

MISSISQUOI BAY INFORMATION SHEET

A Summary of Research Findings on Causeway Removal

Water Quality Concerns

- Excessive phosphorus inputs from the watershed in Vermont and Quebec have made Missisquoi Bay one of the most eutrophic areas of Lake Champlain.
- Causeway removal as part of the replacement of the Missisquoi Bay Bridge was proposed as a means to enhance water circulation between Missisquoi Bay and the Northeast Arm of Lake Champlain.

The Bridge Construction Project

- A new bridge on piers will be built between Alburg and Swanton immediately south of the site of the old bridge.
- The project involves removal of the old drawbridge and the partial removal of the existing causeway.
- Construction of the new bridge will begin in 2004. During the first year of construction, it is expected that shafts for all 22 piers will be drilled and at least some of the piers will be built. Work will also be done on the roadway approaches to the new bridge.
- Permits issued for the project by the Vermont Agency of Natural Resources require that most of the existing causeway be left in place after the new bridge is completed because the causeway provides habitat for the spiny softshell turtle, a state-listed endangered species in Vermont. The species is similarly protected by legislation in Quebec. Causeway removal is limited to the two old bridge abutments and 330 feet of the lakeward end of the eastern (Swanton) causeway arm.

Phosphorus Mass Balance Study

- A phosphorus mass balance modeling analysis of Missisquoi Bay was conducted in 1993 to simulate the enhanced mixing effects of causeway removal.
- The results indicated that removal of the causeway would produce an 8% reduction in average total phosphorus concentrations in Missisquoi Bay, and a 9% increase in phosphorus concentrations in the Northeast Arm region of the lake to the south.
- Because the water quality benefits to Missisquoi Bay would be offset by adverse impacts on the Northeast Arm with no net phosphorus removal benefit to Lake Champlain as a whole, and because of the poor cost/benefit ratio, the report concluded that causeway removal was not justified.
- There was strong public desire for an additional study that (1) was conducted by a scientific consultant independent of state government, (2) developed a true hydrodynamic model that directly simulated changes in water currents in the bay in response to causeway removal, and (3) modeled sedimentation changes in the bay as well as phosphorus concentrations.
- A Project Advisory Committee, composed of scientific professionals, elected local officials, and concerned citizens from both Vermont and Quebec, was formed to promote better public acceptance of the findings of the hydrodynamic modeling study.

Hydrodynamic Modeling Studies

[Hydrodynamic Modeling of Missisquoi Bay in Lake Champlain](#) (PDF Document)

Missisquoi Bay Field Study and Hydrodynamic Model Verification
(PDF Document)

- The results of the first phase of hydrodynamic modeling, completed by Applied Science Associates Inc. in 1997, indicated that for the majority of cases modeled there was a small improvement in the flushing and sedimentation in Missisquoi Bay with causeway removal and generally confined to the region in the vicinity of the causeway. Phosphorus and sediment reduction in Missisquoi Bay were matched by increases in the Northeast Arm.
- Differences between the with and without causeway cases were substantially smaller than differences caused by variations in environmental forces such as wind speed and direction.
- The Project Advisory Committee determined that a second study phase was needed to obtain field data to verify model predictions against actual current measurements and to conduct model runs using realistic time varying environmental conditions for the entire summer season.
- It was found that the model did a good job of simulating the volume of flows through the bridge opening.
- The model results indicated that removal of the causeway will reduce average phosphorus concentrations and sedimentation (fine fractions only) in Missisquoi Bay by about 1%.
- The Project Advisory determined that, *"Although it has some limitations, the study was well planned and executed and the data and information provided by the study (are) valid and should be useful for going forward in the future of the project."* The committee recommended *"that the study be used to assess the merits of actions of removing the causeway or leaving it in or any other design choices related to the construction of the new bridge, as one element (of) the process."* However the committee felt that the significance of the predicted water quality effects on Missisquoi Bay resulting from causeway removal *"is a value judgment which cannot be determined by this committee alone relying solely on the results of the study."*

Long-Term Water Quality Solutions

- Quebec and Vermont are working cooperatively to reduce phosphorus loading to Missisquoi Bay from point and nonpoint sources in its watershed.
- An agreement on phosphorus reduction in Missisquoi Bay, signed by Vermont and Quebec in August 2002, established a division of phosphorus reduction responsibility between the two jurisdictions and defined the maximum allowable phosphorus loads to the bay from Vermont and Quebec.
- Quebec and Vermont are in the process of implementing, preparing, and funding action plans for phosphorus reduction in the Missisquoi Bay watershed.