The Effect of the Paarl Fault on the Main Sulphide Zone, Selukwe Subchamber, Great Dyke

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Platinum group elements (PGEs) are amongst the valuable precious resources in the world. The mining of low-grade PGEs is damaging to any economic system. The drive for optimum and profitable grades can however be affected by geological structures.

This research assessed the impact of the Paarl Fault on the main sulphide zone (MSZ) in the Selukwe Subchamber of the Great Dyke. The main objectives of the study were to assess the effect of the Paarl Fault on the MSZ, the PGE concentration and distribution in the Paarl block, and the alteration mineral assemblages associated with the fault. The lithological units that were identified include gabbronorite, websterite, orthopyroxenite, pegmatoidal pyroxenite and websterite, xenolith outcrops, and serpentinite. Assay results from sampled drillcores were analysed and grouped into two datasets, dataset Paarl A (254m away from the fault) and dataset Paarl B (448m away from the of fault). Dataset A had an average grade of 4.38g/t and a standard deviation of 0.556g/t, with the highest grade of 5.28g/t observed in drillcore PAR49. Dataset B had an average grade of 3.83g/t and a standard deviation of 0.196g/t, with the lowest grade being recorded of 3.64g/t in drillcore PAR42. Within the MSZ, clinopyroxene, orthopyroxene, and olivine showed alteration patterns, with the formation of serpentine also observed mainly in PAR40 drillcore thin sections.

With the assay values obtained in this project, the evaluation of the results suggested that the Paarl Fault could have acted as a conduit for mineralizing fluids, which resulted in high PGE values (g/t) in proximity to the fault. Alteration assemblages show consistency with the effects of faulting on host rocks, whereby the hydrothermal fluids from the fault could have promoted alteration processes resulting in the formation of secondary minerals and different textures which could result in PGE barren zones impacted when mining.