A 2011 Update for the Single-layer Desulphurized Tailings Cover Completed in 1999 at Detour Gold

By

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- Annual precip: 920 mm
- Annual PE: 800 mm
- Air temp: -47°C to 37°C
Site History

- Detour Lake Gold Mine: 1983 - 1999
- Open pit operation
- TMA: 15 million tonnes over 300 ha
- Remediation: Water cover + Desulphurised tailings cover

- Mine will start operating again in 2012
- New mine life: 21 years
Sulphidic Tailings

- Dominant mineral: Pyrite
- Near neutral pH
- Sulphide content: 1% to 2.5%
- NNP: -5 to -75 (kg CaCO$_3$ equivalent per ton material)
- Heterogeneity - interbedded layers
Desulphurised Tailings Cover

- 1.0 m - 1.5 m thickness
- Sulphides <1%
- Constructed by end-pipe discharge
- Objective: reduce oxygen entry
  - High water saturation (> 85%)
  - Oxygen consumption by residual sulphide minerals
Diffusion vs. Saturation

(Aubertin, 2005)
Grain Size Distributions

Sjoberg et al. (2003)
Soil-Water Characteristic Curves

Sjoberg et al. (2003)
Moisture Contents

Sjoberg et al. (2003)
Predictive Numerical Model

Saturation Profile

Oxygen Profile

Sjoberg et al. (2003)
Saturation Degree Assessment

• 5 boreholes > 85% saturation
• 4 boreholes < 85% saturation
• Some potential exists for oxygen diffusion through the cover
Initial NAG pH vs NNP Results

- Sulphide S% > 1.0
- Sulphide S% < 1.0

Sjoberg et al. (2003)
Early Conclusions

• Numerical simulations - desulphurised cover reduces oxygen fluxes to less than 2 moles/m²/yr.

• ABA testing - cover materials were reduced in sulphur, have oxygen consumption potential - unlikely to produce acidity
2011 Update
Paste pH Test Results

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2011 Study Results

- Paste pH samples – most were neutral range
- After 10 years – cover does not show an oxidized profile
- Evidence to date indicates satisfactory performance
- Suction values – 5 kPa to 30 kPa
Soil Suction Results

![Graph showing soil suction results with various data points and labels for different locations and depths.](image)

- B201 0 - 0.2 m
- B201 0.8 - 1.0 m
- B203 0 - 0.2 m
- C201 1.65 - 1.8 m
- C204 1.3 - 1.45 m
- A201 1.3 - 1.45 m

Sjoberg et al. (2003)
Future Considerations

- >85% saturation – non-segregated tailings
- EOP slurry discharged tailings appears to have performed well without thickening
- Valid alternative for using waste for remediation of tailings
- Less risk associated with desulphurized covers
Cost of Partial Desulphurization

(Bussiere and Wilson, 2006)
Summary and Conclusions

• Desulphurized Covers on Tailings – has met expectations
• Paste pH data supports that the cover has not gone acid
• Further chemical analysis will provide better metric of performance