

# **Modelling the mine production chain for improved performance**

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19 July 2023

# Engineering Research with Industrial Relevance

- ❑ **Mine-to-Mill Optimisation**
- ❑ **Rock Drilling and Blasting**
- ❑ **Mine Design and Planning**
  
- Secured research projects with:
  - **ERG Industrial, SA**
  - **Kibali Gold, DRC**
  - **Harmony Gold, SA**
  - **TimRite (Pty) Ltd, SA**
  - **ECG Mining Company, Cuba**

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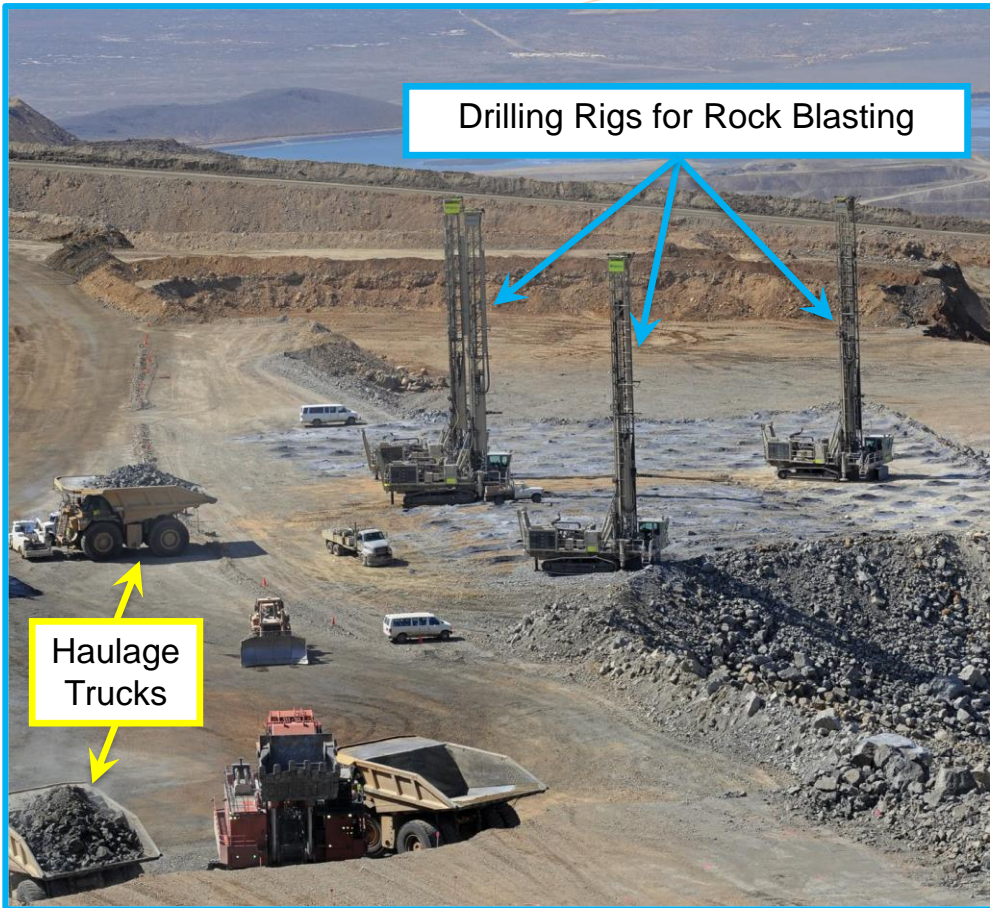
*NRF Rating: C2 (31 Dec 2026)*

# Thematic Area of Interest (1)

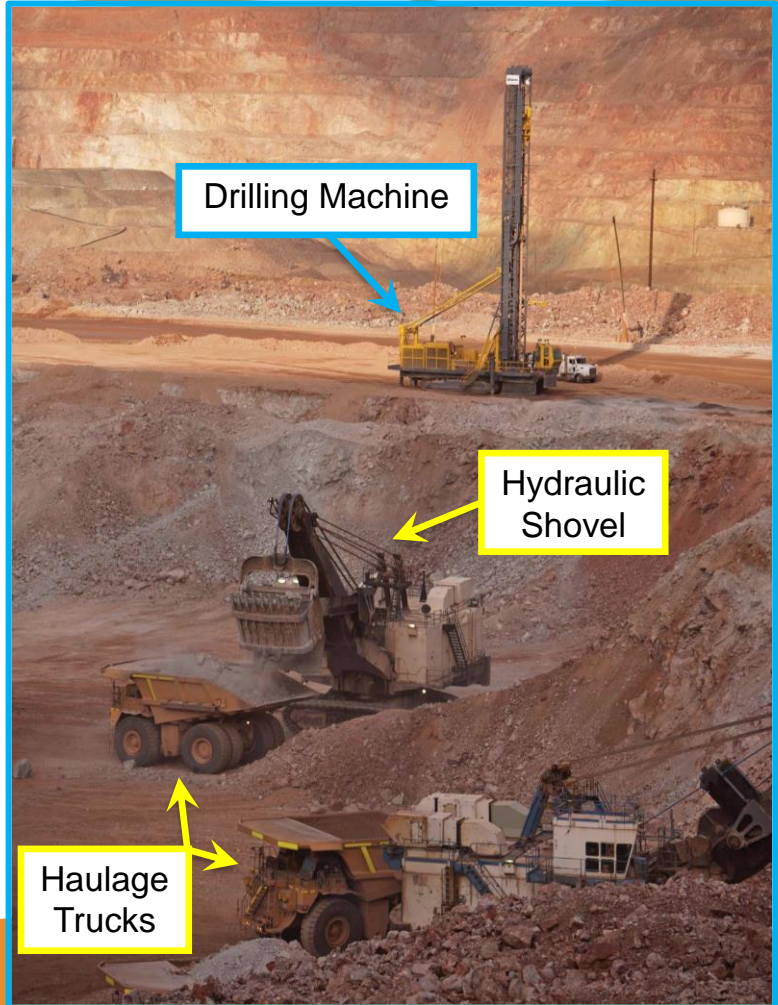
## Rock Drilling and Blasting



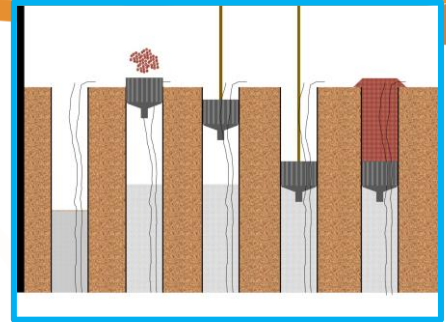




Mining block being prepared for rock blasting while adjacent loading and hauling are underway





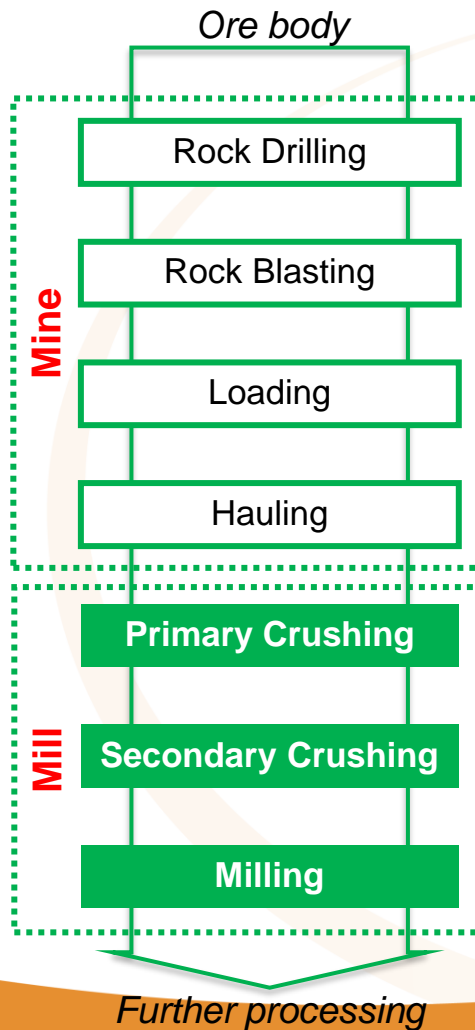


Rock Drilling  
Drill bit performance

## Thematic Area of Interest (2)

### Mine-to-Mill Optimisation





## Mine-to-Mill (M2M) Framework

- **Modelling** the value chain for better return
- Adjusting current practice for high energy and operational efficiency
- **Simulation** of alternative technologies for higher mineral recovery
- When done properly, M2M can incur savings on Operational Expenditure (OPEX) as high as 20% from current baseline



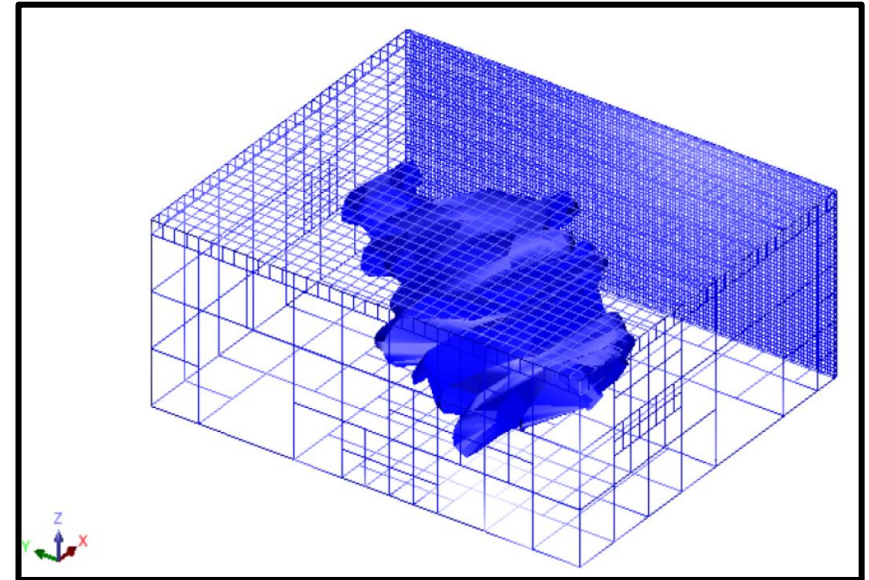
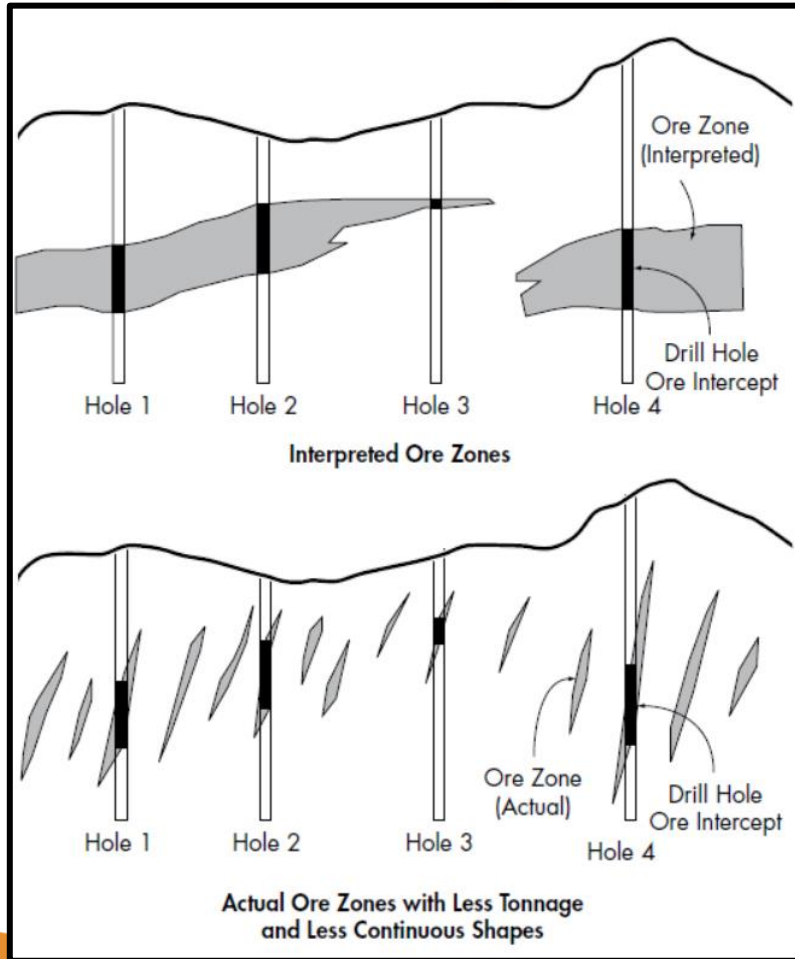
## Thematic Area of Interest (3)

### Mine Design and Planning



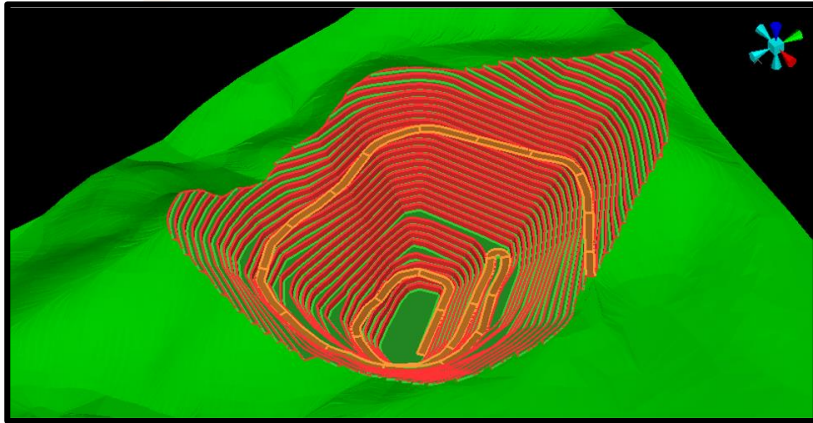


# Ore Body Modelling



Block model of a typical copper-bearing ore deposit generated with **geostatistical techniques**

# Examples of Open Pit Designs

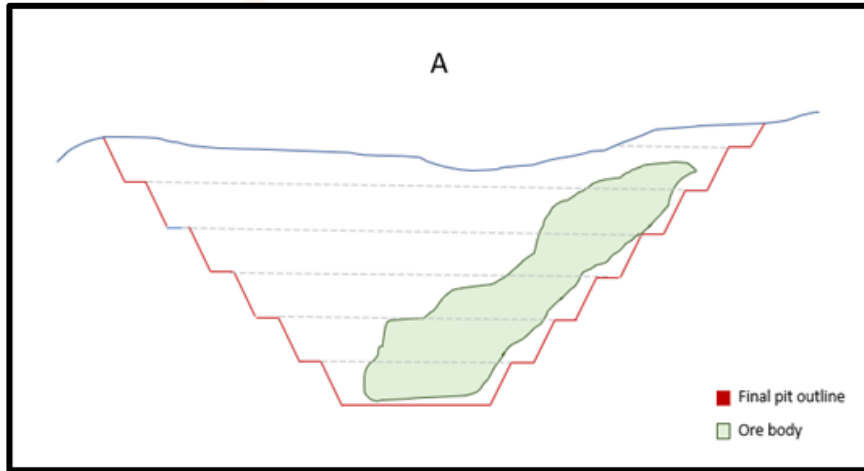


Software-rendered design

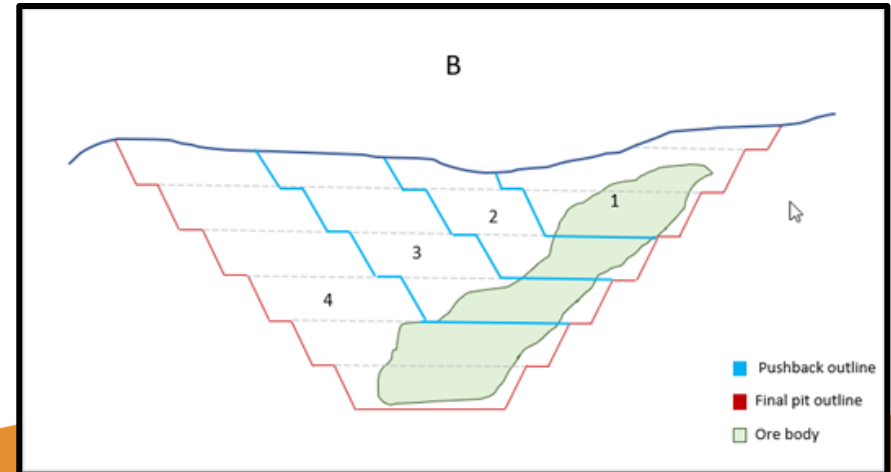


Real operation with failed slope

# Open Pit Mine Planning



Finding the best candidate schedule that leads to the highest net present value for the mineral deposit



Various **algorithms** are developed to solve the mine optimization problem **efficiently**



## Some Master's Graduates



Brian Dlamini 2019  
Project Manager – Anglo Platinum



Dineo Makgoale 2020  
Plant Engineer  
Northan Platinum

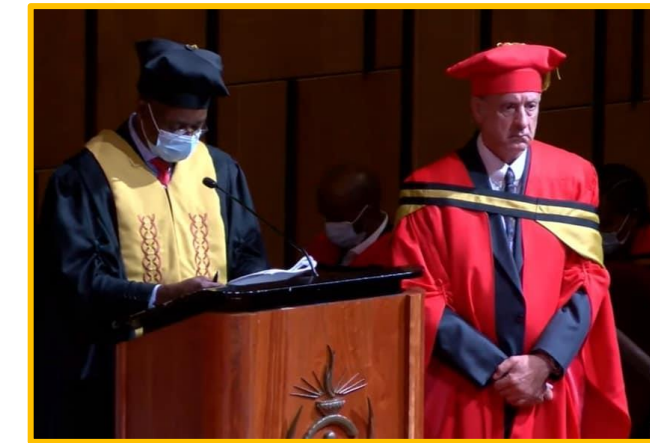


Martin Lusambo 2020  
Technical Sales Manager  
Kemtec Africa Pty Ltd

# Some PhD Graduates



Dr Fhatuwani Sengani 2021  
Senior Lecturer  
University of Limpopo



Dr William van der Walt 2021  
Mining Consultant

Mr Fortune Nkomo  
PhD under examination  
Lecturer  
Gwanda State University (GSU)  
Zimbabwe

# Thank You

Define tomorrow.

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and technology