Numerical Modelling of Complex Slope Movements at Savage River Mine, Tasmania

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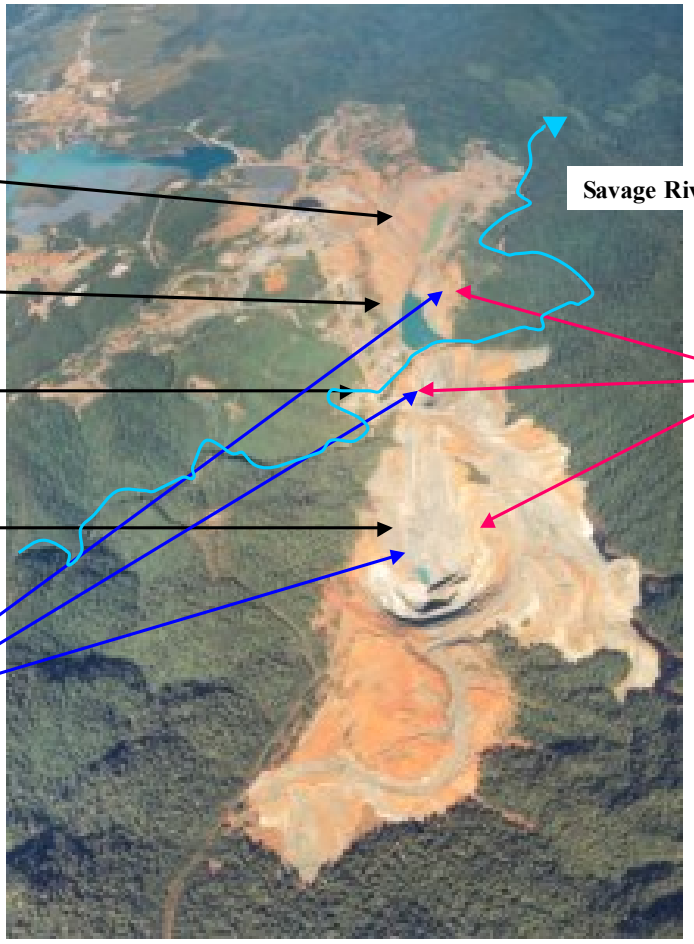
Location of Mine

Slope Stability at Savage River Mine

Savage River Mine



Slope Stability at Savage River Mine

Savage River Mine

Centre Pit - West Wall

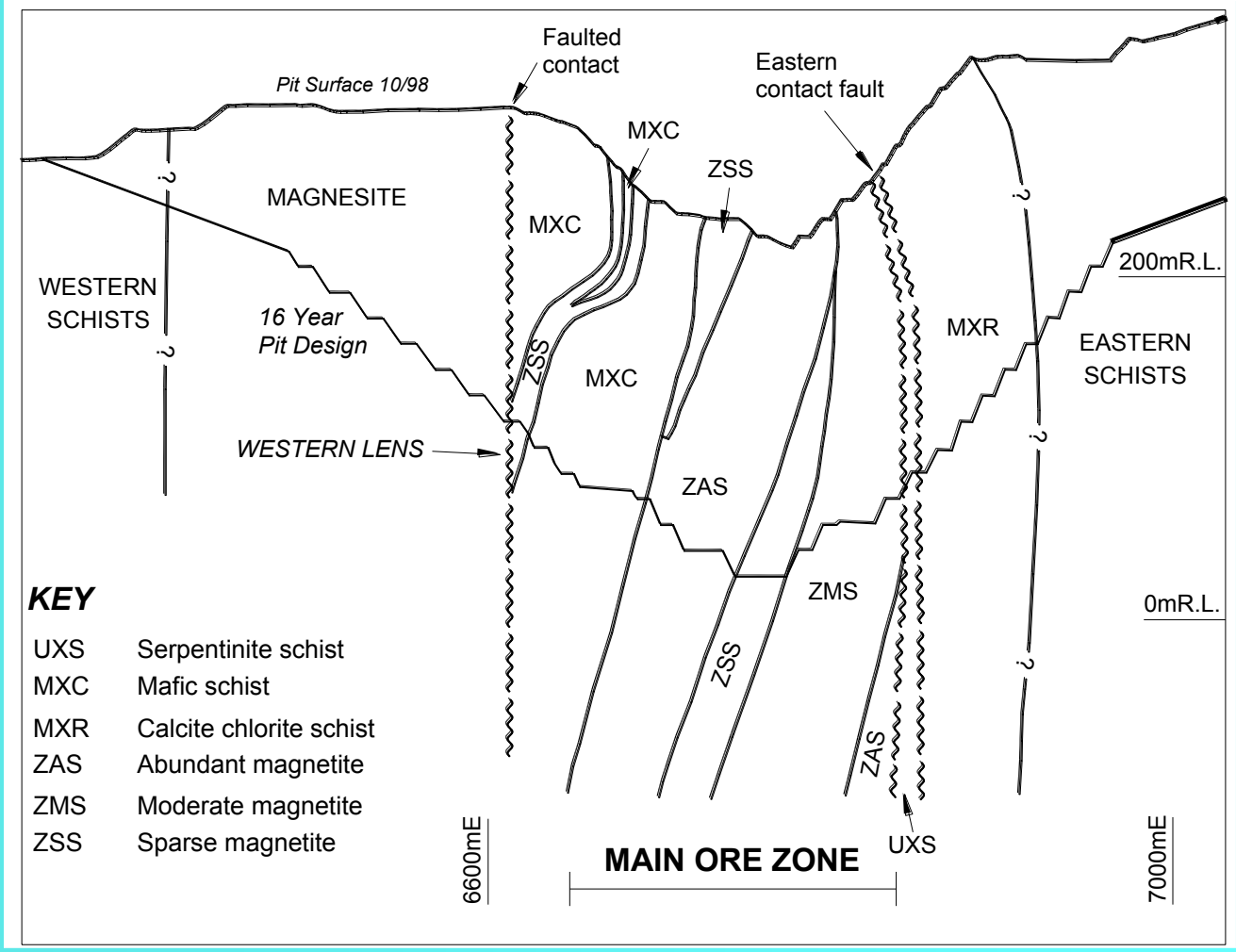
Toppling Failure: 1988-1999

43° & 37° slopes

- toppled twice at approximately 90m in height

ABM

Geological Section



Rock Mass Model

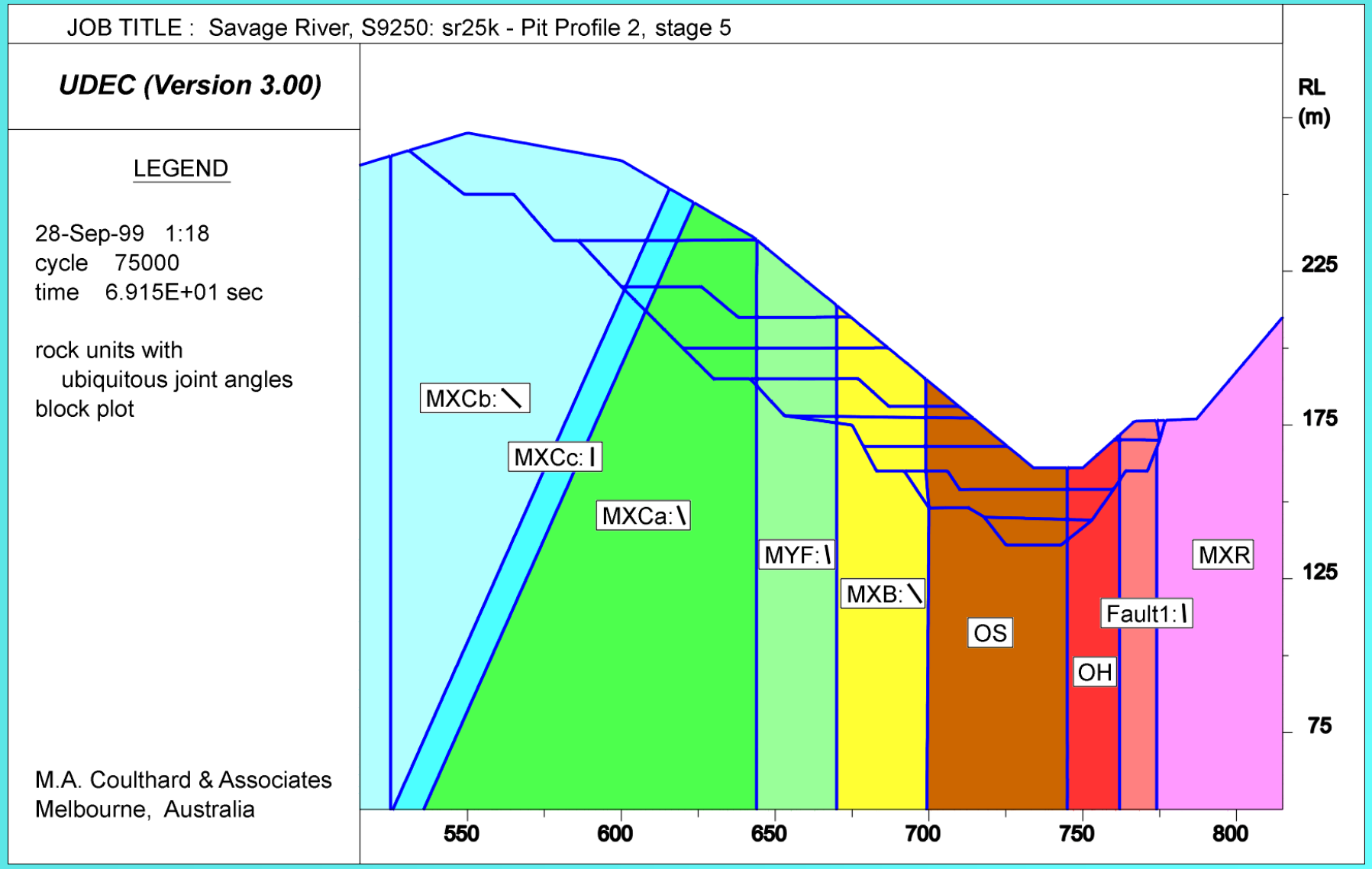
- **Program *UDEC***
- **Explicit discontinuities + ubiquitous joints**
- **Modified Hoek-Brown criterion:**

$$\sigma_1 = \sigma_3 + \sigma_c(m_b\,\sigma_3/\sigma_c + s)^a$$

with parameters from estimated GSI

- ***FISH* code to implement H-B via Mohr-Coulomb**
- **Groundwater pressures in joints and blocks**

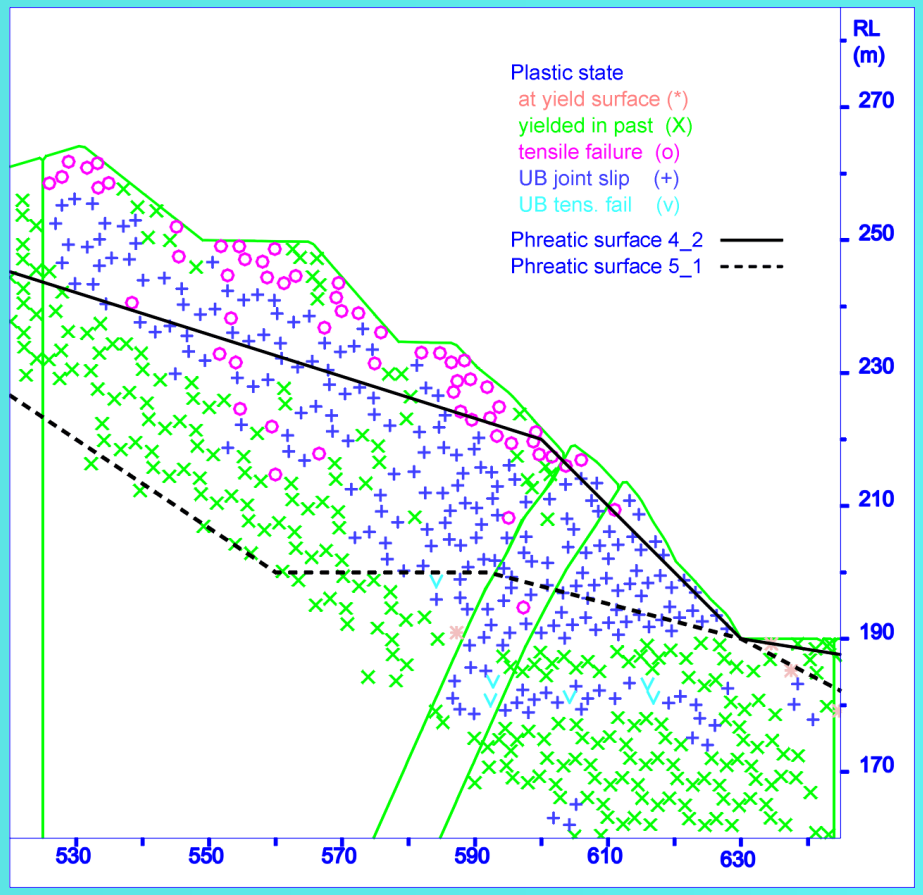
Slope Stability at Savage River Mine

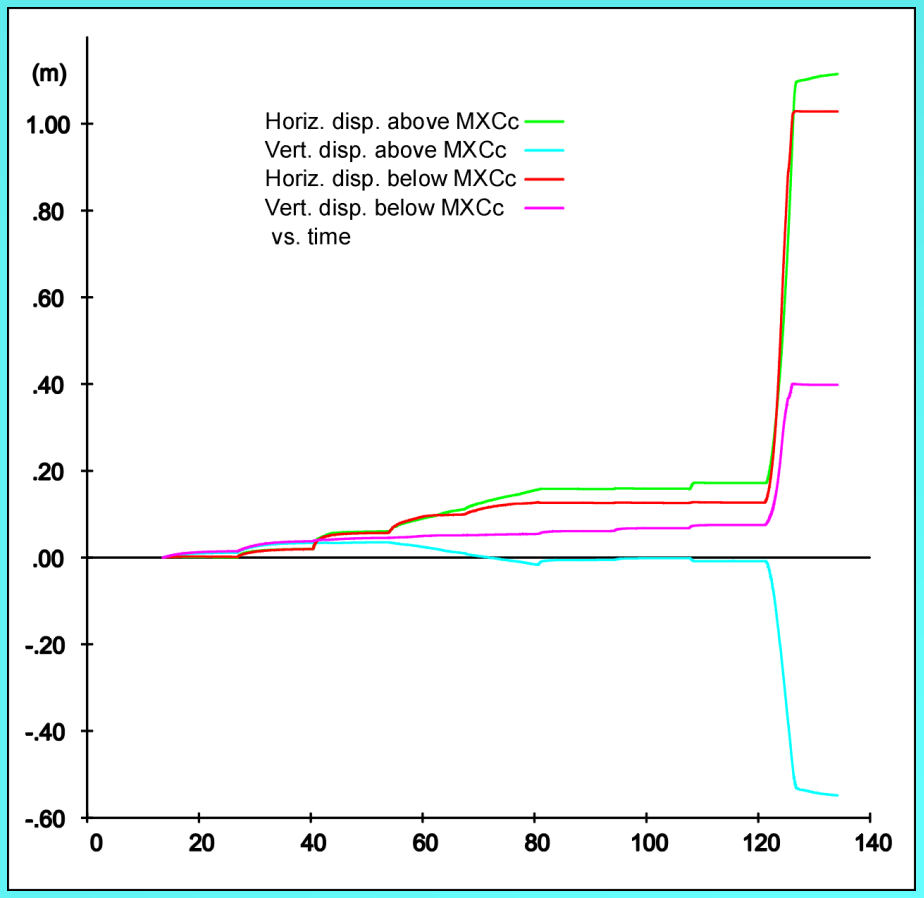


Back Analysis - Section 9250

- **Observed mechanism of failure:**
  combined planar slip - toppling
- **Mid-slope strengths adjusted until slope stable without groundwater**
- **Re-run with estimated phreatic surfaces:**
  major instability, but stabilised by drawdown - consistent with observations
- **Ubiquitous joints in MXB adjusted to reproduce localised slump in lower west wall**

S 9250 failure stabilises after groundwater drawdown





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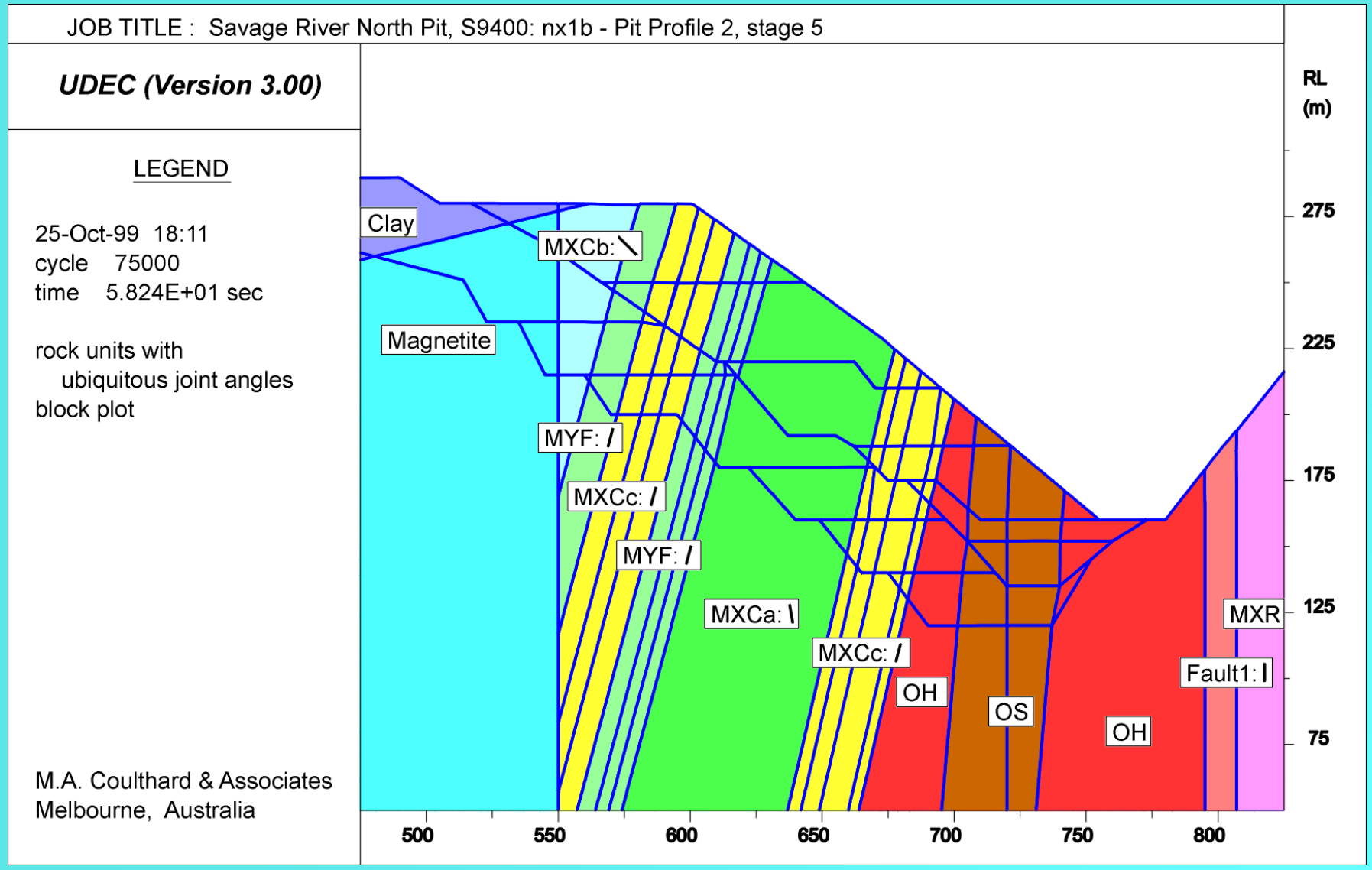
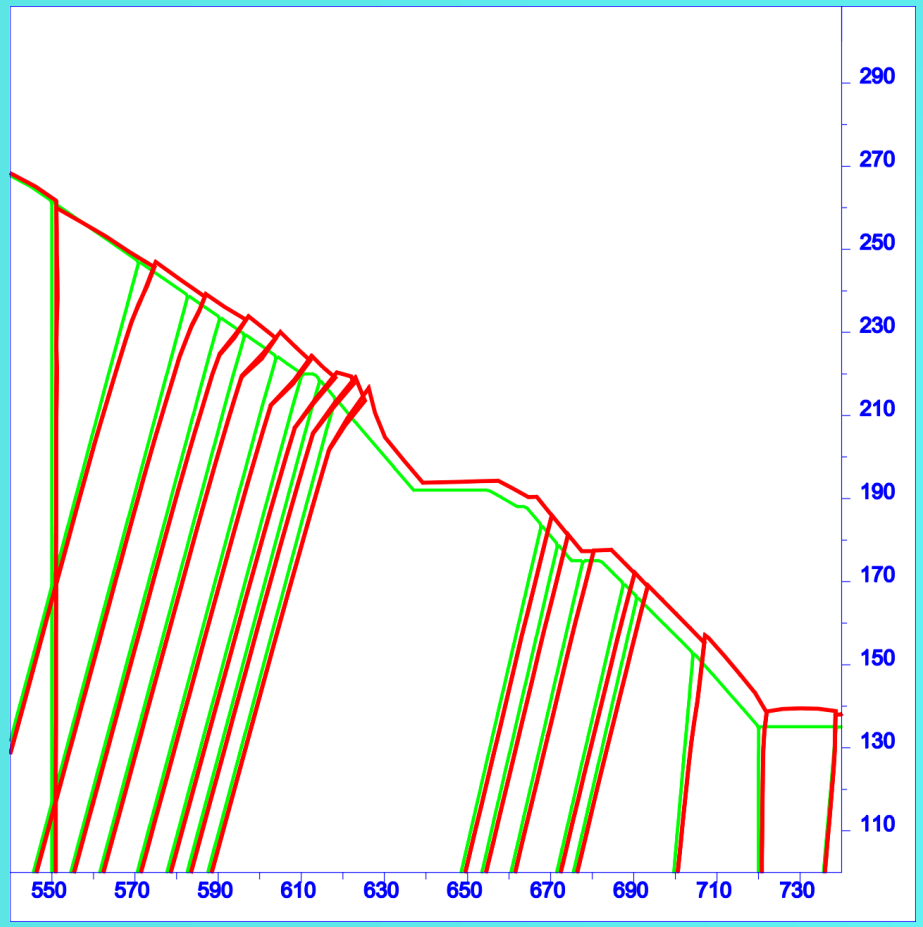
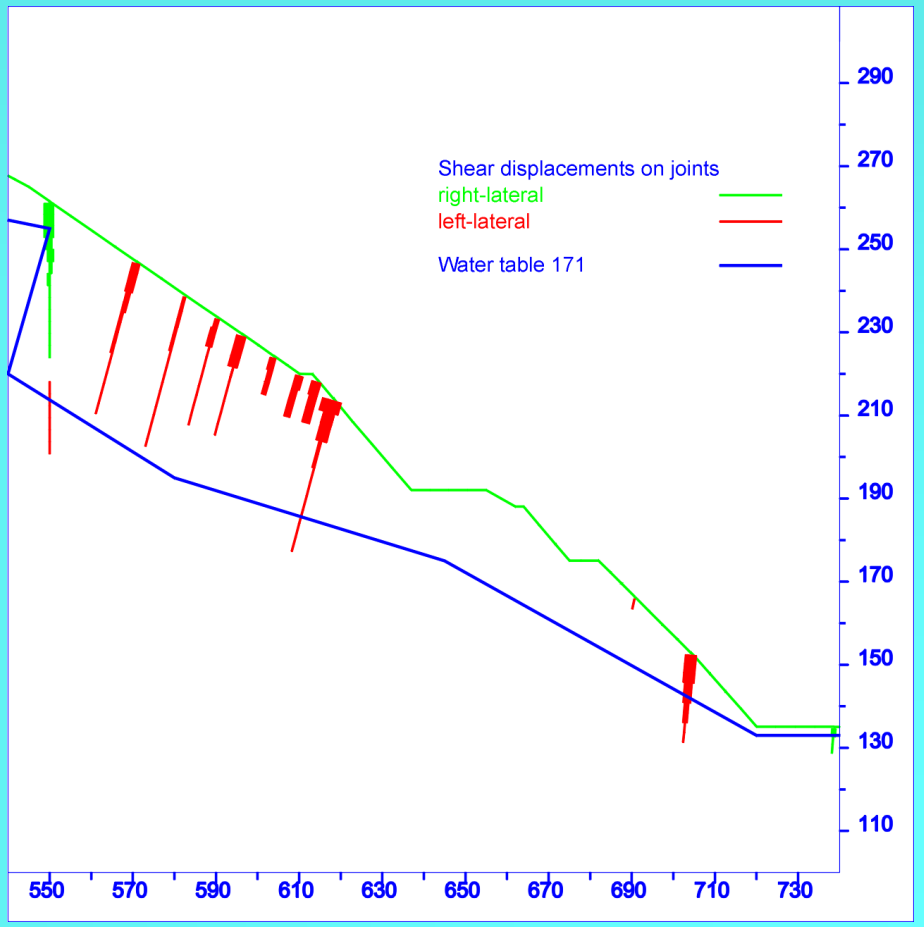


Verification Analysis - Section 9400

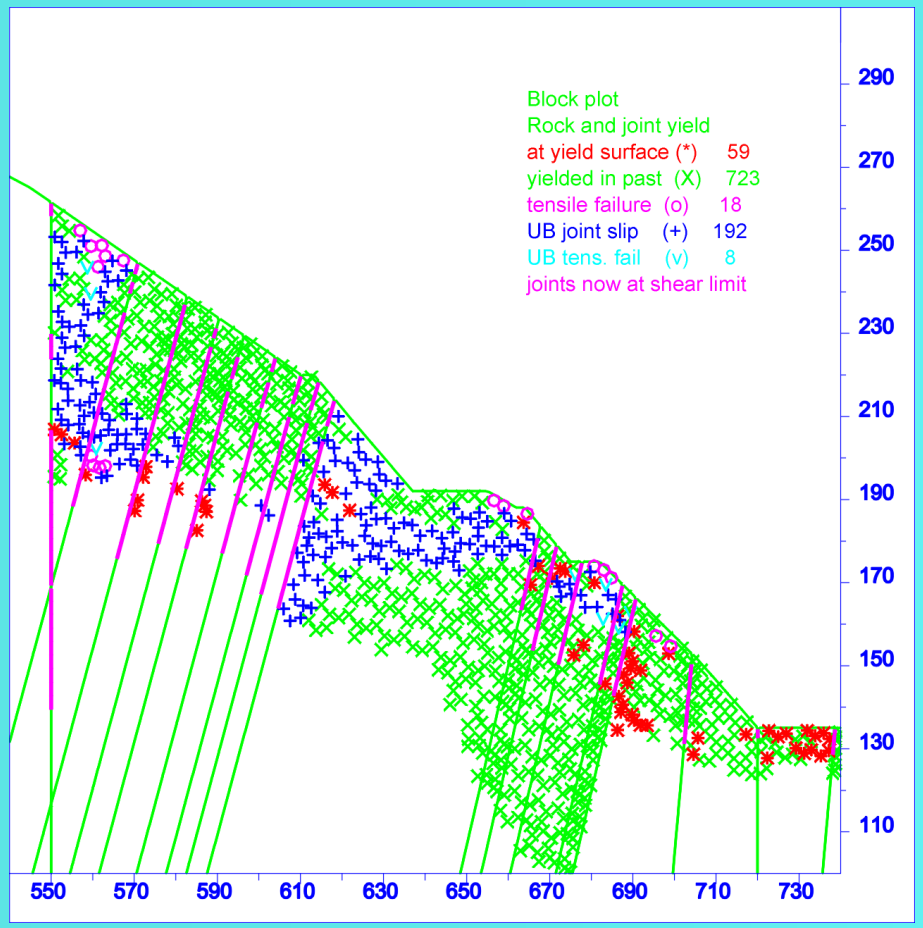
- Rock and joint properties based on S 9250 model
- Mechanism: wedge + flexural toppling
- Good overall agreement with observations:
  mechanism and groundwater effects
- Less relative slip on lower shears than in mine

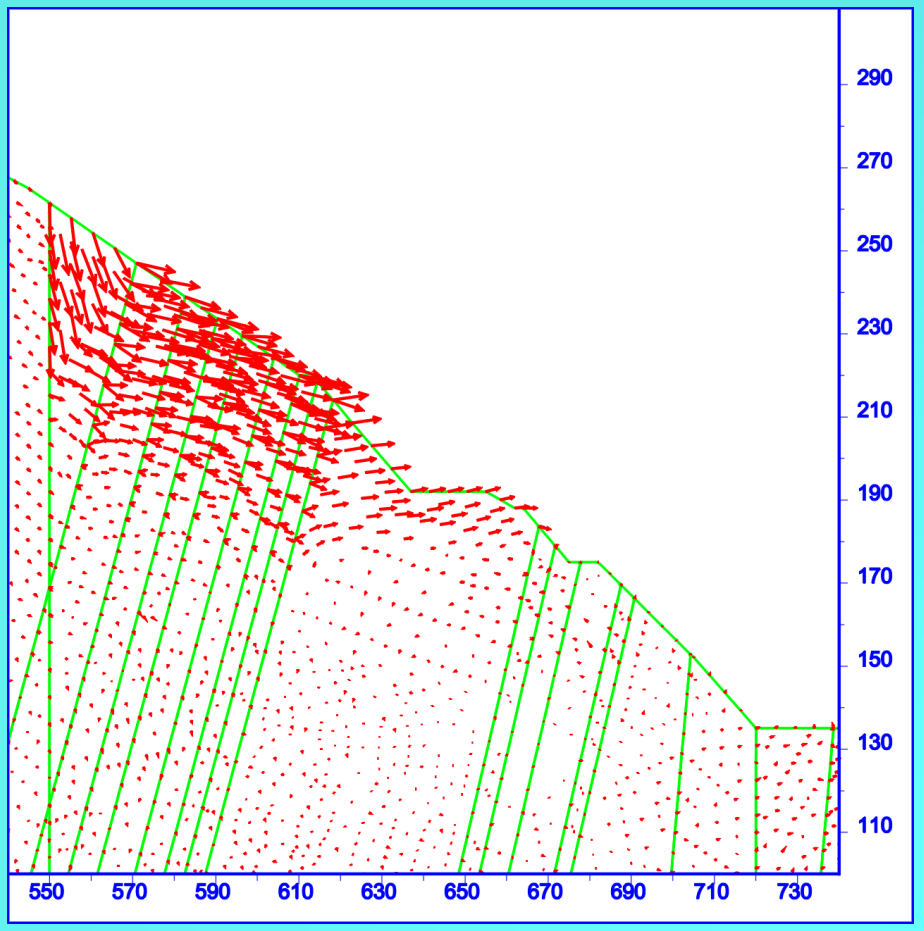
S 9400: wedge and toppling mechanism





S 9400: wedge and toppling mechanism





Assessment of Future Mining Options

- Two options for further mining at S 9400
- Extension 1 - ramp in west wall, floor at RL120:
  similar mechanism, but probably stable without dewatering
- Extension 2 - no ramp, floor at RL80:
  similar mechanism, but slow movement continues even with extensive dewatering

Conclusions

- Rock mass and joint properties from *UDEC* back analysis of S 9250 used in S 9400 model
- Both models of west wall of North Pit matched observed wedge-toppling mechanisms and sensitivity to groundwater depressurisation
- Predictions of stability of future mining options
- Either mining option likely to be feasible, with on-site management and monitoring