Geometallurgy
Conference 2025

Reducing Processing and Cost Risks
for
New Processing Plants
through
Effective Design Simulation

S.K. Edwards and N.C. Steenkamp

14 – 15 October 2025

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Agenda

- The Current Challenge
- The Solution
- The Geometallurgical (GeM) Campaign (Output, analyses & timing)
- The METSIM® Simulation
- Use-Case Study
- Summary
- Questions and Answers

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The Current Challenge

Navigate the more complex mineral deposits

- Increasing lower grade
- Mineralogically more complex ores
- Technical and financial hurdle

Metallurgical Variability

- Recovery loses
- High reagent consumption
- Premature equipment wear

Costly plant redesigns/retrofit

- Additional processing units
- Additional recovery systems

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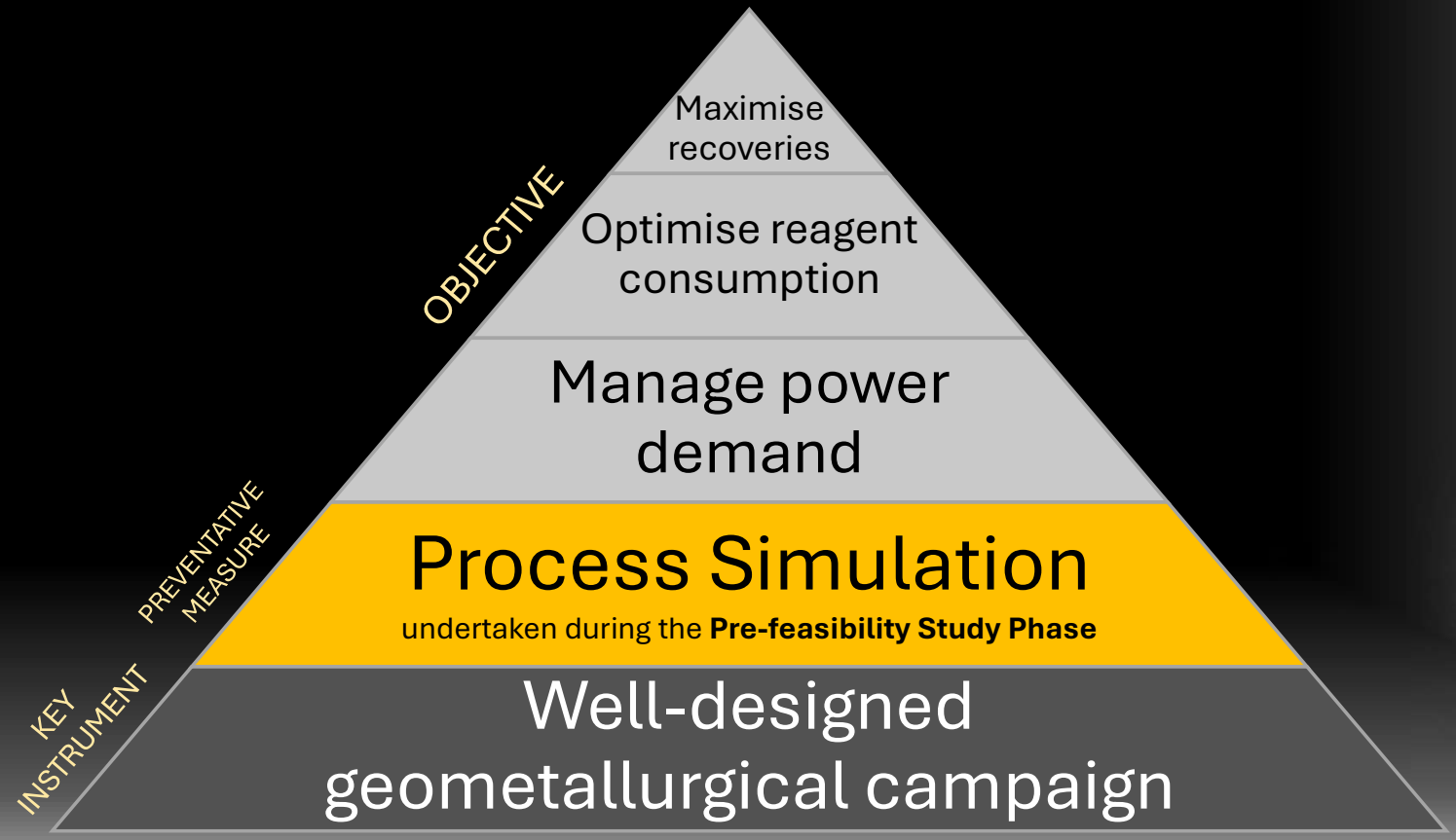
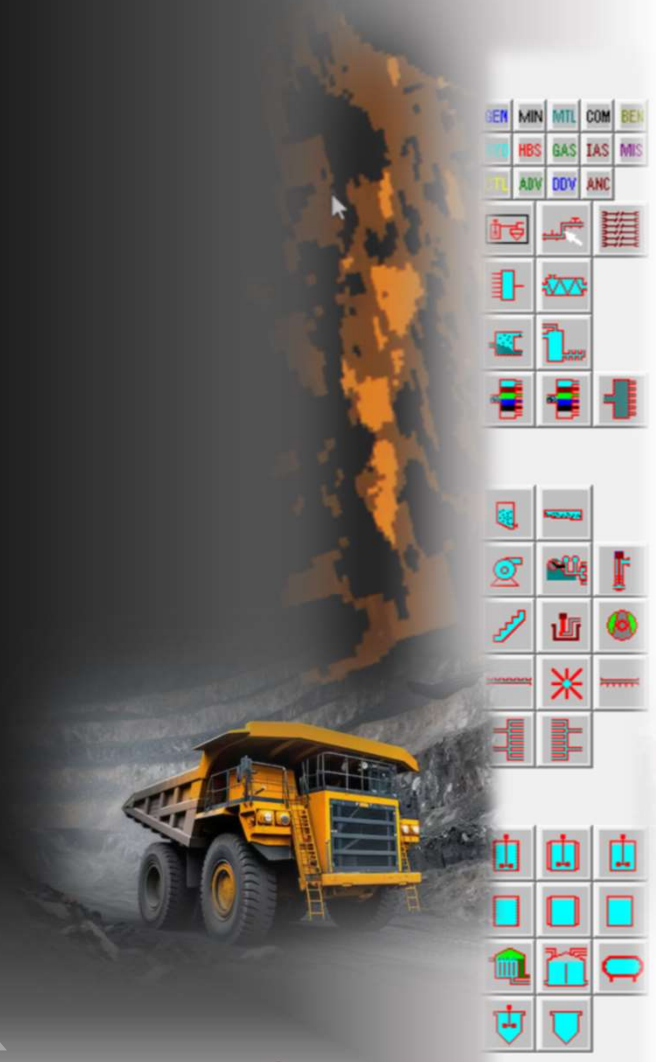
The Solution





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The Geometallurgical Campaign
Data Collection

Strategic Data Collection

Geology

Map domains

Define ore types

Assess variability

Ore type characterisation & behaviour

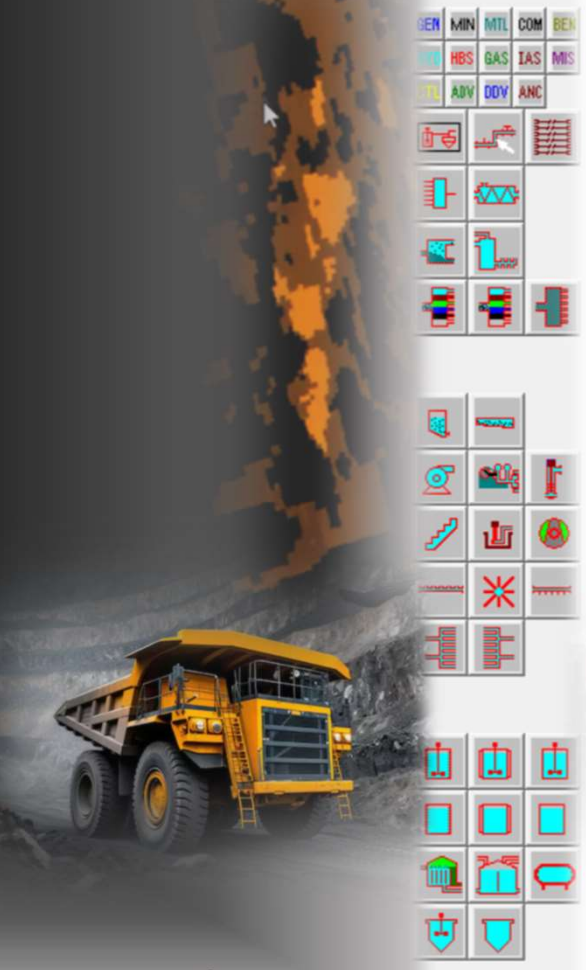
Process Engineering

Informs Process Engineering

Supports economic modelling

Supports business development

Supports mine schedule planning



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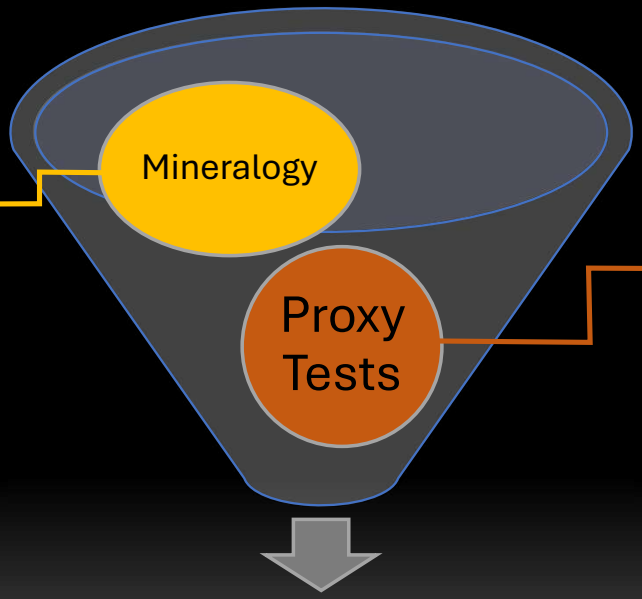
The Geometallurgical Campaign
Ore Characterisation

- Impact breakage
- Grindability
- Recovery

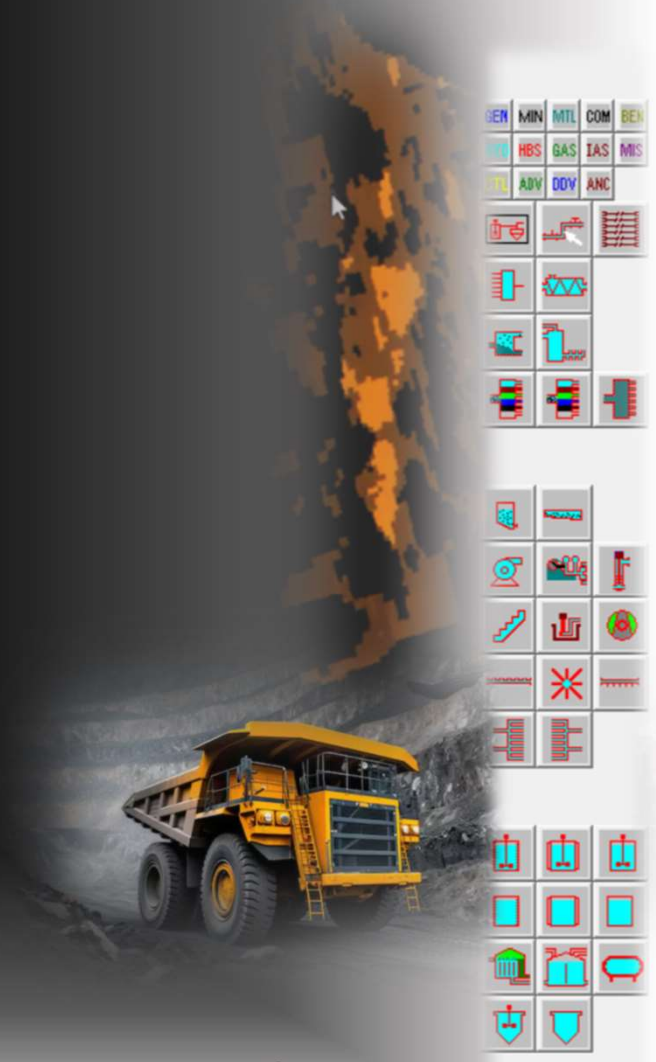


- Hyperspectral Imaging
- Quantitative X-ray Diffraction (QXRD)
- Mineral Liberation Analysis (MLA)
- Hardness, Point Load Index (PLI)
- GeM Comminution Index (JKCi-CRU and JKCi-GRD)

Domain Mapping

Bond Mill Work Index (BMWi)

Bankable Tests



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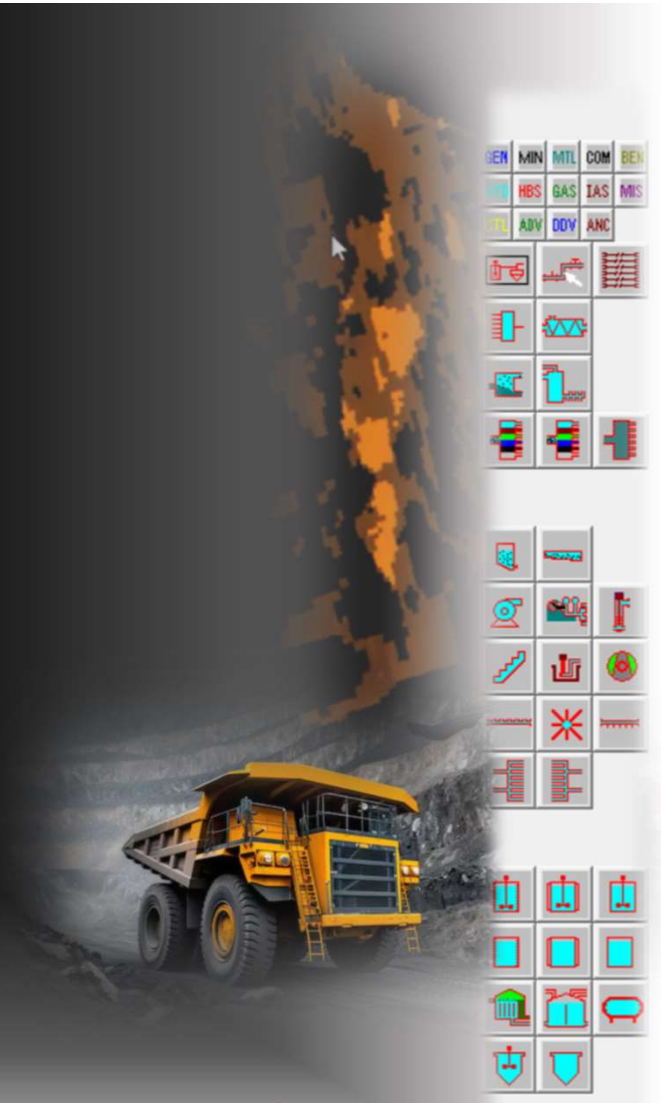
The Simulation
METSIM® Steady-State

GeM Campaign Output	METSIM® Input
Mineralogy	Predicts **mineral recovery**
Grain size distribution	Influences **liberation**
Hardness	Determines **energy** demand
Reagent consumptions	Optimizes chemical **dosing**
GeM comminution indices	Simulates **grindability**
Domain mapping	Links **ore types** to process behaviour
Deposit model integration	Enables feed **sequencing/blending**



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The Simulation

METSIM® Addresses Complex Ores

- **Software** → Simulation backbone enabling predictive decision support
- **Capability** → Modelling system response
- **Approach** → Modular iteration
  - → Flowsheet-driven
  - → Dynamic decision-making tool
- **Inputs** → GeM campaign data
- **Output** → Accurate simulation of ore behaviour and plant performance

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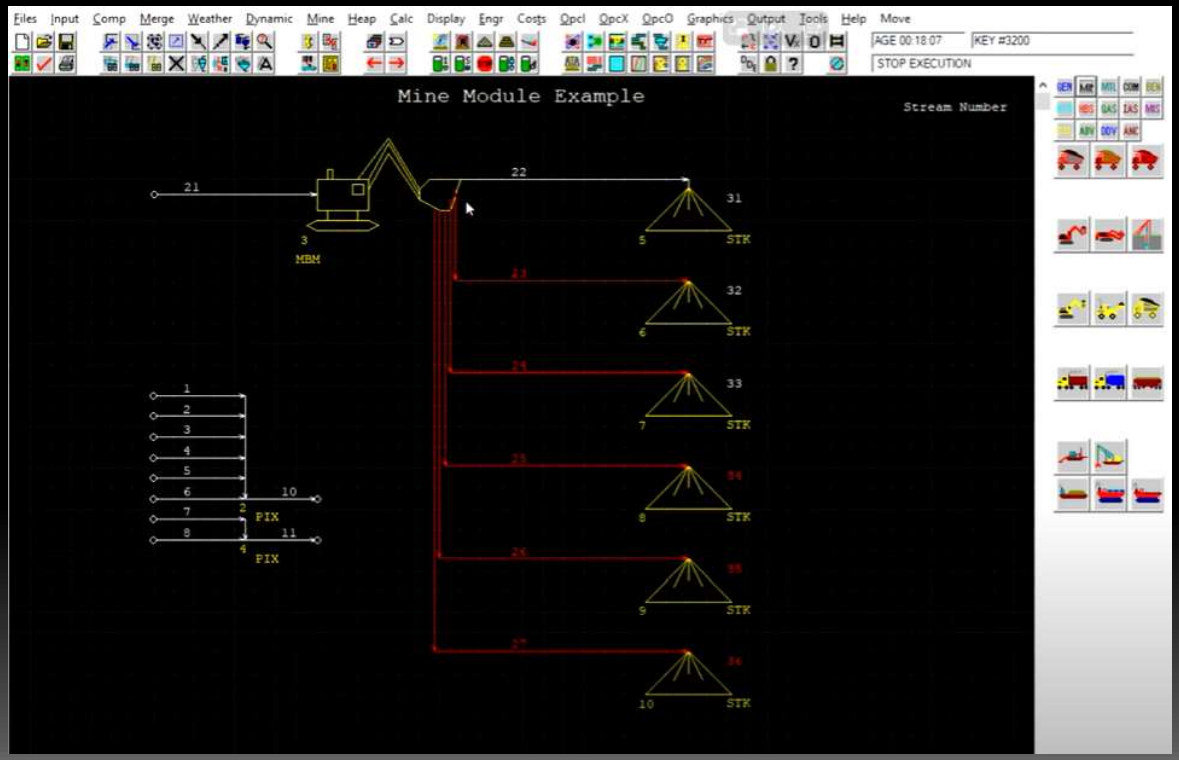
The Simulation
METSIM® Dynamic LoM Model



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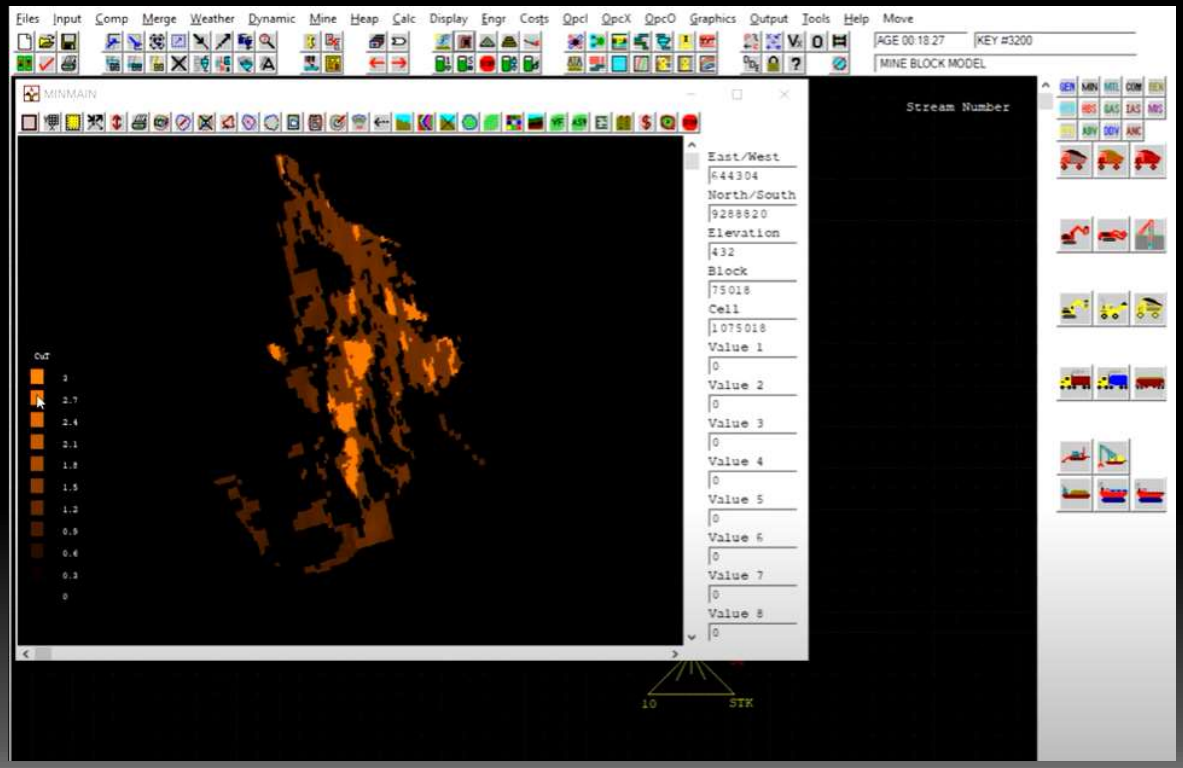

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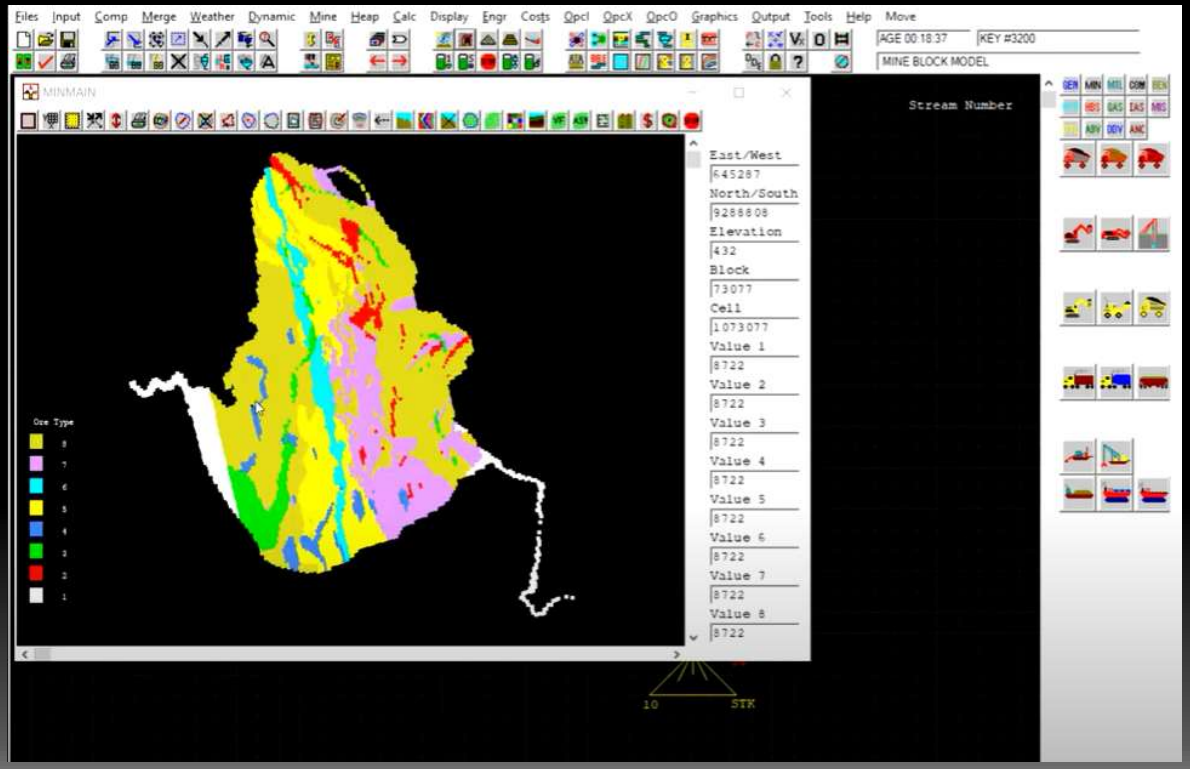

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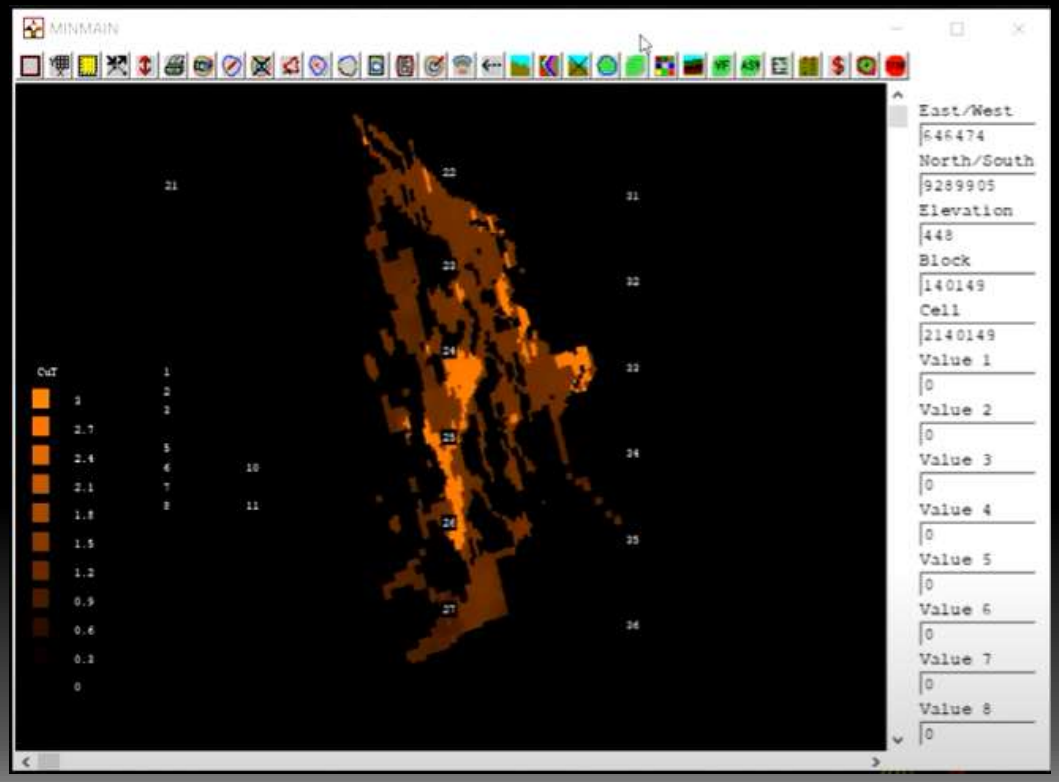
METSIM® Dynamic LoM Model



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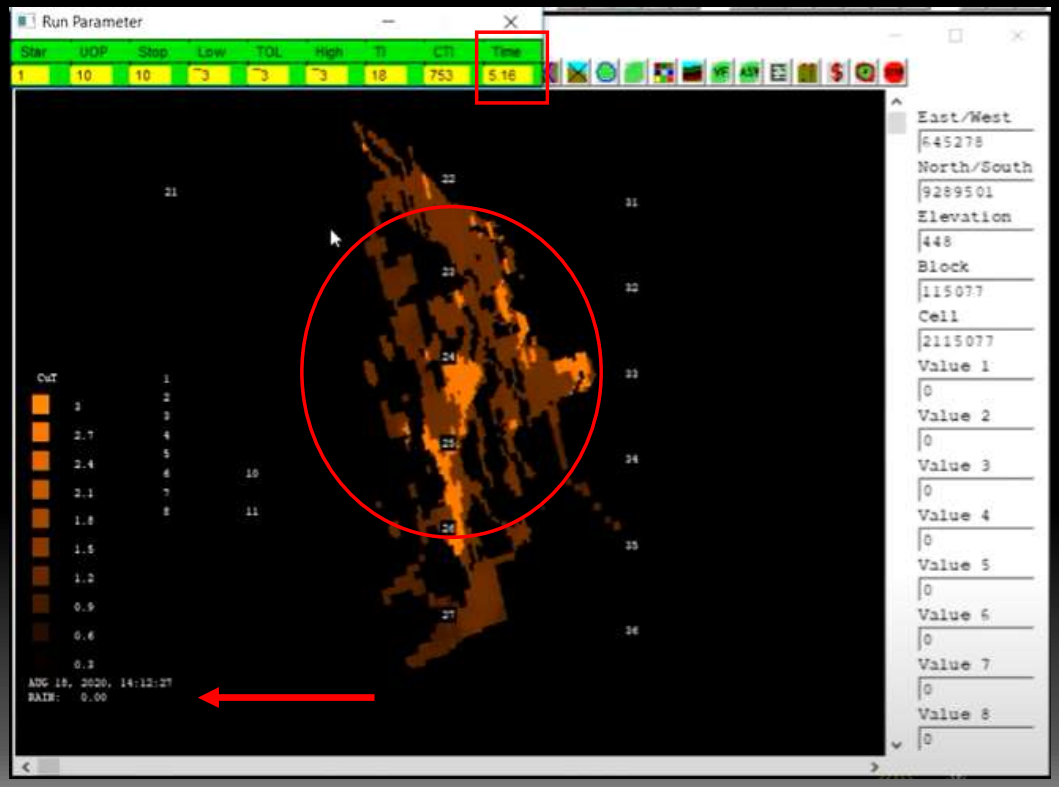

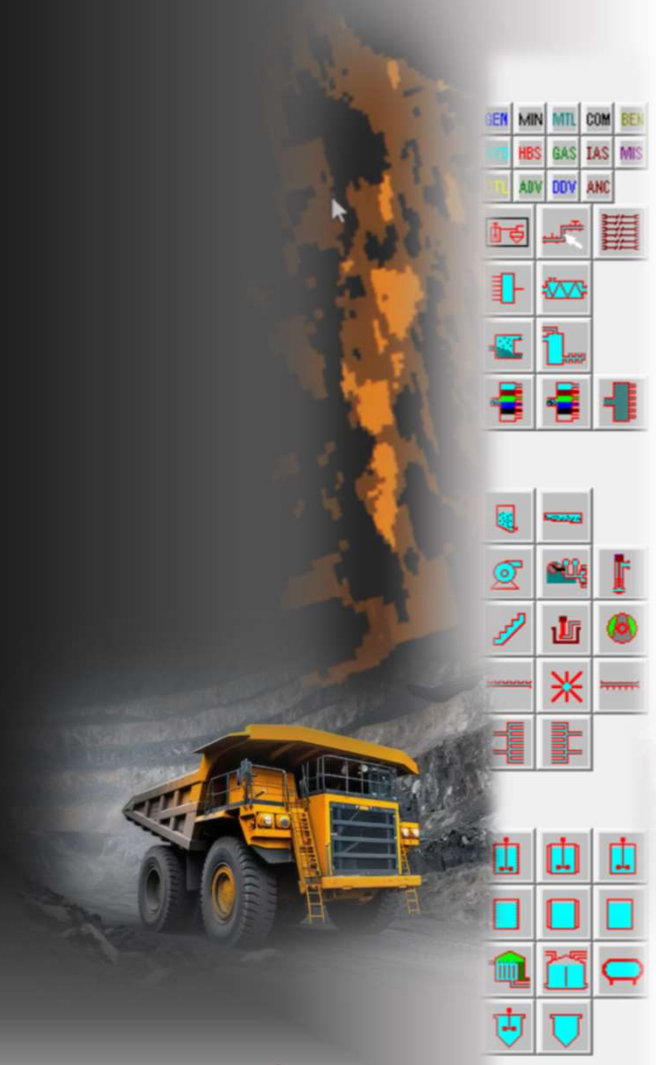

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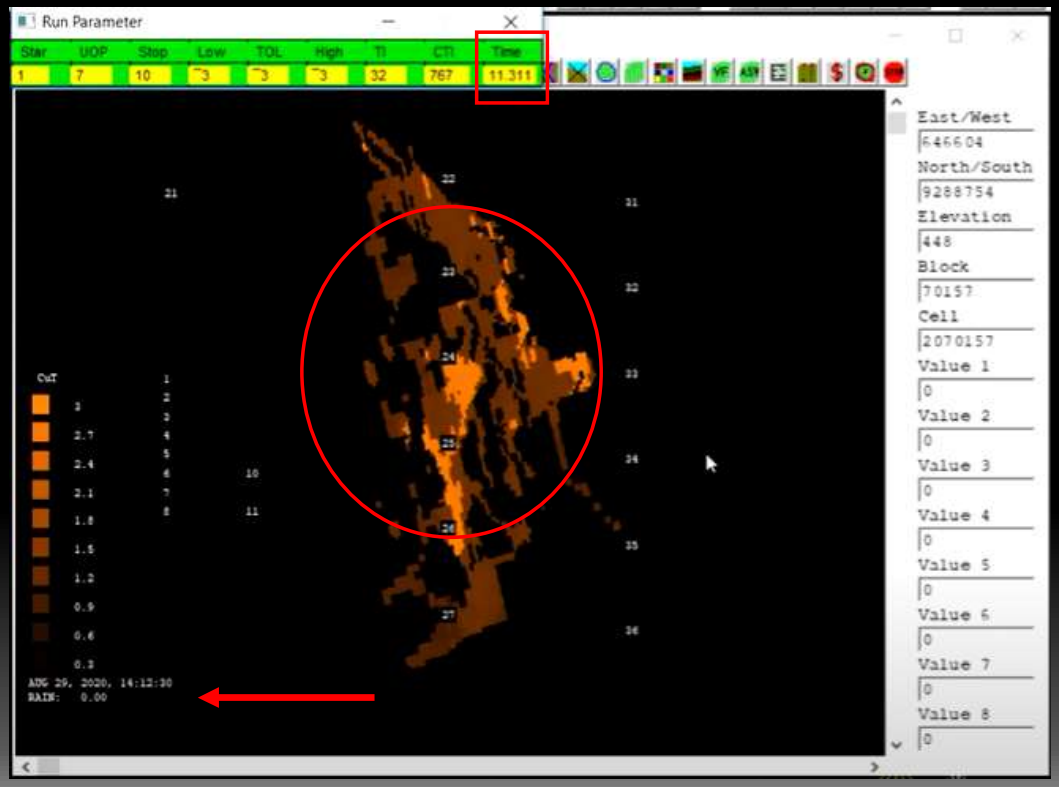

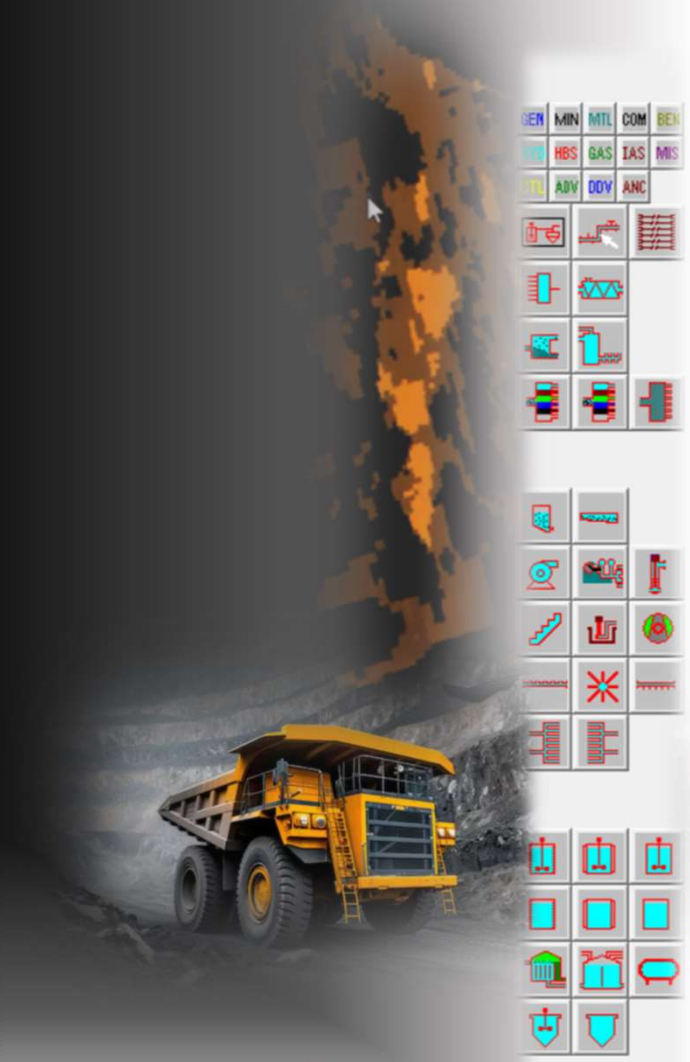

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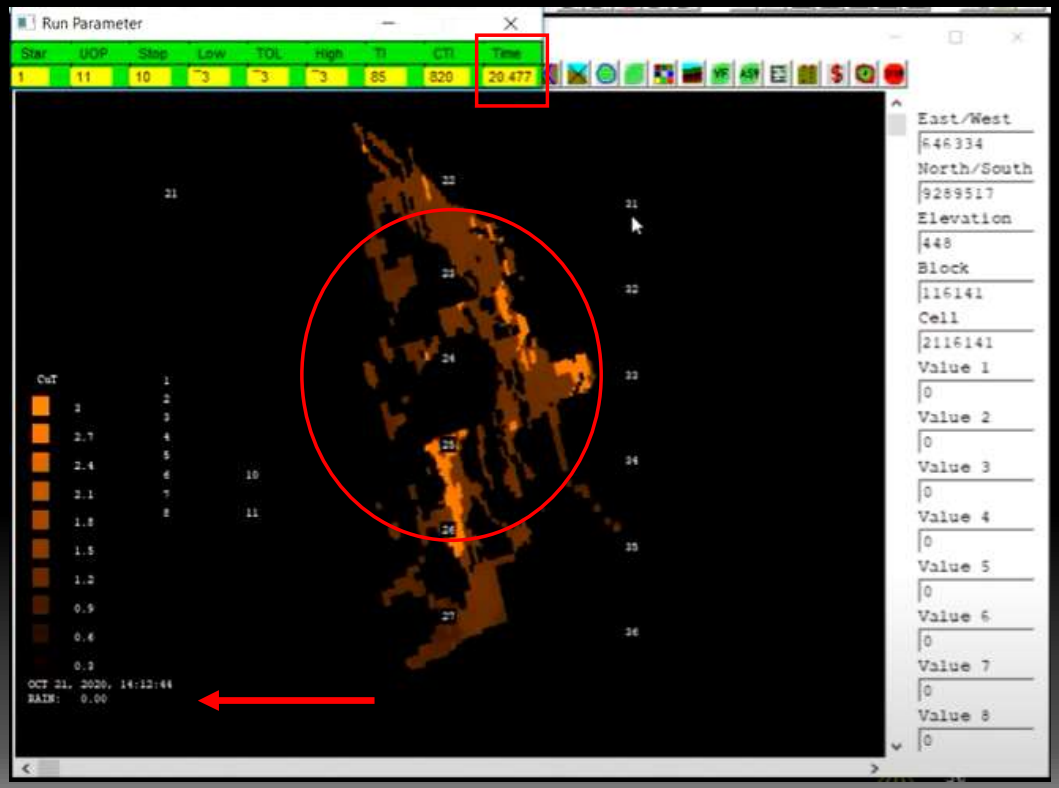

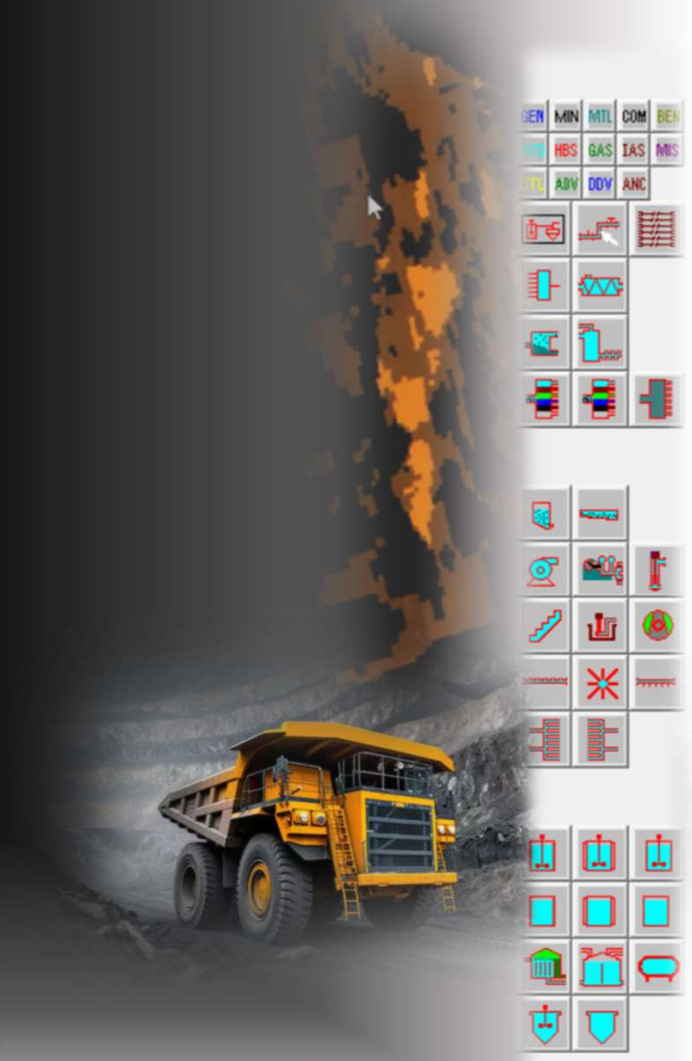

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The Use-Case Study

METSIM® Reducing Design Risk

- ◊ Company → CoreCu(II) Minerals Ltd., Northern Chile
- ◊ Project → New Copper Concentrator
- ◊ Ore Type → Mixed sulfide-oxide copper ore (chalcopyrite, bornite, malachite, cuprite)
- ◊ Challenge → Frequent design changes post-commissioning
  - → Poor recoveries
  - → Cost over-runs (retrofitting, reagent costs)
  - → Ore grade and mineralogy variability
- ◊ Solution → Integrated 10-year LOM mining block model with METSIM® plant simulation

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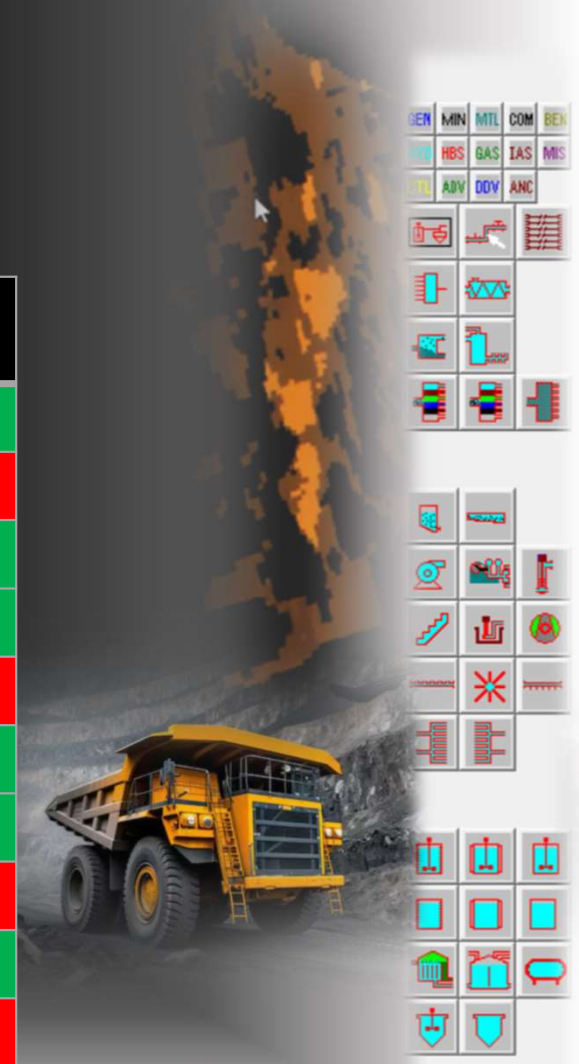
The Use-Case Study
METSIM® Reducing Design Risk

Parameter	UOM	Before METSIM®	After METSIM®	Change (%)
Cu Recovery	%	~86	89 - 91	Precision
Operational Complexity	SOP	80	92 - 100	15 – 25%
Total Reagent Consumption	kg/t ore	14,3	11,3	21%
Reagent Expenditure	US$M/a	~1,2	~0,5	58%
Water Consumption	m^3/t ore	1,2	1,26 – 1,30	5 – 8%
Unplanned Plant Costs	US$/a	12	9,8	18%
Plant Downtime	d/a	14	9	35%
Maintenance Frequency	h/a	480	528 - 576	10 – 20%
Engineering Change Orders (ECO)	#	22	11	50%
Scenario Simulation Runtime	min	2 - 3	6 - 9	200 – 300%



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The Use-Case Study
METSIM® Reducing Design Risk

- ◊ GeM Risk → Pre-empted problematic ore zones
- ◊ Scheduling Risk → Balanced feed strategy
- ◊ Financial Risk → US$10M capital unlocked
- ◊ Strategic Impact → Cross-disciplinary alignment
  - → Boosted investor confidence
  - → Accelerated project delivery
- ◊ Lessons Learned → Integrate geology early
  - → Modular for iteration
  - → Optimised ore targeting

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Summary

◊ **Challenge**	Plant designs based on average (infrequent) ore characteristics
◊ **Current Results**	Reactive response to ore variability Poor economic performance
◊ **Solution**	Well-designed and METSIM®-ready geometallugical campaign
◊ **Impact**	Reduced plant processing risks Reduced plant cost risks

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Questions and Answers

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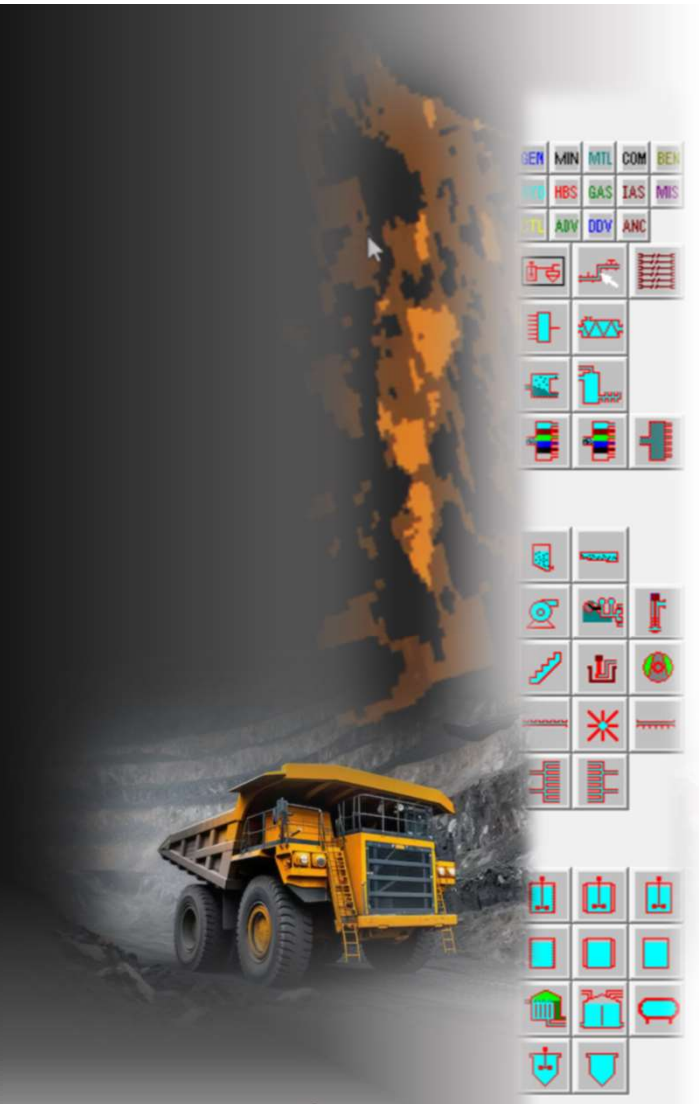

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