AN INVESTIGATION OF THE CONDITIONS AROUND A REHABILITATED GOLD MINE IN MONARCH AREA OF FRANCISTOWN, BOTSWANA

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Abstract: Mining in Monarch area exploited lenticular gold bearing quartz veins up to 400m long and 2m thick. These veins were emplaced along shears within a complex tectonic contact zone between the Francistown Tonalities and the Penhalonga Formation. The shears were localised by inclusions of altered schist within the tonalite. The shears extend some 1500m along a northerly trending strike, dipping steeply to the west. Subsidiary shears trending north-north-east and northwest are also mineralised and the highest grades are found where these intersect with the main zone. The wall-rock hosting the veins also has impregnations of carbonate and sulphide, and typically contains fine-grained biotite (or stilpnomelane) which imparts a brownish hue to the altered zones. Monarch mine in Francistown area was worked underground between 1869 and 1910 and again between 1937 and 1952. An estimated total of 5.66 tonnes of gold was extracted from 650 000 tonnes of ore. The main shaft was sunk to a depth of 300 m even though little mining took place below 270m. Recently, the mined out area began to collapse and there was an urgent need to rehabilitate the mining area. The Department of the Department of Mines of the Government of Botswana carried out rehabilitation on the collapsing areas including all identified shafts. The rehabilitation process consisted of pumping slurry (consisting of 60 parts dumps, 10 part Coal ash and 1 part cement) into the shafts and collapsed areas. It is expected that all the shafts and collapsed areas were filled with the slurry at the time of the rehabilitation, as water underground was displaced and the rehabilitation area was flooded. The filled up shafts, tunnels and collapsed in areas were then covered with a 2 metre ridge material from the dumps. The present study was therefore aimed at using high resolution non-invasive geophysical technique to investigate the post rehabilitation conditions. Several Ground Penetrating Radar (GPR) lines were using a 50 MHz Antenna in a reflection mode were ran across trenches and shafts in the rehabilitated areas in order to image the conditions of the subsurface. The results show that most of the rehabilitated areas are undergoing subsidence. Evidence of the subsidence was observed on the surface during the field work. This therefore calls for close and continuous monitoring of the rehabilitated areas in order safeguard against sudden large collapse that might pose a great threat to human life and animals in and around the area.

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