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A MASS BALANCE STUDY OF ACID MINE DRAINAGE AT QUEENSTOWN, WESTERN TASMANIA.

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Prior to 1994 (when a new company took over operations), the copper mine at Queenstown was a major source of acid mine drainage (AMD), which flowed directly into the Queen and then King Rivers. The AMD was derived from waste rock dumps, abandoned and flooded workings, and infiltration into the active underground mine through an abandoned open cut lying directly above.

Rainfall in the area is high (>2.5m per year), and frequent storms mean that stream flow variability is also high. To calculate the average flow rates and metal concentrations in the stream water, the median was used. At least 4 years of monthly data were available for most sites, and some stations had continuously monitored flow meters.

Because not all sources of AMD leaving the mine site were monitored, a mass balance approach was used to estimate the relative contributions from the sources listed above. These calculations showed that dewatering of the active mine together with one set of waste dumps were responsible for the bulk of the metals in the AMD (particularly Cu).

When this study was carried out (mid- 1994), tailings from the ore processing were released into the Queen River (this practice has now ceased, and a tailings dam is in operation). The mass balance calculations showed that the tailings removed considerable amounts of metals from solution, probably via absorption onto ferric hydroxide coatings on the tailings grains. The tailings also partially neutralised the acidity, probably through dissolution of siderite and perhaps silicates.

Correlation of metal concentrations with stream flow showed that in streams close to the mine site, some metal levels (Cu, Fe, Zn, Al) were negatively correlated with flow. Presumably this was due to the rapid run off following rainfall, which diluted the AMD leaving the mine site.

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