Using soil material identification to deconstruct coalbed methane water storage ponds and rehabilitate pasture land

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BeneTerra

• Based in Wyoming USA and Queensland Australia
• Disturbed land rehabilitation
• Wastewater treatment and re-use
Glenn Bailey

• Formed more than 40 years ago
• Australian
• Trained in Forestry
• Worked in soil science since 2004
• Focus on pedology and soil constraints

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Coalbed Methane in Australia

- CBM (Coal Seam Gas- CSG in Australia)
- Exploration and appraisal wells
- Legal requirement to rehabilitate
- Water storage dams
- Remote sites, small scale, isolated
- 600 mm rainfall, summer dominant
- Hot summers, mild winters

Over 25 sites within Central Highlands Qld
Bowen basin
Problem Statement

Hundreds of holding ponds were built without regard for soil quality and haphazard placement of materials has led to placement of poor quality materials near surface.
Earthen water storage dams

• “Turkey’s nest” design
  • Soil for walls pushed up from dam cavity
• Usually lined with plastic, sometimes dry
• Thirty-six sites rehabilitated to date

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Assessing the dam walls

• Some dam banks appear more favourable than others
From the soil profile to the dam walls

• The native soil is generally best at the surface and grades to poorer qualities—often sodic

• This is inverted in the dam wall construction

• E.g. uniform brown cracking clay (SC18-Vertisol)

Saline and dispersive

Low sodicity and salinity

Dam wall materials

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The example of SC18 (Vertisol)

Ground surface

NW

SE

1.5 m

1st

2nd

pH1:5- 9.0
EC1:5- 0.8
dS/m
Horizon-
C/B2

2nd

pH1:5- 8.4
EC1:5- 1.0
dS/m
Horizon- C

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The example of SC18 (Vertisol)

**Ground surface**

- pH1:5: 8.9
- EC1:5: 0.3 dS/m
- Horizon: B2/A

**Horizon C**

- pH1:5: 9.0
- EC1:5: 1.0 dS/m

**New surface soil**

- pH1:5: 8.7
- EC1:5: 0.2 dS/m
- Horizon: B2/A
The example of SC18 (Vertisol)

• Gradation in salinity from surface
• Usually not focused on just one factor:
  • pH
  • Original horizon position
  • Dispersion/sodicity
  • Morphological features (texture, colour, structure)
  • Calcite, gravel, stone
• Aim for most favourable combination at the surface
• N and P fertiliser and gypsum applied to surface
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