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Workshop on Environmental Aspects of Fundy Tidal Power

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"How many major engineering projects have run into serious opposition, or been halted, or failed to meet their objectives because the planners under-estimated the real or perceived impact on society and the economy?" This rhetorical question was the beginning of one of 20 background reports and papers presented at the Workshop on Environmental Aspects of Fundy Tidal Power held at Acadia University on November 4 and 5, 1976. The workshop, hosted by the Acadia University Institute, and sponsored by the Bay of Fundy Tidal Power Review Board, invited 120 scientists, engineers, and consultants to discuss progress reports, background papers and the results of scientific investigations concerning the environment and the feasibility of developing electrical energy from the tides of the Bay of Fundy.

The five sessions of the workshop were organized to provide initially, some background information, then to move toward the development of a consensus on the priority concerns of environmental impact for a major development scheme. In the first session members of the Management Committee of the Bay of Fundy Tidal Power Review Board reported progress on Phase I of the study program which is designed to reassess the feasibility of tidal energy previously reported by the 1969 Atlantic Tidal Power Programming Board. Within this study program five task areas are identified as: i) tidal power plant design, ii) tidal power generation, iii) systems studies, markets, alternative generation supplies and transmission, iv) socio-economic aspects, and v) environmental aspects. The last four sessions of the workshop were devoted to the environmental aspects especially as these pertained to the prime development sites located in Shepody Bay, Cumberland Basin and Minas Basin (Fig. 1).

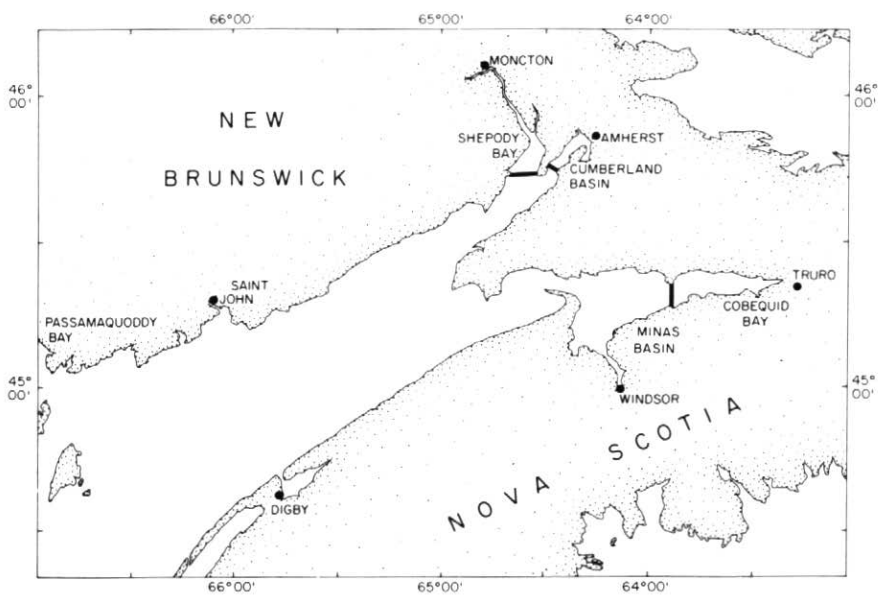

Figure 1
Bay of Fundy and surrounding area. The primary sites for construction of tidal power barrages are shown in Shepody Bay, Cumberland Basin and Minas Basin.

Several preprinted manuscripts concerning the physiography and environmental characteristics, and the interrelationships of environmental and engineering parameters were made available at the beginning of the workshop. Final papers from all of the sessions will be published as proceedings of the workshop, sometime in early 1977.

Background papers dealing with physiography and environmental characteristics included geology and tectonic framework, tidal influence on physical oceanography, climate, sediment regime, biological resources and the land-based resources of the Bay of Fundy area. All of these papers emphasized the great variability of the system, both in terms of its physiography and dynamic processes. These authors also drew attention to the many interactions between geology and biological habitat, physical oceanography and geological processes and between biological resources and the tidal characteristics.

The awareness of such interrelationships prevailed even during the discussion session that was organized by representatives of the four scientific disciplines of biology, chemistry, geology and physical oceanography. This session was held in an attempt to identify the most significant environmental concerns that warranted additional study or might have an economic effect on the development of tidal power.

In the fourth session three scientific papers and a panel discussion presented new data and considerations related to the implications of tidal power development. A mathematical model of the effects of tidal power structures on the tidal regime demonstrated that a drop in tidal amplitude could be expected near a barrier placed in the upper basins and in some instances an increase in tidal amplitude in areas remote from the barrier. This effect would be most pronounced for a development scheme placed in Minas Basin. The effects that a development would have on the erosion, transport and deposition of sediment in Minas Basin were discussed by analogy with the existing sediment budget and by examination of the effects of relatively small estuarine barriers, such as the causeway at Windsor, Nova Scotia. The conclusion was drawn that impermeable

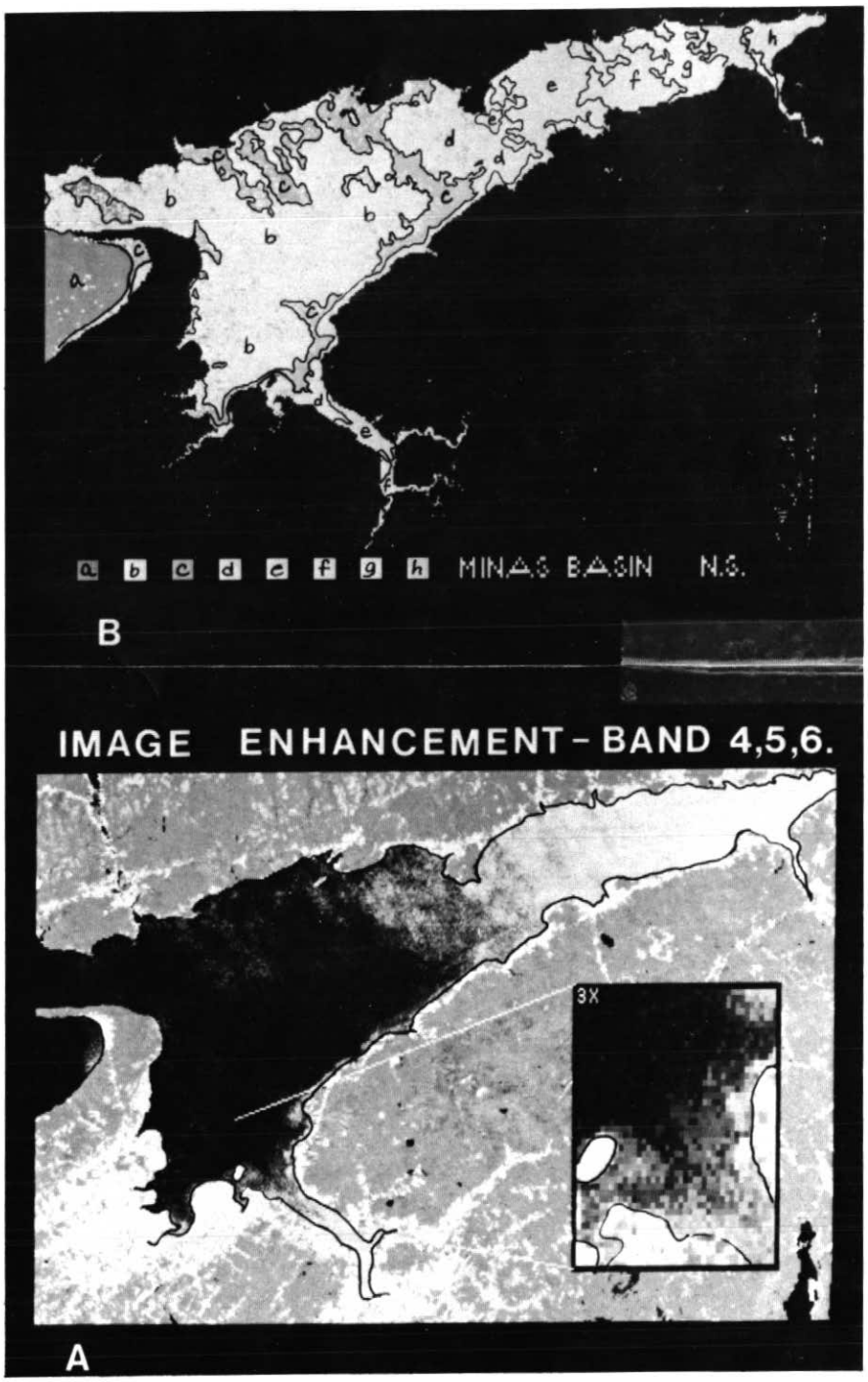

Figure 2A
False colour enhanced image of Minas Basin. Remote image obtained from Landsat satellite.

Figure 2B
False colour image sliced to represent eight class intensities of the water turbidity. Highest turbidity (h) represents approximately 60 to 80 mg/l of suspended particulate matter. Area (b) represents approximately 4 mg/l.

barriers placed in such environments would tend to block the natural headward transport of sediment ($4 \times 10^6 m^3$/year) with the expected result that rapid siltation in front (seaward) of the barrier would occur, perhaps at the rate of $3.0 \times 10^6 m^3$/year. Figure 2 shows the present distribution of suspended sediment in the bay.

Analyses of crustal strength and stability indicated that the Bay of Fundy area is subject to low seismic activity, however, little is known about the distribution of faults and the effects that additional loading from increased tidal heads would have on stressed faults.

With the indication that all primary development sites are located in the Chignecto Bay and Minas Basin areas appropriate consideration of the ecology and biological habitat was focused on the large intertidal areas characteristic of these high-tide (up to 15 metres) regions (Fig. 3). It was pointed out that the mudflat areas are highly productive and specific in terms of benthonic fauna and that this ecology is very dependent on the sedimentological stability of the region. Although the trophic structure of these major bays is not well understood, diverse populations of several economically-important species of fish spend at least part of their life in the area. In addition, the most important habitat for shorebirds in eastern North America is located on the intertidal areas of the upper Bay of Fundy.

In concluding the workshop, attention was focused on the knowledge base that already exists and on the gaps that must be filled in order to provide an adequate assessment of the environment appropriate to the needs of the tidal power feasibility study. It was recognized that the regional geological information available from the Shepody Bay - Cumberland Basin area was far less than that available from the Minas Basin. A precise understanding of the rates of sedimentation and mechanisms of sediment movement in Minas Basin is not yet achieved; the general problems of siltation were recognized, however, as being the most significant concern. The inter-relationships between the benthonic productivity of the upper regions and the economic fisheries and wildlife resources of the Bay as a whole warrant prominent consideration in future studies. Improved and more detailed modelling of the physical oceanography as it would be affected by the barrier, should be considered as another priority to assist in projecting its effects on coastal erosion, biological productivity, and sediment transport.

Analyses of these complex problems are urgent because the Tidal Power Review Board has indicated that crucial decisions will probably be made regarding the feasibility of development within the next 20 to 24 months. The Acadia Workshop did not result in the production of a detailed work plan for the solution of these problems, but it did provide a forum for "planners" and "environmentalists" to express ther priority concerns and recommend studies that could help avoid unproductive conflict between development proponents and environmental opponents.

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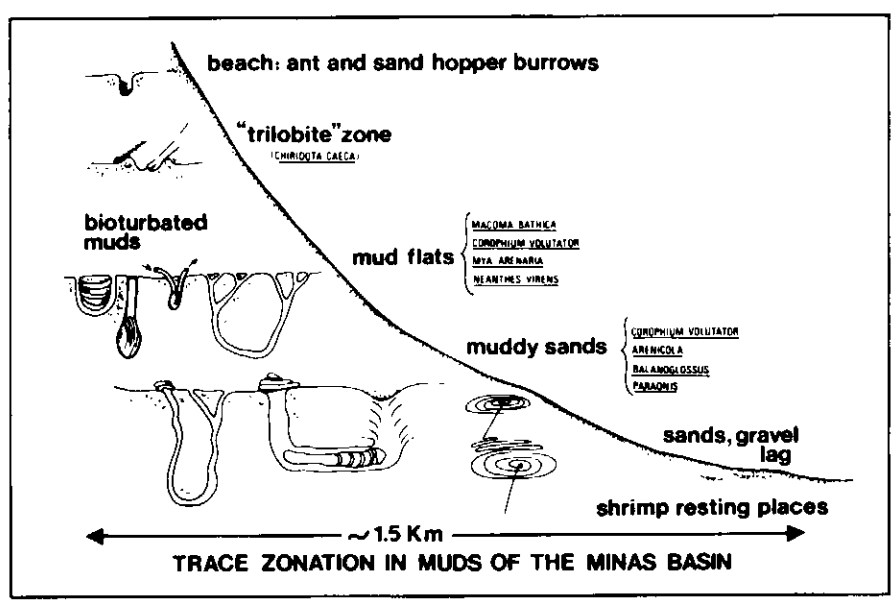

Figure 3
Zonation of organic traces, established by Craig and Risk for the Minas Basin.