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The Gamsberg Zinc Deposit South Africa: awakening of a Mesoproterozoic supergiant

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The Gamsberg zinc-lead deposit is the largest of four Broken Hill-type stratabound-stratiform base metal sulphide deposits that constitute the Aggeneys-Gamsberg Ore District in the Mesoproterozoic Namaqua Metamorphic Province. Currently the District produces 1.4 million tons of Cu-Pb-Zn ore from essentially the Broken Hill-Deeps mine, which has after more than 3 decades of operation, a limited life-of-mine. To ensure continuity of the mining operations in the District, the preparation of an open cast mine at Gamsberg was initiated in July 2015 more than 40 years after its discovery during the early 1970's exploration boom. Production will commence in 2018 and is aimed at producing 250 000 tons of zinc metal from 4 million tons of ore per annum with a conservatively estimated life-of-mine of more than 16 years. It will be the largest zinc producer in Africa.

Structural interpretation supported by exploratory drilling demonstrated Gamsberg to be a large synclinal sheath fold hosting a potential resource of ~500 million tons of medium grade zinc (~6 per cent Zn) and minor lead ore (Fig.1). This will make it the largest known in-situ deposit of its kind in the world, comparable to the essentially mined-out and legendary Broken Hill Pb-Zn-Ag deposit in New South Wales, Australia.

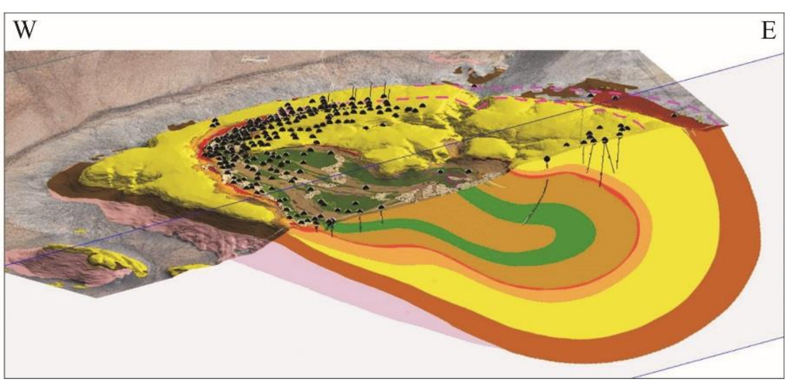

Figure 1. Surface geology of the Gamsberg zinc deposit and section illustrating the synclinal sheath fold structure and potential resource hosted by a metavolcano-sedimentary sequence. (Legend: quartzite

(yellow), aluminous and psammitic schist sequence (brown) with interlayered amphibolite (green), thin red line is the ore zone. After: Rozendaal et al 2016 [1]*).*

The Gamsberg sphalerite-galena ore is hosted by medium-grade metamorphosed, pyrite-rich graphitic pelite and pyrrhotite-rich silicate facies iron formation. Geometallurgical challenges, in particular optimum zinc recovery, relate to the high manganese content of the marmatitic sphalerite, presence of disseminated alabandite and graphite in the ore. Genetically it is a Broken Hill-type/meta-sedimentary exhalative deposit that formed as a result of metalliferous hydrothermal fluid exhalations introduced into a continental, fault-bounded, predominantly siliciclastic third order basin. The well stratified morphology, abundance of sphalerite and immediately overlying barite units, supported by high sulphur isotope ratios suggest that the deposit formed distally to its fault related source.

Reference:

[1] Rozendaal A et al. (2016) S. A. Journal of Geology *submitted*.