Special Acknowledgements

Public Works and Government Services Canada

- Regional Manager/Mine Water Management and Project Manager: Joe Shea P.Eng.
- Manager of Site Operations: Ronnie Kelly
- David Mayich (Retired Site Operations Manager)
CBCL Team

Discipline leads:

- Geology/Mine works: Glenn MacLeod, Geologist
- Environmental/Permitting: Lorna Campbell, P.Eng.
- Modelling: Peter Thorn, Atkins Int.
- Structural: Brad Kennedy, P.Eng
- Electrical: Mark MacNeil, CET.
- Construction Management: Robert Dickson, CET
- Civil/CBCL PM: Richard Morykot, P.Eng.
Project Location
Presentation

1. Brief History of Coal Mining in the Region
2. Mine Pool Evaluation and Characterization
3. Mine Water Delivery System
4. The Treatment System
Background

• Coal mining first occurred in the Sydney Coal Fields in 1685 by the French Military.

• Over the past 150 years there have been over 50 significant underground coal mines.

• These mines have left behind more than 190 million m$^3$ of void spaces.

• Once mining was completed and the dewatering pumps were turned off the mines began to flood.

• The quality of the water depends on the geology and mine configuration. Mine water typically has low pH, high sulphate and acidity, elevated metals, (typically iron, manganese and aluminum) and possibly other contaminates.
Mine Works

Sydney Coalfield Mine Workings

- Hobseam Workings
- Harbour Seam Workings
- Brookfield Seam Workings
- Goulburn Seam Workings
- Phalen Seam Workings
- Gowdy Seam Workings
- Tregy Seam Workings
- Coal Seam Cutting Location

Comprehensive Engineering and Environmental Consulting Services
Typical Mine Working
Discharge to Brook
Mine Water Seep
Mine Water Discharge to Ocean
Key Questions

1. Where are the mine pools located and how do we get access for treatment?

2. What is the water elevation in the various mine pools and how fast is it rising?

3. How will the water quality change with time? (quality highly variable)
Key Considerations

• Access to the various mine pools
• Efficient pumping system
• Land ownership
• Discharge locations (marine or freshwater)
• Location of treatment plant over shallow mine workings
• Sludge disposal
• System flexibility
Mine Pools

- **New Waterford Mine Pools**
  No.12, No.14, No.16 - Actively filling
  No.17, and No.18 - Collieries reached equilibrium

- **Sydney Mines Mine Pool**
  Princess, Queen and Florence collieries began flooding in 1975 - actively filling
~50 km$^2$ with ~42 km$^2$ located under the Atlantic Ocean
Flooding Rate No. 12

Monitor Well C156 - No. 12 Colliery, Ling Street

Filling Rate 2.5 in/day
Selection of Treatment System

After careful consideration and debate of the issues and review of seven potential options, including multiple treatment plants, the New Victoria option was selected.
Why New Victoria?
No.12/14 and 16
Artesian Well (no. 17/18)
Princess Return Airway
System Hydraulics

Sydney Mines

New Victoria

Sydney Harbour

Hub Seam

Harbour Seam

Phalen Seam

Princess Tunnels

No. 16
No. 17
No. 18

C-165
C-168
C-160

C-161
C-162
C-158

Florence
Queen
## Now What is the Water Quality

### Key Chemical Parameter Summary - New Waterford Mine Pool

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Mine Plan Water Modeling
Conceptual Schematic
Pathways Mine Water Interactions

Key
- Yellow: Mine pools where waters will mix
- Purple: Mine pools drawn from only
- Blue down arrow: Principal recharge to workings
- Red down arrow: Mine water linkages
- Blue dashed line: Water levels in mine pools (indicative only)
- Black line: Borehole/Well or linking Shaft
Iron & Sulphate at Treatment Plant - Combined New Waterford and Sydney Mines Mine Pools (inc. dilution from recharge)

Time (Years from start of pumping)

Concentration (mg/l)

Sydney Mines mine water comes on stream
High Density Sludge Treatment System

- Mine Water Delivery System
- Aeration Cascade
- Mechanical Aeration Tank/PH Adjustment
- Seed Tank
- Polymer System
- Clarifier
- Drum Filter
- Geothermal System
Finishing

• Final Polishing through a settling pond and wetland before discharge to Atlantic Ocean

• Sludge placed in containment area
Treatment Plant
Mine Water Delivery System
Aeration Cascade
Treatment System Overview (Control System)
Mechanical Aeration Tank
Clarifier
Drum Filter
Site Layout
Conclusion

• New Victoria site reduced the need to construct additional treatment facilities (9 mines treated at one location)

• Treatment Plant operational in early 2013.

• Achieving treatment requirements

• Iron levels consistently less than 1mg/L
Thank You

2014 ACEC Award of Excellence

2014 ACEC Tree for Life
Questions