

## **A 3 day workshop on “Resource/reserve estimation for selective mining unit (SMU) using an advanced geostatistical methods for mining industry”**

### **Overview:**

A proper selective mining unit based on non linear geostatistical method (indicator kriging) enhances metal recovery and profitability. For example, if a large block has an estimate of .8g/t and the cutoff is 1 g/t, then on the basis of linear geostatistics (eg kriging) the block would be rejected, however, indicator kriging it is important to know that 60% of the block runs at 1.4 g/t Au, and thus part of block could be mined at profit. Indicator kriging is most useful and powerful techniques for analyzing grade variability with high fluctuation and high nugget effect with outliers. The use of linear geostatistical block estimation is not recommended to a complex asymmetric distribution of grade over geological domain. The course will focus on concepts and methods to manage resource risk in order to improve critical business decision. Time will be allocated in each day in the last hour for participant questions and discussions. . It provides an improved level of confidence on indicated resource with associated risk. A theoretical estimation variance study will be carried out to determine the required optimum grid size and pattern for exploration. After determining optimum drilling grid, it is then necessary to quantify the risk associated with calculating resources from such pre-determined grid. The additional drill holes into the dislocated 3D orebody may be required to make meaningful resource classification and assist in quantifying the risk associated with resource/reserve estimations. Uncertainty over grade or geology can be integrated into the optimisation and mining design plan for further processing.

### **Day 1 (Indicator based Estimation Methods)**

#### **Morning Session:**

10:00 – 10.10am	Introduction and Welcomes
10.10 – 11.50am:	Why use non-linear geostatistics/Under which conditions different methods can be used//The notion of Indicators/Indicator variable
11.50– 12pm	Coffee Break
12- 1 pm	Grade Cutoff values/classification, how to choose several cut off values for multiple indicator kriging

1 – 1.45pm: Lunch

#### **Afternoon Session: (Spatial Continuity of Mineralization)**

1.45 – 3 pm	Calculation of Indicator Variogram/Indicator kriging Residual Indicator kriging/geometric and zonal indicator kriging/Introduction of GSLIB software
3 – 3.20pm	Coffee break
3.20-5.30	Selective mining Unit/Volume-variance relationship

### **Day 2: (Resource Estimation)**

9.30-10.45am	Overview of Support effect & dispersion variance/Volume-Variance Relationship (Affine Correction)
10.45 – 11am	Coffee
11 – 1pm	Estimation variance & error/how to change smaller mining units from larger mining units vice versa/
1 – 1.45pm	Lunch
1.45 – 3pm	how dispersion variance estimated from variogram/change of support/different between ordinary and indicator kriging
3 – 3.20pm	Coffee
3.20 -5.30pm	Cross validation/Indicator kriging output/risk assessment/Introduction of GSLIB software
Day 3: (Resource Estimation)	
9.30 – 10.45am	Resource and reserve risk/Practical resource classification/Meeting JORC requirements
10.45 – 11am	Coffee Break
11 – 1pm	Risk Assessment, Computer case study of multiple indicator kriging based on various cut off values
1 – 1.20pm	Coffee Break
1.20 – 5pm	Introduction of GSLIB software/Computer case study

#### Benefits:

- Learn how to choose the best indicator variogram model and Non-linear estimation methods
- Get practical experience with real-life case study using multiple indicator kriging
- Identification of drilling prospects in a cost effective manner if block is not viable
- Increase reserves with quantified risk
- Resource/reserve estimation using indicator variogram and kriging
- Accelerate cash flow and financial return of any project using non-linear geostatistics.
- Reduce operating costs from exploration stage to production stage using non-linear geostatistics
- Increase confidence in applying indicator variogram and kriging in the real case study