

# 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



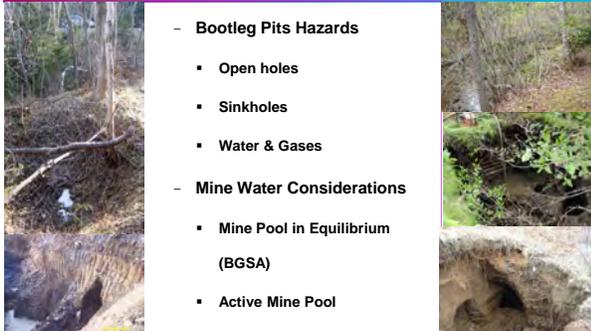

## LEGACY

- 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




## LEGACY

- **WHAT IS THE COAL MINE SUBSIDENCE HAZARD?**




### LEGACY IN THE SYDNEY COALFIELD

- **SINKHOLE SUBSIDENCE**

Page 7

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### 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

Page 8

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### 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)

Page 9

AECOM

### LEGACY – HAZARD MAPPING

Page 10

AECOM

### INFLUENCING FACTORS

#### SEAM GEOMETRY

Page 11

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### INFLUENCING FACTORS

#### SEAM GEOMETRY

Page 12

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**INFLUENCING FACTORS**

**MINE WATER**



Page 13

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**REMEDIATION EXAMPLES – LOCATIONS**

**III. BOOTLEG MINES**  
- Kaneville

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



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

Page 15

AECOM

**REMEDIATION EXAMPLES – HAZARD TO ENVIRONMENT TP**



Page 16

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



Page 17

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**REMEDIATION EXAMPLES – III. BOOTLEG PITS**

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



Page 18

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## 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 Protocols
- **OTHER**



Page 19

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## SUMMARY

- **ABANDONED MINES LEAVE HAZARDS TO PUBLIC**
- **IMPACTS MANY ECBC PROPERTIES**
- **ECBC IMPLEMENTING MINE SITE CLOSURE PROGRAM**
  - Comprehensive frame work 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.



Page 20

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## ACKNOWLEDGEMENTS

### Acknowledgements

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### References

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Page 21

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## LEGACY

### SAG SUBSIDENCE



Page 22

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