AMD PREDICTION AND CONTROL METHODS - AN UPDATE FROM AUSTRALIAN CASE STUDIES

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Testwork and advanced modelling methods used to predict the generation and impact of AMD for the purpose of designing AMD mitigation works are presented. The performance of specific models is evaluated by examining a number of AMD case studies at Australian coal and metalliferous mines. The case studies include preventative works (eg. proactive measures such as waste scheduling, wetland construction) and remediation works (eg. liming and compaction of surface wastes, introduction of external capping materials). Predicted seepage rates and water quality are compared with field data collected before and after the implementation of AMD control measures. The parameters used in the prediction models are reviewed in light of the comparisons between actual and predicted data.

In association with ABA, geochemical and kinetic testing, three principal models, LEACH, PITQUAL, and ENTEC are used for predicting AMD and designing control measures. The leachate quality model (LEACH) simulates the movement of solutes through mine wastes subject to infiltration, dispersion, adsorption, ion exchange, precipitation dissolution and complexation reactions. Infiltration rates are assessed using the unsaturated flow model HELP. Any waste type and layering configuration can be accommodated by modifying the geochemical database read by the program. Parameters such as leachable salt content, sulphide content, voidage (which affects oxygen permeability), hydraulic conductivity, and particle sizes are specific to each case and must be supplied by the user.

The pit water quality model (PITQUAL) assesses the quality of water in decommissioned mine pits and wetland retention basins. Unlike LEACH, PITQUAL considers a batch system (eg. a water body in a mine void). Sources of acid and salt are introduced to the water body as the simulation progresses according to the frequency of flushing events, dissolution rates, and groundwater infiltration. ENTEC, a mine planning and environmental package, is used to design the earthworks associated with wetland basins, waste dumps, etc.

USE OF A BROMIDE TRACER TO DETERMINE RETENTION TIME OF MINE DRAINAGE IN ANOXIC LIMESTONE DRAINS

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A tracer test using sodium bromide (NaBr) was performed on two anoxic limestone drains (ALD's) to determine the retention time (RT) of mine drainage in the ALD's. The Howe Bridge ALD, located in Jefferson County, PA, is the larger of the two drains with the capacity to hold 133,280 L of water. It has a mean flow rate of 87 L/min and has an estimated RT of 25.5 h. The Morrison ALD, located in Clarion County, PA, has the capacity to hold 20,090 L of water, a mean flow rate of 8.0 L/min and an estimated RT of 41.9 h. Estimated RT's were determined by dividing the estimated capacity of the drain by the flow rate, then expressing the result in hours. The tracer test consisted of pouring a concentrated solution of NaBr into an access area near the beginning of the drain and then measuring the concentration of bromide in the effluent water. Mean RT's were calculated from the change in the concentration of bromide over the duration of the test. The Howe Bridge ALD had a mean RT of 42 h, while the Morrison ALD had a mean RT of 87 h.

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Mines Special Publication SP 06B-94

INTERNATIONAL LAND RECLAMATION AND MINE DRAINAGE CONFERENCE

AND

THIRD INTERNATIONAL CONFERENCE ON THE ABATEMENT OF ACIDIC DRAINAGE

Volume 2 of 4: Mine Drainage

Proceedings of a conference held in Pittsburgh, PA on April 24-29, 1994.
This conference served as the annual meeting for both the American Society for Surface Mining and Reclamation and the Canadian Land Reclamation Association.

Copies of this and the three companion volumes can be obtained by through NTIS.

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