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Creating enduring value

## SGME VALUES



## PROJECT CASE STUDY: Geochemistry and Cover Design for a Tailings Storage Facility

**SGM Environmental Pty Limited (SGME) did forensic analysis of a tailings storage facility (TSF) for geochemistry and performance of a capillary break cover.**

**Site description:** The mine operation includes two sites in the remote lower Gulf region of Queensland, Australia: the mine at Lawn Hill and associated dewatering and ship loading facilities at Karumba Port. The project involved an autopsy of the bulk sample tailings dam (BSTD) and testing of samples for geochemistry and physical parameters required for cover performance analysis.

**The problem:** The BSTD produced acid mine drainage (AMD) with low pH ( $\leq 3$ ) seepage. The company wanted to use the decommissioning of the BSTD as a learning exercise to better understand geochemical processes, cover and geotechnical performance. Findings from this project have been used in closing the main TSF.

**What SGME did:** The project was done in two parts: cover performance and tailings geochemistry. Cover performance was assessed by considering rainfall, runoff, infiltration and water storage in a 1-dimensional model. Soil water characteristic curves (SWCCs) were developed for each cover layer using pedotransfer functions in the 1-dimensional model. Conceptual performance was then determined.

An understanding of the sulfide / sulfate balance with depth was needed to model and understand the kinetic chemistry. Static analysis included total S, chromium reducible sulfur, soluble sulfate, net acid generation (NAG) pH, pH, electrical conductivity (EC) and acid neutralising capacity (ANC). Static analysis was enhanced by kinetic analysis. An important outcome of the project was to combine geochemistry with cover performance to determine interrelationships.

The project was done using C/Tran and Vadose/w. Vadose/w was used to assess seepage and C/Tran was used to assess seepage quality for the mixture of infiltrating rainwater, leached unsaturated zone and reactions with saturated tailings.

