



Hydrodynamic Analysis and Culvert Design to Improve Tidal Flushing in Phinney's Bay

Barnstable, Massachusetts

Phinney's Bay is a coastal lagoon that connects to East Bay and Vineyard Sound through an undersized tidal culvert. The existing culvert restricts tidal exchange with the larger estuary system. Consequently, water quality impairment, including elevated fecal coliform bacteria levels, eutrophic conditions, and a dominance of Phragmites exist in Phinney's Bay. Enlarging the culvert would lead to improved tidal circulation, improved water quality, and a decrease in the extent of the invasive Phragmites.

Horsley Witten Group (HW) assisted the Town of Barnstable Department of Public Works with design of a replacement tidal culvert system and obtaining necessary permits. A series of pressure transducers were deployed in the field to measure the headwater/tailwater hydrodynamics of the existing culverts. This data was used to calibrate a model of the existing tidal hydrodynamics using the PondPack hydrologic/hydraulic software package (v. 8.0 by Haestad Methods). A series of alternative replacement culvert sizes were then analyzed using the calibrated model to arrive at the most cost effective culvert design that would optimize tidal flushing.

HW produced construction contract drawings and specifications and applied for permits with the Town of Barnstable Conservation Commission, the U.S. Army Corps of Engineers, and the Massachusetts Department of Environmental Protection, Waterways Regulation Program. HW provided construction administrative services for the Town, construction was substantially completed in April, 2006.

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