Dust control in mining towns

Have you ever heard of mullock? It's waste rock from mining operations. Who would have thought it could be put to use in reducing the dust storms that often afflict some of our old mining towns?

Here's how it works. The mullock is evenly spread over the affected area, thereby reducing the movement of fine sand. The rock fragments also foster plant regeneration by trapping seeds in the loose soil and, with good rains, these should germinate.

Forming 'rock meadows' like this, along with contour furrowing and application of fertilizer, would not only lend itself to the establishment of vegetation but would also prevent soil erosion.

Dr John Marshall of the CSIRO Division of Land Resources Management, who devised the treatment, believes that it could also be used in other areas faced with similiar problems. These may include lands adversely affected by urbanization, agriculture, road-building, and recreation.

In Kalgoorlie and neighbouring Boulder, the main sources of dust are the huge slime dumps to the south-east of the Golden Mile, where waste from gold-treatment operations has accumulated. The waste consists of very fine particles of sand, silt, and clay, and so the dumps are susceptible to wind erosion. They also shed water and some have a high salt level near the surface as well as being low in plant nutrients.

Since the area averages only 250 mm of rain a year, the dumps afford a rather dry habitat for plant growth. As a result, the twin cities are often enveloped in dust whenever strong winds blow there.

Since 1974 the Goldfields Dust Abatement Committee (GDAC) and State and local authorities have been looking for ways of reducing the dust hazard. Recently, their involvement in dust control programs paid dividends, when the simple and relatively inexpensive mullock treatment proved successful in reducing the generation of dust from Chaffer's dump, a large

An alternative way of keeping the dust down is practised at Mt Tom Price. But sowing ground cover costs more than allowing plants to naturally regenerate in a rock meadow.

Not beautiful, but littering this mine dump with mullock keeps the dust down. Dr Marshall's dust traps (visible in the foreground) have proved this.

table-top hill occupying some 40 hectares south-east of Kalgoorlie.

The smooth surface of the dump was sprinkled with 6 kg of mullock to the square metre. With the help of GDAC and officers of the Western Australian Forests Department and Department of Agriculture, Dr Marshall monitored movement of surface material on the dump over a 20-month period. He found that it was reduced by 85%.

Dr Marshall first became involved in the goldfields' dust problem after paying a visit to the area in 1974. He had studied wind erosion on grazing lands at Deniliquin, N.S.W., and the principles developed from his study appeared to him to be relevant to controlling soil movement on the Kalgoorlie dumps.

His studies showed that the problem there is caused by small particles of sand sweeping across the surface of the dumps with sufficient force to 'splash' the finer clay particles into the air. Although fine, the sand is abrasive enough to sand-blast the surface and make life hard for plants attempting to establish themselves.

In theory, dust control will be achieved if the wind velocity at a surface falls below a threshold velocity. He calculated that arrays of roughage like mullock, or slag from the nickel smelter — with each rock spaced about three times its diameter from neighbouring fragments — should substantially reduce the wind force at the surface, and hence eliminate the generation of dust. These theoretical considerations formed the basis of his experiments with mullock for stabilizing the ground.

In early experiments on Kleman's dump he compared particle movement on an untreated tract with that occurring on four trial plots having different amounts of rock cover. Two of these had evenly spaced rows of mullock, and on the other two mullock was scattered over the entire surface.

Dr Marshall monitored movement of surface material by collecting it in a series of 20 traps placed on each plot. Fine sand, silt, and clay blowing in through a 35-mm-wide gap would settle in a polythene bag contained in a tin buried beneath the surface. Local residents donated powdered-milk tins for this task.

From these trials it was clear that the plot with the denser and more even rock cover gave the best results. Such ground cover was then successfully established on Chaffer's dump, with rocks averaging 4 cm in diameter scattered about 12 cm apart.

The treatment, which involved the collection and scattering of something like 2400 tonnes of mullock, cost about $560 per ha. This may seem a large amount, but it is small compared with the cost of establishing full ground cover. Despite the expense involved in acquiring the mullock, the Committee found that the method provided one of the cheapest ways of controlling the dust nuisance.

The mining companies at Broken Hill have taken a different approach. They are using treated waste water, delivered to the dumps by a trickle irrigation system, to establish vegetation and bind the soil together. The proximity of the dumps to the city area and the abattoirs made it essential to achieve a high standard of dust prevention.

Although this treatment is more expensive than the 'rock meadow' technique, a spokesman for the Zinc Corporation Ltd in Broken Hill has pointed out that much of the cost is associated with control of dust from the sides of slime dumps. Dr Marshall's technique is not so suitable for treating the steep slopes of dumps, which sometimes rise 30 metres above the surrounding countryside.

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Control of dust from slime dumps at Kalgoorlie. J. K. Marshall, J. G. Morrissey, and P. C. Richmond. *Proceedings of a Conference on Rehabilitation of Mined lands in Western Australia, Perth, October 1978*, 1978.