

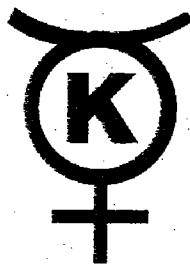
Tailings & Water Services

■■■■ Geotechnical Evaluation
Summary Report for
December 17, 1999
State Engineer's Meeting

December 17, 1999

Prepared for

Kennecott Utah Copper Corporation
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1.1 PURPOSE AND SCOPE

The purpose of this report is to provide a summary of the Magna Impoundment stability evaluations as of December 17, 1999 for the State Engineers Meeting. Numerous geotechnical reports have been developed in the past, which are summarized in this report.

Items addressed in this summary report include the following:

- Geotechnical site characterization for the various study areas and study sections located around the Magna Tailings Impoundment (Section 2.0).
- Description of the design criteria as applied to the North Expansion and Magna tailings impoundments, based on the State of Utah Statutes and Administrative Rules for Water Retention Dams Safety and modifications agreed between KUCC and the State Engineer's Office (Section 3.0).
- Methodology for the various analyses completed to evaluate the stability of the Magna Tailings Impoundment slopes, including the two North Expansion abutments (Section 3).
- Summary of the Magna Impoundment slope stability analyses results (Section 4).
- Design revisions for the east and west abutments of the North Expansion embankment (Section 5).
- Summary of the geotechnical monitoring program and observational approach as applied to both impoundments (Section 6).
- Conclusions (Section 7).

1.2 FACILITY DESCRIPTION

The Kennecott Utah Copper Corporation (KUCC) Tailings Facility is located approximately 10 miles west of Salt Lake City, near Magna, Utah. The facility is comprised of two tailings impoundments: the Magna Tailings Impoundment, and the new North Expansion Tailings Impoundment. The two tailings impoundments, located adjacent to each other and occupying approximately 9,200 acres, are bounded by State Highway 201 and the Oquirrh Mountains on the south, Highway 202 and the Great Salt Lake on the west, and Interstate I-80 on the north. An aerial photograph of the site is shown as Figure 1.1. A general layout and site plan for the Kennecott Tailings Facility is shown on Figure 1.2.

1.2.1 Magna Impoundment

The Magna Impoundment has been in operation since the early 1900s, and is nearing its operational capacity. Its total area is about 5,700 acres and it is currently about 240 feet high. It

has been built using upstream method of construction. The overall side slopes around this 90-plus year impoundment vary approximately from 5H:1V to 7H:1V.

As part of the tailings management strategy, the tailings storage operation is currently being transitioned from the Magna Impoundment to the new North Expansion Impoundment. The transition of tailings is anticipated to be complete by the end of 2004, after which the Magna Impoundment will be completely reclaimed. The reclamation plan, due to the interior surface area of the Magna Impoundment being large (approximately 3,000 acres), is subdivided into six smaller and more manageable areas, as shown on Figure 1.2. These areas will be reclaimed in a systematic and sequential manner, while tailings continue to be deposited into the unreclaimed areas. A series of reclamation dikes constructed across the surface of the impoundment will isolate and delineate each of the reclamation areas. The sequential reduction in active tailings deposition areas will limit susceptibility to wind erosion during the transition period.

The first reclamation dike was completed in the fall of 1998. Approximately 500 acres of impoundment surface were removed from active tailings deposition and reclaimed with vegetation cover. The second reclamation dike is currently being constructed and when complete, will cut-off additional 890 acres of the impoundment surface.

1.2.2 North Expansion Impoundment

The North Expansion Impoundment, located on the north side of the Magna Impoundment, has a total area of approximately 3,500 acres. The tailings within the North Expansion Impoundment will be retained by constructing an embankment along the perimeter of the impoundment. The geotechnical design of the North Expansion embankment was completed in 1995 (Woodward-Clyde 1995) to meet the design criteria established by the Utah State Engineer's office, in addition to Kennecott's requirements. The central focus of the design process was to develop an embankment capable of surviving the Maximum Credible Earthquake (MCE) event without failure of the impoundment and subsequent uncontrolled release of tailings. The North Expansion embankment will be constructed from compacted underflow sands using a center-line method of construction. The projected design geometry of the North Expansion embankment is 245 feet high, with a crest width of 100 feet and an overall side slope of 4H:1V.

The North Expansion embankment will be raised sequentially during mining and processing operations, and is designed to store approximately 1.6 billion tons of tailings. The new embankment will tie into the Magna Impoundment at the east and west abutment locations, as shown on Figure 1.2. Abutment berms will be constructed at both abutment locations to provide adequate seismic stability to the existing impoundment corners.

Whole tailings deposition into the North impoundment began on May 24, 1999 and about 14.3 million tons of tailings have been deposited to date in the embankment and within the new impoundment.

1.3 BACKGROUND AND OTHER COMPANION REPORTS

The Magna Impoundment has been investigated and evaluated on numerous occasions and the results have been summarized in various reports. Each investigation has provided additional data associated with the impoundment that has progressively increased the level of knowledge. This report presents the results of the stability analyses conducted between 1998 and 1999 by URS Greiner Woodward Clyde (URSGWC) based on our up-to-date understanding of the conditions at the Magna Tailings Impoundment. Similar previous evaluations were conducted by Woodward-Clyde (now URSGWC). The past studies that have been utilized in the preparation of this summary report include:

- North Expansion, Geotechnical Site Characterization Report (Woodward-Clyde 1991).
- North Expansion Design Report (Woodward-Clyde 1995).
- North Expansion Geotechnical Detailed Design Report, Appendix G (Woodward-Clyde 1995a).
- Geotechnical Site Characterization, Southeast Corner Seismic Upgrade Design (Woodward-Clyde 1998b).
- Investigations/Remediation of Northeast Corner Toe Slide (Woodward-Clyde 1998a).

This report is intended as a summary report associated with the stability of the Magna Tailings Impoundment, including the revised designs of the east and west abutments of the North Expansion embankment. Detailed stability evaluations for the different areas around the Magna Tailings Impoundment are presented in the following Reports:

- North Slope Stability Evaluation Report (URSGWC 1999b).
- Revised East Abutment Berm Design Report (URSGWC 1999).
- Northeast Corner Raise Evaluation Report (URSGWC 1999a).
- East Slope Stability Evaluation Report (URSGWC 1999c).
- South Slope Seismic Stability Evaluation Report (URSGWC 1999d).

This summary report also includes results of stability analyses completed for the West Slope of the Magna Impoundment and the West Abutment Berm. Formal reports documenting these analyses will be issued upon completion in January 2000.

