

Shoreline and Benthic Erosion Potential due to Rt.78 Missisquoi Bridge Reconfiguration



CLIENT:

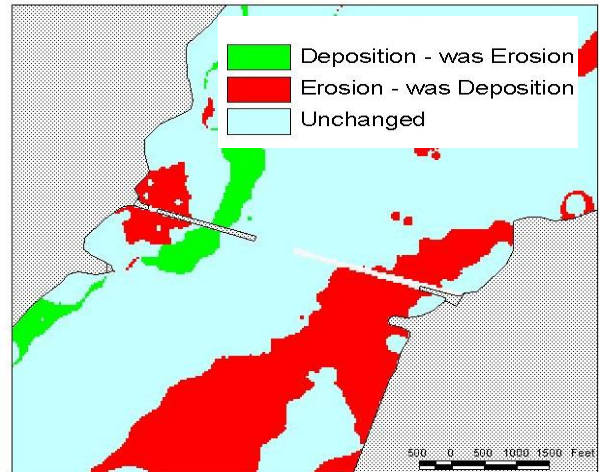
Vermont Agency of Transportation through Vanasse Hangen Brustlin, Inc.

PROJECT #:

2000-085

PROJECT ELEMENTS:

- Hydrodynamic and wave modeling
- WQMAP BFHYDRO Hydrodynamic Model
- Sediment sampling surveys
- Numerical wave model: REF/DIF



PROBLEM. PURPOSE.

Missisquoi Bay is a small, shallow embayment located in the northeast corner of Lake Champlain. The Route 78 Missisquoi Bay Bridge connects West Swanton and East Alburg at the southern end (mouth) of the bay. During bridge reconstruction planning and design concern was raised as to the effect on the shoreline and bottom habitat the new bridge will have, particularly since the preliminary bridge designs envisioned a larger center opening. ASA was commissioned to perform analysis of the current and wave environment and the effects on shoreline change and bottom erosion and deposition patterns.

SCIENCE. SERVICES. SOLUTIONS.

The wave environment within Missisquoi Bay was estimated for the existing and eight alternative bridge/causeway configurations for various environmental conditions. Due to the bathymetric and shoreline complexity of the area it was necessary to employ a numerical wave model, REF/DIF. The model is capable of simulating the behavior of a wave spectrum or monochromatic wave train over irregular bathymetry with complex shoreline configurations. The model incorporates the effects of shoaling, refraction, diffraction, and turbulent energy dissipation to produce a detailed description of the wave field (wave height, period, and direction) in a given study area.

To accurately represent the extreme geometric constriction between Missisquoi Bay and Northeast Arm, a boundary-fitted coordinate hydrodynamic model, BFHYDO was applied. The boundary fitted method allows close matching of the model coordinate system with the complex shoreline.

In order to more accurately define the bottom sediment characteristics near the causeway within Missisquoi Bay, two sediment sampling surveys were designed and conducted. The first consisted of sampling six sites distributed along the eastern and western shores relative to the existing causeway location. The second survey consisted of collecting samples adjacent to the existing bridge/causeway.

PRODUCTS. RESULTS.

A major concern was how each causeway design will change bottom sediment transport in Missisquoi Bay. The hydrodynamic model results were used as a predictive tool to map areas of predicted deposition and erosion for the present causeway and three of the eight alternative bridge configurations.

The information developed from this study was then used in the evaluation of the various causeway alternatives.