



Grade Control at the Kemess Mine

Minerals North - Mackenzie

Apr 27, 2006



Presentation Outline

Northgate Exploration and the Kemess Mine

1 Introduction to Northgate

2 Grade Control at Kemess Mine

3 Benefits of a Good Grade Control Program

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Northgate

- *We are an Mid-tier Gold Producer*
- *Reserve life at Kemess South until mid 2009*
- *In 2006, Northgate will invest \$7.6 million in diamond drilling at Kemess, Young-Davidson, and the RDN properties.*
- *An initial expenditure of \$2.2 million at Young-Davidson to design and permit an underground exploration program and fund various technical and environmental studies that will be used for project evaluation and feasibility studies*





Kemess South Mine

Principal Assets

- > 300,000 ounces of gold per year
- > 75 Million pounds of copper per year

Reserves & Resources

- > Mineable Reserves: 68.2 Million tonnes.
- > Gold: 1.41 million oz.
- > Copper: 322 Million pounds.

At December 31, 2005

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Kemess North

- 5½ km from existing infrastructure
- In 2005 exploration was focused on the extensive claim package around the Kemess South mine.
- Diamond drilling at Kemess North resulted to the discovery of the fault offset portion of the deposit
- Further exploration of Kemess North to be carried out in 2006.
- Low development cost at the end of Kemess South mine life





Kemess North

Mineral Reserves - Kemess North

	Quantity		Grades		Contained Metals	
	tonnes	Gold (g/mt)	Copper (%)	Gold (ounces)	Copper (000's Pound)	
Proven	299,267,000	0.30	0.16	2,910,547	1,030,798	
Probable	124,631,000	0.29	0.15	1,180,855	412,970	
Total	423,898,000			4,091,402	1,452,768	

At December 31, 2005



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Grade Control at the Kemess Mine

1 GEOLOGY of the KEMESS MINE

2 SAMPLING PROCESS

3 ALTERATION MODEL

4 STOCKPILE MODELLING

5 MAPPING OF STRUCTURES

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SAMPLING PROCESS



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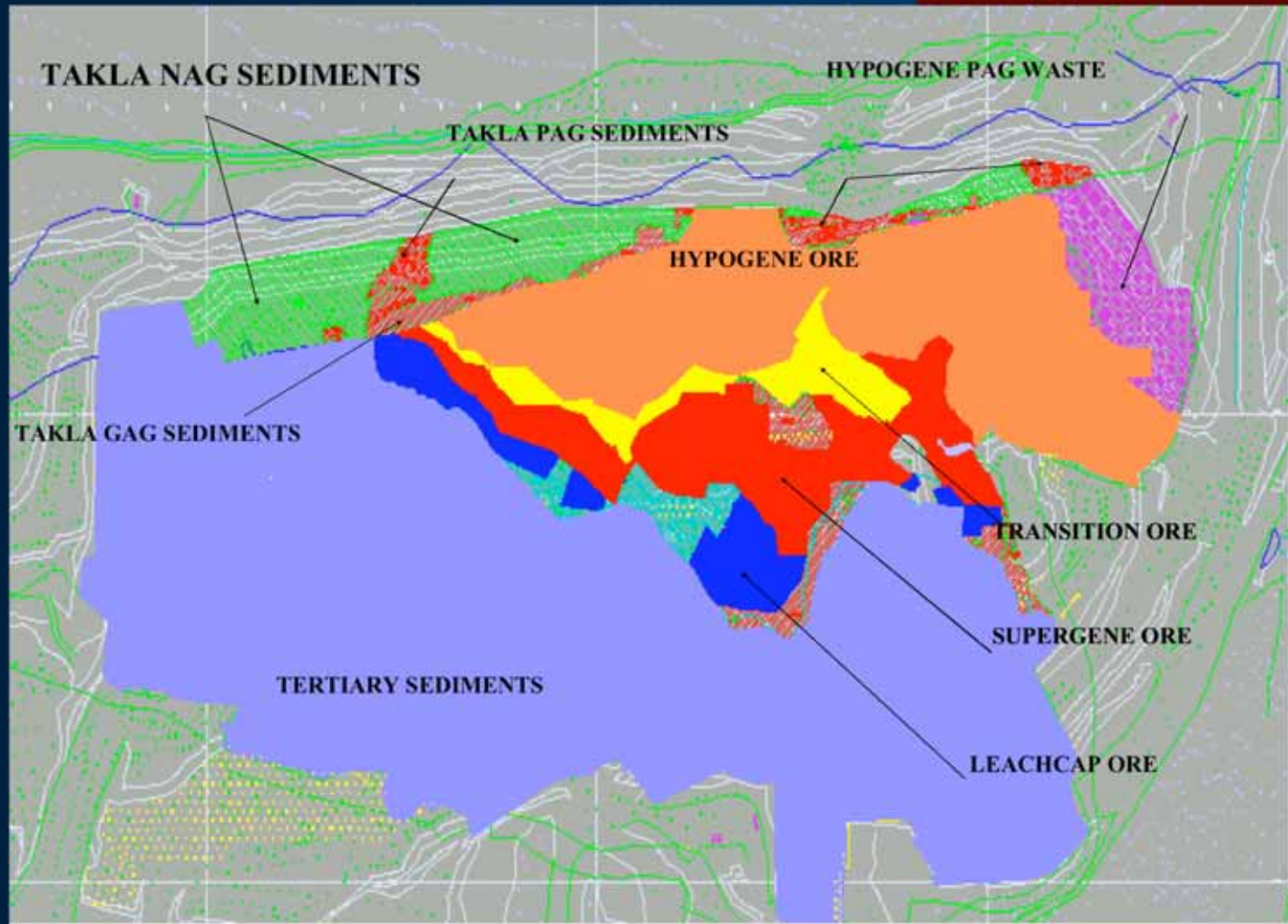
SAMPLING PROCESS

- EVERY ORE BLASTHOLE is sampled and mapped
- EVERY WASTE BLASTHOLE is mapped.
- EVERY WASTE BLASTHOLE, in acid generating waste, is sampled for S%, and every fifth hole is sampled for ABA.
- Four ore types and seven waste types
- Close interaction with the mill and mine supervisors
- Effective communication with the entire operation
- Dig maps are distributed to the crews.

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Geology of Kemess Mine



Bench 1290

MILLING



SAMPLING PROCESS

- On 12 hour intervals a report is sent to the mill which describes the feed for the shift.
- Grade and tonnes estimated
- Alteration description and hardness domain
- Mine and Mill Maintenance Scheduling
- Pyrite to chalcopyrite ratio, and total sulfide content are estimated for Transition and Hypogene ore.
- Native copper and copper oxide contents are calculated for Supergene, Transition, and Leach-cap ore.
- Communication with metallurgist throughout the day



❖ **Materials Management**

- Define the waste characteristics from blasthole samples
 - » Four ore and seven waste types
 - » Stockpile modeling and construction materials
 - » Adhere to permit M-206 requirements
- Daily monitoring of the materials as extracted and placed
 - » Database is updated daily
 - » Efficient software programming updates daily materials moved into a daily/monthly/yearly and stockpile format

❖ **Quarterly reporting of materials moved from the pit**

❖ **Timely permitting acceptance**

Geology of Kemess Mine

Material Management



Alteration Model

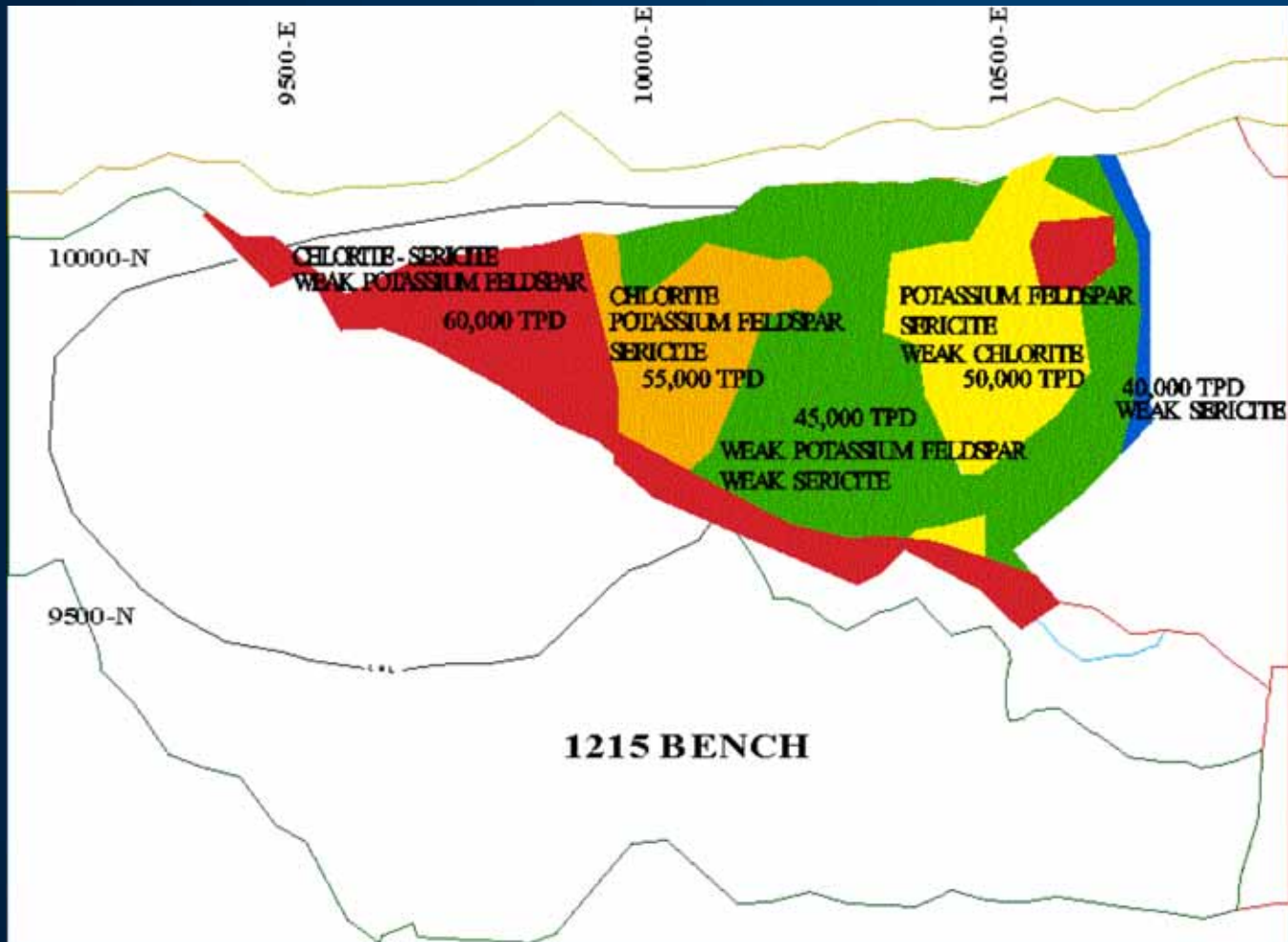
Alteration Types

- Potassic-altered Monzonite: Pink/Brown; Euhedral primary biotite is replaced by finer grained biotite and k-spar.
- Phyllic-altered Monzonite: Light-green; quartz-sericite-pyrite alteration replaces K-spar rich potassic alteration. Or, dark-green quartz-chlorite-pyrite alteration replaces biotite-rich potassic alteration.
- Late Potassic-altered Monzonite: Pink; K-spar-hematite alteration associated with pyrite stringers.
- Supergene altered Monzonite: intense hematite alteration replaces primary hydrothermal minerals and textures.

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Alteration Model – Plan View





- Primary Economic Minerals

1. Chalcopyrite, 0.5-3.0%
2. Gold (Native Gold, Electrum, 1-50 μm), >95%
3. Submicroscopic Gold < 5%
4. Silver – Ag : Au ration is 1.4 : 1

- Accessory Economical Minerals

1. Native Copper
2. Chalcocite – Cu_2S
3. Bornite – Cu_5FeS_4
4. Cuprite – Cu_2O
5. Molybdenite – MoS_2

- Non-economic Minerals

1. Pyrite, 2 – 5 %
2. Magnetite < 1%

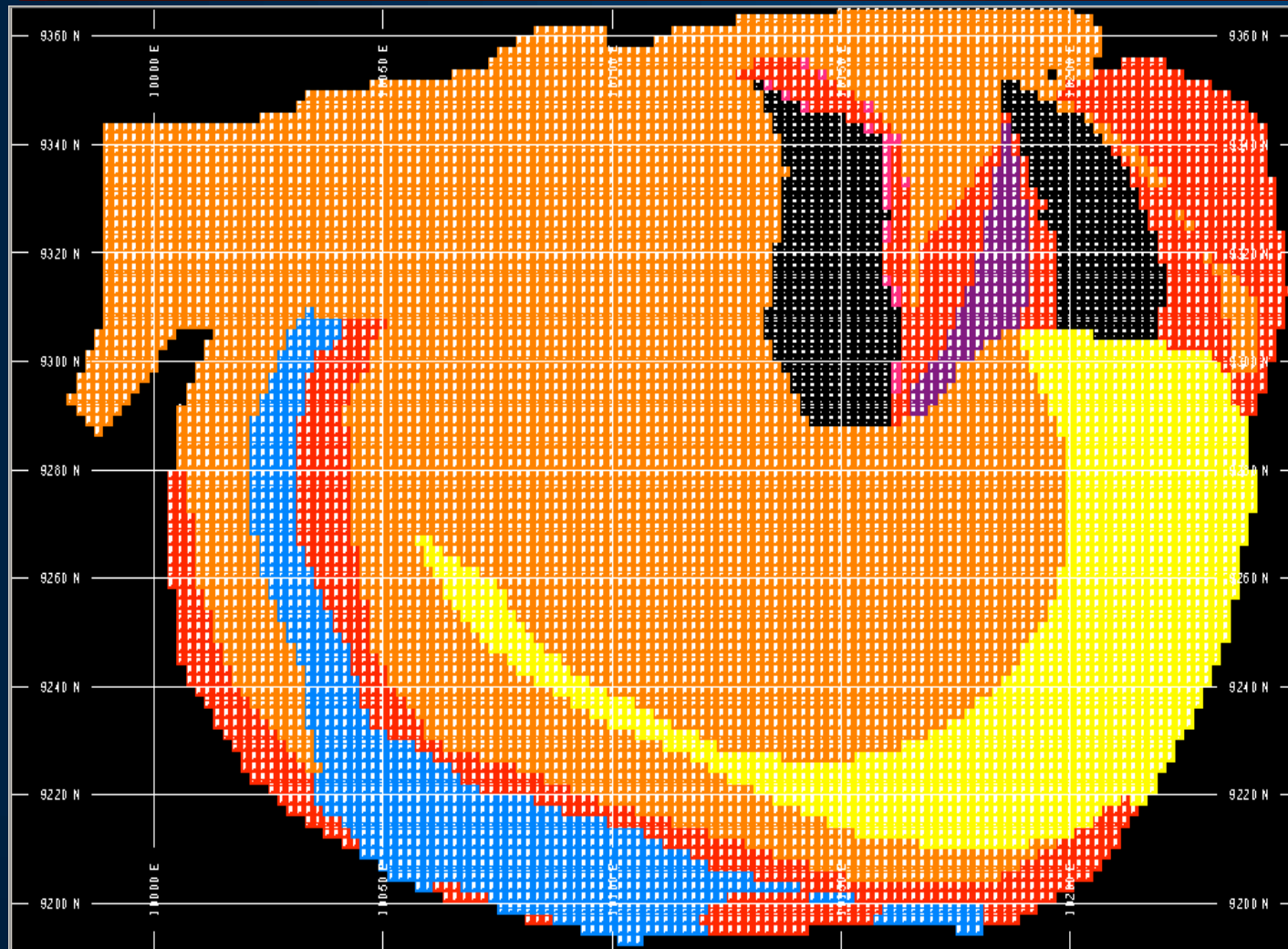
Geology of Kemess Mine

Mineralogy

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STOCKPILE MODELLING





Structural Mapping

High-wall mapping using Sirovision software

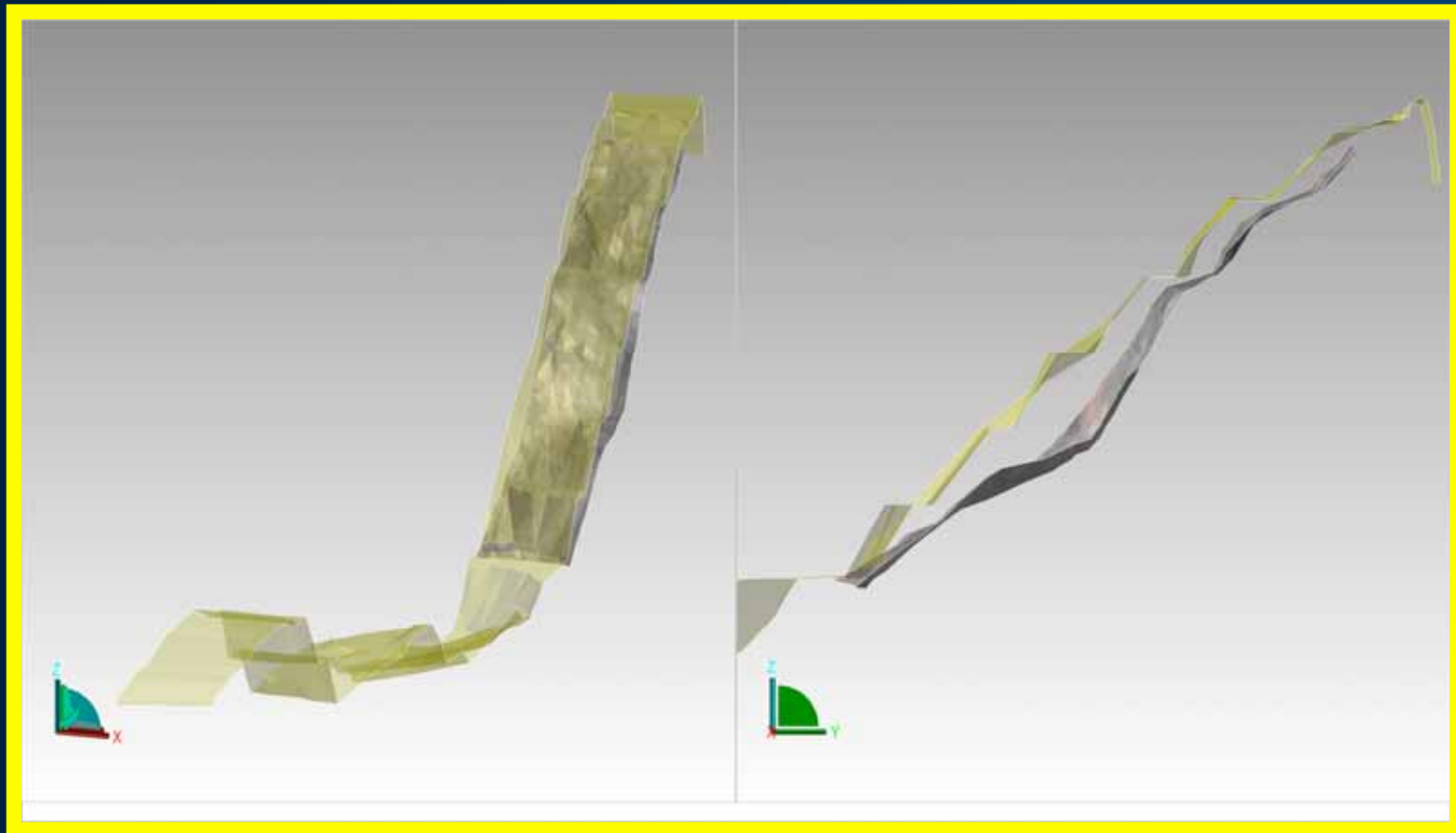
- 3D digital image mapping of rocks and surfaces for Geology and Surveying.
- Pre-failure and post-failure data collection without placing personnel close to the high-wall.
- Data collected is highly accurate and could be gathered from up to 700 m away.
- Data collected is highly precise (1-2 cm) from 100 m away.
- Detailed information can be collected from the entire wall rather than just two meters that previously could be reached.

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Clipped bench view of the Sirovision surface vs. surveyed pit surface

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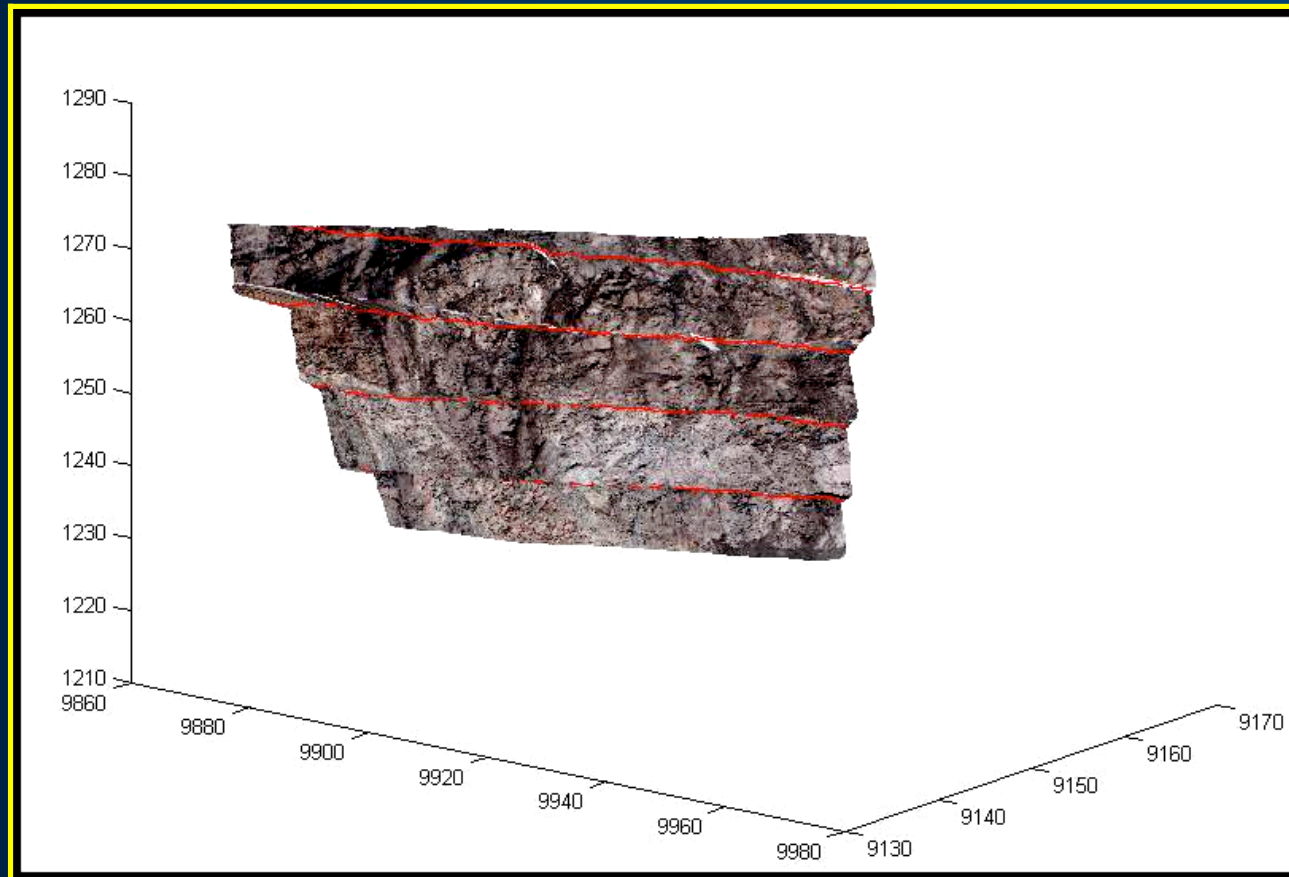


Clipped Sectional view of the Sirovision surface vs. the pit surface

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Structural Mapping

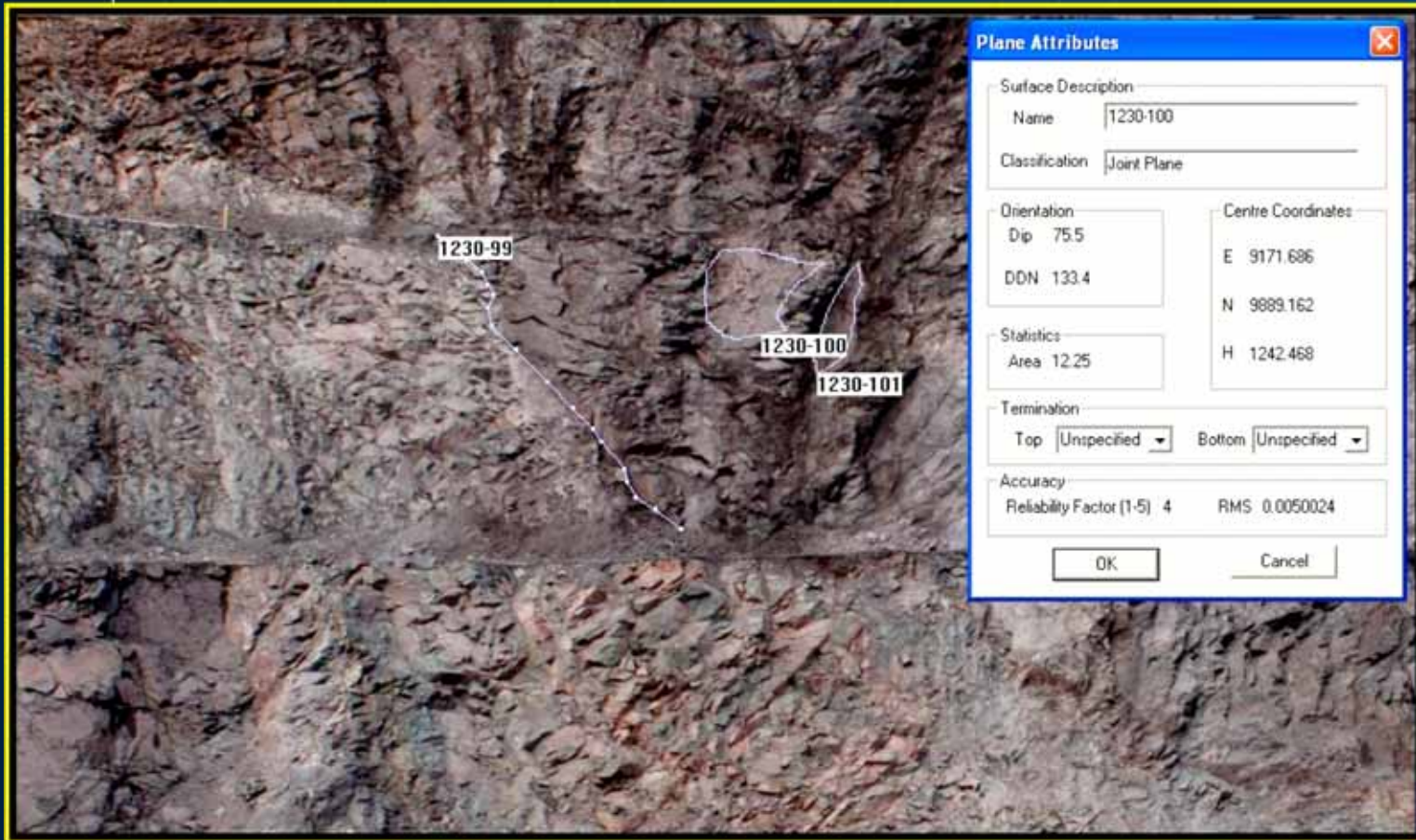


3 D image generated by Sirovision software

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Structural Mapping



3D image of high-wall analyzing the structural features using Sirojoint software



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Operating Costs

Project Operating Costs (per mT milled)

	Kemess South		Kemess North	
	2005	2006-2009	2006-2009	2010-2019
Mining	\$3.42	\$2.45	\$2.45	\$1.61
Milling	\$3.60	\$2.45	\$2.45	\$2.00
G&A	\$1.07	\$1.07	\$1.07	\$0.73
Total	\$8.09	\$5.97	\$5.97	\$4.34



Kemess South Mine

Achievements Since Acquisition in 2000



Increased gold production by 32%



Reduced cash operating costs by 40%



Increased reserve grade by 10%



Increased resource base by 500%



Productivity and External Benchmarks

Operating Costs

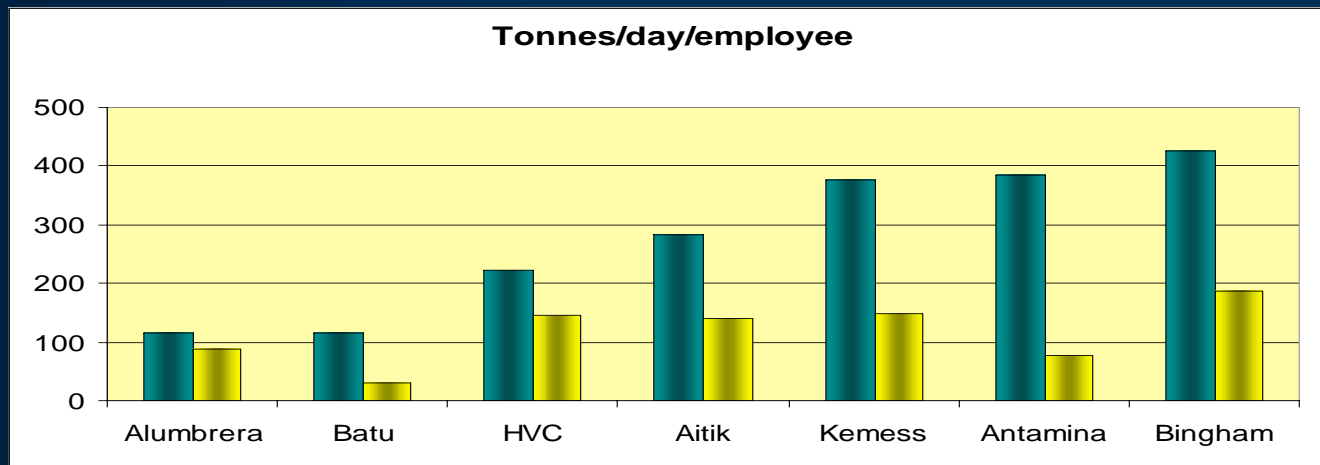
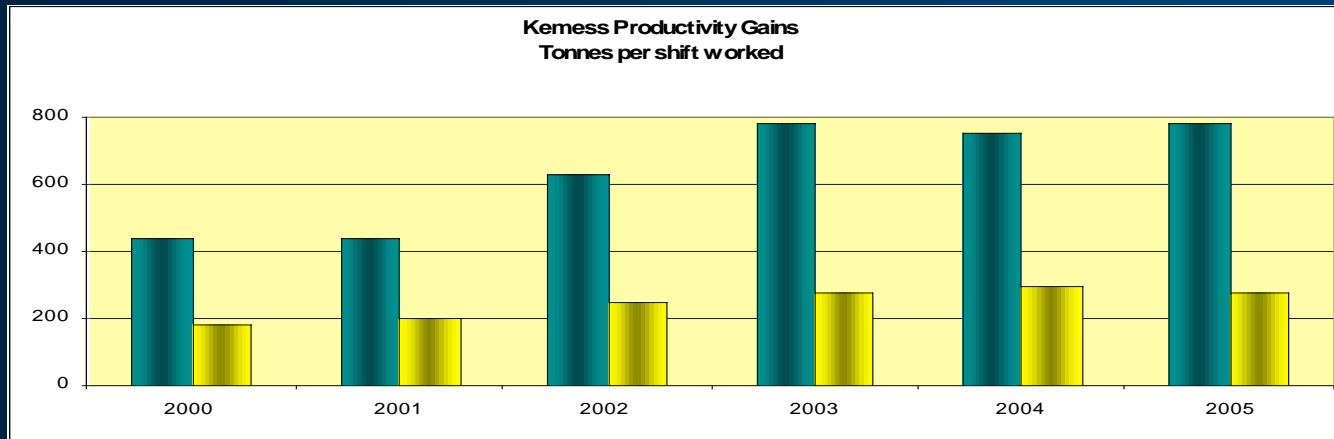


Figure from Chris Rockingham



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