Hyperspectral Sensing Technology for Best Practice Mine Environmental Management - Dream or Reality?

Cindy ONG
The dream ........

Guidelines for future environmental monitoring

Recognition as best practice

Adopted by regulators & industry for routine monitoring

Guidelines for future environmental monitoring

Recognition as best practice

Adopted by regulators & industry for routine monitoring
The reality - knowing how the market

HIGH IMPACT - KEY MINE ENVIRONMENTAL ISSUES IN AUSTRALIA

- Acid Drainage
- Rehabilitation – Performance Monitoring/Closure Criteria
- Dust
- Mining below the water table
WHY CHANGE? - CHALLENGES WITH CURRENT METHODS

- Obtaining accurate and representative information
  - point measurements;
  - labour intensive;
- limited sampling especially when
  - Remote;
  - Inaccessible;
  - culturally or environmentally sensitive;
- Consistent over time
  - subjective;
- Ability to compare information both spatially and temporally
- Known quality standard
- Ability to deal with issues of contamination and pollution
AD: one of the main strategic environmental issues facing the mining industry in Australia

Map from www.cia.gov.au

BRUKUNGA
50 km east-south-east of Adelaide
Mineral mapping with imaging spectroscopy
Multi-temporal pH mapping
Inventory, monitoring and risk assessment of abandoned mines
Mapping acid drainage contamination

May 1999
June 2004
June 2005
Salt minerals mapping – trace mineral storage?

Area mapped: 131,376 m²

Using Buckby, et. al. (2003) on Rio Tinto ~0.05 m depth, 25% porosity, 2.65 g/cm³ density, 7043 mg/kg Zn, 5376 mg/kg Cu

Results in 13,055,490 kg precipitates with 91,950 kg Zn; 75,200 kg Cu
Soil & vegetation information products from hyperspectral data to characterise the landscape, integrated with DEM from digital stereo pairs to evaluate erosion potential.
Erosion potential map
Monitoring of rehabilitated lands: A substantial regulator’s challenge, linked to environmental bonds, performance monitoring and closure criteria
Rugged, inhospitable environment
Stability

Infiltration

Nutrient Cycling

2002

Multi-temporal
Dust: Topical issue that threatens to close down operation
<table>
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<th>Year</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Average</th>
<th>Variance</th>
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**Note:** The table contains data for different locations and years with maximum, minimum, average, and variance values.
Multi-temporal map of iron oxide dust on mangroves

1998
Pre-wet

1999
After cyclone

2002
Pre-wet
Impact of cyclone “Gwenda”
Impacts of dust management

Pre-wet 1998

Pre-wet 2002

Change between years
INDUSTRY

• Incorporation into environmental management plan;
• Applying for inclusion into Ministerial agreement;

REGULATORS

• Endorsement from regulators, environmental groups, industry and community
The next dream ...............