow in a northwesterly direction with vertical ground water flow gradients predominantly in an upward direction for the majority of wells completed in the shallow system. A ground water mound exists directly beneath the Tailings Impoundment with downward vertical gradients indicating a potential for discharge of Tailings into the Shallow Aquifer system. Water quality in this system varies markedly from the contact with the bedrock system on the south showing good quality waters with TDS values around 1000 mg/l to TDS values exceeding 200,000 mg/l in the vicinity of the Great Salt Lake.

Ground water in the bedrock system flow path discharges to the north of the concentrator facilities either directly to Adamson Spring or passes into the Principal Aquifer and into Adamson Spring or the Return Canal. The Return Canal is a surface drainage associated with the operation of the Kennecott Tailings Impoundment where flows from tailings water are routed back into the process water system for use in Kennecott Copper operations. Kennecott modified the collection system for Adamson Spring discharges to segregate spring water from Return Canal flows. Adamson Spring flows are collected by a north and south sump and the flow is discharged to the Utah - Salt Lake Canal through Outfall 011. Flows from Adamson Spring may also be diverted to the Power Plant for use as process make-up water. A UPDES permit was issued to Kennecott for this discharge. This discharge could reflect impacts from the Tailings Impoundment.

The Little Valley area encompasses the surface drainage from the decommissioned Bonneville Mill. Recharge from rain and snow events that come in contact with the former ore storage area or other decommissioned operations associated with Bonneville facilities would enter the bedrock system beneath the Little Valley area

Background Water Quality

The water quality in the Bedrock Aquifer beneath and immediately adjacent to the concentrator facilities is generally a Class II water with TDS values that range from 1,000 mg/l in the southern area to near 3,000 mg/l in the northern area. Sulfate concentrations can be an indicator of Kennecott process waters. KUCC process water typically has sulfate levels that range from 1,500 to 2000 mg/l. Ground water concentrations of sulfate typically range from less than 250 mg/l up to 600 mg/l.

However, the concentration of sulfate found in monitoring well NEM637 at 1200 mg/l suggests that ground water in this area has been impacted by operations. In addition, the seepage from the Utah - Salt Lake Canal has an average sulfate concentration of approximately 400 mg/l. This appears to influence the ground water quality in the area along the canal that is east of the concentrator site.

Concentrations of dissolved trace metals are relatively low. Cadmium, chromium, lead, mercury, and silver are near or below the minimum detection limit. Arsenic concentrations are generally in the 0.005 to 0.016 mg/l but well below the ground water quality standard of 0.05 mg/l. Dissolved copper concentrations range from non-detect to 0.02 mg/l. Selenium concentrations range from non-detect to 0.025 mg/l.

Basis for Permit Modification

Kennecott has replaced the Magna Process Water Reservoir, an integral component of the water circuit that recycles water from the Tailings Impoundment to the Copperton Concentrator. The old reservoir was a single concrete-lined basin with minimal leak detection control.

The Magna Reservoir, located in the North Concentrator facilities area, consists of two reservoirs located adjacent to each other. The reservoirs were designed to primarily be operated in series with flow typically first entering Reservoir No. 1, flowing to Reservoir No. 2, and then to Pump Stations 3, 3A, and 3B. However, each reservoir has an inlet, outlet, and overflow that can be isolated from the other reservoir so that the reservoir could be operated independently during periods of maintenance or modification. The reservoirs include an identical, double containment liner system as the seepage barrier:

- A primary liner consisting of an 80-mil HDPE geomembrane with microspikes for surface traction is located on top.
- A secondary liner consisting of a 60-mil HDPE geomebrane with drainage nubs is located beneath the primary liner.

The volume of leakage will be monitored by electrical controls in the leak detection manhole that are linked to a PLC located at the leak detection manhole and monitored remotely at the Tailings Control Room.

Boron has been added to the list of analytes monitored in the historic North Concentrator area compliance wells and operational monitoring points. Boron is a component of coal and fly ash and could indicate releases from the power plant process water containment structures to ground water. Because limited ground water sampling data for boron existed, statistically valid background level could not be calculated at the time of permit issuance in March 2009. Kennecott has collected samples of boron in groundwater at compliance point samples and compliance limits for boron are established in Table 1 of the Ground Water discharge Permit.