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REHABILITATION OF UNOXIDISED PYRITIC WASTE ROCK
AND TAILINGS AT
MARTHA HILL GOLD MINE, N.Z.

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ABSTRACT

At the Martha Gold and Silver Mine in Waihi, New Zealand, land disturbed by mining operations is required to be revegetated. Areas include pit walls above the natural water level, the slopes of the dam impounding the tailings and the tailings surface. The research work reported in this thesis is concerned with revegetation of acid generating material situated on the pit walls, and tailings revegetation.

Hydroseeding with grass species onto pit slopes comprising unoxidised pyritic rock material proved to be unsuccessful because of acid generation which caused the pH to drop as low as 2.2 on the slope surface. Where calcite veins were present the pH was maintained at higher levels. It was found that a mixed species of hydroseeded grass grew successfully where the pH was 6.0 or above. Clover began to show signs of stress when the pH dropped to 4.5 and when the pH fell as low as 3.6, all grass died.

Boreholes at a diameter of 100 mm were drilled to a depth of 500 mm into the slope surface of pyritic rock material to provide planting holes for native species at 1.5 m intervals. Toetoe, manuka, kanuka, flax and akeake all had acceptable survival rates over a ten month period. Coprosma kirkii was not successful and is not recommended for further plantings. Topsoil placed in the boreholes was found to have a beneficial effect on the overall plant survival rate, more so than the addition of lime or fertiliser.

Although survival rates for native plants were acceptable over a ten month period, the objective of providing a vegetation cover that would improve the visual appearance of the slope was not achieved with 1.5 m spacings between plants.

In contrast to the unoxidised pit slope material, tailings were found to have few limitations to plant growth. In 1992, two separate tailings trials were established to investigate the use of native plants as an alternative land use to pasture and the use of compost as an amendment for pasture production and native plant growth. Within the first six months following sowing, pasture dry matter yields from tailings plots with a 50 mm layer of compost applied to the surface were not significantly different from yields from tailings plots without a compost amendment although clover production was

visually greater on compost plots. For subsequent cuts, compost-amended plots gave significantly higher pasture dry matter yields than nil-compost plots. Yield differences after the first six months were considered to be due to the improved P status on compost-amended plots.

Yields off nil-compost plots in the first year of the 1992 trial averaged 11,000 kg DM/ha, compared to 9,000 kg DM/ha obtained from an earlier trial on an older tailings deposit (Union Hill). Yields off the compost-amended plots in the 1992 trial averaged 14,000 kg DM/ha, significantly higher than topsoil-amended plots in the Union Hill trial which yielded between 6,000 and 7,000 kg DM/ha in the first year. Yield differences between treatments of the two separate trials may have been due to differences in P status or rainfall.

The survival rate for the native plants in the tailings trial (flax, cabbage tree, kanuka and Pittosporum tenuifolium) was 100%. The addition of compost caused significantly higher growth rates in the first six months but beyond six months no significant differences were observed.

A rehabilitation predictive model was developed for tailings rehabilitation which investigated costs and returns over a fourteen year period based on five different rehabilitation scenarios. The scenarios included the use of clay covers, resurfacing with compost in the event of a topsoil shortage, and a comparison between pasture and native plant land uses. It was found that if a clay cap was required on the tailings surface, large quantities of material would be required. Relatively high costs were found to be associated with the need for a clay cap and compost. Rehabilitation with native plant species was found to be more expensive than rehabilitation to pasture, and if treatment of surface water derived from the tailings surface was required, there would be significant added costs. Maintenance costs for natives were also found to be high and where pasture provides some revenue, further trials are required to determine whether revenue from natives timber species is possible.

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