



**RIO
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COAL AUSTRALIA



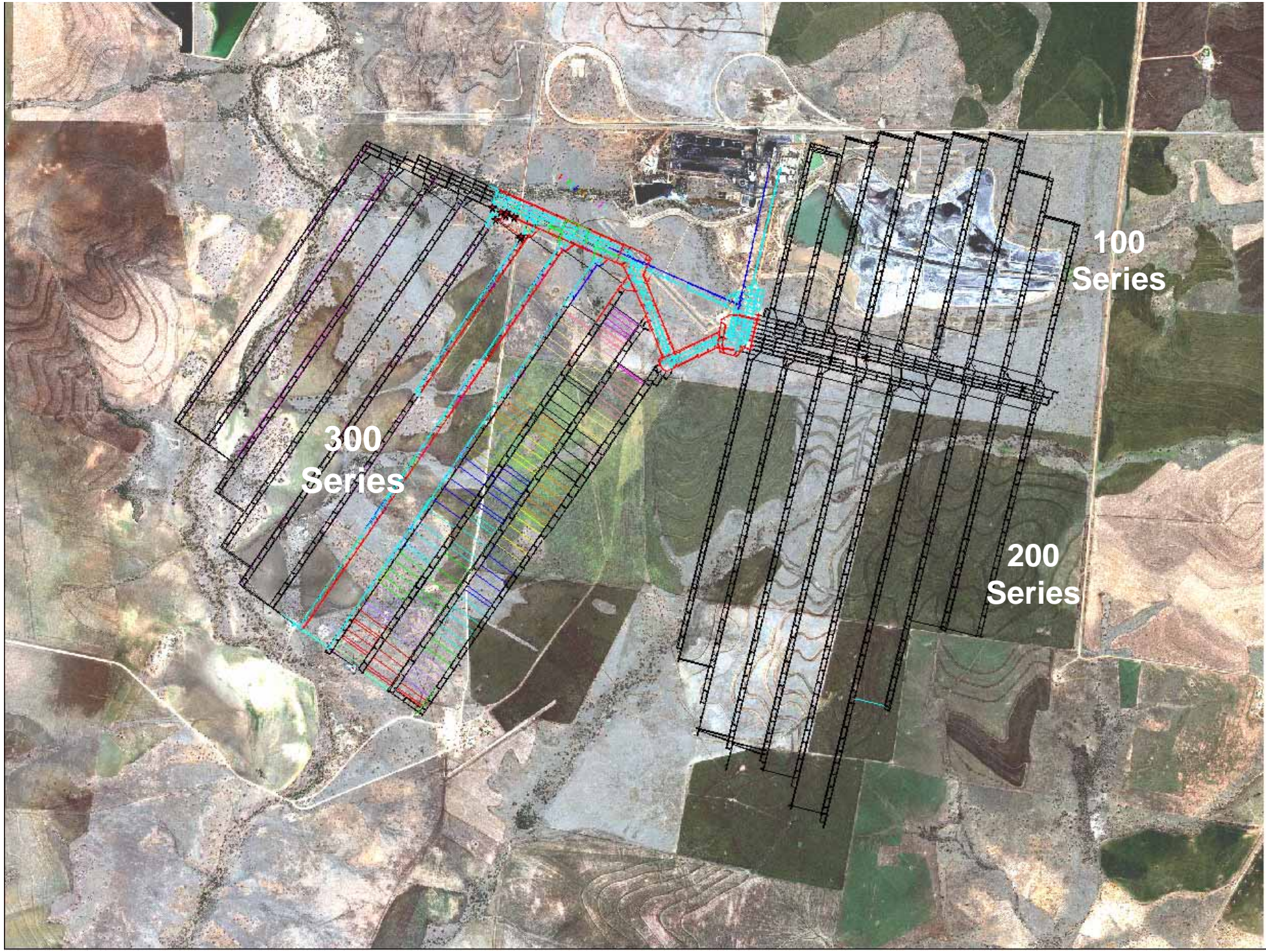
Kestrel Coal Mine

Subsidence and Agriculture

Fitzroy Basin Association
CQ Mining Forum
Emerald Memorial Club 18 October 2006

Kestrel Overview

- Located 50km NE Emerald.
- Underground longwall mine, producing 4mt product per annum, mainly high quality coking coal.
- Life of Mine is approx 30 years.
- Current surface operations situated on Gordon Downs, which is owned by Rio Tinto. Leased to NAPCo for cattle backgrounding. Forage crops are planted when permitted by seasonal conditions, majority planted to butterfly pea & perennial grasses.
- Current longwall surface disturbance occurs within Gordon Downs under the existing mine plan.



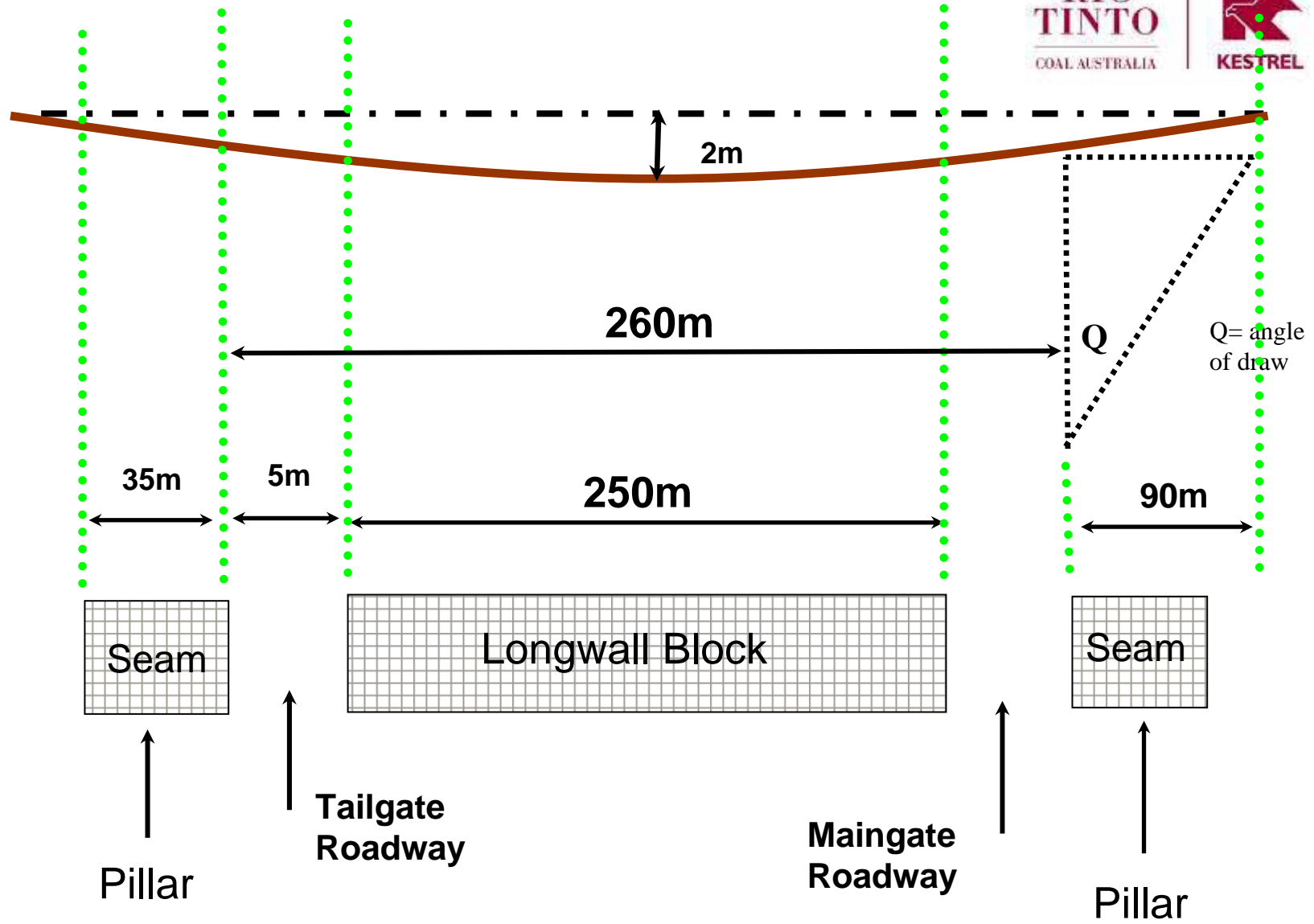
100 Series

300 Series

200 Series

Longwall Subsidence

- Coal at Kestrel occurs in 3m seam and ~280m below the ground.
- Coal mined in panels approx 4km long and 250m wide.
- Each panel takes about 10 months to mine.
- As coal is mined, rock above collapses into empty space known as the goaf: collapse occurs instantaneously as longwall retreats.
- On the surface this results in 1.6 – 2m subsidence along the centreline of the panel.
- Surface subsidence is complete within 60 days.
- ML conditions define as = / >20mm movement.
- Subsidence Angle of Draw caused by horizontal stresses.
Factor of cover depth: typically ~90m beyond goaf boundary, therefore total influence zone is wider than the longwall panel.



Rehabilitation Strategy

- Subsidence from goaf collapse is Kestrel's main footprint: 120ha in 2005.
- Subsidence Management Plan to manage land exposed to subsidence: protect soil.
- Land to undergo subsidence is identified; existing contours removed. Vegetative cover maintained to minimise risk of erosion: may not need to remove grazing if permanent pastures.
- Following subsidence, new contour system developed, land returned to production.
- Aim of rehabilitation is to return land to previous use: cropping or grazing.
- Successfully rehabilitated 811ha to date.

Natural undulation of land pre-subsidence

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Land surface following subsidence



Agricultural Production

- Visually, hard to determine subsided land as surface is naturally undulating: no open cracking, topography is altered.
- ACARP / UQ study undertaken 2003 Gordon Downs: wheat yields & germination not significantly different between subsided and unsubsided land: unsubsided 2.73t/ha vs subsided 2.88t/ha.
- Permanent pastures biomass and species diversity does not appear to be influenced from subsidence. Further work program.

Summary

- Longwall mining low surface impact method.
- Rehabilitation methods enable land to be returned to production.
- No significant impact on agricultural productivity
- Opportunity for mining and agriculture to 'cohabit'