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Review of EBA Engineering's 2001 Report "Assessment of Back Bay Tailings Deposit, Giant Mine, Yellowknife, NT"

by

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To: Yellowknives Dene First Nation Land & Environment Committee

and

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Background:

Starting in 1948, tailings from Giant Mine's gold mine were dumped in a channel running into Back Bay. It was not until 1981 that a treatment plant to clean the mine effluent water was built.

In the winter of 2000, field work was done by EBA Engineering and Vista Engineering that examined the tailings deposited in Back Bay by Giant Mine. The tailings contained in the drainage channel emptying into Back Bay, just west of the tailings beach, could not be evaluated because of snow cover.

At least 240,000 tonnes of tailings have gone into the bay, out of a total of about 375,00 tonnes sent to the Beach Tailings area of Back Bay. 62,000 tonnes are now in the area studied in EBA's report. Tailings have gone into Back Bay in 2 ways:
(1) dumped directly in via the discharge channel located west of the tailings beach, and
(2) eroded from the shore into the bay by wind and wave action.

Contaminants will likely be leaking out of the tailings for a period of 1 to 4 generations. Things that determine the amount of tailings material released into the water of Back Bay are:
- temperature
- amount of disturbance of the tailings
- amount of water in contact with tailings.

The tailings already in the waters of the bay extend 100 meters out from shore.

Contaminants:

A. Acids

Acid-producing sulphide, being more dense than other components of the tailings, settled to the bottom of the bay quicker than the rest of the tailings could. This is why the acid production vs. acid neutralizing ratio is lower closer to the drainage channel outflow. In other words, there is more acid-producing material and less acid-neutralizing material the closer you get to the source of the tailings input, the drainage channel. Overall, though, there seems to be a lot more acid-neutralizing material than acid-producing material. So most of the acid produced by the tailings should be buffered (diluted) by the acid-neutralizing material.

In the laboratory, water allowed to leak out of tailings samples had lots of acid-neutralizing salts (eg. calcium and magnesium). This is more evidence that the tailings likely will not create an acid pollution problem.

B. Heavy metals

Mercury is not a problem in the tailings. In fact, none of the samples contained mercury in detectable amounts. But levels of other metals are high enough to make it advisable to do more contaminants testing of the nearshore water of Back Bay. These metals (arsenic, antimony, cadmium, copper, magnesium and zinc) were higher than governmnent guidelines for the protection of fish and water bugs (fish food) in about half of all samples from tailings porewater (water inside the tailings material).

The highest metal concentrations were in porewater from beach tailings (Appendix F: stations BH-1, -4 and -12), not submerged tailings. So metal pollution of water inside tailings was greater in tailings exposed to air than in tailings submerged in lake water.

Reclamation of the Site:

Beach tailings: Tailings at the top of the beach must be either:

➡ A) removed and placed in another location.
- Remove all tailings from everywhere in the beach area.
- Replace with sand and recontour the shoreline.
- Rip-rap (clean rock) might be needed to place over some places to prevent sand from moving.

➡ B) physically stabilized so that it does not erode into the bay. The 3 options to do this are:

⏭ (1)- Remove the topmost layers of the tailings slope at the head of the beach.
- Place rip-rap (clean rocks) on top of the remaining tailings all the way out to at least 1.2 meters below the minimum water level of the bay.

⏭ (2)- Remove the entire tailings slope to the level of the natural shoreline.
- Place rip-rap on top of the remaining tailings all the way out to at least 1.2 meters below the minimum water level of the bay.

⏭ (3)- Don't touch the tailings, but build a break wall (concrete? rock?) in the water in front of the beach to act as a "wave-buster" to protect the tailings beach from the erosion caused by wave action. This would do nothing, however, to prevent wind erosion of finer-grain tailings.

The disadvantage of option (B) is that it does not do anything about the tailings in the discharge channel west of the beach. However, none of the above options are guaranteed to be

foolproof. To varying degrees, there is some risk of environmental impacts attached to all of the above ways of dealing with the problem.

Submerged tailings:

(A) if environmental impact is proven to be low, then options are:

- leave it alone, or
- build a rock break wall where the tailings end to isolate the tailings from the rest of the bay, or
- place and anchor an impermeable liner over the tailings in summer, then in winter put clean rocks on the ice above it, allowing the ice to melt in spring which gently lowers the rocks onto tailings without stirring them up into the water.

All of these options could be supplemented by filling in the submerged area with dirt and allowing grass and other land plants to grow, creating a new area of land after a number of years.

(B) if environmental impact is proven to be great, then most likely all the tailings will have to be removed. Options for this are:

- building a dike around the tailings and then pumping out the water. A backhoe can then remove the tailings which can be trucked to the South Pond, or
- backhoe the tailings and overlying ice in winter, or
- suck up the tailings with a dredge, or
- if currents are weak, silt curtains can prevent tailings material from floating out into the bay as it is being removed from the bottom.

Whatever reclamation options are chosen, its objectives can be summarized as: In consultation with DIAND and affected stakeholders (First Nations, Environmental Agencies and NGOs) the reclamation of the site must (1) return the disturbed land to a self-sustaining condition with growing plant life that is similar to the surrounding landscape, and (2) protect the site from erosion and do whatever else is necessary to protect the land and Back Bay from further contamination and environmental damage.

The reclaimed land will have to be monitored to ensure the site is responding well to the reclamation procedures.

EBA Recommendations for Further Studies:

EBA is recommending that more studies are necessary before making a decision on the best reclamation strategy. These studies are:

1. Resample the submerged tailings for metals in the porewater.

2. Sample the water above the submerged tailings to check for contaminants.

3. Compare solid tailings from beach and submerged areas to determine what impacts water saturation has on metals and leaching of acid and metals over the long-term.

4. Determine if arsenic from the tailings is of a type that is easily ingested by fish.

5. Assess how much tailings are in the drainage channel and determine if acids are leaking out into the bay.

6. Determine which will do greater harm to the water: removing the submerged tailings or leaving them alone.