MEND VANCOUVER WORKSHOP

Designing a Treatment System to Deal With the Combined Discharge from a Group of Nine Flooding Coal Mines

Vancouver, British Columbia
November 28/29, 2012
OUTLINE OF PRESENTATION

1) Sydney Coal field – brief description
2) Identifying and quantifying the problem
3) Trying to limit the water inflow paths
4) The project design and schedule
5) Implementing the design
6) Waiting for the mine water
The Maritimes Carboniferous Basin

Newfoundland

New Brunswick

PEI

Cape St. Mary

Nova Scotia

Sydney Coalfield ~ 400 km²
More than 50 u/g mines produced over 450 million tonnes

Left behind voids for more than 190 million m$^3$ of AMD

And so began the …..
Typical Stratigraphic Section Through Coal Seams Mined in the Sydney Coal Field
(Section ‘A – B’ through the New Waterford Mine Pool)

Projected Sea level
Geodetic zero

New Victoria
New Waterford
Atlantic Ocean

‘A’
‘B’

Sedimentary Section

- Hub Seam-2.5 m
- Harbour Seam-1.8 m
- Phalen Seam-2.3 m
- Emery Seam-1.1 m

Idealized Geology
Between Coal Seams

- Peat Swamp
- Soil Horizons (Siderite & Calcareous nodules common)
- Red beds
- River Channelling
- Lake/bay fill
- Peat Swamp

+37 m asl
-920 m bsl
Running out of Time!

Connection needed to combine the DM-12/DM-14 and DM-16 to avoid a 10 L/s outfall in the Town of New Waterford.

Projected Sea level

Cameron St C155

Jan. 2009 New Borehole

New Waterford

Ling St C156

Atlantic Ocean

New Victoria

No.16 mine water now flowing to No.12/14 empty mine workings

Harbour Seam

Phalen Seam
Tools available to find the “bootleg” or “crop” pit locations

- Identify the high risk zones on surface maps
- Travel high risk zones on a scheduled basis
- Investigate reports from citizens and others
- Fly LIDAR aerial survey to see landform
- Other geophysical methods

Examples of bootleg pits, high risk zones, use of LIDAR to find bootleg pits
Typical subsidence effect from shallow “bootleg pit”
New Victoria/Kaneville area risk zones

High risk zone D/h = 0 - 6

Medium risk zone D/h = 6 -12

Harbour Seam Outcrop
Lidar Imagery with mine workings in the Kaneville Area
New Victoria - Kaneville “bootleg pits” 2009
Kaneville area remediated 2009
Criteria used by ECBC to determine where the mine water treatment plant needed to be located

- Identify the location(s) where the abandoned mine workings can be accessed in order to intercept the rising mine water.
- Look at connecting mine pools to be able to minimize the number of treatment plants that need to be constructed.
- Does ECBC own sufficient land at these locations to construct a treatment plant and dispose of the solid waste residue.
- Locate the treatment plant as close to the ocean as possible so that it can receive the treated water with minimum effect on the environment.
- Locate the treatment plant in an area that will have the least effect on the community.
### New Victoria Mine Water Treatment Plant Project Schedule

<table>
<thead>
<tr>
<th>TASK</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Winter</td>
<td>Spring</td>
<td>Summer</td>
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<tr>
<td>Preliminary Design</td>
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<td>Field Investigations</td>
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<tr>
<td>Mine Pumping System Design</td>
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<tr>
<td>Treatment Process Selection and Design</td>
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<tr>
<td>Site Layout</td>
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<tr>
<td>Equipment Tender and Procurement</td>
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<td>Construction Phase I, II, III</td>
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<tr>
<td>Commissioning Pumping System</td>
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<tr>
<td>Commissioning Treatment Plant</td>
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<tr>
<td>Facility Fully Operational</td>
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<tr>
<td>Mine Water Outfalls Predicted</td>
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</table>

The New Victoria Mine water Treatment Plant must be fully operational before November 2012 when mine water levels are expected to reach equilibrium and outfalls are predicted to occur.
One HDS Treatment Plant – Combined Sydney Mines and New Waterford Mine Pool Flow Schematic

Sydney Mines Pool
- Flow: 12 L/s
- Iron: 950 mg/l
- Manganese: 300 mg/l
- Acidity: 1700 mg/l
- Mine Water: -164 ft/BSL

New Waterford Mine Pool
- Flow: 12 L/s
- Iron: 2475 mg/l
- Manganese: 278 mg/l
- Acidity: 4550 mg/l

DM-17/18 Mine Pool
- Flow: 4 L/s
- Iron: 50 mg/l
- Manganese: 10 mg/l
- Acidity: 0 mg/l
- Alkalinity: 60 mg/l
- Mine Water: 58 ft/ASL

New Waterford Mine Pool
- Flow: 12 L/s
- Iron: 2475 mg/l
- Manganese: 278 mg/l
- Acidity: 4550 mg/l
- Mine Water: -31 ft/BSL

Eliminate an Existing Discharge
- Pump ~ 12 L/s

Treat 28 L/s or 450 US gpm

One Treatment Plant located at the New Victoria site
New Victoria MWTP site December 2011
Drum filter, Aerator and from Clarifier bridge
Hydrograph for Monitor Well C155 - No. 16 Colliery, Phalen Seam

Flooding resumes in No.16 in December 2011

Mine water diverted from No 16 to No 12 Colliery in January 2009

Question – What would happen if we didn’t treat the rising mine water?
Acidic discharge of 1000 mg/L Fe at 4 L/s
**Guidelines** - The NVMWTP will adhere to the Canadian Federal guidelines for a discharge into the Marine Environment as noted and posted in our CEAA document to Ottawa.

**Regulations** - The NVMWTP will be regulated by DFO, EC, and HC in relation to the discharge from the MWTP. (i.e. fish toxicity tests, alteration of habitat, etc.)

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### CCME Water Quality Guidelines For the Protection of Aquatic Life for Marine Discharge

*That ECBC will Apply to the New Victoria Mine Water Treatment Plant*

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Chemical group</th>
<th>Short Term</th>
<th>Long Term</th>
<th>Date</th>
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<td>Colour 1</td>
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<tr>
<td>Debris</td>
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<td>7.0 to 8.7 &amp; Narrative</td>
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<td>Suspended Sediments TSS 4</td>
<td>Physical Turbidity, clarity and suspended solids, total particulate matter</td>
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### Operational Guidelines ECBC will apply in addition to CCME Marine Guidelines at the NVMWTP

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<th>Chemical name</th>
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<td>Zinc**</td>
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Thank you - Questions
Testing various polymers