Water pumped from underground via the Conveyor Tunnel is by far the largest copper contributor to Haulage Creek. This reflects the high pyrite and copper content of the ore and waste rock within the active mine area below the West Lyell open-cut.

The West Lyell waste rock dumps are the second greatest contributors to pollutant loads. MLMRCL commissioned ANSTO to monitor oxygen and temperature profiles within these dumps. ANSTO (1994a, 1994b) indicated the dumps are oxidising at the maximum rate possible, with no factor limiting, and this is likely to continue for a period of up to 60 years. Preliminary modelling suggests sulphate loads may continue at a reduced rate for up to 600 years in the absence of remediation strategies.

5.0 Conclusions

A substantial volume of literature has accumulated on the environmental impacts associated with mining at Mount Lyell, with most attention focused on the discharge of acid leachates from the site. The most limiting factor in assessing these impacts is a lack of quality data, particularly in respect of water flows in catchments draining the lease site. Where good data exist they are frequently of short duration, and inadequate to fully represent the range of seasonal variation.

The Comstock–Linda catchments have good quality flow data as a result of monitoring by the Hydro-Electric Commission. Environmental monitoring in these catchments is associated with the development of Lake Burbury and the need to protect the ecological values of this lake, particularly for recreational fishing. In the Queen River catchment, acceptable water quality data are available for stations 5, 11 and the North Lyell Tunnel from 1993 to present, as a result of continuous monitoring at these stations.

EGI has developed reasonable flow estimates for other catchments on the lease site which have not been monitored. Estimates have been derived from the size of the subcatchment and assuming an annual rainfall of 2500 mm and 100% runoff to give a mean flow. Median flows were determined by applying a conversion factor to the mean, consistent with measured HEC data for similar catchments.

The Hydro-Electric Commission has demonstrated a good relationship between catchment areas and median flows. Median flow values have generally been used to calculate mass loads by EGI, HEC and GH&D.

A combination of catchment characteristics and rainfall intensities indicate that up to 80% of runoff may occur in 20% of the discharge period in small lease area catchments. Consequently, the use of median values to represent typical discharge may substantially underestimate mean or total flows. Use of median flows for determining mass loads in these catchments is likely to underestimate total discharges.

The dataset for water quality parameters is highly variable and datasets should be thoroughly checked against laboratory analytical reports where possible. Due to the inconsistencies in the concentration data, median concentrations for water quality parameters are considered appropriate.

Few trends are evident in the monitoring dataset with the exception of station 6, West Lyell Tunnel, which demonstrates a gradual decrease in sulphate, iron and copper in the past five years. The most likely cause of this is thought to be a decrease in the rate of oxidation of sulphates as available sites are oxidised and leached.

Strong correlations exist between conductivity, sulphate and copper concentrations for waters derived from a single source. Conductivity may provide a useful indicator of copper loads in point source streams on the lease site. The correlation tends to break down when effluent sources are mixed.

Both HEC and GH&D data suggest an inverse relationship between water quality parameters and flow, suggesting concentrations may be diluted by rainfall. However, this relationship is not always consistent for catchments containing large volumes of waste rock, where increasing flows associated with rainfall following long dry periods results in peak metal loads associated with flushing of oxidation products.

For streams low in suspended solids and high in acidity typical of the Mount Lyell lease site, total and dissolved parameters are very similar. However, this is not the case for tailing-contaminated waters where the abundance of adsorption sites on tailings particles results in a reduction of dissolved parameters.

For surface catchments there is an obvious relationship between the catchment characteristics related to mining activities and pollutant loads. The major pollutant source is the Conveyor Tunnel in the Haulage Creek catchment, which contributes in the order of 60% of total metal loads to the Queen River. The West Lyell waste rock dumps in this catchment are the second major source of pollutant loading (approximately 20%).

For the single West Lyell waste rock dump monitored by ANSTO (1994b) it was estimated that acid generation will continue for more than 600 years. Measurements have shown that approximately 130 tonnes of copper and 1300 tonnes of sulphate per year leach from a single 25 ha dump below the West Lyell open-cut.

The Mount Lyell mining lease sites are likely to be an ongoing source of pollution as a result of acid drainage to downstream water catchments. There have been insufficient good quality data to accurately quantify and characterise effluent discharges from the lease site, particularly in respect to flows. For environmental assessment, good quality information is required to develop time duration analyses of concentrations and loads, and the current dataset is inadequate for this application.

In order that environmental remediation strategies are effectively targeted for maximum possible benefit, it is critically important that good quality environmental monitoring data are collected. Provision of accurate monitoring data will greatly facilitate future site management decisions.

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