Overcoming the Pitfalls of Abandoned Mine Workings – in the Sydney Coalfield

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PITFALLS OF ABANDONED MINE WORKINGS

IN THE SYDNEY COALFIELD:
• LEGACY ISSUES
• INFLUENCING FACTORS
• REMEDIATION EXAMPLES
• SUMMARY

LEGACY – SYDNEY COAL FIELD

LEGACY

• Of abandoned shallow workings of unrecorded location and extent known as crop pits or bootleg pits.
• They are usually located along the crop between the surface and official company workings.
• Such workings pose several pitfalls:
  i) those affecting public safety e.g. open holes, collapsing ground and flooded pits; and
  ii) those impacting groundwater flow e.g. providing pathways for percolation into deeper company workings, or draining interconnecting bootleg workings into streams and wetlands; sometimes with Acid Rock Drainage (ARD).

LEGACY ISSUES

• Bootleg Pits Hazards
  • Open holes
  • Sinkholes
  • Water & Gases
• Mine Water Considerations
  • Mine Pool in Equilibrium (BGSA)
  • Active Mine Pool

WHAT IS THE COAL MINE SUBSIDENCE HAZARD?

SAG SUBSIDENCE

SINKHOLE SUBSIDENCE
**LEGACY IN THE SYDNEY COALFIELD**

### SINKHOLE SUBSIDENCE

- **LEGACY - MINING HAZARDS**

  - Mining hazards related to mine workings include the following:
    - existing unstable ground formed by past subsidence events;
    - unstable ground could potentially develop during/after remediation;
    - unsecured mine openings;
    - the accidental discharge of untreated acid mine waters into the environment; and
    - release of potentially hazardous & explosive gases (methane) - must be identified, detected and controlled

### LEGACY – HAZARD MAPPING

- sinkhole subsidence hazard maps
  - for each seam under each site - simple guidelines in the ECBC MWP
  - using a ratio (D/M) of seam depth (D) to seam extraction height (M):
    - D/M >0 < 6 = High risk - long-term visual monitoring is required (red zone);
    - D/M >6 < 12 = Moderate risk - long-term visual monitoring is suggested (orange zone);
    - D/M >12 = Low risk - long-term visual monitoring is not required (green zone);
    - D/M infinity i.e. no mining = No risk - long-term visual monitoring is not required (green zone)

### INFLUENCING FACTORS

**SEAM GEOMETRY**

- Water level 2.75 mbgl
- 3.0 mbgl
- 6.4 mbgl
- 7.3 mbgl
- Old Workings
- 3m
- 13m
- Ground surface

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**INFLUENCING FACTORS**

**MINE WATER**

**REMEDIATION EXAMPLES – LOCATIONS**

**III. BOOTLEG MINES**
- Kaneville

**II. FORMER MAIN SLOPES**
- Dominion No.5 & 10

**I. ENVIRONMENTAL TEST PIT**
- Dominion No.3

**REMEDIATION EXAMPLES – HAZARD TO ENVIRONMENT TP**

**DO3C TP 21**
UNEXPECTED MINES

**REMEDIATION EXAMPLES – II. MAIN ACCESS SLOPES**

**REMEDIATION EXAMPLES – III. BOOTLEG PITS**

Kaneville: Large Scale Remediation (~500m x 50m)
REMEDIATION METHODS

- DO NOTHING
- INSTITUTIONAL CONTROLS (Signage & Fencing)
- OPEN HOLES (SHAFTS, SINKHOLES, etc)
  - Fill using CBDC-ECBC MINE WORKINGS PROTOCOLS
    - Stage 1 – Information Gathering;
    - Stage 2 – Initial Mine Site Investigation;
    - Stage 3 – The Mine Workings Report;
    - Stage 4 – Detailed Mine Site Investigations;
    - Stage 5 – Mine Opening Remediation; and
    - Mine Site Monitoring.
- HUMPS & HOLES
  - Rough Grading
- FLOODED HOLES
  - Pump out
  - Fill using Mine Workings Portocols
- OTHER

SUMMARY

- ABANDONED MINES LEAVE HAZARDS TO PUBLIC
- IMPACTS MANY ECBC PROPERTIES
- ECBC IMPLEMENTING MINE SITE CLOSURE PROGRAM
  - Comprehensive framework for remediation, closure, divestiture
  - Established Mine Workings Protocols (MWP)
  - Successfully applied to wide variety of abandoned mine hazards
- SUCCESSFUL REMEDIATION
  - Old Mine access slopes and shafts (~ specific hazards are exposed
  - Sinkholes & Open-holes (filled and backfilled using MWP
  - Bootleg Pits – larger areas cleared, backfilled and regraded
  - Mine Water – provision for ongoing drainage, treatment on a site specific requirement basis
- ONGOING LONG-TERM MONITORING & MAINTENANCE
  - Ongoing annual visual monitoring for future differential settlement.

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References

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LEGACY

SAG SUBSIDENCE