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**STATUS AND PROPOSED CONTROL OF POLLUTION
IN BOSTON HARBOR AND ITS TRIBUTARIES**

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Introduction

Boston has one of the finest harbors in the United States. It has considerable potential for the development of commercial, industrial, residential and recreational facilities. Unfortunately, many of its waterfront structures have been allowed to deteriorate and its recreational value has been reduced because of polluted waters. Its shipping has declined and most of the tidal flats have been closed to shell fishing.

It is estimated that over 240,000 persons take part in swimming, fishing and boating in Boston Harbor on the average summer day. The value of its shell fishing could be increased to over \$100,000 annually. A World's Fair is planned to be sited in the Harbor in 1975, with the filled area available for residential development afterwards. The Water Front Urban Renewal Project and proposed private developments will improve conditions in some deteriorated areas. Implementation of the containerization facility at Castle Island will be a big step forward in the increase of shipping in Boston Harbor.

Development of the Open Space and Recreation Program for Boston Harbor recommended by the Metropolitan Area Planning Council at an estimated cost of \$23,000,000 would provide acquisition of open areas and the construction of facilities for boating (including marinas), camping sites, beaches, picnic areas, bicycle and walking trails.

Pollutants

Pollution in the Harbor is of several types of solids and liquids. Liquid pollutants include sewage discharge from municipalities, shore installations,

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ships and small craft; chemicals from industries; wastes from fish processing plants; and oil from accidents, leakage or the discharge of ballast water. Solid wastes comprise wood and debris from rotting waterfront structures such as piers, wharves, slips, seawalls, bulkheads, and sunken hulks; spillage from loading docks and from scows hauling demolition material and refuse for disposal by open burning in the Outer Harbor; and floating debris from filling operations in tidewater.

Pollution in the rivers is caused principally by storm water over-flows from combined sewerage systems, and from industrial wastes. Floating debris is not as extensive in rivers as in the Harbor.

The Federal Water Pollution Control Administration has approved the water quality standards and classifications adopted in 1967 by the Massachusetts Division of Water Pollution Control for the inland and tidal waters of the Commonwealth.

The classifications adopted show that the Charles River Basin and the Neponset River have fresh water classifications of C and that the tidal waters in the Harbor are classified as (1) Boston Inner Harbor, SC; (2) Boston Outer Harbor, SB; and beyond a line from Hull to Deer Island, SA. If these waters are to meet the required standards, the sewage overflows into the Harbor and its tributaries must be eliminated.

History of Pollution

The problem of pollution from debris has been accelerating over the past half century. Harbor facilities have been deteriorating and decaying with many wharves demolished or burned out. Floating debris from this source and from spillage results in serious navigational hazards. Oil pollution is probably the most serious pollutant for marine life in the harbor.

The Boston urban renewal program and the construction of major highways required an extensive amount of demolition over the past decade. Some of this material has been disposed of by burning in the Outer Harbor. Spillage from loading and transporting this material in scows has presented a problem at times.

Pollution of the Harbor and its tributaries extends back over more than a century. The first drains constructed prior to the year 1700 and until 1823 were all privately owned and used for draining cellars and land only. These drains and later the common sewers discharged into the nearest water course. Fecal matter was excluded until 1833. By the 1870's conditions in the sewerage system and at the outlets resulted in odor and health problems.

Between 1877 to 1884 the City of Boston pioneered in constructing major sewerage works known as the Boston Main Drainage System; consisting of 25 miles of main and branch intercepting sewers, a pumping station at Calf Pasture and storage tanks at Moon Island for discharge on the ebb tides. This system was designed to carry the dry-weather sewage flow with an allowance for a small quantity of storm water from combined sewers which formerly discharged into the Harbor and its tributaries.

Storm over-flows from this system along with combined sewer overflows from neighboring communities including Brookline, Cambridge, Chelsea and Somerville discharge through about 100 outlets into the Harbor and its tributaries. This discharge, along with the leakage of some dry-weather flow, has resulted in objectionable odors, grease balls, and sewage sludge deposits, along with evidence of bacterial pollution, in the vicinity of these overflows, some of which are located in beach areas.

The North Metropolitan Sewerage District was established in 1889. Its sewerage system serves communities north of the Charles River and discharges into Boston Harbor off Deer Island. The South Metropolitan Sewerage District was created in 1899 to serve portions of the Charles River Valley and the Neponset River Valley. Its system discharges into the Harbor off Nut Island. Discharge from these systems created pollution in the immediate areas of the outlets. This has been alleviated at the Nut Island outlet by the construction of a primary treatment plant and will be abated at Deer Island when the new treatment plant serving the M.D.C. North Metropolitan and the Boston Main Drainage Systems is placed in operation.

The establishment of oil storage facilities along the Mystic River and the change over from the use of coal to oil by power generating plants and other major fuel consumers has created some relatively minor pollution problems and some potentially major hazards. Leaks and accidents during the transfer of oil from ships to storage tanks and being washed out of barges or tankers discharging ballast have created pollution. Recently the hull of a large tanker was ruptured by ice when entering the Fore River, Weymouth. Fortunately, most of the spillage was contained in a limited area. Otherwise the beaches and shore line could have been seriously contaminated.

Responsibility for Control

The responsibility for the control and abatement of pollution in Boston Harbor and adjacent waters is divided among many governmental agencies

whose responsibilities frequently overlap and their authority is divided.

Eight Federal agencies, six State agencies and three City agencies have some degree of control or responsibility over the Harbor waters and the rivers.

The Federal agencies are

- Department of Interior
 - Federal Water Pollution Control Administration
 - U. S. Fish and Wildlife Service
- Department of Housing and Urban Development
- Department of Health, Education and Welfare
 - U. S. Public Health Service
- Department of Commerce
 - Economic Development Administration
- Department of Defense
 - U. S. Army Corps of Engineers
 - U. S. Navy
- Department of Transportation
 - U. S. Coast Guard

State agencies are

- Department of Natural Resources
 - Division of Water Pollution Control
- Department of Public Health
- Department of Public Works
 - Division of Waterways
 - Division of Motor Boats
- Metropolitan District Commission
- Massachusetts Port Authority
- Metropolitan Area Planning Council

City of Boston agencies are

- Public Works Department
- Health Department
- Police Department - Harbor Master

The division of responsibility and the lack of a centralized authority has made it difficult to exert firm control over the use of or pollution of the harbor and river waters. However, the various agencies have been attempting to coordinate their efforts, the most recent being the formation of a Bos-

ton Harbor Pollution Committee. This committee has representatives from almost all of the aforementioned agencies and has been instrumental in effecting some improvement in the Harbor waters. It has recently been proposed that a Boston Harbor Development Commission be formed to coordinate the activities of all the various Federal, State and local agencies concerned with harbor development and pollution control.

Proposed Corrective Measures

Currently the Metropolitan District Commission has a \$110,000,000 program under construction that will further alleviate but not entirely eliminate pollution in the Charles River and Boston Harbor. These projects resulted from engineering studies and investigations by the Charles A. Maguire and Associates, Engineers, and from legislation enacted in 1951 authorizing construction of the following:

Project A. The construction of a tunnel between Columbia Circle and Deer Island with necessary shafts and appurtenant works.

Project B. The construction of a tunnel between Ward Street pumping station and Columbia Circle with necessary shafts and appurtenant works.

Project C. The enlargement of the previously authorized Deer Island sewage treatment plant to care for the flow from Project A.

Project D. The construction of a relief sewer between Boston University Bridge and Ward Street.

Project E. The construction of a relief sewer for the west side and Stony Brook interceptors of the Boston Main Drainage District.

Project F. The construction of a Marginal Conduit pumping station and appurtenant works.

Project G. The rehabilitation of tide gates and pumping stations.

The U. S. Army Corps of Engineers, New England Division has been directed by the U. S. Senate to make a study of debris control in Boston Harbor. This study is now in progress and is being made "with a view to determining the advisability of eliminating the sources of drift and debris and other obstructions and injurious deposits that pollute the waters of Boston Harbor, by removal and disposal of dilapidated structures and derelicts, and by other appropriate measures, along the shores of the harbor, and its tributary waters, that constitute possible obstacles or hazards, or produce damage to existing navigation."

According to Colonel Remi O. Renier, Corps of Engineers, New England Division Engineer, the benefits to be derived from the study are

- “(1) Reduction in boat damages
- (2) Reduction in cost of present debris collection program
- (3) Reduction in cost for cleanup of shores of public beaches in area
- (4) Land enhancement, certain shore properties
- (5) Reduction of fire hazards
- (6) Reduction of water pollution from debris only
- (7) Reduction of infestation of marine borers
- (8) Reduction in hazards to life from drift, derelict vessels and dilapidated shore structures
- (9) Aesthetic improvement of harbor.

The solution or correction of the debris problem is first of all a matter of prevention, and secondly of removal.”

The Boston Harbor Pollution Committee was sponsored by the Massachusetts Port Authority to coordinate the efforts of the various agencies concerned with, and in an attempt to improve the conditions of Boston Harbor. Most of the governmental agencies previously mentioned are members and although the Committee has no official standing, its efforts have been fruitful in getting cooperation and coordination of activities. The aims of the Committee, as outlined by Mr. Thomas Callaghan of the Massachusetts Port Authority are

- “1. Exchanging information on pollution and floating debris in Boston Harbor.
2. Encouraging disciplinary action under existing laws.
3. Seeking legislation to strengthen adequately the present system of pollution control in Boston Harbor or to recommend a reconstituted system, including a Harbor Pollution Control Committee created and empowered by legislation.”

The U. S. Army Corps of Engineers has contracted with a towing company for a three day a week pick up of flotsam in the Harbor at a cost of \$9,000 a year. To keep abreast of this work would require an estimated expenditure of \$115,000 annually. It has been proposed that the frequency of

pick ups be increased and the possibility of acquiring a specially designed debris pickup vessel for this work is being studied. A harbor waste recovery boat designed and built in England, called a Port Retriever and sold under the trade name Water Witch, has a basket scoop on the front of the craft capable of lifting up to 1000 lbs. of heavy drift wood in one swoop. It is operated by one man and each scoopful can be dumped into a waiting scow. The Port of Baltimore is now using one of these units.

The State Department of Public Works, under a legislative appropriation of \$50,000 removed 4 sunken hulks from Boston Harbor and the U. S. Coast Guard has removed two hulks.

The Boston Public Works Department is preparing contract documents for removal of dilapidated piles and timbers from the approaches of the former Warren Avenue Bridge. The Boston Building Department has been engaged, along with the Boston Fire Department Fire Prevention Bureau, in inspecting dilapidated waterfront structures and citing owners for violations that contribute to the drift hazard.

The City of Boston engaged the engineering firm of Camp, Dresser and McKee to make a study and report with recommendations on Improvements to the Boston Main Drainage System and the Abatement of Pollution in Boston Harbor. This study was made under a \$220,000 interest free loan from the U. S. Department of Housing and Urban Development and the report is now being reviewed for acceptance by City and Federal agencies.

Four principal alternative methods of pollution abatement for Boston Harbor and adjacent waters were studied. The four methods are: (1) complete separation of all sanitary sewerage and storm drainage systems, (2) construction of chlorination detention tanks, (3) construction of surface holding tanks, and (4) construction of the Deep Tunnel Plan.

The Engineers recommend the construction of sanitary sewers and storm conduits wherever existing principal conduits do not provide adequate capacity to carry estimated year 2020 peak design flows or runoff from 15-year frequency design rainstorms. Recommended improvements have been arranged in two programs: the "Initial Construction Program" and the "Future Construction Program." The Initial Construction Program is of greater urgency than the Future Construction Program because of structural conditions evidenced by failures which have occurred in existing sewers, and in addition, the facilities which are affected by the initial program are the most important parts of the existing system located in the core area of the city and along the most heavily utilized beach areas in the city.

The recommended Initial Construction Program consists of three stages as follows:

Main Interceptor

Dorchester Brook Dry Weather Connection

Massachusetts Avenue Sewers

Mt. Vernon Street Sewers

East Side Interceptor - Roxbury Canal Branch

Improvements to Outlets and Appurtenant Facilities

Estimated Construction Cost - \$15,050,000

South Boston Pollution Control Conduit

Carson Beach Pumping Station

South Boston Force Main

Estimated Construction Cost - \$15,400,000

East Side Interceptor

Atlantic Avenue to Union Park Street

Estimated Construction Cost - \$7,400,000

The estimated total construction cost of the Initial Construction Program is \$37,850,000.

Facilities included in the recommended Future Construction Program are estimated to have a total construction cost of \$118,900,000. The Engineers recommend the construction of these facilities as soon as possible after construction of the Initial Construction Program inasmuch as deficiencies exist in many areas served by facilities affected by this program.

Improvements to existing outlets, including tide gates, and appurtenant facilities not included in the initial program are recommended in the future program. Such improvements will serve to reduce the volume of tide water entering the sewerage system, reduce the degree of surcharging in existing sewers, and reduce pollution in Boston Harbor, the Charles River Basin and the Neponset River.

Proposed facilities included in the Initial and Future Construction Programs are designed to complement a proposed Deep Tunnel Plan.

The proposed Deep Tunnel Plan will involve the construction of large deep rock storage tunnels, shafts, transmission tunnels, surface connections, a main pumping station located on Deer Island, and an ocean outfall with diffuser pipes.

It is estimated that the construction cost of the Deep Tunnel Plan will

be about 430 million dollars and that the capitalized annual operation and maintenance costs will be about 66 million dollars, or a total for comparison purposes of 496 million dollars. This compares with total estimated costs of 584 million dollars for complete separation, 533 million dollars for chlorination detention tanks and 814 million dollars for holding tanks. These estimated costs are based upon facilities required to serve the Boston region consisting of Boston and the neighboring communities of Brookline, Cambridge, Chelsea and Somerville, each of which have extensive combined sewer systems. The construction cost of a Deep Tunnel Plan to serve the City of Boston alone is estimated at 300 million dollars. However, in the Engineers' opinion, it is not reasonable to expect the City of Boston alone to completely dispose of its mixed sewage and storm water overflows unless neighboring cities and towns having similar combined systems and overflow problems do likewise. For this reason, the proposed Deep Tunnel Plan should be constructed as a regional facility.

The Deep Tunnel Plan is the most positive method of collecting and disposing of overflows of mixed sewage and storm water. With this method all flows of mixed sewage and storm water from Boston and the region, including flows in excess of those resulting from the greatest recorded 24-hour rainfall which has occurred in Boston, may be disposed of well off-shore in Massachusetts Bay. The pollution of Boston Harbor and adjacent waters by such flows will then be eliminated. No alternative method studied provides this degree of mixed sewage and storm water disposal.

The Engineers propose that the City of Boston take the initiative in making the proposed Deep Tunnel Plan become a reality. To implement this plan, it is recommended that the City initiate efforts for the region to obtain funds to defray the cost of further engineering investigations and planning for such a system. In addition, it is recommended that the City join together with other major cities in the United States having similar problems in an effort to obtain the substantial financial assistance from government sources necessary to effect pollution abatement by this method.

Conclusion

To restore the tremendous economic value and the fine recreational potential of Boston Harbor, it will be necessary to move forward in many areas; one of the more principal being the alleviation and eventual elimination of pollution.

Progress must be made in removing the sources of floating debris and implementing the removal of flotsam. The recommended programs for

keeping liquid pollutants out of the Harbor waters must be financed and constructed.

The efforts of all the many agencies concerned must be coordinated and streamlined. The formation of the proposed Boston Harbor Development Commission would appear to be advantageous. Such an agency, given adequate authority and financing, could overcome the divided responsibilities and shortages of money and personnel of the many agencies now involved. It could take the decisive actions necessary to develop commercial and recreational facilities and to eliminate the pollution now preventing such development.

ERRATUM

“The Massachusetts Water Pollution Control Program” by John R. Elwood. Volume 55, Number 3, July 1968.

In table on page 194, under “Inland Waters, Class C”, change “TOTAL PHOSPHATE, mg/l as P”, from 0.5 to 0.05.