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Application of indicator kriging and conditional simulation in assessment of grade uncertainty in Hunters road magmatic sulphide nickel deposit in Zimbabwe

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ABSTRACT

The assessment of local and spatial uncertainty associated with a regionalised variable such as nickel grade at Hunters Road magmatic sulphide deposit is one of the critical elements in the resource estimation. The study focused on the application of Multiple Indicator Kriging (MIK) and Sequential Gaussian Simulation (SGS) in the estimation of recoverable resources and the assessment of grade uncertainty at Hunters Road's Western orebody. The Hunters Road Western orebody was divided into two domains namely the Eastern and the Western domains and was evaluated based on 172 drill holes. MIK and SGS were performed using Datamine Studio RM module. The combined Mineral Resources estimate for the Western orebody at a cut-off grade of 0.40%Ni is 32.30Mt at an average grade of 0.57%Ni, equivalent to 183kt of contained nickel metal. SGS results indicated low uncertainty associated with Hunters Road nickel project with 90% probability of an average true grade above cut-off, lying within +/-3% of the estimated block grade. The estimate of the mean based on SGS was 0.55%Ni and 0.57% Ni for the Western and Eastern domains respectively. MIK results were highly comparable with SGS E-type estimates while the most recent Ordinary Kriging (OK) based estimates by BNC dated May 2006, overstated the resources tonnage and underestimated the grade compared to the MIK estimates. It was concluded that MIK produced better estimates of recoverable resources than OK. However, since only E-type estimates were produced by MIK, post processing of "composite" conditional cumulative distribution function (ccdf) results using a relevant change of support algorithm such as affine correction is recommended. Although SGS produced a good measure of uncertainty around nickel grades, post processing of realisations using a different software such as Isatis has been recommended together with combined simulation of both grade and tonnage.