

Paper Number: 3769

Environmental Impacts of Pt, Cr and V Mining in the S.W Limb of the Bushveld Complex

Mphephu, N.F¹ and Viljoen, M.J.²

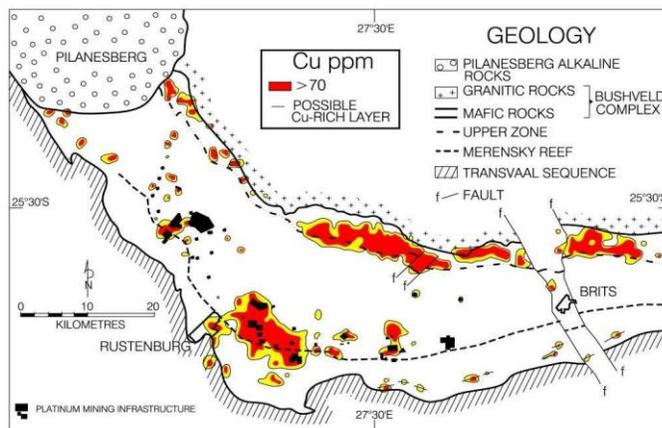
¹Cort & Fred Civil & Environmental Consultants, 94 Bekker Road, JHB, fred@cort.co.za

²Bushveld Minerals Ltd. Corner Fricker and Harries, Johannesburg

The Western Bushveld Complex is characterised by major mining operations which include platinum, chrome and vanadium smelters and refineries.

The results of soil geochemical sampling (at 1km intervals) by the South African Council for Geoscience over the thin residual clay-rich podsollic soil developed on the mafic and ultramafic rocks of the south west limb of the complex are examined in relation to the major geological zones of the complex and mining infrastructure. Certain anomalous elemental concentrations are evident such as high Cr contents over the Critical Zone and high Cu over the Upper Zone. Certain narrow platiniferous layers also giving rise to sporadic Cu and Pt anomalies but the distribution of these elements are also clearly related to mining and metallurgical complexes.

Ground water geochemistry based on samples from water quality monitoring boreholes shows similar high concentrations of Cu, Ni and S in particular, around mining infrastructure. Ground water plumes high in sulphate from calcined dumps, the residues left after V extraction using a Na₂SO₄ salt roast process are present in places. Data from air quality monitoring around smelters show significant amounts of SO₂ and NO_x.



Ways used to mitigate these environmental impacts of Pt and V mines in particular, are briefly discussed. They include the plastic lining of calcine and tailings dumps and the use of electrostatic precipitators and scrubbers to control smelter emissions. The careful management of tailings dams and mine water together with smelter emissions has now become of crucial importance. Finally the specifications for, and the monitoring of pollution in this prime mining district are briefly outlined.

Figure 1: Cu anomalies over the South Western Limb of the Bushveld Complex highlighting primary high Cu background values over Upper Zone rocks with anomalous Cu values around Pt mining infrastructure.

References:

[1] Bonnie J. G. and Gavin M.M (2010) The environmental costs of platinum–PGM mining and sustainability: Is the glass half-full or half-empty? Minerals Engineering 23: 438–450

[2] Rauch S and Fatoki O.S (2015) Impact of Platinum Group Element Emissions from Mining and Production Activities. F. Zereini and C.L.S. Wiseman (eds.), Platinum Metals in the Environment, Environmental Science and Engineering: 19 -28.

