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Geostatistical modelling and simulation of uncertainty of a kimberlite pipe.

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2014-02-03
http://hdl.handle.net10539/13633

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ABSTRACT

Understanding uncertainty associated with grades in resource models is an essential requirement for mineral resource evaluation. One of the most important considerations in diamond estimation is the use of an appropriate variable that represents the true variability of grades in the kimberlite. The Spm3 variable used in the Murowa pipes expresses true the variability of the grades in the kimberlite pipes.

Kriging in the Normal Scores (NS) approach and conditional geostatistical simulations were used to investigate and quantify uncertainty of the grade in the KIMB4 unit of the K1 pipe. The kriging in NS approach did not perform well in demarcating areas that are truly high and those that are truly low in the estimates. Point realisations were then generated using the sequential gaussian simulation algorithm. The resultant conditional means and variances highlighted areas of high and low uncertainty in the grade estimates. The point scale realisations were then averaged to the blocks size used at Murowa (25m x 25m x 15m) to obtain the block conditional simulation model. Zones of high and low uncertainties in the grade estimates of KIMB4 of the Murowa K1 kimberlite were delineated and additional drilling was proposed to reduce the uncertainty in the grade estimates. The uncertainty in grade was also investigated down the pipe and this further identified the need for additional sampling at depth.