Paper Number: 1401

Structural Setting and Geometry of the Klipbankfontein Deposit, Kolomela Mine, South Africa

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The Klipbankfontein deposit is situated at the southern extent of the Maremane Dome, within Kumba's Kolomela Mine. This area exhibits a protracted series of deformation events, with the initial development of the 2.78-2.64 Ga Ventersdorp rift basin, comprising NE-SW-trending faults along graben boundaries, followed by ca. 2.60-2.52 Ga development of a carbonate platform during widespread marine transgression. Hydrothermal deposition of the manganiferous chert of the Wolhaarkop Formation and subsequent deposition of the important Asbestos Hill Subgroup banded iron formations accompanied further ca. 2.52-2.46 Ga off-craton/oceanic rifting towards the west. This deposition was succeeded by 2.46-2.35 Ga incipient break-up and rifting during a "second extensional stage" or "E_1". Development of the "Kalahari Orogeny" at ca. 2.35-2.25 Ga, produced the initial folding (F_1) and thin-skinned thrusting phase, accompanied by inversion of pre-existing, rift-related normal faults and strike-slip movement along conjugate NE- and SE-trending strike-slip faults. The Postmasburg Unconformity, developed as a result of uplift and erosion of the Ghaap Group, played a pivotal role in regional ore development and/or preservation. Ca. 2.24-1.83 Ga reactivation of predominantly NNE- to NE-trending faults accompanied the volcanosedimentary/ volcaniclastic Upper Postmasburg Group, with the Ongeluk lavas signifying the peak of mafic lava extrusion at ca. 2.22 Ga. Overlapping with this interval, deposition of conglomerate, "grit", quartzite and shale of the lower Olifantshoek Supergroup occurred at ca. 2.05-1.93 Ga, forming the Gamagara/Mapedi Formation. A second extensional event or "E_2" occurred during or shortly after this period, with reactivated normal faults offsetting the lower Olifantshoek Group. The ca. 1.83-1.73 Ga Kheis Orogeny similarly showed eastward tectonic vergence and thin-skinned thrusting, with F_2 folds co-axially tightening F_1 folds. The ca. 1.15-1.0 Ga NNW-directed Lomanian (Namaqua-Natal) Orogeny comprised the last major deformational event, thereby reactivating, segmenting and buckling N-S trending normal and inverted normal faults, reactivating 2.35-2.24 Ga NE- and SE-trending conjugate strike-slip faults - usually with an upthrow to the SE and SW, respectively - and producing broad ENE-trending F_3 folds. Regionally, Bushveld-age gabbroic rocks intruded into the Ghaap and Postmasburg Groups within clearly-defined NE-trending grabens, accommodated by reactivation of Ventersdorp faults.

The effects of these deformation events are represented within the Klipbankfontein deposit, which has recently commenced mining/stripping operations. The mineralization setting, defined by combining high-quality diamond drilling, pit mapping and implicit 3D modelling in Leapfrog™, include relatively downthrown ore preserved in a relict, deposit-scale, graben/half-graben/sub-basin geometry, bound by partially-inverted normal faults. These faults are flanked by high-energy sediments, including conglomerate and HEM-rich conglomerate, with general thickening of lithologies downdip toward the

southeast of the Klipbankfontein deposit area. This is accompanied by an increase in the general thickness of Ongeluk andesitic basalt and Gamagara shale. Andesitic basalt, towards the SW of the prospect, thickens downdip, whilst dolomite intersections are noticeably higher to the NW of the deposit area, although this deepens dramatically towards the adjacent Leeuwfontein deposit. Consequently, there may be a fundamental structural break between the Klipbankfontein and Leeuwfontein deposits, with modelled geological volumes downthrown to the NE of NW-SE trending structures and to the NW of NE-SW trending structures. A thick, persistent gabbro body underlies the ore in both Leeuwfontein, which is the main producing deposit at Kolomela, and Klipbankfontein.