

# Practical Geostatistics & Mineral Resource Estimation Course

Date: 15<sup>th</sup> – 19<sup>th</sup> June 2020

Swakop Sands, Swakopmund, Namibia



## Led by world class expert

**This 5-day course will consist of two parts.**

### Part 1 – Practical Geostatistics Workshop

The first 3 days of the course will cover the practical basis of Geostatistics. It will bring the delegates to in-depth understanding of the mysteries of ordinary kriging and its variants. This is a classroom course and includes manual exercises to reinforce understanding of the techniques. This workshop is composed of lectures augmented by practical PC/laptop-based exercises covering many different applications. Case studies ranging from coal through base metals and iron ore to precious metals such as gold and platinum will be covered. All case studies are drawn from Dr Clark's extensive worldwide experience. Practical Geostatistics is aimed at any professionals dealing with the estimation from or interpolation between samples collected on a spatial basis. A minimum of mathematics is necessary to explain the techniques - mainly simple algebra, up to understanding the concepts behind solving simple sets of simultaneous equations and differentiating  $x^2$ . Questions and discussions are actively encouraged. Participants are advised to bring a laptop.

### Part 2 – Mineral Resource Estimation Master Class

Participants in this Master Class are expected to be conversant with Geostatistical procedures or at least to have completed the Practical Geostatistics Workshop. Participants are invited to contribute discussion and ideas from their own practical experiences and to bring their own data for preliminary analysis during and after the workshop. The workshop is aimed at professionals who are interested in discussing real world applications of resource estimation techniques. Using little or no mathematics, Isobel Clark discusses case studies involving interpretation of everyday questions, such as:

- Is my data homogeneous enough for geostatistical mapping?
- Do I have trends in my data and (if so) what kind?
- How do I interpret semi-variograms which deviate from the ideal shapes?
- What Kriging method should I use (if any)?
- Should I be using Kriging results at all?

Participants will be encouraged to discuss their own practice and compare it to others and recognised best practice. Real projects and case studies will form an important part of the workshop and participants will be encouraged to discuss and reflect on their own organisations practices and ways to improve them.

### BYO – BRING YOUR OWN SESSIONS!!

Get the trainer to address the concern you have in YOUR OWN projects!

YOU can BRING and ANALYSE YOUR own data using Practical Geostatistics 2000 teaching software under the supervision of Dr. Isobel Clark.

Take away copies of all software and data sets! You will be provided with a CD containing all relevant teaching materials.

## Format

This course will be an interactive and participative workshop where participants will be encouraged to discuss their own practice and compare it to others and recognised best practice. Real projects and case studies will form an important part of the workshop and participants will be encouraged to discuss and reflect on their own organisations practices and ways to improve them.

## Certificate of Attendance

Upon the successful completion of this course, you will receive a Certificate of Attendance bearing the signatures from Dr. Isobel Clark and the Course Organizer. The Certificate will also indicate your CPD Credits and serve towards your professional advancement.

## Who Should Attend

- Geologists (Exploration, Production, Resource)
- Mining Engineer / Engineering Manager
- Mine Evaluator / Evaluation Manager
- Mine Planners / Planning Manager
- Mine Surveyors / Survey Manager
- MRM Practitioners
- Anyone with interest in the evaluation of mineral resources and reserves



Delegates can claim  
5 CPD Credits

CESA-1322-03/2021





## 5 Day Practical Geostatistics & Mineral Resource Estimation

### About Your World Class Presenter

Isobel Clark is renowned for her down-to-earth approach to resource estimation in general and geostatistics in particular. After 46 years of teaching, software development and consulting in mineral resources and reserves, she will present this practical workshop with real world examples.

Dr Isobel Clark is a professional Mining Engineer who specializes in the technical evaluation of mineral resources and reserves at all stages in the life of a mine. She has taught, researched and consulted in the field of geostatistics for over 45 years and has wealthy experience in practical application of computer-based design and evaluation methods. Possibly best known as the author of the introductory text "Practical Geostatistics" (1979), she is also co-author of a more complete textbook "Practical Geostatistic" (2000). With proven communication skills honed by training non-specialists, she has conducted numerous short courses on a regular basis to companies and educational institutions in four continents. Dr Clark lectured for 11 years at the Royal School of Mines, Imperial College, London, at the University of Witwatersrand in Johannesburg for 9 years and was visiting professor at Camborne School of Mines for 2 years. Isobel acts as a Director of Geostokos Limited and also maintains her position as associated educator at Geostokos (Ecosse) Limited, two international consultancy companies based in Central Scotland. Her recent consultancy assignments range from the evaluation of diatomite deposits in the USA to the study of protected sea-birds in the UK. Dr Isobel received her Ph.D. in Mining Engineering from the University of London, specialising in the reconciliation of grade control data with actual production. In addition to formal qualifications, she regularly attends relevant conferences to learn new methods, theory and applications. She also attends seminars and meetings of the various professional societies of which she has memberships

### Partial list of Consultancies and Projects in Africa

- Ad hoc advice on mineral sands applications, for Shell Minerals, **South Africa**
- Advice on sampling at Richards Bay Minerals, **South Africa**
- **American Mineral Fields Int. Ltd.**, supervision of feasibility study --- valuation and geology
- Assessment of Alexander Bay Diamond Mine, **South Africa**
- Audit of resources, tantalite deposit, **Mozambique**
- Evaluation of mining resources, Hartebeestfontein Mine, **South Africa**
- Fergusson Stewart, **Johannesburg**, evaluation of Joel Mine.
- Freda-Rebecca Mine, **Zimbabwe**
- General Mining Union Corporation, **Johannesburg**
- Ghanaian Australian Goldfields, geostatistical modelling and advice on valuation
- Hartley Platinum, BHP **Zimbabwe**, peer review.
- Investigation of problems with Mine Call Factor for Libanon Mine, **South Africa**
- ISCOR Mining, audit of valuation for deposit in **Zaire**
- Johannesburg Consolidated Investment Limited, **Johannesburg**
- Lonrho **Zimbabwe**, advice on evaluation of small gold deposits
- Lumwana Copper Mine, Zambia for Barrick Corporation
- MIMCO, **South Africa**, evaluation of gold mine.
- MineNet South Africa, evaluation of resources and reserves at Skorpion project, **Namibia**
- Mineral resource and reserve valuation for Skorpion Zinc project in **Namibia**
- Palabora Mine, underground development, RTZ Management Services, **Johannesburg**.
- Potgietersrus Platinum, JCI, benchmark evaluation.
- Public statement of remaining reserves at the Droogebult Mine, **South Africa**

- Resource evaluation studies for Lonrho Platinum, **South Africa**.
- Short training for **Nigerian Geological survey**
- Small scale consultation, AngloGold Ashanti Goldfields
- Study of sampling methods and calibrations for Namco Diamond Mining, **Cape Town**
- Tenke Fungurume project, **Congo** audit of computerized database
- Vaal Reefs Exploration & Mining Co. Ltd., audit of annual reserve statement
- Valuation advice for the Ayanfuri Project, **Ghana** for Cluff Minerals

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# 5 Day Practical Geostatistics & Mineral Resource Estimation

Part 1 (15<sup>th</sup> – 17<sup>th</sup>)

## Practical Geostatistics

### Session 1

- The basic assumptions of spatial estimation methods
- Inverse Distance interpolation methods

### Session 2

#### Statistical Methods

- Classical statistics: the Normal distribution
- Confidence levels
- Standard errors

### Session 3

#### Statistical Methods

- Construction and interpretation of semi-variograms
- Identification of trends
- Multi-component models
- Confirmation of basic assumptions
- Outliers

### Session 4

#### Geostatistical Methods

- The experimental semi-variogram
- Modelling semi-variograms
- Trends
- Anisotropy
- Geological features

### Session 5

#### Geostatistical Methods

- Ordinary Kriging
- Lognormal methods
- Indicator methods
- Regression problems (conditional bias)
- Simulation

### Session 6

Case Studies and discussions on your own data (BYO)

Part 2 (18<sup>th</sup> – 19<sup>th</sup>)

## Mineral Resource Estimation

In Part 2 of this course YOU will be bringing YOUR own data. This will be a BYO session preliminary study of real data sets and open discussion guided by participants' interests and previous Q&A

on participants' interests we can go in depth to the following topics:

1. Basic assumptions and requirements for mineral resource estimation
2. Data validation, top-cuts and capping
3. Construction, interpretation and modelling of semi-variograms
4. Model validation and reconciliation with geological knowledge
5. Geostatistical resource estimation, 3D and block modelling and Kriging
6. Other Kriging techniques, such as MIK and Lognormal Kriging
7. Geostatistical Simulations and Risk Assessment
8. Grade control
9. Drill hole spacing analysis

### Session 7

#### Case Studies and BYO

- construction and interpretation of semi-variograms
- identification of trends
- confirmation of basic assumptions
- outliers

### Session 8

#### Case Studies and BYO

- choice of appropriate kriging techniques
- practical applications of kriging

### Session 9

#### Case Studies and BYO

- discussion of case studies from course participants
- general discussion of case studies

### Session 10

#### Case Studies and BYO

- general discussion of case studies
- simulation techniques

**Accreditation Number:**

**CESA-1322-03/2021**

# Registration Form

## 5 Day Practical Geostatistics & Mineral Resource Estimation

Date: 15th – 19th June 2020

Swakop Sands, Swakopmund, Namibia



**R24 990**

Per delegate

**Fax Completed form to: 086 625 8511**

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Company Name: \_\_\_\_\_

Type of Business: \_\_\_\_\_

Address: \_\_\_\_\_

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2.		
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### Terms & Conditions

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All payments to be made directly to TSK Training & Conferences, payment is required in full 5 days from date of invoice. No seats will be reserved, unless otherwise stated by TSK Training & Conferences. TSK Training & Conferences reserves the right to change speakers, program content date and venue, due to unforeseen circumstances. The signed registration form is a legally binding document. The conference / workshop fee includes conference / workshop material, Lunches and refreshments. TSK Training & Conferences will not be held liable for travel and accommodation.

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