Application of Geotextile on Slope Stability for Establishment of Tailings (Waste) Dam in Gold Mines - In the Case of Hidden Valley Mine, Papua New Guinea-

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1. Introduction

The Hidden Valley (HV) tailings dam (TSF – Fig.1) is contructed with downstream method of embankment. The initial dam crest elevation was designed for RL2000 with a storage capacity of about 40 Mt of tailings with a mill throughput of 4.2 Mtpa, (Rynhoud et al., 2017). The TSF has reached its designed capacity at RL 2000 and the mining company plans to raise the dam height to RL 2015 to increase the volume. In this study, it proposes for further 20m dam height expansion in two stages (RL 2025 & RL 2035) with the application of geotextile for slope stabilization.

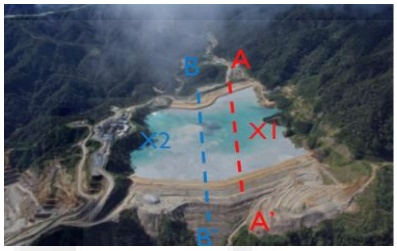

Fig.1 Hidden Valley (HV) Tailings

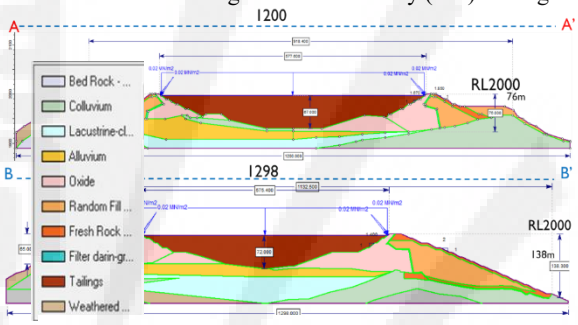

Fig.2 Model view of section AA' and BB' at RL 2000

2. Numerical Simulation

Analysis of the TSF is carried out in four stages(stg) and in 2 cross section (Fig.2). i.e.RL 2000(stg1), RL 2015(stg2), RL 2025(stg3) and RL 2035(stg4). Phase^2 software is used for numerical simulations with: (1) no reinforcement; (2) geotextile reinforcement. Desired critical shear strength reduction factor (SRF) is 1.3 and above.

3. Results, Discussion and Conclusion

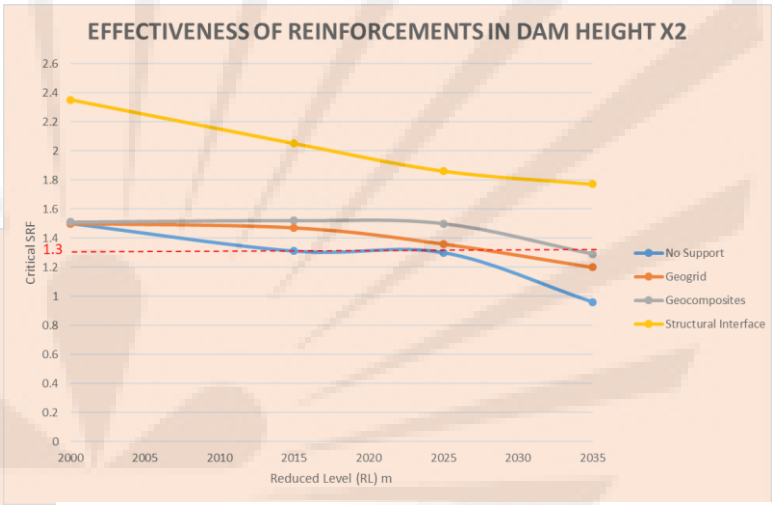

Fig.3 Effectiveness of reinforcement as dam height increases (X2)

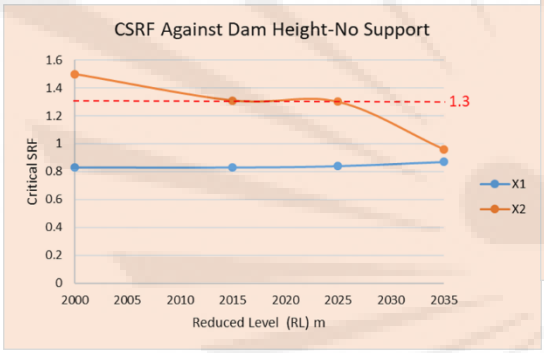

Fig.5 Evaluation of initial condition with no support

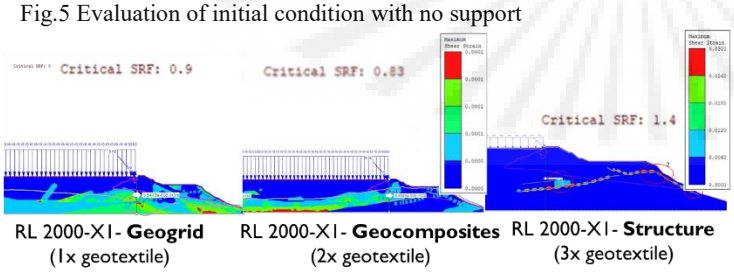

Fig.4 Effectiveness of reinforcements at initial stage (RL2000-X1)

It is unsafe at initial stage with no support in X1 (Fig.4). Geogrid and Geocomposites are unsafe in X1, whereas structural interfaces are safe in X1 (Fig.5). In X2, it is safe at initial stage, but unsafe as the dam height increases (Fig.4). Geogrid and Geocomposites are safe at initial stage but unsafe as height increases. Structural interface is consistent and safe (Fig.3). RL2035m is possible to achieve with application of geotextile reinforcement in structural interface for stability in both X1 and X2.