FINAL YEAR PROJECT REPORT

FACULTY OF ENGINEERING

DEPARTMENT OF MINING ENGINEERING

STABILITY ASSESSMENT OF MINE WASTE DUMP

CASE STUDY: OPTIMA MINES AND MINERALS LIMITED

BY

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A final year project report submitted to the department of mining engineering in partial fulfillment of the requirements for the award of the Bachelor* of Science in mining *engineering degree at Busitema University

DECLARATION

I **BALYA DERICK**, hereby declare that this final year project report is my own research work and has not been previously submitted to any institution of higher learning for any kind of award to be achieved.

Signature: .....

Date: 16./01./2023

DEDICATION

I dedicate this report to my dear parents, dear lectures and fellow students who have stood by me and always believed in me. You are the best.

ACKNOWLEDGEMENT

I would like to extend my sincere gratitude to the almighty GOD who has enabled me reach this far as the academic journey is concerned, still thank him for the gift of life and good health. Special thanks to my parents towards their financial support, guidance and encouragement towards my studies and for making this research possible. I would love to express my gratitude to my supervisors Mr. Bakama Michael, Mr. Tugume Wycliffe and other lecturers of Busitema University in person of Mr. Kidega Richard for their advice and encouragement throughout the research period. May the good lord bless you!

ABSTRACT

Mining extracts useful materials from the earth. Although provides a large quantity of valuable minerals, it also generates a hung quantity of waste piled at different places called waste dumps in a gradual manner. Due to the limited space, dump structures are constructed with steep angles however if not well managed dump failure is most likely to occur which leads to loss of life, property and equipment as well as increases the mine economics. This has been a matter of concern in the past years for safe and optimum design of dump slope. This study presents the effect of different waste dump parameters that is the slope height, angle and the shear strength variables that affect the stability of slopes. For the stability assessment waste dump samples were tested in the laboratory for cohesion, internal angle of friction, unit weight etc. The shear test parameters gotten from the shear test were used in stability assessment performed using RocScience software. FoS was evaluated by varying the slope angle and height of dump. It was observed that as the angle and height of the slope increase FoS decreases.

APPROVAL

This project report has been submitted with the approval of my supervisors.

Supervisors:

MR. Nassasira Bakama Michael

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MR. Mr. Tugume Wycliffe

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Acronym

LEM - LIMIT EQUILIBRIUM METHOD

GLE - GENERAL LIMIT EQUILIBRIUM

SLIDE -SLOPE STABILITY ANALYSIS SOFTWARE

FOS – FACTOR OF SAFETY

1 CHAPTER ONE

1.1 INTRODUCTION

1.1.1 Background of study

Introduction, Mine waste are categorized as coarse grained wastes that are usually stored in surface mine dumps, and fine-grained wastes, usually stored in hydraulic-fill structures.(Blight, 2011). Approximately 98 percent of the material extracted from the mine reports to waste storage. (Porter and Bleiwas, 2003).

Globally, Mining industry generates about 100 billion tonnes of solid waste annually. This waste has risks if not well managed, failure due to geotechical issues has caused lethal disasters.(Anita, Kamini and Jacson, 2022)

In recent decades, numerous accidents due to instability of waste dump have been recorded that has resulted in the loss of life, production, machinery and damage to the properties and environment in the near vicinity. (Gupta *et al.*, 2022)

The slope geometry and the geo-mechanical strength of dump materials mostly control the stability of the dump.(Ogbonnaya, 2018)

Height increment of mine waste dump is a good engineering aspect of an open pit mine because of its economic impact on production operations and safety to mine, machine and personnel. This is further important because of the limited space. Steep slopes are best for the case of economics; while less angles are preferred in case of stability. Any changes made between these two options may lead to dump slope failures. The factor of safety depends on the type and nature of the waste dump material.(Verma *et al.*, 2017)

In Uganda, management of mining wastes was implemented to ensure that structures such as waste dumps and tailing storage facilities are planned, designed, and operated so as to appropriately assess geotechnical but the guide lines are not put in place. Crawford, Disney and Harris, 2015)

At Optima mine, the progressive mining is generating more and more waste material. Under this condition, the stability and design of waste dump slopes become vital from the viewpoints of safety and economics of the mine. There have been some localized failures at the mine site.

REFERENCES

Anita, parbhkar fox, Kamini, B. and Jacson, L. (2022) 'Tapping mineral wealth in mining could ofFOSet damage from new green economy mines', *The conversation* [Preprint], (2022).

Blight, G. (2011) 'Mine Waste: A Brief Overview of Origins, Quantities, and Methods of Storage.

Crawford, A., Disney, K. and Harris, M. (2015) 'Uganda: Assessment of Implementation Readiness', (March), pp. 1–56. Available at: http://www.iisd.org/sites/default/files/publications/mpf-uganda-assessment-of-implementation-readiness.pdf.

Fleurisson, J. (2012) 'Slope Design and Implementation in Open Pit Mines : Geological and Geomechanical Approach.

Formation, T.H.E. *et al.* (1967) '7[OW8b', (August 1967).

Guidelines, I. (1991) *Investigation and design of mine dumps*.

Gupta, G. *et al.* (2022) 'Ó The Institution of Engineers (India) Numerical Modelling-Based Stability Analysis of Waste Dump Slope Structures in Open-Pit Mines-A Review', *Journal of The Institution of Engineers (India): Series D* [Preprint], (March).

Herza, J., Ashley, M. and Thorp, J. (2018) 'Factor of Safety ? -Do we use it correctly ? Factor of Safety ? - Do we use it correctly ?', (September).

Kishore, N. (2017) 'Engineering characterization of dump material for numerical', (September 2021).

Liu, C. and Hounsa, U.S.F. (2018) 'Analysis of Road Embankment Slope Stability', pp. 121–128.

Nayak, P.K. and Dash, A.K. (2020) 'Design Considerations for Waste Dumps in Indian Opencast Coal Mines - A Critical Appraisal .', (January).

Ogbonnaya (2018) 'Evaluation of the mechanical properties and critical slope parameters of mine tailings at Enyigba , South eastern , Nigeria', *International Journal of Geo-Engineering,*

Olivier, D. (1992) ‘Waste Rock Dump Management and Stability Evaluation’.

Porter, K.E. and Bleiwas, D.I. (2003) ‘Physical Aspects of Waste Storage From a Hypothetical Open Pit Porphyry Copper Operation’, *U.S. Geological Survey*, p. 63.

Sazid, M., Singh, T.N. and Saharan, M.R. (2012) ‘Risk Analysis of Mine Dump Slope Stability- A Case Study Risk Analysis of Mine Dump Slope Stability- A Case Study’, (January).

‘Slope stability and stabilization methods (2001).

‘User’s Guide’ (2002).

Verma, a.k. *et al.* (2017) ‘Stability analysis of a mine waste dump over an existing dump’, (Feb).

Watkins, R. *et al.* (2016) ‘Pipe Zone Bedding and Backfill : A Flexible Pipe Perspective’, 41138(December).