

**EXPLANATION OF SIGNIFICANT DIFFERENCES
KENNECOTT SOUTH ZONE OPERABLE UNIT 2
SOUTHWEST JORDAN RIVER VALLEY GROUND WATER PLUMES**

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BACKGROUND

In December, 2000, EPA and UDEQ signed a Record of Decision which selected a remedy for the Zone A ground water plumes associated with past mining activity in the Oquirrh Mountains. During the design phase of the project, Kennecott Utah Copper Corp. (KUCC) conducted treatability studies to refine flows and treatment parameters and to combine the infrastructure associated with this project with similar infrastructure needed to manage other contaminated flows at the mine. These new concepts and study results have led to some minor changes in the selected remedy as chosen by the Record of Decision. The overall approach to the problem and ability to meet the stated objectives remain unchanged.

COMPARISON OF SELECTED REMEDY (as given in the Record of Decision) AND THE REMEDIAL DESIGN (as detailed in the Final Design for Remedial Action)

Remedy in Record of Decision	Remedy in Design Phase	Differences, if any
Operations and maintenance of surface source controls	Not specifically mentioned in the Remedial Design. O+M of the source controls is addressed in a State Ground Water Permit.	Surface source controls not addressed in Remedial Design document. This is required in a State Ground Water Permit.
Integration and use of Institutional Controls, as approved by the State Engineer	Restrictions on use of water from existing wells, restrictions on installation of new wells, moratorium on new water rights will be established through the State Engineer as needed.	The State Ground Water Management Plan issued by the State Engineer in June 2002 addresses issues specific to the remediation effort and needed restrictions in the area of the plumes.
Point of Use Management for private well owners (in-home treatment units, bottled water, deepening of wells, replacement of wells)	Plan for addressing impacts to other well owners was developed. Work with owners to develop best form of reparations.	Same

Remedy in Record of Decision	Remedy in Design Phase	Differences, if any
Plan to deal with consequences of water level drops (new and deeper wells, deeper completions in wells, alternate water sources, purchase or exchange of water rights), well abandonment and compensation.	Options include reduced pumping, replacement water, injection, deeper well installation	Same
Install a barrier well containment system at leading edge of acid plume at points in path of movement (where sulfate is less than 1500 ppm). No water with sulfate concentrations greater than 1500 ppm should move off Kennecott property.	Three wells to serve as an initial barrier well system have already been installed	Same
Install well or wells in core of acid plume	Two wells to operate at any time. Wells moved in response to plume	Same
Pretreatment of acid water using nanofiltration	Acid water sent directly to tailings line without pretreatment. Neutralization and metals removal takes place in the tailings line. Neutralization by tailings can be augmented with lime if needed.	Nanofiltration step eliminated in final design.
Treatment of pretreated acid waters by RO	Not relevant any more	No pretreatment of acid waters. Treatment of acid waters occurs in tailings lines, not by RO plant.
Treatment of water from barrier wells by RO	Treatment of water from sulfate barrier wells by RO	Same

Remedy in Record of Decision	Remedy in Design Phase	Differences, if any
Treated waters to municipal water purveyor	Treated waters from sulfate wells sent to JWCD, acid waters kept by Kennecott for use in milling processes.	Acid waters are kept by Kennecott for use in processes, and are not sent to a water purveyor.
Install and maintain a monitoring system to track plume movement	Monitoring system plan presented	Same
Prior to mine closure, dispose of concentrates in the tailings line	Acid water and RO concentrates added to tailings line	Very similar
Post Closure plan should be developed during RD/RA which can be implemented quickly.	Post Closure Conceptual design options presented	Same

EXPLANATION OF DIFFERENCES

In the process of designing the remedy, the approach to treating the waters withdrawn from acid plume was changed. Originally, the waters from the acid plume core were to be pretreated using nano-filtration technology. The permeate was then to be further treated using reverse osmosis, with the concentrate recycled to the waste rock dumps for use in active leaching of the waste rock. However, since this approach was studied and advocated, Kennecott discontinued the active leaching of waste rock. This makes the concept of re-use of the concentrate for leaching no longer available. With the cessation of active leaching, Kennecott began experimentation on treatment of the residual leachate and leachates produced with precipitation falls on the dump areas. A study during the design phase indicated that insertion of the acid waters into the tailings pipeline was feasible. The tailings, which contain carbonates, were able to neutralize the acids. The tailings line, therefore, serves as a 13-mile long acid neutralizing facility. The neutralization capacity is required in the tailings line whether the nano-filtration concentrate waters are neutralized or the acid plume waters themselves are neutralized. Further studies revealed that the neutralization process was actually completed in the first few hundred yards of the pipeline. The experiments further proved that both waste streams, the residual leachate water from the dumps and the acid waters removed from the aquifer, could be treated effectively in this manner. The resulting water with its soluble components is not of drinking water quality and therefore will not be provided to the municipalities. Instead, it would be recycled and used in Kennecott's processing, especially at the Copperton Concentrator. One of the principles in the National Contingency Plan (NCP) indicates that water generated by treatment of contaminated aquifers should be put to beneficial uses. Although the water will not go to municipal culinary use, it will have a beneficial use as industrial water.

Calculations have also revealed that treatment of the acid plume is not cost-effective because the acid plume is of such poor quality. Although such a scheme was proposed in the RI/FS and agreed to in the ROD, only 24% of the acid plume waters would actually go to drinking water and the rest would end up in the tailings pipeline (and then for industrial use). For this small volume of drinking water product, the cost would be about \$6-7/1000 gals. Treatment of the less contaminated waters at the barrier wells is much more cost-effective and can be done with less waste of the water. The cost of treatment of barrier well water is \$0.70/1000 gals.

In terms of operations of the barrier well reverse osmosis treatment plant in Zone A, Kennecott will construct and operate the plant for the first 5 years at least, perhaps longer. This is to allow time for Kennecott to develop the operational parameters and costs so that long-term management negotiations can proceed. Kennecott may choose to operate the plant indefinitely so that the facility can be expanded and integrated with Kennecott's industrial water management system. As is the original plan, the treated water from the reverse osmosis plant will go to JWCD and the treatment concentrate to the tailings line.

Scientists agreed very early that effectiveness of source control infrastructure was extremely critical in cleaning up the aquifer. The cut-off walls and pipelines associated with these source control measures were constructed and are now maintained through provisions of a state groundwater protection permit. Because of its importance to the cleanup program, maintenance of these source controls was listed as an element of the ROD of December, 2000. The source control maintenance is not described in the remedial design because this is already included in the groundwater permit. The parties remain committed to this part of the remedy. Maintenance of the source control facilities will continue either under the auspices of the groundwater permit or under terms of the federal RD/RA Consent Decree.

CONCLUSIONS

Although some of the treatment details presented in the Remedial Design are different than detailed in the ROD, the overall approach remains unchanged. Unchanged is the concept of barrier wells which prevent spread of the contamination. Unchanged is the withdrawal of the heavily contaminated waters from the core of the acid plume so that the plume diminishes in size over time. Unchanged is the approach for beneficial use of the waters withdrawn from the plume, a concept which works for both the waters treated in the reverse osmosis plant and in the tailings pipeline.

APPROVED:



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