FINAL YEAR PROJECT REPORT

TITLE: DESIGN OF AN OPEN PIT MINE

CASE STUDY: TIIRA GOLD MINES

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“May the good Lord bless you”.

APPROVAL

This is to certify that this final project report has been written under the guidance of our supervisor and it is to be handed in to the department of Mining and Water Resources Engineering Busitema University.

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DECLARATION

I **NAKAGGWA DOROTHY, TENYWA SAMUEL HOPE, NAMAGANDA JACKLINE EVELYN**, hereby declare that this final year project report is our own research work and has not been previously submitted to any institution of higher learning for any kind of award to be achieved.

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ABSTRACT ONE

Open pit mining is an important mining method in the mining industry as it's used in extracting different minerals like gold, vermiculite, among others. However, studies and evidences have showed that poor benching and lack of established ultimate pit limits increases the threat of pit collapse and the costs of production respectively, hence this can lead to pit slope failures and low profit maximization. Tiira gold mines are mostly operating by open pit mining and are currently facing similar challenges due to high costs incurred in stripping the overburden.

A field study was conducted and the relevant data was obtained (both primary and secondary), which included the collar, survey, assay, topographical and geology data. Samples were also picked to analyze the rock uniaxial compressive strength, the indirect tensile strength, internal angle of friction and cohesion. Results obtained from the laboratory indicated that the samples picked at a depth further from the surface have greater rock strength compared to those picked from the near surface. The current state of the pits was determined and the acquired information was used in the Mine sight 3D software, using the triangulation method to develop a geological model.

The average internal angle of friction and the average cohesion obtained were used to calculate the bench slope angle using Mohr-coulomb failure criterion from the equation;

$\mathbf{X = 2\sqrt{(í - \beta)(\beta - \Phi)}}$, where; í is the bench slope angle from horizontal. The factor of safety was also obtained from the equation; $F= \frac{cA+W\cos\beta\tan\varphi}{W\sin\beta}$. In determining the bench slope angle and factor of safety, some assumptions and measurements were made and these included; the bench width (X), basing on the rock strength and other parameters like the shape of the ore body, the bench height, β was estimated by carrying out measurements from the field using a geological compass, the block weight was obtained by weighing the rock sample on a weighing scale.

The block economic values were obtained from; the available geological block model containing the block grade values, the estimated costs, the projected gold price and the available recovery factor obtained from one of the existing mines. Cost estimation was done using the O'Hara cost estimator. In obtaining the block economic values, some assumptions were made and these included; tonnage of waste (Tw) and ore (To) to be mined per day, tonnage of waste and ore to be handled per day, tonnage of ore to be milled per day (T), Number of personnel to work in the

mine (Np), it was assumed that the mill will be operating three 8-hour shifts per day and 7 days/week, regardless of the shifts worked by the open pit.

In determining the optimal mining sequence, floating cone method was used and the Mine Sight 3D software was used to design the benches and the ultimate pit. The optimal Net Present Value of the optimal pit was found by summing the values of the blocks within the pit limit and the optimal stripping ratio was determined from the ratio of the number of negative (−) blocks to the number of positive (+) blocks, where negative blocks indicate waste and positive blocks indicate ore.

The following results were obtained; bench slope angle=, optimal Net Present Value=, optimal stripping ratio=