When Politics Trumps Evidence: The Misguided Prohibition Against Underwater Tailings Disposal

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LORAX ENVIRONMENTAL

Outline:

- *Background: why underwater disposal?*

- *History of the Myra Falls mine operation in Strathcona Park and the tailings discharge into Buttle Lake: community and political elements (context is important!).*

- *A few data from previous work in Buttle Lake.*

- *An editorial, or at least a personal opinion.*

The geochemical case for underwater disposal...

- *Hypothesis: because oxygen has low solubility in water, oxidation of submerged sulphide minerals (thus, production of acid) should be inhibited.*

- *Sulphides should be geochemically stable in a low-oxygen to zero-oxygen (anoxic) environment, characteristics that apply to lake and coastal marine sediments.*

An oft–adopted option in the past: Conventional tailings ponds with no water covers. Acid Rock Drainage (ARD) is a common product.

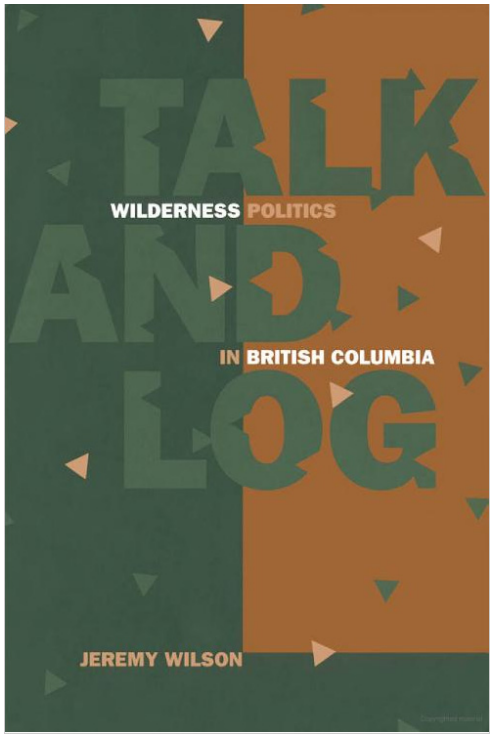
Photo: the surface of a conventional tailings pond in central Canada

Strathcona Park, Central Vancouver Island:

Created 1911; Oldest provincial park in BC

STRATHCONA PARK

Mineralization had been discovered in the Myra Creek Valley in about 1917 (hydrothermal sulphides in the Sicker Group volcanics)



1998, UBC PRESS

Some local Western Mines history…

The 1960s chapter in the long-running saga of Strathcona centred on Western Mines' proposed copper-zinc mine on Myra Creek above Buttle Lake. Far from involving just a five-hectare hole in the ground, the Western proposal entailed a number of additional works within the park, including a townsite, a sawmill, a power plant, roads, and a system to dump mine tailing into the lake.[126] Western had little trouble convincing the Social Credit cabinet to override the meek protests of the Parks Branch, and the regulatory obstacles were quickly removed. As noted, a 1964 order-in-council opened all parks larger than 2,000 hectares to mining development. Any ambiguity concerning this temporary green light to Western was removed the following year. Using powers confirmed in the new Park Act, Kiernan downgraded the Buttle Lake section of the park from class A to class B status, thus permitting development as long as it did not 'unduly impair recreational values.'[127] The Pollution Control Board, a rather pliant agency composed entirely of provincial civil servants, then granted the company a permit to dump tailings into the lake. (The company decided not to proceed with the townsite after workers indicated a preference for living in Campbell River.)

from Keeling and Wynn, BC Studies, no. 70, Summer 2011:

"Initially, [Western Mines] proposed [tailings] impoundment on land. But early in 1966, it announced its intention to dispose of its tailings in Buttle Lake…If tailings were deposited on land, rainwater…would wash impurities into the lake's surface waters; disgorging…twenty-five to thirty metres…below the surface might make the water "a little bit murky" but would not contaminate it."

"…in August [1966] the province's Pollution Control Board…approved the dumping without holding hearings on the issue."

Opposition to lacustrine deposition was immediate and strong—even before discharge commenced:

"Campbell River opponents distributed bumper stickers saying "Drink Tailings - Campbell River's Exclusive Beverage."[51] The Chamber of Commerce sent letters to MLAs protesting the absence of public hearings in Campbell River over the issue. Councillor Ken Forde distributed 2,000 petitions in nine central Island communities. The Campbell River and District Pollution Control Society organized a demonstration on the steps of the Legislative Building in Victoria.[52] However, the most vigorous local opposition came from the Campbell River District Water Board."

Source: John Dwyer, 1993, M.A. thesis, SFU

"A Neat Double-Cross …", Editorial, The Vancouver Sun, 24 September 1966:

"…the government has chosen this moment to show that it doesn't give a damn for history, water conservation, parkland preservation, or the sensibilities of its citizens, if these come in conflict *with the will of industry*." (italics added)

But keep in mind the geochemical context: in the 1960s, knowledge of the behaviour of tailings underwater was close to zero.

A condensed history of the Zn, Pb, Cu, Au, Ag Myra Falls operation:

- Production began in 1966: open-pit, then underground (1968).
- Tailings discharged to South Basin via submerged (several metres) outfall from May 1967 to July 1984.
- ~6 Mt in total, limed (pH ≤ 10), averaging 7000, 1300 and 900 ppm Zn, Cu, Pb.
- Dissolved metal levels rose progressively through the 70s.
- Zn in South Basin waters rose from ~2 ppb in mid-60s to as much as 200 ppb in early 80s, causing shift in plankton assemblages and concerns re fish health.
- In the public's mind, tailings in the lake were the source.

From " A Preliminary View of Buttle Lake Water Quality", 1980, by Dr. MJR Clark, BC MoE, p. 12:

3.5 Tailings and Lake-Bottom Sediment

During the course of preparing this report, it was discovered that the Waste Management Branch had retained two samples of mine tailings collected March 19, 1970 (one with and one without flocculant), plus a sample of bottom sediment collected from the tailings raft September 16, 1969. The sample containers were well sealed and no evaporation occurred. Samples taken from the three containers are described in Table 13, and the results of analyses of these materials reported in Table 14 (Tailings and Lake Sediment) and Table 15 (Supernatant Samples). Probably the most significant results are the very high levels of copper and zinc in lake water having had a decade to come to equilibrium with the contaminated bottom sediments. Dangerous as it is to extrapolate from one sample, these results do seem to reflect the developing problem in Buttle Lake.

A condensed history, continued…

- Intense pressure to curb subaqueous deposition, given deteriorating water quality in the lake.

- 1981: BC Research, reported contamination of Myra Creek by ARD from the original waste-rock dump.

- 1981: Westmin "installed a diversion ditch around old open pit and waste-rock dumps to minimize production of contaminated water." (Malcolm Clark, June 1982 report).

- 1982: Pedersen was asked to look at metal release from the submerged tailings

- Hypothesis: tailings were releasing metals to the overlying water column

A condensed history, continued…

- Result of Pedersen's limited pore-water study: metal fluxes (Zn, Cu, Cd) were *into* the tailings; no evidence of significant release.

- Report submitted to the Province in October 1982, and published in the peer-reviewed scientific literature (Mar. Poll. Bull) in 1983.

Abstract of the 1983 Mar Poll Bull paper:

"Dissolved Zn, Cu and Cd concentrations in interstitial waters…indicate that the tailings are not releasing heavy metals to the overlying lake water…and there is no evidence to suggest that significant oxidation is occurring in the deposit. The lake waters are enriched in metals from surface drainage, however, while pore waters in natural sediments are heavy-metal-depleted. Diffusion into the natural sediments therefore tends to buffer the lacustrine metal load..."

And a conclusion of the paper (and the 1982 report):

"At present, the tailings deposit cannot be considered to be a contributor of dissolved heavy metals to the lake."

Meanwhile…

"…the company was charged under the Fisheries Act in 1981…[and] convicted four years later, found guilty of depositing a deleterious substance into water frequented by fish, and admonished by the court for its "casual disregard…tantamount to willful blindness." *(Keeling and Wynn, 2011)*

And in 1983, the ***Province ordered the mine to cease depositing tailings in the lake*** *and instead construct conventional ponds on land.*

The consequences:

- *Lacustrine deposition ceased in July 1984.*

- *Old growth in part of the Myra Creek Valley was clear-cut to make room for the tailings ponds.*

A few years later, this was the sentiment:

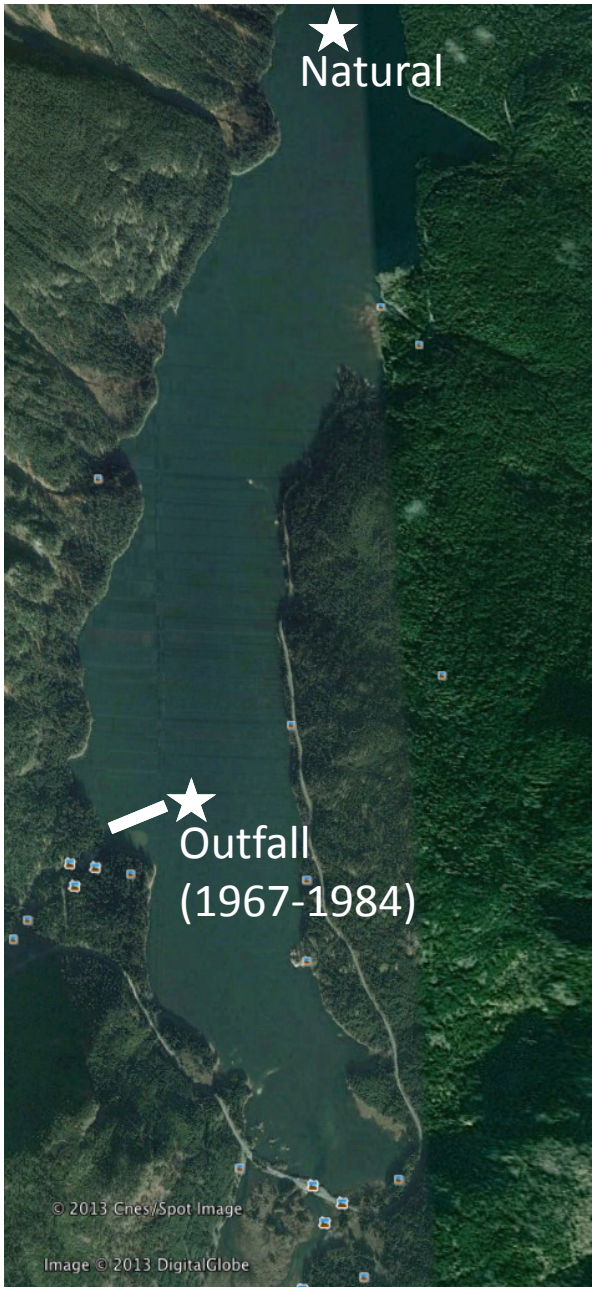
"Although this [switch] produced new concerns about acid rock drainage, it appeared to improve conditions in Buttle Lake." *Keeling and Wynn (2011)*

There was still skepticism about the geochemical behaviour of the tailings, so…

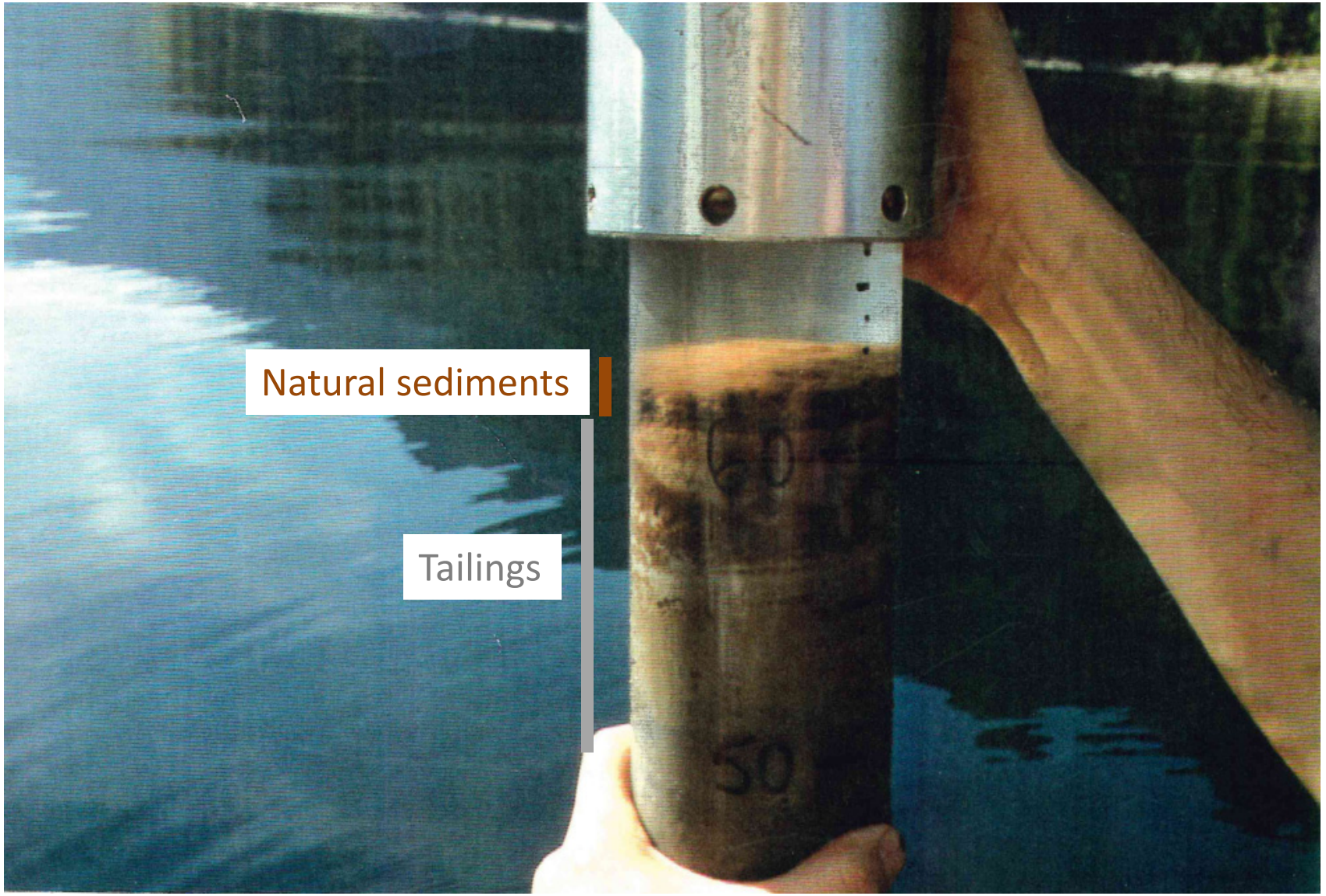
- *Additional studies on the submerged tailings were carried out with support from the MEND Program in 1989 and 1993.*

- *These confirmed the earlier findings of no significant release of metals from the deposits on the floor of Buttle Lake.*

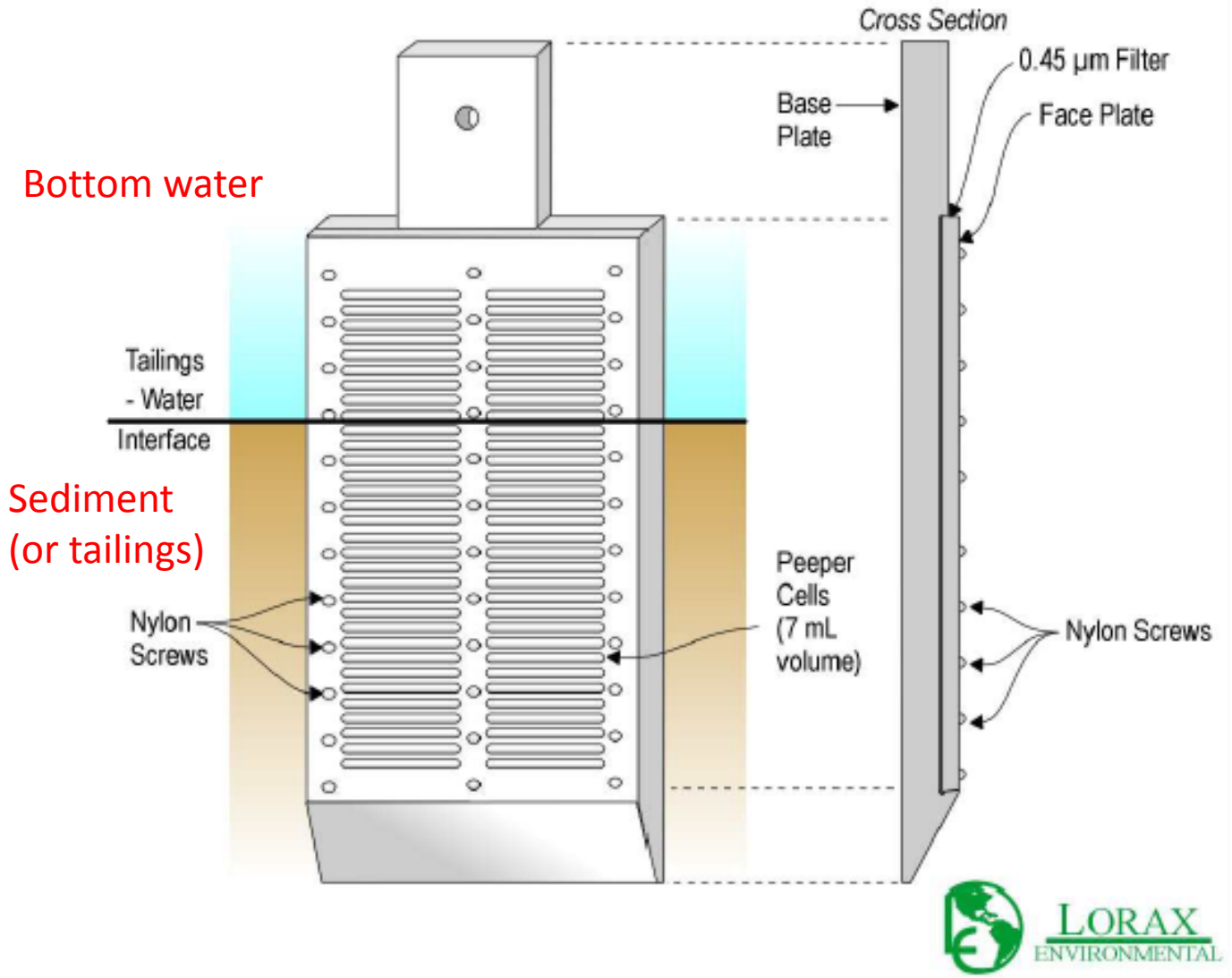
2003 Landsat Image



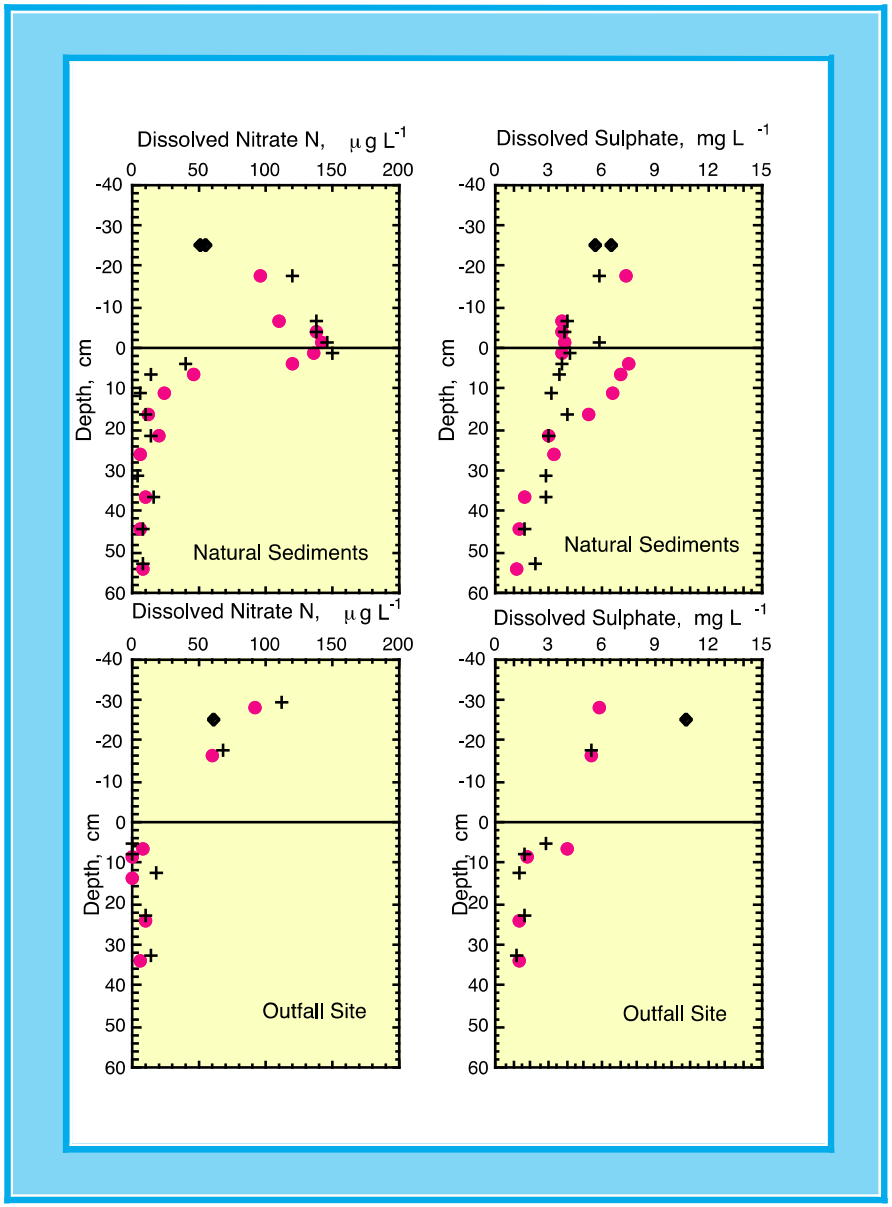
South Basin, Buttle Lake, Summer 1989



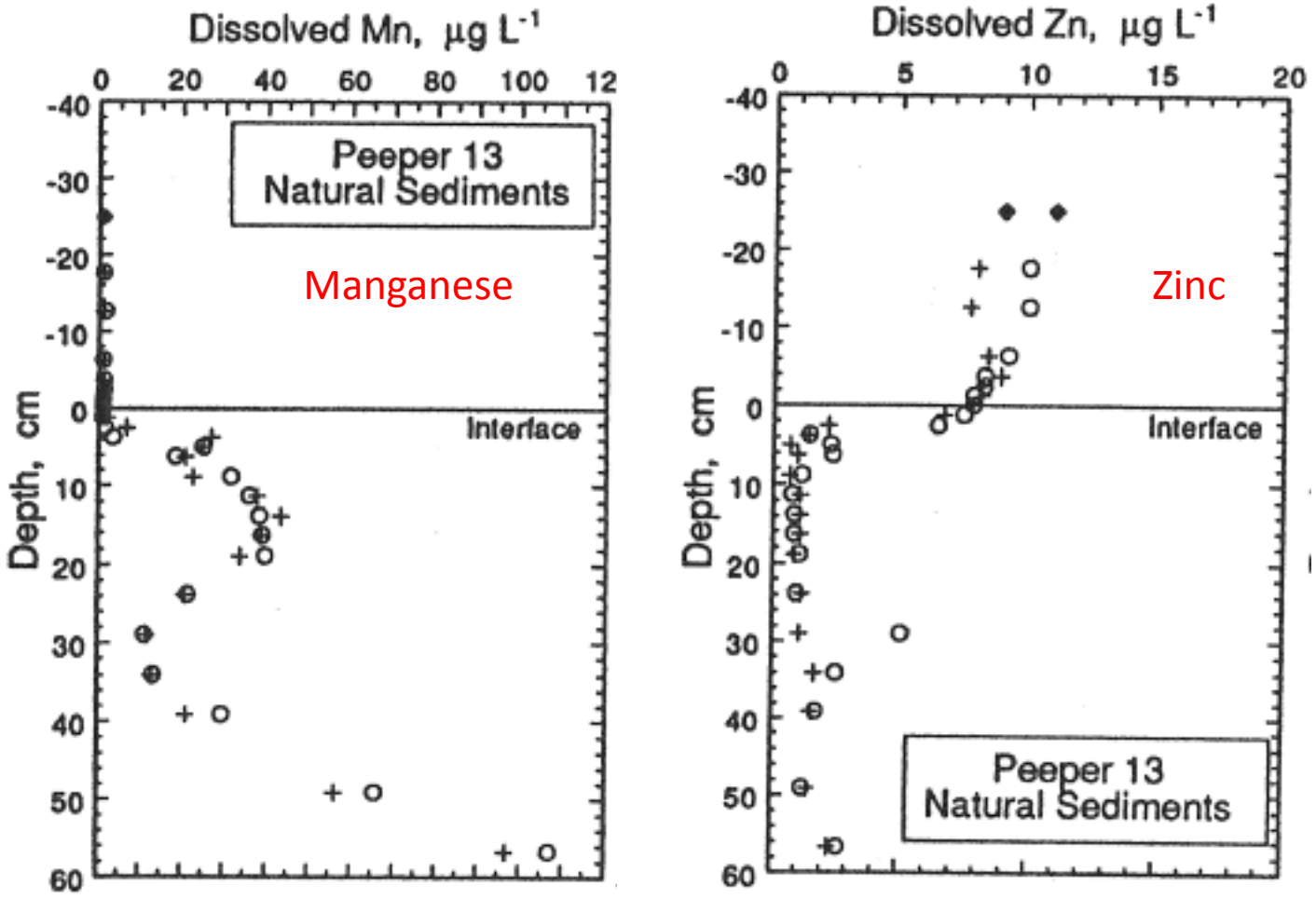
Dialysis array for pore water collection (1993)



Buttle Lake, 1993 Pore Water Data

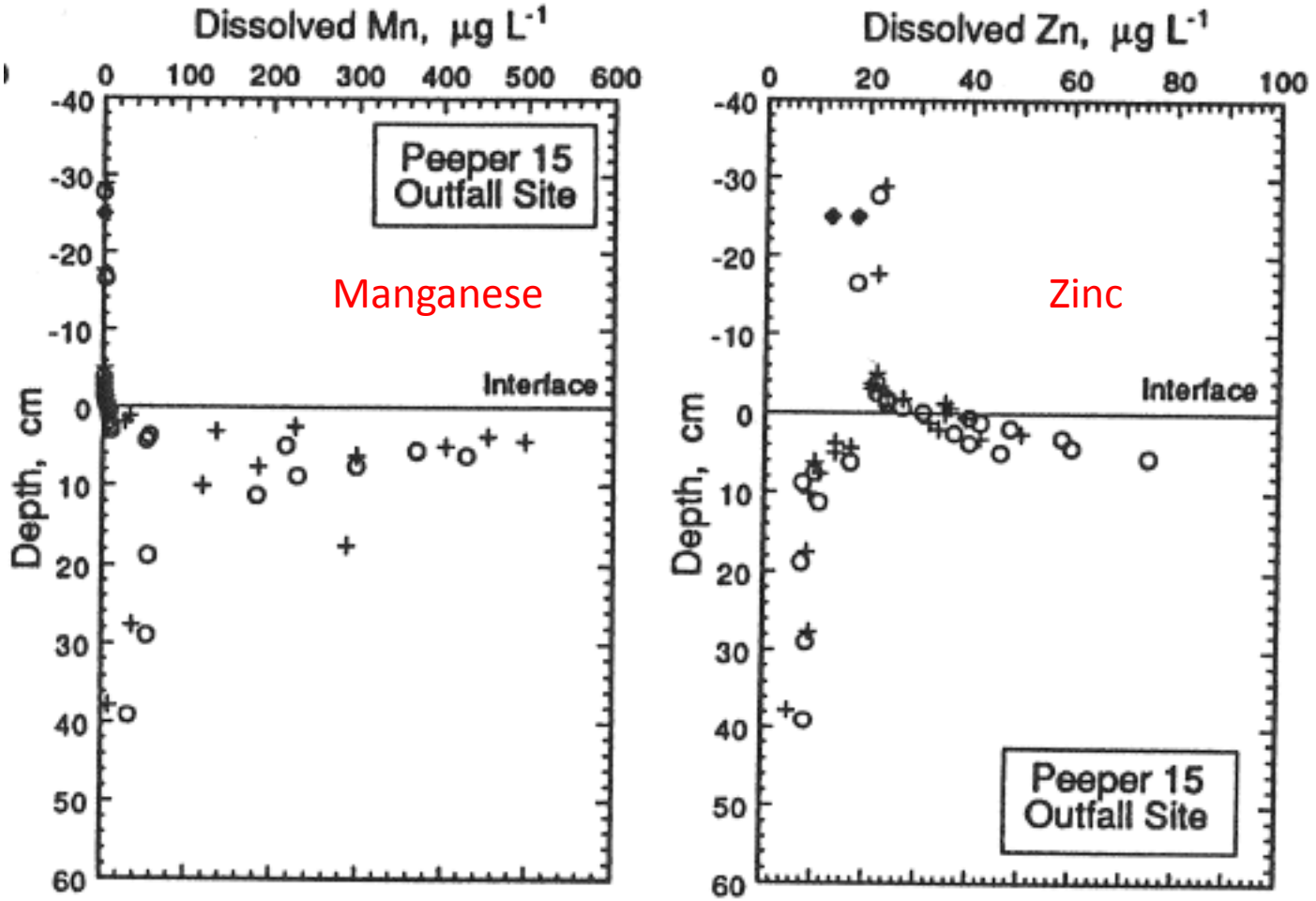


Buttle Lake, 1993 Pore Water Data, Natural Sediments Site



From Pedersen et al., 1998, "Geochemical behaviour of submerged pyrite-rich tailings in Canadian Lakes", in W. Geller et al, "Acidic Mining Lakes". Springer-Verlag.

Buttle Lake, 1993 Pore Water Data



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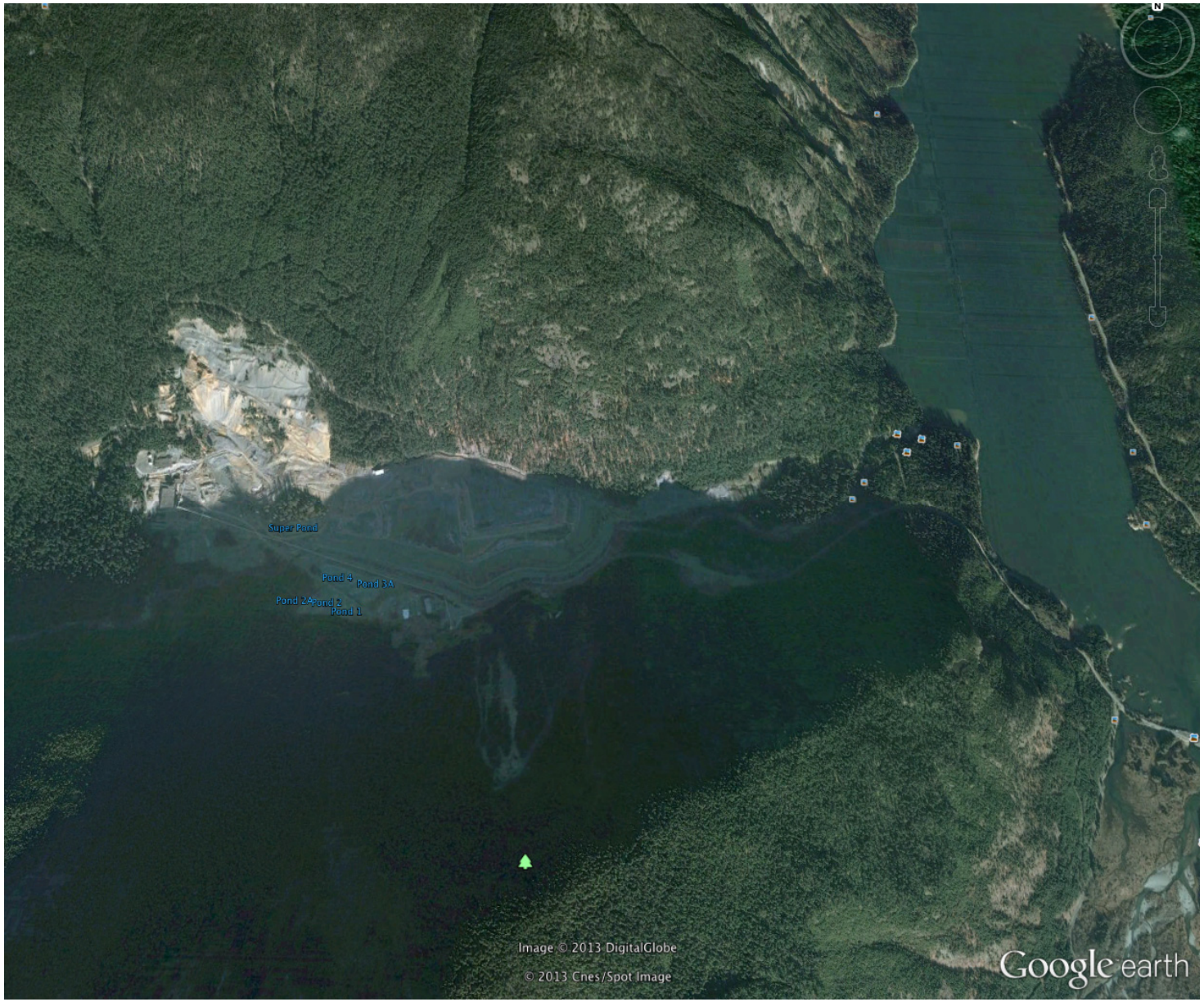
The mine site from space in 2003



A recent image of the Myra Falls mine site, perched above Buttle Lake

Seismically active region, steep slopes, 2.6 m of rain annually, anticipated increase in extreme rainfall and rain-on-snow events as a consequence of ongoing global warming.

THE GLOBE AND MAIL

MARK HUME

A century ago, B.C. cared about its parks

MARK HUME
VANCOUVER — The Globe and Mail
Published Sunday, Jul. 17 2011, 6:32 PM EDT
Last updated Thursday, Sep. 06 2012, 10:24 AM EDT

"Mr. Ellison returned to Victoria, after a month afield, with such a stunning report that cabinet moved, in the spring of 1911, to set aside 250,000 hectares of wilderness, creating Strathcona Provincial Park.

There were plans for a railway branch line and two Canadian Pacific hotels like those that had helped make the Rocky Mountains international travel destinations. But the magnificent hotels proposed were derailed by the First World War and over the years the once-revered park, which was intended to rival Banff and Lake Louise, came in for a lot of abuse. [The] Campbell River was dammed, mining tailings leached into Buttle Lake and logging was allowed in some places."

From the minutes of the Strathcona Park Public Advisory Committee meeting, July 2012, re tailings ponds:

Anne Moody, Reclamation Scientist, MEMPR:

"Old waste rock is covered by newer material. *This exposed old waste is now thought to be what was the source of acid generating run-off which caused problems in the 1980's, rather than the tailings dumped in the lake.* The waste rock must be covered so water does not get to it causing oxidation and release of acid drainage."

But, zinc is still reaching the lake via Myra Creek:

"The current treatment system is removing approximately 75%-80% of the zinc contamination, however, it must be noted that dissolved zinc was entering the water naturally prior to the mine site."

Summary and editorial:

- *There is no scientific evidence that mine tailings on the floor of Buttle Lake contributed to contamination of the overlying water.*

- *Constructed impoundments on land, with water covers, require perpetual maintenance to avoid ARD generation; natural lakes do not.*

- *Other terrestrial-disposal considerations: seismic risk, water balance issues, aesthetics, habitat degradation, scale of pond footprints.* ***All apply to the Myra Falls operation.***

- *Note that underwater deposition in lakes* ***does*** *degrade habitat, but that is* ***temporary****.*

- *A personal opinion: Using Buttle Lake as an example (there are many others), there is no good scientific rationale to ban* ***well-designed*** *disposal schemes in* ***appropriate*** *lakes.*

- ***The environment does not benefit when politics trump science. The Buttle Lake tailings-disposal decision in 1983 was political, not scientific.***

Thank you.