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Geo-environmental Assessment of Mining Impacts on the Central Rand

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Although having been of inestimable value to the economy of South Africa, mining activities on the Witwatersrand goldfield have left a legacy which has, in certain instances, impacted negatively on the surrounding environment and nearby communities.

The Central Rand Goldfield extends in an east-west belt immediately south of Johannesburg. It is the area most directly affected by gold mining due to high population densities and commercial developments in the immediate vicinity of old mining infrastructure and tailings dumps in particular (Figure 1) (Mphephu, 2004).

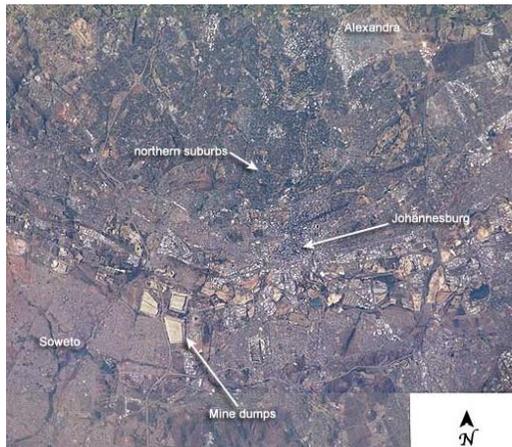


Figure 1: Image of the greater Johannesburg region with many conspicuous tailings dumps, taken from the International Space Station. Courtesy: NASA Earth Sciences and Image Analysis Laboratory-Johnson Space Centre.

The important gold-bearing conglomerate layers (reefs) are characterized by abundant auriferous pyrite in the matrix. After crushing, milling, cyanidation and gold extraction using activated carbon, huge quantities of the residue have ended up in tailings dumps and dams, seventy of which have been identified on the Central Rand alone.

One of the major environmental impacts is from water pollution derived from oxidation of the sulphides and heavy metals in the surficial parts of the mine tailings, to form a secondary oxidation product termed efflorescence. This consist mainly of a combination of hydrous ferrous and ferric sulphates that are water soluble and the source of elevated amounts of dissolved salts as well as acid mine drainage in water emanating from poorly managed dumps. Air pollution in the form of airborne dust from unrehabilitated, partially rehabilitated and reprocessed mine tailings, is also major environmental impact particularly on nearby housing. Large tracts of prime land are also sterilized by mine tailings.

The mining of remaining low grade shallow resources coupled with reclamation of mine tailings, if properly undertaken with an end-use in mind, can lead to the preparation of valuable and strategically placed land for productive uses with a major benefit to the population and the environment of the huge conurbation of greater Johannesburg, South Africa's prime city founded on gold.

References:

[1] Mphephu, N.F (2004) Geotechnical Environmental evaluation of mining impacts on the Central Rand. PhD Thesis. University of the Witwatersrand.

