

The Mine...

➤ Xstrata Nickel's Montcalm Mine is a nickel/copper mine, 85 km NW of Timmins, Ontario. Development started in 2003 and anticipated to be in operation until 2011.

➤ Ore is extracted and trucked offsite for processing. A mine waste water treatment system was needed to treat water pumped from underground

➤ A receiving water body was needed. Nearest location with assimilative capacity was Groundhog River

The River...

➤ The Groundhog River is located northwest of Timmins, ON, Canada

➤ A healthy sturgeon population exists within the Groundhog River.

➤ It stretches 360 km, the bottom 330km of which are inhabited by lake sturgeon.

➤ Groundhog River is a 5th order tributary within the Moose River Basin.

➤ Groundhog River flows north eventually draining into James Bay.

The Challenge...

➤ Mine needed to discharge treated mine waste water.

➤ Original location for discharge was in a proposed Waterway Park.

➤ Mine has an existing lease on river but location is sensitive due to the population of sturgeon and nearby spawning area.

➤ "Ecological Concern vs. Economic Development" – Need a Balance

The Decision...

➤ An amendment was proposed in which the existing lease could be 'swapped' for the land required to discharge further downstream.

➤ There was considerable concern by some regulators and NGOs about setting a precedent by allowing an amendment to a park boundary

➤ The decision was made to construct a 15km pipeline to the existing claim block.

Montcalm Mine Initiatives to Protect Groundhog River Lake Sturgeon

...Decision weighted by predicted effluent quantity, quality and dispersion.



Effluent Dispersion...

Estimated mixing of effluent in GHR ~100m downstream

Actual mixing of effluent in GHR ~50m downstream

*determined through dispersion model (2003)

**determined through conductivity (2005)

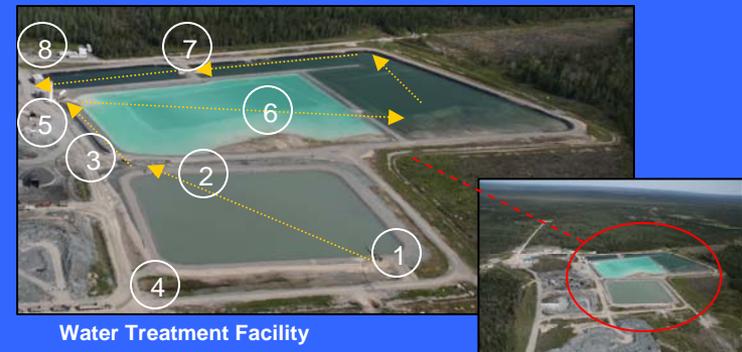
Effluent Quantity...

Estimated Quantity ~5000m³/day

Actual Quantity ~1700m³/day

Treatment of Mine Water

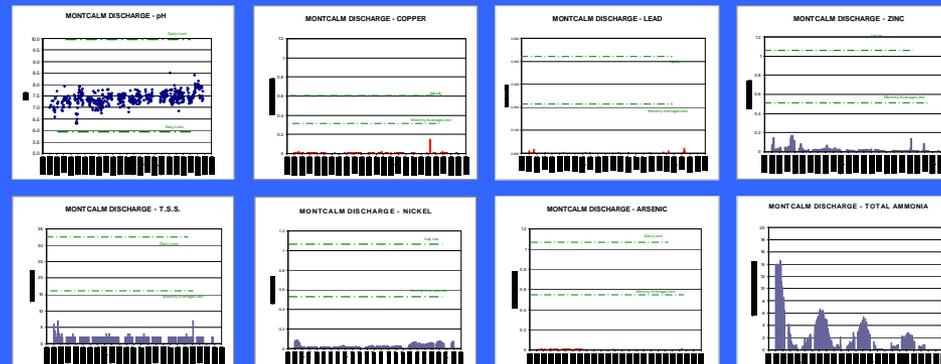
- 1) Mine water from underground pumped to the Slimes Settling Basin. As water flows through, suspended solids from underground sumps settle out.
- 2) Water in the Slimes Settling Basin overflows through a decant swale to the Interceptor Ditch 2
- 3) Water flows to the Lime Reactor Tank for treatment.
- 4) In addition to water pumped from u/g, all site run-off that is potentially impacted is also collected for treatment.
- 5) Lime addition system raises the pH of in flowing water to approx 10.5. At an elevated pH, dissolved metals form metal-hydroxides, which settle out of water, removing the metals.
- 6) Water flows from Lime Reactor Tank to Mine Water Treatment Ponds. Clarified water from Cell A flows into Cell B over a depressed crest in splitter dyke for further clarification.
- 7) Water from Cell B flows through a water control structure (WCS) into the polishing pond. Carbon dioxide (CO₂) gas is sparged into the treated water to lower the pH to between 6.0 and 9.5 prior to final discharge.
- 8) Discharge from the pumphouse is directed to an approx 15.5 km long buried pipeline which routes the treated effluent SW to the Groundhog River.



Water Treatment Facility

Treated Mine Water Quality

Limits as set in permit by Ontario Ministry of the Environment (MOE)



Sampling of Treated Mine Water before Discharge

Sturgeon Monitoring Program



...Decision balanced by applying additional conditions for lake sturgeon monitoring and research.

Montcalm Sturgeon Studies to Date...

2004 - Year 1 of Sturgeon Study (Baseline year - No Effluent Discharge)

2005 - Year 2 of Sturgeon Study (Baseline year - No Effluent Discharge)

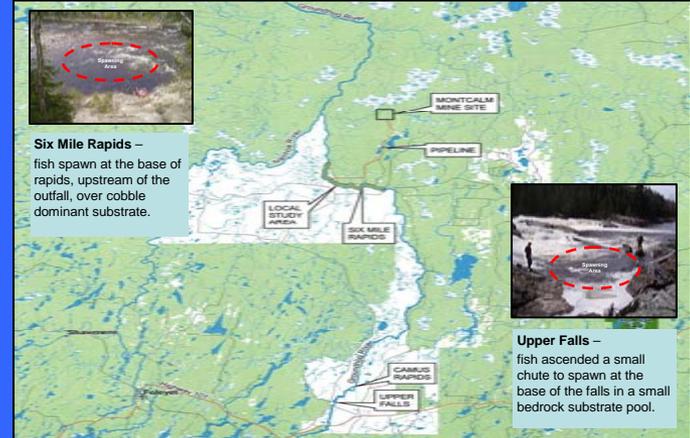
2006 - Year 3 of Sturgeon Study (Discharge flow during spawning period)

2007 - Year 4 of Sturgeon Study (Discharge suspended prior to spawning period)

"Is treated mine water effluent affecting the quantity of eggs, hatch success, or the size, growth, or condition of larval lake sturgeon?"

"Is treated mine water effluent affecting the spatial pattern of habitat use by spawning lake sturgeon in Six Mile Rapids?"

Study Area



Key Study Elements

Quantitative Effects Assessment

- Egg/Larval Survival and Development
- Habitat Use Patterns of Spawning Lake Sturgeon



Population Data and Descriptive Statistics

- Spawning Adult Census and Tagging
- Genetic, Size, Sex and Age Data
- Egg Number Index



Overall Findings

- Selection of spawning habitat remains unchanged.
- No avoidance observed due to diffuser.
- Reference conditions have confirmed that egg incubation is a viable tool for *in-situ* monitoring of lake sturgeon egg development to hatch.
- Egg/larval development and survival demonstrated under exposure conditions in 2006.
- Continue to build data set on population structure for Upper Groundhog River.
- Determination of "uniqueness" of community by genetics analysis in progress.



Six Mile Rapids
– Groundhog River



Sturgeon Population Data Collection
– Groundhog River