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Improving open pit mine economics through ultimate pit slope optimization: case study of Pickstone Peerless mine

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ABSTRACT

In most open pit mining operations the need to create stable pit slopes and the influence of the overall pit slope on the economics of such an operation is highly appreciated. Despite such knowledge many open pit mines are designed with little or no geotechnical investigations being carried out so as to come up with an optimized pit slope in line with site specific conditions. This can lead to under or over estimating pit slope angles. Conservative (too gentle) slopes result in high stripping ratios therefore a high operating cost. Slopes too steep may result in slope failures, which may lead to high operating costs or premature mine closure. This project emphasises the importance of geotechnical investigations not only for safety reasons but for economic reasons as well. A case study of Pickstone Peerless mine was used. Geotechnical data was gathered through core logging and face mapping of the existing pit. The data gathered was then used for stability analysis employing empirical, kinematics, limit equilibrium and numerical modelling. Rocscience software packages were used for numerical based analysis. From the results obtained it was concluded that it is possible to steepen the current 52^{o} overall pit slope angle of the Peerless pit by 1^{o} without compromising stability at both bench and regional scales. This will be possible provided adequate slope management practices are put in place and adhered to. The steeper slope would have saved the mine more than 2,681,110 m^3 of waste stripping, translating to in excess of $12,064,995.00 (USD) in financial savings for the existing pit. The steeper angle applicable to the current pit may not be appropriate to the pit extensions. Further geotechnical evaluations should be done on suitably positioned and spaced boreholes in the area of the extension, to verify the

stability of steeper slopes in that area. The analysis done as part of this project was used to show that the current pit can be deepened by 5 m without a push back.