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Modelling and evaluation of the tin resource on two farms on the Potgietersrus Limb of the Bushveld Complex

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ABSTRACT

The properties of Roodepoort 222KR and Groenfontein 227KR are located within part of the Zaaiplaats tin mining district about 30km north-west of Mokopane (Potgietersrus). Tin mineralisation occurs within the upper part of a sheet of Bushveld granite which overlies the mafic rocks of the Potgietersrus Limb of the Bushveld Complex. Tin has been commercially mined in this area since 1907 and has been recovered by Zaaiplaats Tin Mining Company from Zaaiplaats 223KR, Roodepoort 222KR and Groenfontein 227KR, the latter two having been worked under tribute from Transvaal Consolidated Lands mining company (TCL). In 1978, a major drilling program was carried out with the aim of investigating the economic viability of the remaining resource on Roodepoort and Groenfontein. The programme background, implementation and results were assessed and reported on by I.M. Clementson in February 1979.

The programme was divided into three drilling and sampling phases. The outcome of the first two phases revealed that mineralisation in the upper fine grained Lease Granite is largely restricted to the surface outcrop area of an exposed elongate dome-like structure and only extends for a limited distance down dip. It was observed that the overlying pegmatite zone and pipe ore bodies contain good but isolated and unpredictable tin grades. Twenty boreholes, RDP077 to RDP097, were collared in visibly mineralised Lease Granite within a surface geochemical anomaly and gave encouraging results. This prompted Phase 3 which involved percussion drilling on a 30m by 30m grid pattern over the major portion of the surface geochemical anomaly. Boreholes RDP98 to RDP213 were drilled and most of them intersected significant disseminated tin mineralisation with only 4 holes out of 107 not intersecting anomalous tin values(<120ppm Sn).

The zone of anomalous tin values forms a roughly lenticular domical body, elongated NW-SE traceable for a distance of nearly 1km. The mineralisation is thickest along central axis and tapers off in all directions. The results of the Phase 3 and adjacent boreholes from other Phases however were sufficient to warrant calculation of the economic potential of the disseminated tin mineralisation in the area covered by the drilling. Previous underground mining within the disseminated mineralisation zone targeted the rich, tin-bearing pipes, which represent only a small proportion of the zone of the disseminated mineralisation. Thus, in areas with underground workings, a conservative figure of 5% by volume was discounted for the disseminated mineralisation which is investigated in this project.

Modelling and evaluation of the data gathered during previous drilling programmes has shown the presence of a body of disseminated tin mineralization, 850m long, 250m wide and with a maximum thickness of 30m, a minimum thickness of 2m and an average thickness of 14m using a 200ppm cut-off grade. The average grade is 813 ppm Sn and this can be upgraded using a higher cut-off grade. Grades were considered to be sub-economic at the time of the exploration programme in 1978 and Tin price was at US$1,625/t, (Clementson, 1979). The increase in global tin price, which now stands at about US$15,000/ton Sn (October 2009) makes this deposit highly attractive and it could be economically viable. The ore body could easily be mined by open cast methods. In this report, a cut-off grade of 200ppm Sn (0.02%) is used for reserve calculation since it results in the best grade continuity of mineralisation. Using a maximum overburden thickness of 30m and cut-off grade of 200ppm Sn, the polygonal estimate for the anomalous disseminated tin-bearing body within the Lease Granite constitutes an indicated resource of 6, 26 million tonnes with an average grade of 813.05 ppm Sn. The resource would yield 5,085 tonnes of tin. The kriged block estimate for the disseminated tin-bearing body constitutes an indicated resource of 6.06 million tonnes with an average grade of 528.69 ppm Sn and contains 3,203.86 tonnes, for a cut-off grade of 200ppm and 30m overburden limit.

The ore body is generally exposed at the surface with the dome crest having been removed by erosion and with very little overburden. In this study, maximum overburden thickness in the anomalous zone is 30m and is localised in the south-western edge of the area. The mineralisation is open ended to the northwest and also to the south-east .Further investigation is recommended in these areas. Small but very high grade tin pipes occur in the area and they could not be investigated by normal exploration methods due to their small size and unpredictability but they kept mining operations going for more than a decade on a small scale in the old Groenfontein mine in the seventies (Clementson, 1979). An opencast operation could expose the pipes which would enhance the average grade derived from the disseminated mineralisation which envelopes them. The financial valuation using polygonal estimates has yielded positive results suggesting that selective mining could be economically viable. The financial valuation using geostatistical estimates has yielded negative results suggesting that bulk mining may not be economically viable and should be discouraged based on the economic modifiers used.

This research is part of a bigger project by VM Investment Company aimed at re - evaluating the tin resource on two farms since the price of tin has gone up during the past decade. More investigation should be done to ascertain the economic factors in the conversion of the resource to reserve.