Case Study – Rainfall Simulation Aids Mine Rehabilitation

Rainfall simulator study of erosion and hydrologic properties of noise control bund.

In August 1996, a study of runoff and erosion was carried out on the soundbund at the NorthParkes Mine, using simulated rainfall and overland flows. Field data were collected to establish meaningful parameters for use in modelling. Computer simulations of infiltration, vegetative growth, runoff, and erosion on the soundbund, were established and recommendations developed for the future management of the soundbund.

For the topsoiled batters of the soundbund, both runoff and erosion were reduced by surface vegetative cover. Relationships between cover and both infiltration and erosion were established for use in subsequent computer simulations. Comparison of data from batters that had been revegetated for either one or two years showed considerable improvement in soil properties with time under vegetation — increases in infiltration and in soil aggregation, and reductions in erodibility.

Overland flow studies indicated that erosion rates did not increase with increasing flows, from which it can be inferred that slope length has little effect on erosion of this soil. The data suggest that for vegetated soil, slope lengths of at least 60 metres should be stable under rainfall and runoff.

Of the two spoil materials used in the soundbund, the white spoil was found to be slightly more erodible. For that reason, and because of its better water holding capacity, the red spoil should be used as the medium underlying topsoil where possible.

Computer simulations of infiltration, vegetative growth, runoff, and erosion on the topsoiled batters showed that vegetation growth was strongly seasonal, but predicted an average long-term cover of 85%.

Predicted long-term erosion rate was low — 0.8 t/ha/year for topsoil overlying red spoil — and unlikely to cause significant siltation of bench channels.

For a design storm of 1:500 year ARI, simulations of runoff from the batters and flow in the bench channel indicated that the upper batter could be adequately drained by a bench channel on 0.2% slope, with three (3) drop structures capable of carrying peak flows of 200 L/s installed to convey channel flow to ground level. A number of issues with respect to channel design are detailed in the report, but it appears to be possible to install a channel that would have very little potential to overtop.

Computer simulations showed that vegetative growth is essential to the stability of the batter/bench channel system. For the batters, the need to provide adequate surface cover during the most erosive period of the year is of particular concern, and there is a need to introduce both more perennial species, and species that will produce persistent (slowly-decomposed) dry matter. The potential role and management of trees on the batters is also discussed. For the bench channel, development of vegetative roughness is essential, and a range of grass species has been suggested for planting in the channel.

Rainfall simulator on the soundbund at NorthParkes Mine, measuring runoff and erosion properties of the topsoil and impacts of vegetation cover.