

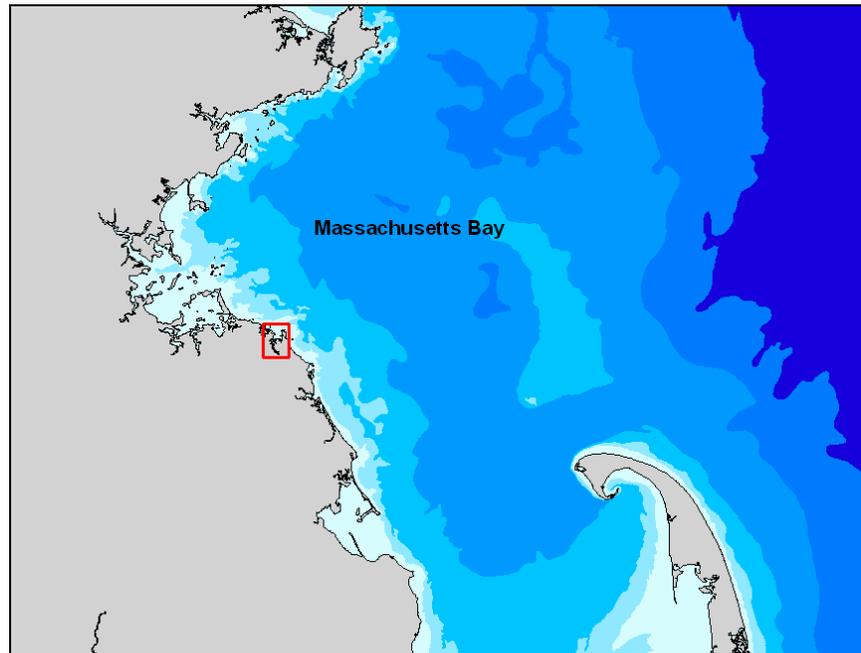


## Massachusetts Bays National Estuary Program

### COHASSET HARBOR ESTUARY 2006 MONITORING PILOT

July 6, 2006

There has been growing local concern that water quality has significantly declined in the Cohasset Harbor Estuary (CHE) during the past 25 years. A 2005 report prepared by the Cohasset Harbor Health Committee identified losses to once-abundant shellfish resources, degradation to the benthic community and sediment quality, and, more recently, observed lobster mortalities. Cohasset Harbor is also perceived to have significant pollution impacts from non-point sources of land-based contaminants (e.g., nutrients) and from the Town's wastewater treatment facility, which discharges approximately 250 thousand gallons daily into the inner portion of the Harbor. Further, the Town is proposing to increase the wastewater treatment facility's capacity by an additional 50% in the near future.



The CHE estuary is one of the few remaining estuaries that contain extensive eelgrass beds. Eelgrass beds are considered to be a highly-valued habitat; supporting diverse and distinct groups of aquatic and avian species and critical nourishment to herbivores and detritivores (animals that eat partly decomposed organic material). (see [http://www.mass.gov/czm/coastlines/2004-2005/habitat/e\\_grass.htm](http://www.mass.gov/czm/coastlines/2004-2005/habitat/e_grass.htm)). This habitat is also known to be very sensitive to changes in water quality. Most of the existing eelgrass beds in the CHE are confined to the outer harbor. Because of the sensitive resources within this system, the concerns of local citizenry and the increase in coastal development, the Massachusetts Bays Program (MBP) is initiating the monitoring pilot to ensure the protection of these ecologically-important resources for future generations.



*The Cohasset Harbor Estuary system: The large green area shows the areal extent of eelgrass beds located in the outer Harbor region (from MassGIS).*

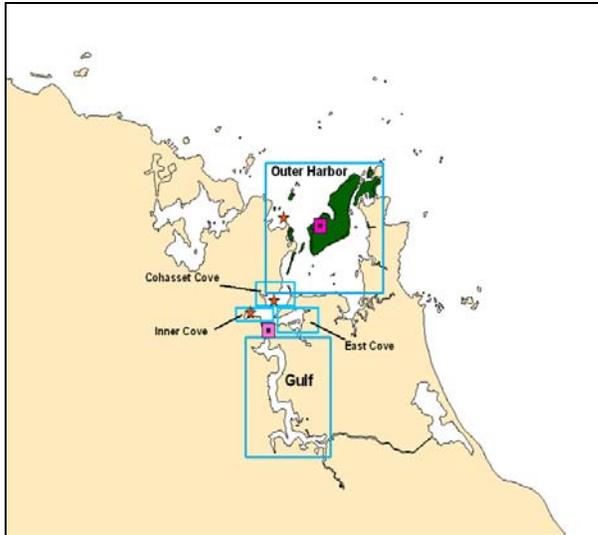
The CHE monitoring pilot will marshal resources within the Commonwealth in a coordinated program that could provide a scientific basis for (1) better understanding of the factors influencing water quality in the CHE; (2) establishing appropriate water quality conditions protective of sensitive habitats (eelgrass beds); and (3) providing the background for assessing the effects of future management actions (e.g., increased wastewater discharge, non-point pollution mitigation) on the CHE. Our partners include the Massachusetts Dept. of Environmental Protection, U.S. Environmental Protection Agency, MA Office of Coastal Zone Management (MCZM), and the University of Massachusetts in Boston.

The CHE Monitoring Pilot has been designed to provide data to support the development of water quality modeling of the estuary, answer basic questions about the CHE ecosystem, and provide benchmark data for future monitoring. Three questions fundamental to the project scope and sampling design are:

1. *Is the dissolved oxygen standard ( $>6 \text{ mg L}^{-1}$ ) met for the high quality classification (class SA) assigned to the surface waters of the CHE?*
2. *Is freshwater (and associated contaminants) from various sources (stormwater runoff, wastewater discharge, James Brook) to the CHE having a significant effect on the biological community and on lobster mortality within the CHE?*
3. *What are the water quality conditions (i.e. concentrations of nutrients, dissolved oxygen, chlorophyll, organic particles) that eelgrass beds are exposed to?*

## OUR STRATEGY:

*Review:* First, we will review existing information on Cohasset Harbor water quality and physical models previously designed to understand the characteristics of mixing and dispersion of fresh water in the Harbor. We will develop a simple box-model approach for a first order approximation of water quality dynamics (mixing rates, residence times) in CHE to evaluate influences on water quality in the CHE, including exchanges with Massachusetts Bay, discharges from the Cohasset WWTF, and non-point source loading. Preliminary model construction is based on the work of Applied Science Associates, Inc (ASA) in 1997<sup>1</sup>.



*Simple "box model" of the Cohasset Harbor Estuary system. The orange stars represent autonomous monitoring sites (sonde locations) where data for depth, salinity, temperature, and dissolved oxygen are recorded at 15 min. intervals and weekly surface water "grab samples" will be collected for nutrients, chlorophyll, suspended solids and particulate organic carbon analyses. Two of these sites will be monitored for daily PAR photon flux. The pink squares indicate sites where surface water grab samples are collected weekly.*

*Field Monitoring:* Using 3-4 autonomous monitoring sondes (depicted below) deployed strategically at three stations in the CHE system, a subset of water quality parameters (e.g., dissolved oxygen, salinity, temperature, and photosynthetically-active radiation--i.e. the available light for photosynthesis) will be monitored at each site beginning in June and continuing into October, 2006. Further, discrete water column samples will be collected weekly throughout the period for chlorophyll, total suspended matter, and dissolved nutrients (TN, NO<sub>3</sub>+NO<sub>2</sub>, NH<sub>4</sub><sup>+</sup>). Concurrent water column monitoring of these parameters conducted by the Massachusetts Water Resource Authority, under their outfall monitoring program, will serve as a measure of the of the Massachusetts Bay water that exchanges with the CHE system with each tidal cycle.



*A typical sonde (YSI model 6600 fitted with a LiCor PAR sensor): Used to monitor salinity, temperature, dissolved oxygen, and photosynthetically-active-radiation at depth every 15 minutes.*

<sup>1</sup> Sanson and Mendelsohn. 1997. Circulation and Flushing Modeling Study for Cohasset Cove and Cohasset Harbor. Submitted to Tutela Engineering Associates, Inc as part of the Final Wastewater Facility Plan and Environmental Impact Report Cohasset, MA (EOEA # 10275).

*Synthesis:* Staff from the MBP and MCZM will be analyzing the field data and developing models that describe the characteristics of freshwater mixing and dissolved oxygen dynamics in the CHE, provide first order approximations of water residence times (how long water resides within each segment of the CHE), and describe the water quality exposure of the eelgrass beds. If the data lends itself, we will estimate the contributions of non-point, point, and ocean loadings of nutrients to the CHE. We anticipate a report to the Cohasset Harbor Health Committee sometime during the February, 2007.

The concerns of the local citizenry over the perceived impacts to the natural resources of the CHE have highlighted existing gaps in our knowledge of the ecosystem. The CHE 2006 monitoring pilot will improve our ability to distinguish trends from annual variability and enhance management of the estuary by: (1) developing an understanding of the linkages between non-point (watershed-based) and point source material (nutrients, organic matter) loading, exchange with Massachusetts Bay, and how the CHE ecosystem responds; (2) proposing management strategies that are protective of sensitive aquatic habitats; and (3) developing reference data on water quality and ecological conditions.