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Integration of Geological and Geophysical Data for Sediment-Hosted Copper Deposits: An Example from the Deblin Copper Mine Area, Kombat South, Southern Otavi Mountain Land, Northern Namibia

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The southern Otavi Mountain Land (OML), including the area around the Deblin Copper Mine, preserves valuable records of the tectonic development and associated base metal mineralization in the northern Damara Orogen, northern Namibia. Mineralization style of the Deblin Copper Mine is still a matter of discussion. Work on the Deblin Copper Mine by many researchers has resulted in a large set of data but also controversial interpretations. Many geologists pointed out similarities with volcanic-hosted massive sulphide deposits, whereas others proposed a shear-hosted hydrothermal style and interpreted the mineral assemblage as equivalent to the Iron Oxide Copper Gold-type. The structures in the southern OML are thought to have major influences on the distribution of base metal mineralization. The Deblin Copper Mine area has insufficient rock exposure due to extensive Cenozoic Kalahari Supergroup sand cover, which leads to difficulties in understanding the local structural framework. The conspicuous extensive sand cover in the study area precluded researchers to fully understand the distribution of lithology, stratigraphy, and the development of structures that possibly control copper mineralization in the Deblin Copper Mine from limited surface geological data. Undoubtedly, the mineralization style and deep ore potential in the Deblin Copper Mine area are still worthy of further research.

This study aims to use geological mapping, petrography of both borehole core and outcrop, ore mineralogy and geochemical data, in an attempt to review the mineralization style of the Deblin Copper Mine area and to improve the existing local geological map. In addition, aeromagnetic and ground magnetic data, and magnetic susceptibility data, are used to create a structural framework of the area around the Deblin Copper Mine to see through the extensive sand cover that obscures local lithologies and lineaments. A new 1:2,500 geological map was created, while 180 rock samples were collected for petrographic studies and geochemical analyses.

The study discovered that the mineralization occurs in the silicified dolomite and breccia dolomite with minor occurrences in the underlying agglomerate. In addition, strong mineralization occurs in quartz-calcite veins at the base of the silicified dolomite along its contact with the underlying agglomerate. The primary copper sulphide mineralization is characterized by chalcopyrite, pyrite, and sphalerite with minor amounts of bornite and covellite. The sulphides exhibit multiple replacement texture and veinlet mineralization type, which represent a hydrothermal epigenetic mineralization style. Subsequently, we conducted a ground magnetic survey using a cesium vapour magnetometer to collect data along the survey lines, across the study area and a proton precession magnetometer at the base station to record the diurnal variation. The aim is to decipher the concealed structures that possibly control the copper mineralization. Based on 62 line km of ground magnetic data collected along N-S traverses at 25 m line spacing and 5 m station spacing in the study area, conspicuous ENE lineaments were revealed. It is suggested that these lineaments have focused the mineralizing fluid flow in the

Deblin Copper Mine area. The presented data lends support to the carbonate rock-hosted ore system.