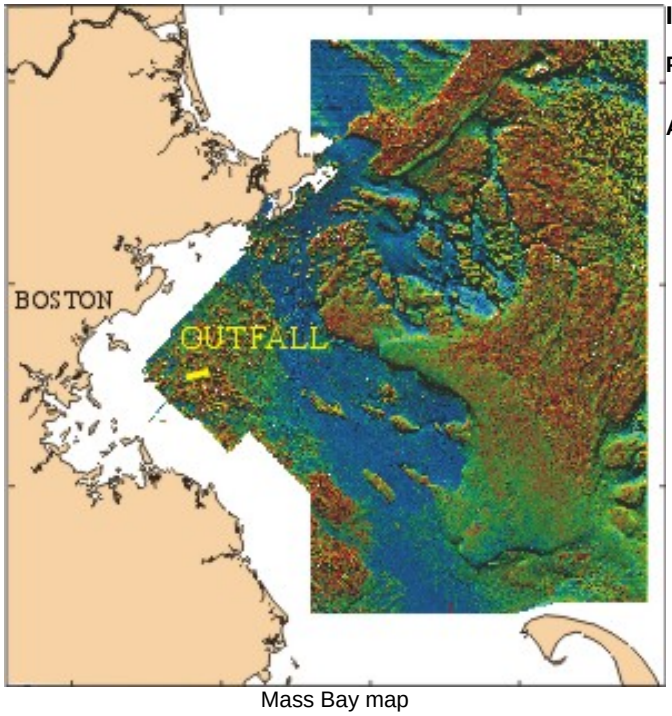
The Massachusetts Bay Experiment

SUMMARY:

The discharge of wastes from metropolitan centers to coastal waters around the US continues to compromise human health, degrade habitat for living resources, hinder economic development, and restrict recreational activities. In Boston Harbor and Massachusetts Bay a court ordered plan costing $4 billion has been implemented to minimize these consequences of discharged wastes. Throughout a continuing clean-up effort, the USGS has worked cooperatively with the Massachusetts Water Resources Authority to provide fundamental scientific information to assist management decisions concerning environmental and engineering issues. The procedures we are developing and the information being provided for Massachusetts coastal waters is applicable to other contaminated areas in the nation and world.



Mass Bay map

INVESTIGATORS:

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DESCRIPTION:

The Massachusetts Bay Experiment seeks to refine and verify a predictive capability for the transport, fate, and environmental effects of wastes discharged to the coastal ocean utilizing the new Boston sewage outfall as the anthropogenic signal. On September 6, 2000, the nation's second largest sewage treatment plant stopped all discharges into Boston Harbor and began discharging treated sewage effluent at the new location in Massachusetts Bay 9 miles seaward of the harbor mouth. This change in outfall location continues to provide an unprecedented opportunity to test our predictions about the transport of wastes in the coastal ocean and to quantify the mechanisms of exchange between contaminants in sediments and in the overlying water. During the next proposal year, we plan to continue synthesis and publication of data from this multi-disciplinary project. In addition, we will continue the field operations funded by reimbursable funds from Mass Water Resource Authority designed to document sediment and contaminant transport processes through long-term oceanographic observations (since 1989) and transport model development. We will also measure contaminant concentrations in sediments and suspended matter in western Massachusetts Bay to provide an early warning of any environmentally significant changes from pre-outfall conditions. The project is conducted cooperatively with the Massachusetts Water Resources Authority (MWRA), the lead agency under federal mandate to clean up Boston Harbor.

START DATE OF PROJECT:

October 1, 2002

END DATE OF PROJECT:

September 30, 2007

LOCATION:

Massachusetts

TOPIC:

Aquatic and Marine Processes Related to Human Health

APPROACH:

The technical goals and approaches for the lifetime of this project are to: (1) Monitor long-term changes in contaminant levels in sediments following discharge from the new outfall, both in Boston Harbor and Massachusetts Bay, and identify mechanisms and rates of these changes; (2) Monitor currents, suspended sediment, and other parameters in western Massachusetts Bay to document inter-annual variability and catastrophic events as part of a multi-disciplinary program to assess the effects of the new ocean outfall and to understand the sediment transport system in the Massachusetts Bays; (3) Test and improve the 3-dimensional numerical modeling of sediment and pollutant transport in this region; (4) Provide information to managers, scientists, and the public rapidly and in an effective format. (5) Develop research techniques and insights to marine processes that can address problems in other coastal regions of the US. Our strategy for meeting program objectives is to: (1) provide easily accessible information to managers, scientists and the public by establishing and maintaining a web home page and by meeting regularly with MWRA and federal managers; (2) document pre- and post-discharge changes in contaminant levels in sediments of Boston Harbor, the outfall site, and in the Massachusetts Bays by continuing established time- series sediment sampling at selected sites; (3) Develop a predictive model for the transport of sediment and associated contaminants; and (4) publish results in scientific journals.

IMPACT/RESULTS:

This research project provides a regional perspective to both scientific and management issues of wastes in the coastal ocean of Massachusetts and develops techniques and information that can be applied to other US (and foreign) urban coastal areas. We continue to use a multi-disciplinary approach to address questions about the transport and fate of contamination. Specific to the Boston area, our research is also a critical component of the EPA mandated monitoring plan to evaluate the potential environmental impact of this outfall. Our work is sufficiently relevant that MWRA, responsible for implementing a $4 billion waste management program, has contributed $200 K/ year to this research project during the period 1990 - 2000 and $300 K/year for years 2001 # 2003. They have invited us to submit a renewal 2-year proposal for up to $300 K/year. Our products have had the impact, acknowledged by the MWRA, of saving millions of taxpayer dollars by providing scientific justification for cost-saving management decisions during the Harbor Cleanup Program. One specific example: the model results helped MWRA evaluate and gain approval for downsizing the planned secondary sewage treatment plant. The downsizing saved Boston area rate payers $160 million. During the life of the Boston Harbor/Mass Bay project through 1/17/03, products completed total 98 papers, reports, maps or www sites, and 63 abstracts. The complete bibliography (less 5 publications in press) is available at our project website http://woodshole.er.usgs.gov/project-pages/bostonharbor/index.html

PUBLICATIONS:

- Butman, Bradford, Bothner, M.H., Lightsom, F.L., Gutierrez, B.T., Martini, M.A., and Strahle, W.S., 2002. Long-term oceanographic observations in western Massachusetts Bay offshore of Boston, Massachusetts: Data report for 1989 - 2000. U.S. Geological Digital Data Series #74, DVD.
- Bothner, M.H., Casso, M.A., Rendigs, R.R., and Lamothe, P.J., 2002, The effect of the new Massachusetts Bay sewage outfall on the concentrations of metals and bacterial spores in nearby bottom and suspended sediments. Marine Pollution Bulletin, Vol. 44, pp. 1063-1070.

RELATED:

- Boston sewage outfall: The fate of sediments and contaminants in Massachusetts Bay