Engineering & Construction

Backfill or not?? Water management considerations during rehabilitation

Chris Gimber - Principal Environmental Engineer, KBR
Brad O'Reilly - Environmental Engineer, New Hope Group

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Introduction

- Voids are an inherent part of open cut operations
- Decision required about how to rehabilitate voids
- Goals:
  - Safe
  - Non-polluting
  - Stable Landform
  - Sustains Agreed Land Use

Introduction

- Australian Centre for Sustainable Mining Practices (ACSMP) – Jan 2016
  - In Hunter Valley currently plans for 30 final voids
  - Combined footprint of 3,840 hectares (~38 km2)
- Reported plans for final void use was varied:
  - backfilled and rehabilitation to a stable landform (n=6)
  - coal and tailings placement (n=7)
  - water storages (n=6)
  - others (undecided)

Final void management decisions

- Start with end use in mind

Water storage
Aquaculture
Pumped hydro

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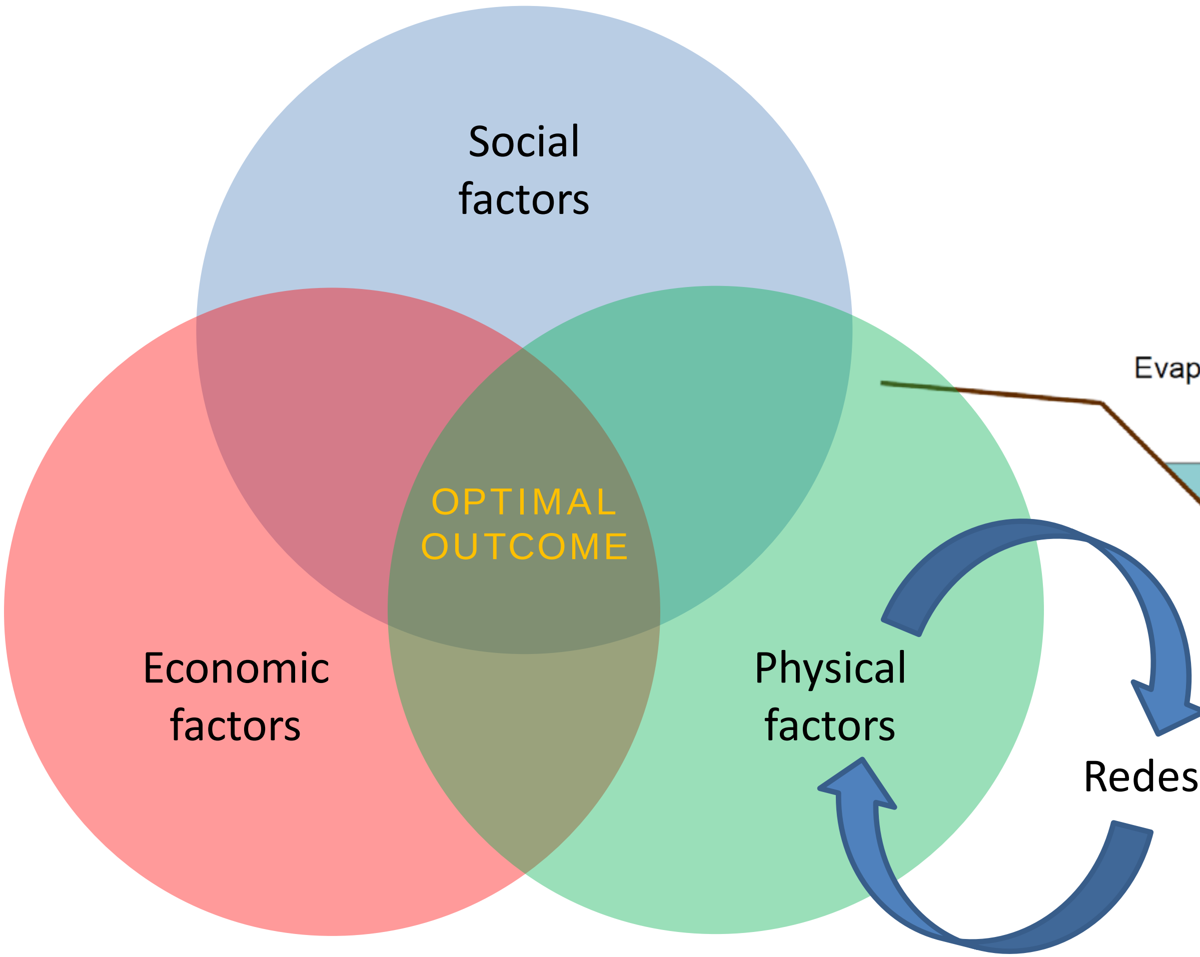
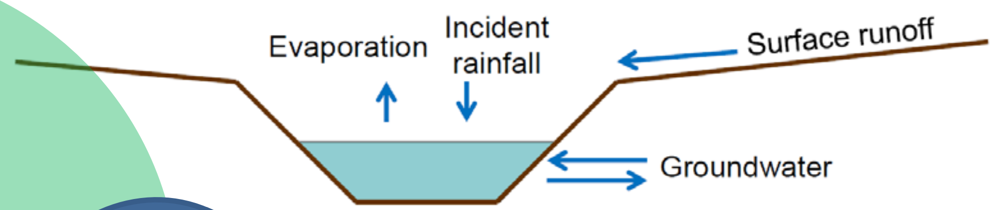
Final void management decisions





Redesign

- Regrade catchments
- Flood
- Backfill
- Re-contour
- Passive treatment

Final void management decisions

Void management at closure – hierarchy (Queensland Rehabilitation Guidelines, EHP):

- Generally acceptable
  - Backfill to original ground level
  - safe to people and animals
  - Contains good quality water
  - Battered slopes with vegetative cover
  - Alternative high value use (e.g. water reservoir)

Final void management decisions

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Void management at closure – hierarchy (Queensland Rehabilitation Guidelines, EHP):

- May be acceptable
  - Build safety barriers
  - Void acts as a sink or reservoir for contaminated water with minor risk to stock or wildlife
  - Battered moderate slopes with little vegetation
  - Steep slopes in competent rock
  - Waste disposal
  - Industrial or commercial land use
  - Unused void with low risk

Final void management decisions

Void management at closure – hierarchy (Queensland Rehabilitation Guidelines, EHP):

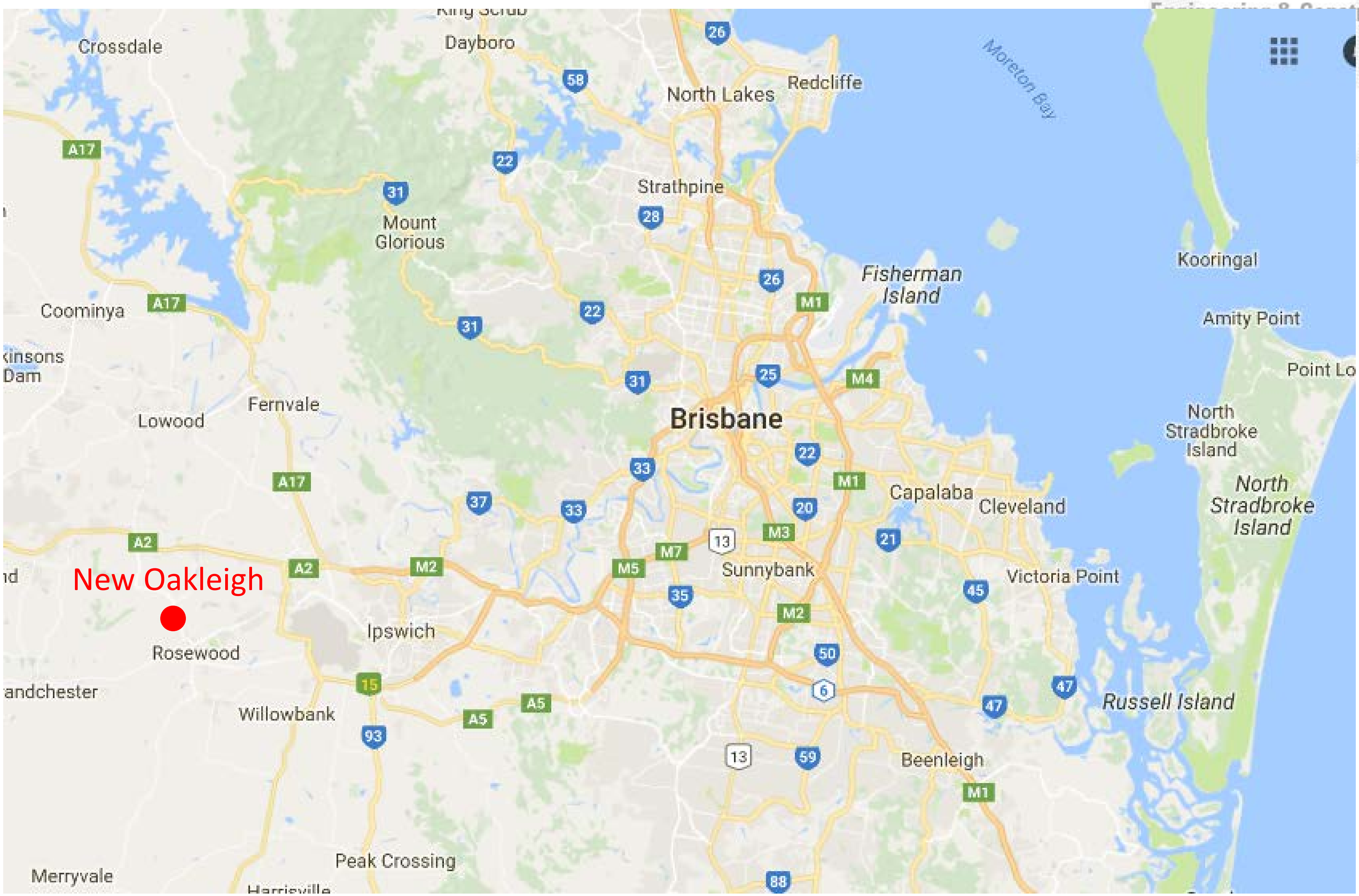
- Rarely acceptable
  - Poor water quality that poses a high risk to stock or wildlife
  - Accumulates hazardous material

Final void management decisions

Challenges with backfilling:

- Dewatering
- Compaction
- Surface water management

Case study: New Oakleigh



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Background

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1990:
Pre-mining

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Background

2005:

Active mining

Background

2010:

Active mining

Background

2012:

End of mining

Background

2012:

End of mining

Decision time

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- Relevant factors:
  - Proximity to Rosewood township and other neighbours - active community interest
  - Steep catchments (~100m fall from top of catchment to bottom, steep grades)
  - Significant topsoil deficit (~30 ha of residual areas for which topsoil was not available)
  - Underground workings in/near ML – potential issues with groundwater
  - Water harvesting - licence
  - Final landuse – grazing

Decision time

- Void backfilled to form free-draining landform
- Approximately 4 million m^3 was moved to backfill the ~80m deep void to the designed levels, taking ~2 years
- Site re-contoured to the final landform
- Topsoil imported
- Seed and gypsum applied
- Biosolids used – good results

Implementation

2013:

Commence backfilling

Implementation

2014:

Bulk earthworks complete

Implementation

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2015:

Final grading, topsoiling and seeding

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Water management

- Previously controlled discharge site with large water retention capacity (in final void)
- Transitioned to passive discharge site
- Schedule bulk earthworks and site stabilisation, while managing discharge $\Rightarrow$ requires careful planning

Water management

Water management

Water management

- Sediment containment key issue during rehabilitation
- Sediment basin (containment of 10 year ARI, 24 hr storm, 100 ha catchment) = 90 ML
- Implications:
  - Major disturbance during construction
  - Water harvesting in perpetuity
- Alternatives:
  - Pump and store in other voids (need large sump and high pump rate)
  - High Efficient Sediment (HES) basin – volume required around 25% capacity of traditional sediment basin

Water management

Conclusions

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- The best final void management approach depends on local factors $\Rightarrow$ every site is different
- Backfilling may be appropriate in some circumstances
- Backfilling requires careful planning from a water management perspective
- Emerging erosion & sediment control technologies have application to the mining industry during rehabilitation activities

Chris Gimber
Principal Environmental Engineer, KBR
chris.gimber@kbr.com
0419 734 969

Brad O'Reilly
Environmental Engineer, New Hope Group
boreilly@newhopegroup.com.au
0418 404 876