The Progress of Rehabilitation

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History

• Prior to Sept 1990 some mining leases had restore or rehabilitate conditions, others didn’t.

• Sept 1990 – May 1995 shall undertake rehabilitation to satisfaction of the Minister. The requirements were defined in EMOS. From May 1995 to January 2001 EMOS was statutory requirement.

• Post 2001 rehabilitation should comply with Rehabilitation Guideline & EA conditions

• Original mine site EOs willing to “have a go”
  – Conducted many trials
Open Cut Problem Areas

- Out of pit slope
- Elevated landform
- Low wall
- Final void
- Highwall
Challenges

• Dispersive material
• Final Land Use
  – Grazing
  – Bushland / native ecosystem
• Four general rehabilitation goals:
  – site safety
  – site stability
  – avoidance of adverse impacts off-site and
  – ability to sustain an agreed land-use
Unstable and/or dispersive material
<table>
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<tr>
<th>Rank</th>
<th>Strategy</th>
<th>Comments</th>
<th>Provisos</th>
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<tbody>
<tr>
<td>1</td>
<td>Bury under other spoil</td>
<td></td>
<td>Do not locate dispersive spoil at toe of low wall</td>
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<tr>
<td>2</td>
<td>Cover with at least a metre of rocky spoil</td>
<td></td>
<td>Select cover material that is able to store and release infiltration without allowing free water to contact the dispersive spoil</td>
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<td>3</td>
<td>Topsoil and grass cover (some trees might be introduced later)</td>
<td></td>
<td>Select slope angle to avoid sliding failure along the soil/spoil interface when wet. Provide measures to assist erosion control until grass is established.</td>
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*Not Recommended for Tertiary Spoil*

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<td>4</td>
<td>Trees and shrubs without continuous grass/ground cover</td>
<td></td>
<td>High risk of gully erosion</td>
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<tr>
<td>5</td>
<td>Landforms with plateau or batter ponds</td>
<td></td>
<td>Ponds only poorly establish vegetation, and allow water to enter landform</td>
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Contour Banks / benches

- Contour banks are earthen structures constructed across slopes, at intervals down the slope.
- They intercept run-off and safely channel it into stable waterways.
- Their function is to reduce slope length and to intercept runoff before it concentrates into an erosive force.
- Contour banks play an important role in acting as sediment traps. Up to 80% of the soil moved from a contour bay may be deposited in the contour bank channel.
Learn from agriculture?
Former contour banks
Ponded landforms
Successes

- Australian subsidence case studies in areas of undulating topography and well drained soils have shown negligible effects on broad-acre cropping (wheat, soya beans, lucerne and pasture) and viticulture production.
- Progressive rehabilitation signed off for initial LW panels at Kestrel returned to grazing.
- Creek diversions completed according to 2002 ACARP guidelines (adopted by DNRM) heading toward relinquishment.
- Examples of successful spoil rehabilitation.
Creek Diversion
Spoil Rehab - 3 months & 15 months

- Wheat in winter & millet in summer provide rapid ground cover, which is eventually replaced by perennial grasses
Final Outer Slope
Failures

• Failure to learn from mistakes.
  – Still constructing engineering structures for final landforms
  – Structures still failing
• Knowledge sharing and mentoring.
  – Most of the old heads from 80s & 90s gone
  – Wiki ACARP project, may be too little, too late
  – Re-inventing the wheel.
• Still see sites planned around mining only, then rehabilitation is an add-on.
  – Eg final void located next to diversion only protected by levee.
Rehabilitation Progress?

- The total Bowen Basin coal area disturbed until 2006 was 95,600 ha, of which 26,700 ha had been rehabilitated (DERM 2007). (28%)
- Currently 156,200 ha disturbed (coal), 29,200 ha rehabilitated. (19%)
- Total Rehab Liability (coal) - $4.9B ($38.5k/ha)
- FA after discounts - $4.4B
Where to from here

- Historic rehabilitation (pre 2001) must be evaluated against requirements in place when rehabilitation was completed.
  - If there is an identified objective (e.g., low intensity grazing) evidence must be provided how objective has been achieved
- Progressive signoff
  - Progressive Rehabilitation Advisory Committee
  - Evidence that completion criteria met
  - Risk assessment
    - What components at risk of failure
    - Likelihood of failure
    - Consequence of failure
Acknowledgements

• Various ACARP projects
• CQMRG presentations
• Gil Fletcher
• Rob Loch