E.1b. Panel Discussion on Waste Disposal in Natural Water Bodies

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PANEL DISCUSSION ON WASTE DISPOSAL IN NATURAL WATER BODIES

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Response to Question 1

What are the gaps in the scientific information?

- Information Requirements for Assessment of Relative Risk:
  - Long-term implications of leaving wastes in place in a lake basin
  - Acclimation, adaptation of biota to elevated levels of metals (I.e. what is the actual long-term risk rather than simply comparing predicted levels to water quality criteria)
  - Cumulative effects of several stressors: e.g. salinity plus metals; nutrients plus metals
  - Effects on fish populations from various degrees of habitat disturbance or exposure to stressors

Response to Question 2

Under what conditions should waste disposal in natural water bodies be permitted/not permitted?

- This is a question of relative risk
  - leave acid-generating materials on the surface:
    - » prevent seepage to groundwater
    - » prevent migration to surface water
    - » long-term performance? (closure)
  - water cap:
    - » minimize destruction or degradation of habitat
    - » minimize risk of downstream water quality impacts
    - » long-term performance? (closure)

Response to Question 2, continued

Conditions for permitting waste disposal in natural water bodies

- Define "waste" - waste rock; raw tailings; treated tailings; mixed tailings and waste rock; mine water plus tailings
- Compare risks of the disposal options, including the long-term performance of each option
  - e.g. during operation, a tailings impoundment that allows treated effluent to be discharged may be the lower risk option; however, at closure, the long-term integrity of the tailings dam and maintenance of sufficient water cap will be an issue
  - perpetual maintenance requirements should be avoided, if possible

Response to Question 2, continued

Conditions for permitting waste disposal in natural water bodies

- Physical and engineering restrictions means that alternatives are few
- Disposal in natural water bodies is often the only practical solution
  - look for other options - old quarries? Mined-out open pits?
  - target water bodies with no fish if possible
- Minimize the risks during operation and after closure
  - minimize waste volume
  - thorough water management plan
  - maximize opportunities for natural processes to assist in maintaining water quality
  - habitat compensation: fish habitat will almost always be an issue

Response to Question 2, continued

Conditions for permitting waste disposal in natural water bodies

- Recent Examples:
  - 45 hectare lake that had some northern pike in it – used it for tailings impoundment because there were no other alternatives – surrounded by large lakes – only real alternative – **huge habitat compensation**
  - tailings disposal in a valley - covering some very small lakes with the tailings –was the most feasible natural area for tailings storage - **habitat compensation**
  - drained the lake and used the basin for tailings – decant goes through a marsh; **habitat compensation** was the building of lake trout spawning habitat
  - tailings impoundment in a small lake with one fish caught in it; so doing a **small amount of habitat compensation**

Response to Question 2, continued

Conditions for permitting waste disposal in natural water bodies

- Older Examples
  - 50 hectare lake basin– very low cost compared to amount of storage –no noticeable increases in contaminants downstream –no increase in groundwater concentrations of contaminants – 15 years of operation.

Response to Question 2, continued

Conditions for permitting waste disposal in natural water bodies

- Examples of problems:
  - side-hill tailings facility with a huge dam – having to divert water into the watershed to maintain water cap on the ARD tailings- they had to divert the water away at first and now they have to re-direct it
  - originally designed as a zero disharge tailings impoundment. During operations – lots of recycle and no discharges. However, now there's a wall of water behind a huge dam – large long-term liability. Therefore, in retrospect, it would have been better to have permitted discharges to the environment and not have a large dam that has to be maintained in the long term.

Response to Question 3

Suggested Research Projects

✷ Practical alternatives for decreasing ecological risk of waste disposal in surface water bodies:

1. Minimize Surface Water Impact

- **Minimize** waste volume: paste backfill

2. Mitigation Measures

- **Rehabilitate** affected receiving streams
- **Replace** wetlands lost to development
- **Restore** flow regime by diversions or pumping
- Construct fish **habitat enhancement** measures

Response to Question 3, continued

Suggested Research Projects

3. Sustainable Drainage Systems

Replicate **natural analogues** by incorporating **robust** and **self-healing** features of natural channels which are **dynamic**, capable of adjusting to change without significant impacts

- Allow for occurrence of beaver dams
- Avoid dams and reservoirs above original ground
- Avoid uniform topography in the reclaimed landscape
- Avoid berms on waste dumps
- Avoid man-made materials for reclamation drainage
- Avoid water handling systems which are vulnerable to overtopping

Response to Question 3, continued

Suggested Research Projects

4. Habitat compensation:

- ➟ means of assessing the value of a lake – e.g. value of a fish community. E.g. one small reef that 6 different species of trout use at various times of the year – how much is this worth? – need to value the entire lake if the whole lake is going to be lost. Affecting bears, ospreys, otters as well as other human uses (including potential uses in the future) – not just the fish.

5. Cooperative Approaches

- ➟ e.g.using sludge from pulp mill to cover tailings to serve as a mulch; slash from the forest industry
- ➟ some industries may have some storage capacity – look around for a hole to store tailings in – e.g. an old quarry.
  - Cost and liability comparison of transporting wastes to an existing hole versus long-term management of a tailings impoundment.

Response to Question 3, continued

Suggested Research Projects

6. Make better use of monitoring data

- ➟ gear up for making good use of the EEM for Mining data – build the information back into decision-making on waste management
- ➟ use for improving risk assessment – e.g. compare the performance of disposal directly into lake basin with building of an impoundment that has to be maintained perpetually with disposal in an old pit or quarry with a pervious surround.
  - ➟ at present, we don't have good data to allow us to compare the risks of these three alternatives quantitatively without large uncertainty and therefore a large degree of conservatism built in