



SGS MINERALS SERVICES

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WHEN YOU NEED TO BE SURE





- Deposits are harder to find
 - Grades are lower and ores more complex
 - Located in more remote areas with little or no Infrastructure
 - Located in areas with more political risk
- Costs are rising
 - Energy and labor increasing
 - Remote sites result in premium costs
 - **SO**, tonnages treated and margins required are increasing
 - Cost control is important
- Risk profiles are increasing
 - Must be more carefully managed
- Key technical & operational risks to profile
 - Capital investment costs (capex)
 - Energy (opex)
 - Labor



Risk management is the art of being wise before the event

Project Risk

Discovery
Technical
Environmental
Social

Financial Risk

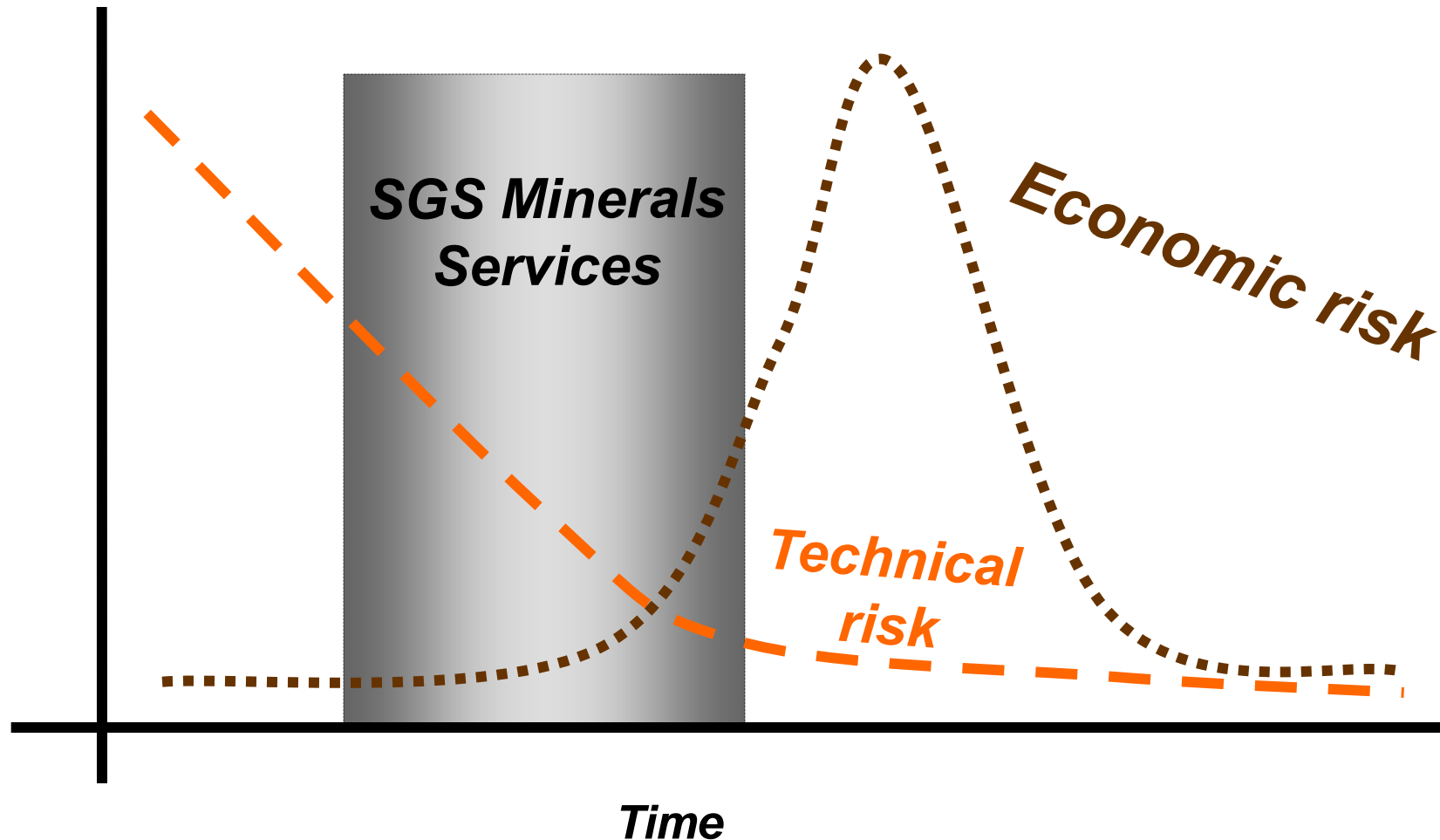
Ability to finance
Metal prices
Interest rates

Political Risk

Nationalization
Contractual
“Regime change”

What can we control or mitigate?

SGS SERVICES REDUCE TECHNICAL RISK BEFORE ECONOMIC RISK INTENSIFIES





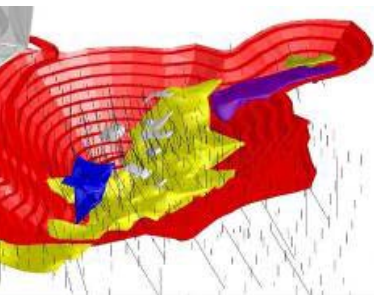
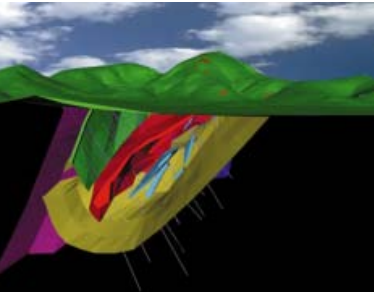


Automated Sample Preparation



Chemical Analysis

DEFINE THE SIZE AND SHAPE OF THE DEPOSIT



*400 million tonnes of
67% copper & 0.02%
molybdenum*

■ Orebody modeling

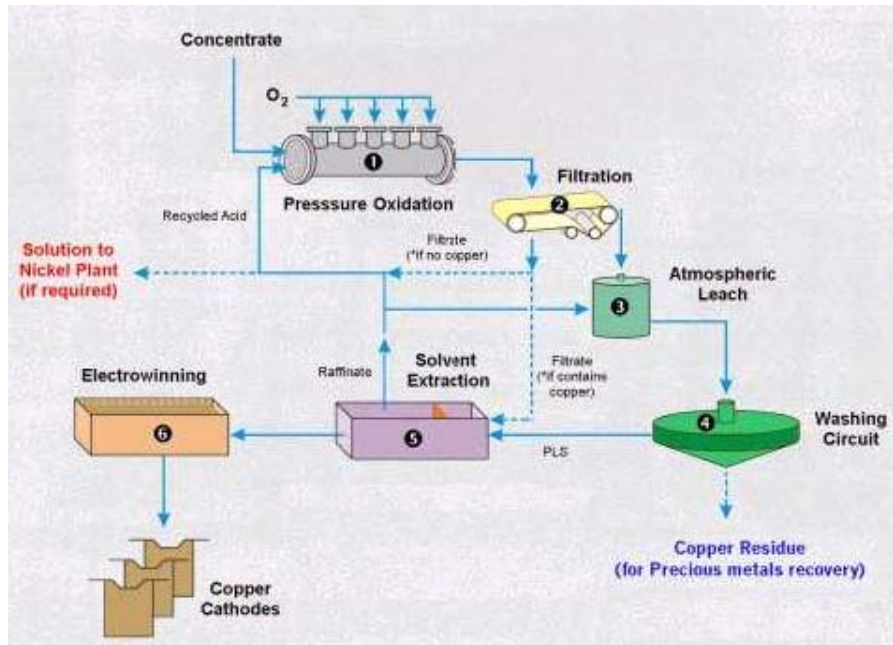
- Statistical treatment to extrapolate drill hole information
- Computer-based 3D modeling showing variability in geological, grade and metallurgical parameters

■ Resource calculation services

- Size-of-deposit assessments
- Develop resource estimates and improvement strategies
- Gives size, tonnage and grade of deposit

■ Technical Reports

- Information reports for stakeholders and investors
- Summarizes important technical progress
- Mandated by stock exchanges



- Design, test and evaluate potential process routes
- Determine efficiencies in:
 - Grade
 - Recovery
 - Operational costs
 - Energy profile
 - Environmental issues
- Independent assessment accepted by technical experts and banks

PROVE IT WITH AN INTEGRATED PILOT PLANT



Beneficiation



PAL Circuit

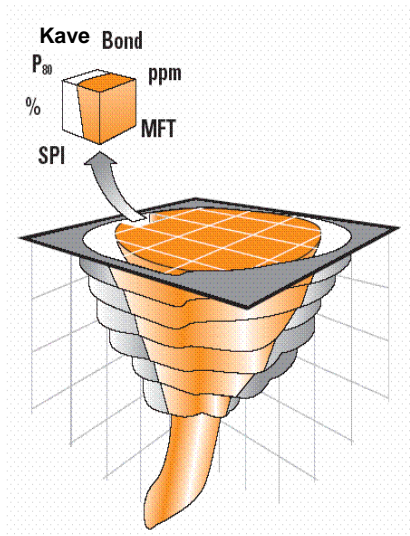


Neutralization, CCD

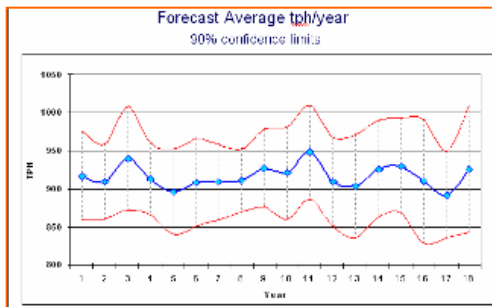


Precipitation, SX-EW

- Mini-mine demonstration of flowsheet running in an integrated fashion using real ore
- Make final concentrate similar to what the mine will produce
- Effective management needed
 - Complex infrastructure, including expertise, facilities, services
 - Strong emphasis on health and safety and written protocols
 - 24/7 operation possible, 100 -150 dedicated staff needed



- Geometallurgy is the integration of geological, mining, metallurgy, environmental, economic information to maximize the Net Present Value of an orebody while minimizing technical and operational risk
- SGS can
 - Recommend how to domain and sample the orebody
 - Test for technical parameters
 - Distribute test data statistically across the deposit
 - Model the planned met processing flowsheet
 - Generate engineering constraints
 - Design and optimize the metallurgical infrastructure
 - Plan mine and site operations, power & water usage for life of mine
 - Simulate and model operations
 - Forecast production variables and product grade





Failures cannot be tolerated...how will we mitigate risk going forward?

■ SGS strategies to control technical risk

- Improve understanding of ore variability
- Model operational scenarios
- Predict metallurgy as we do grade
- Proof of processing (piloting) available for unusual elements
- Risk profiling operational variables over mine life

■ SGS can help improve operational efficiencies

- Onsite labs
- Scenario modeling
- Automated operations
- Process control

■ SGS supports environmentally sustainable operations

- Acid rock drainage prediction and mitigation
- Water treatment technologies
- Water, energy footprint management

Integrated Case Study (geochem, met, min, geomet)

Raglan Ni, Canada, Xstrata



Selbaie Cu-Zn, Canada, BHP Billiton



Escondita Cu, Chile, BHP Billiton



Goldstrike Au, USA, Barrick



SGS INVESTOR
DAYS 26 - 27 MAY 2011,
TORONTO



2014
FOR THE
COMPLETE PICTURE

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