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# WASTEWATER ENGINEERING AND MANAGEMENT PLAN

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FOR  
BOSTON HARBOR - EASTERN MASSACHUSETTS METROPOLITAN AREA

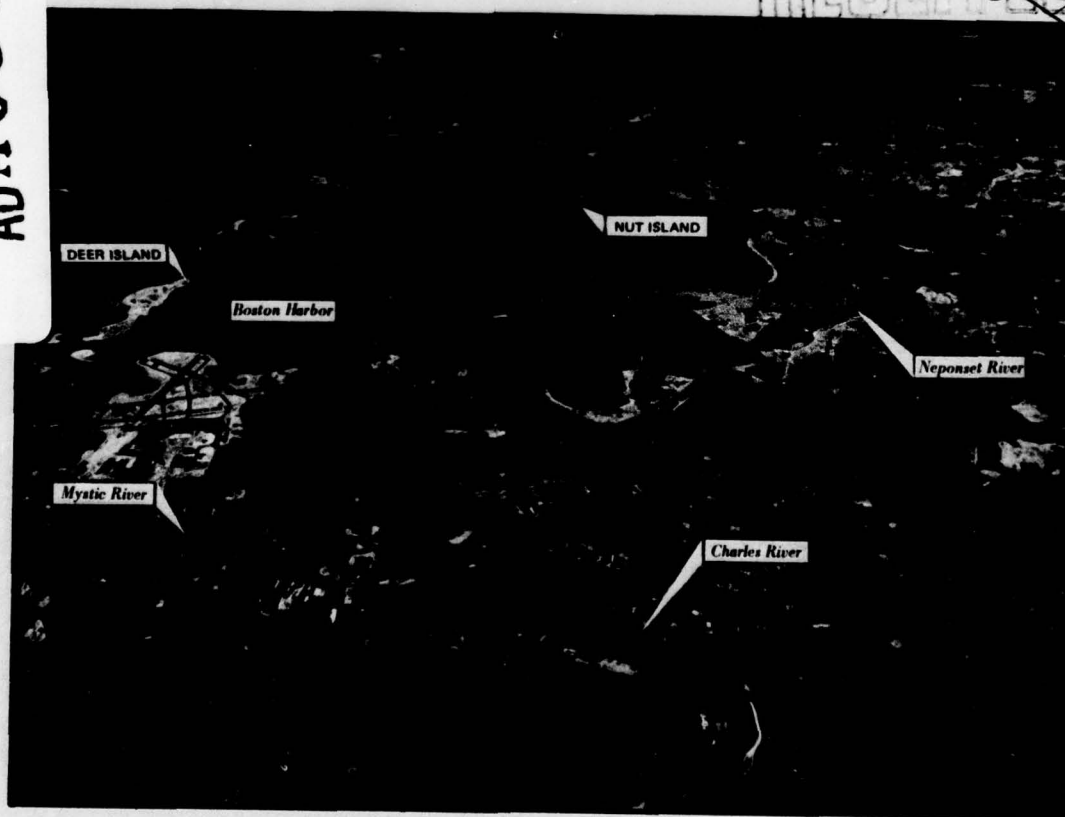
## EMMA STUDY SUMMARY REPORT

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**SUMMARY REPORT**

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### COVER PHOTOGRAPH

The cover photograph on this Report depicts the Boston Harbor area and was taken in April of 1969.

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**WASTEWATER ENGINEERING  
AND MANAGEMENT PLAN  
FOR  
BOSTON HARBOR—EASTERN MASSACHUSETTS METROPOLITAN  
AREA EMMA STUDY.**

**SUMMARY REPORT.**

**FOR THE  
METROPOLITAN DISTRICT COMMISSION**

**COMMONWEALTH OF MASSACHUSETTS**

**BY**

**METCALF & EDDY, INC.,** *Boston, Mass.*

*410 091*

*New*

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**CHAPTER 1**  
**INTRODUCTION**

**Foreword**

The intensive inter-agency study addressing methods for combatting pollution in the Boston Harbor-Eastern Massachusetts Metropolitan Area (EMMA) and vitally affecting the Metropolitan Sewerage District (MSD), begun three years ago, has been completed.

As shown on the inside cover, the EMMA Study results and findings are presented in a series of 22 Technical Data Volumes, which are summarized in a Main Report. This Summary Report provides a capsule of the more significant aspects of the study and describes the study recommendations.

The District presently serves 43 member communities comprising more than 2 million people in an area of 400 square miles. The initial study area as shown on Figure 1-1 covered 109 communities. However, the recommendations outline specific projects for service to 51 communities in a slightly expanded MSD. The concepts developed ranged from a maximum expansion of the Deer Island and Nut Island service area to a substantially reduced service area with satellite plants located upstream on the inland rivers. The recommendations include an \$855 million construction program expected to be funded from Federal, State and local sources, most of which is to be completed within the next 10 years. The major projects are as follows:

|  |                      |
|--|----------------------|
| Upgrading two existing primary plants with sludge disposal     | \$118 million        |
| Secondary treatment facilities for the existing primary plants | 265                  |
| Two new satellite treatment plants (AWT)                       | 91                   |
| Combined sewer facilities                                      | 270                  |
| Interceptors and pumping stations                              | <u>111</u>           |
| Total  | <u>\$855 million</u> |

Construction priorities for these projects have been established.

In addition to the recommended water oriented alternative, the study also considered a land disposal alternative, industrial waste regulations and urban stormwater management. Impact analyses and evaluations were made on all alternatives and summarized for the recommended plan. The financial impact of the construction program was analyzed in terms of both cash flow and the user charge/industrial cost recovery provisions of PL 92-500. Recommendations were also made on changes to the existing management structure of the MSD.

In addition to pursuing the long-range measures recommended by the EMMA study, the Metropolitan District Commission (MDC) is presently proceeding with a number of pollution control steps. Among them are sludge management facilities for the existing plants, harbor tidegate rehabilitation, certain new interceptor sewers, certain major conduits and treatment facilities to abate pollution from combined sewer overflows, and a new Charles River Dam



**FIG. 1-1 EMMA STUDY AREA LOCATION**



jointly undertaken by the MDC and the U. S. Army Corps of Engineers.

#### **Purpose of the Study**

Many of the MSD facilities have reached their installed capacities and there is a need to upgrade or replace some of the components of the system. Accordingly, after having the responsibility of providing sewer service for over 80 years, the MDC is now planning for the next 80 years.

Also, in 1972 the Committees on Public Works of the U. S. Senate and U. S. House of Representatives passed similar resolutions requesting the Secretary of the Army, acting through the Corps of Engineers, to undertake a joint study with the Commonwealth of Massachusetts to recommend wastewater management improvements and alternatives for the Boston metropolitan area. As a result of these resolutions, an agreement was signed by the Corps of Engineers and the Commonwealth of Massachusetts to undertake jointly a planning effort for wastewater management in the Boston metropolitan area. Through this agreement, the Corps of Engineers became a co-participant with MDC in this study.

Further, under an agreement between the United States Environmental Protection Agency (EPA) and the Commonwealth of Massachusetts, signed in May, 1972, the MDC is committed to eliminating the discharge of digested sludge into Boston Harbor and providing a minimum of secondary treatment for all wastes discharged from the Deer Island and Nut Island treatment plants. Included in

the same agreement are the requisite comprehensive engineering and management studies covering, in addition to the above, consideration of possible expansion of the District, changes in organizational structure, revisions in charges for waste treatment, new methods of capital financing, and consideration of associated wastewater reclamation for such purposes as maintenance of minimum flow in streams throughout the Boston metropolitan area.

As best represented by the recent water pollution control legislation, Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), the public demands not only cleaner waters but also unified management of this precious resource. How far this type of management should extend geographically for the MSD, and what facilities are necessary to best serve its members, are some of the complex questions that were to be addressed by this study.

Other issues include:

- *What should be the ultimate MSD area and what communities should finally be served by the Deer Island and Nut Island treatment plants?*
- *How large should the interceptors, pumping stations and treatment facilities be built when their upgrading becomes necessary?*
- *What are the priorities that should be addressed first?*
- *What are the costs for achieving water quality goals and how best should they be paid for?*

- *What type of management organization would best achieve the goals?*

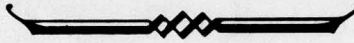
#### **Study Management**

At the very outset, it was determined that the study would be managed by a Technical Subcommittee (for listing see inside of back cover) on Boston Harbor, which was chaired by the MDC. The Technical Subcommittee developed the Scope of Work with

Metcalf & Eddy, Inc., the major project consultant to MDC.

A Citizens Advisory Committee (CAC) also participated in the study and assisted in the public involvement program.

Before the program can be implemented, further public meetings will be held and an environmental impact statement will be prepared on the major study recommendations.



## CHAPTER 2

### EXISTING SITUATION

#### General

Boston Harbor has three major tributary rivers, the Mystic, Charles and Neponset, which flow through Boston and empty their accumulated flows into the Harbor. Prior to 1889, the increased expansion of local sewer systems discharging their wastes directly into these rivers gave rise to considerable public concern. While the need for common action was clearly indicated, voluntary cooperation by the interested municipalities surrounding the core City of Boston was not attainable. Accordingly, in 1889 at the request of the Legislature, the State Board of Health completed an exhaustive investigation and recommended passage of the act establishing the MSD.

The first legally constituted metropolitan district in the United States was the MSD, established in the Commonwealth of Massachusetts in 1889. This regional agency was charged with the responsibility to build, maintain, and operate a metropolitan sewerage system for the communities surrounding the City of Boston. Other related agencies established at about the same time were the Metropolitan Parks District in 1893 and the Metropolitan Water District in 1895. In 1901, an act of the Massachusetts Legislature abolished the Metropolitan Sewerage Commission and the Metropolitan Water Board and transferred their powers and duties to the newly created Metropolitan Water and Sewerage Board.

A constitutional amendment in 1918 required that all State boards and commissions be organized into not more than 20 departments. Accordingly, MDC was created in 1919 to assume the powers, duties, and responsibilities of the Metropolitan Parks Commission and the Metropolitan Water and Sewerage Board. This institutional arrangement was maintained for half a century until pressure to reorganize the entire executive branch of State government resulted in the legislative establishment of a cabinet level structure of 10 executive offices. All State departments, boards, commissions, and divisions were realigned, generally along functional and programmatic lines, and placed within one of these executive offices.

The Executive Office of Environmental Affairs (EOEA), under the direction of a Secretary appointed by the Governor, is comprised of the departments of Environmental Quality Engineering; Environmental Management; MDC; Food and Agriculture; Fisheries, Wildlife, and Recreational Vehicles; and numerous other previously autonomous commissions, boards, and divisions. Included are the Water Resources Commission (WRC), Massachusetts Division of Water Pollution Control (DWPC), and Bureau of Environmental Sanitation.

#### Existing Organization

The MDC is an agency of State government which provides water, sewerage, and park and recreation services to member cities and towns in the Boston metropolitan area. It maintains the third largest police force in New England to provide security to parks and other facilities as well as to

patrol certain boulevards and parkways. The aggregate community membership of the MDC is 54, with the MSD representing 43 municipalities.

Although it falls within the structure of State government, the MDC can be considered a multi-purpose metropolitan service delivery agency. As such, it provides one of the foremost national examples of integrated service delivery through a single administrative structure.

It is headed by a full-time commissioner and four part-time associate commissioners. The Commissioner is appointed by the Secretary of Environmental Affairs with the approval of the Governor. The Governor appoints the Associate Commissioners.

Responsibility for the overall administration of the MDC rests with the Commissioner, who serves as executive officer of the agency. Actions may be taken only by majority vote, including that of the Commissioner. While most decisions are made by the Commission as a whole, the Commissioner retains veto power.

As a State agency, the MDC is affected by the administrative and management policies of State government (as established by statute or regulation) which apply to all agencies. In addition, the realignment of agencies into an executive office structure places certain authority in the Office of the Secretary, which somewhat limits the MDC's administrative authority and flexibility.

A distinction is necessary between

the MDC's authority to administer its operations and to formulate overall policy for the administration of its operations. The Massachusetts Legislature is the only governmental body with power to make policy decisions and make appropriations for maintenance or construction. As an agency of the Commonwealth rather than a political subdivision, the MDC has no governing body. Despite this relationship with the General Court, the MDC possesses substantial autonomy in its day-to-day operations.

The MDC is organized into 14 divisions, six of which provide administrative support, and eight of which have operating responsibilities. One of the operating divisions maintains and operates the MSD facilities.

The Sewerage Division is headed by the Chief Sewerage Engineer who serves as its Director. The FY 75 budget provides for 553 positions to maintain services for the member municipalities of the MSD. The five subdivisions within the Sewerage Division are:

- *Administrative Operations*
- *Sewer Lines*
- *Deer Island Treatment Plant*
- *Nut Island Treatment Plant*
- *Pumping Stations.*

MSD is a wholesaler of sewage treatment services to its member communities. The responsibility for construction, operation and maintenance of local sewerage systems rests with each community.

Construction of major projects, such as treatment plants, is assigned to the Engineering Division of the MDC which is responsible for providing design and construction supervision. Following completion, the Sewerage Division operates and maintains the facilities on behalf of the communities within the MSD.

#### Existing Facilities

The MSD facilities, as shown on Figure 2-1, include approximately 225 miles of interceptor sewers, serving nearly 5,000 miles of local sewers. The District has 12 pumping stations, four headworks, and two large primary treatment plants at Deer Island and Nut Island. These plants have an average treatment capacity of more than 450 mgd (million gallons per day), with a combined capability of handling maximum flows at the rate of 1.2 billion gallons per day.

Included with the major components of the wastewater transport and disposal system in the Boston Harbor area are 69 major combined sewer overflows, as shown on Figure 2-2, and numerous minor overflows. These overflows come from local sewerage systems in five member communities serving 900,000 people in an area of 36 square miles. It was suggested during a conference on Boston Harbor\* that the biggest problem confronting the Boston Harbor area is solving the combined sewer discharge problem. It was proposed as the number one priority. MDC's recent attention on abating pollution from combined sewer overflows has resulted in two combined sewer overflow treatment facilities in operation in Cambridge and Somerville and a third

under construction along the Charles River on the Boston-Cambridge line.

*\*Proceeding, Third Session, Conference in the Matter of Pollution of the Navigable Waters of Boston Harbor and Its Tributaries - Massachusetts, Environmental Protection Agency, October 1971.*

#### Existing Financing Structure

The three essential elements of the MDC's financing system are budgeting, capital outlays, and assessments.

*Budgeting.* Funds for the MDC's operation are provided each fiscal year through appropriations by the Massachusetts Legislature.

The one very important fundamental difference between the financial operations of the MDC and most other State agencies is that the cost which is directly attributable to the water, sewer, and parks districts is eventually reimbursed to the Commonwealth by the cities and towns in the districts served.

*Capital Outlays.* The capital budget for the Commonwealth includes projects over \$10,000 for acquisition of land, or construction, reconstruction, or repair of facilities.

When necessary to finance large construction projects, bonds are sold by the State Treasurer pursuant to an act authorizing such issue and upon request of the Governor. General obligation bonds are backed by the full faith and credit of the State. Since the debt resulting from the sale of bonds to finance MDC projects is not incurred for the benefit of the entire Commonwealth, the interest and





principal payments are annually assessed against the member municipalities by the State Treasurer.

*Assessments.* The costs of operations, maintenance, and debt service are annually determined and subsequently apportioned through an assessment system for payment by the cities and towns within each of the districts of the MDC.

The basis for financing operations and maintenance for the MSD is the proportion that each municipality's total population bears to the total district population.

The payment of debt service for the MSD is based upon the demand capacity ratio method. Under this method, a city

or town is charged in the ratio of its capacity demand, based on the number and size of its connections, to the capacity available for it in the metropolitan trunk system.

The bases used by cities and towns to raise their share of annual MSD debt service and operation and maintenance costs presently is decided by each city and town.

On July 1, 1976, the bases for cost apportionment will change in accordance with Chapter 814 of the Acts of 1975. In effect, Chapter 814 requires MDC to modify certain of its administrative procedures and provides MDC with additional authority for purposes of carrying out the requirements of PL 92-500.





## CHAPTER 3

### CONCLUSIONS AND RECOMMENDED PROGRAMS

#### Conclusions

1. The rate of population growth in the EMMA area is expected to level off in the long-term future. However, a nearly 50 percent increase is expected by 2050. The change in economic activity in terms of total employment is expected to be uniform, increasing slightly in its proportion to population by 2050. Manufacturing employment is expected to decrease while service-oriented industrial activity is expected to increase. The aggregate effect of these projections is shown on Figure 3-1.

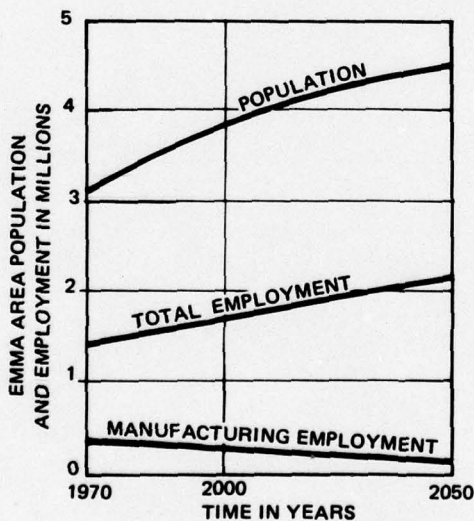


FIG. 3-1 PROJECTED POPULATION AND EMPLOYMENT TRENDS - 1970 TO 2050 - EMMA AREA

2. Seventy-four percent of the population in the EMMA area is presently served by sewers. Sewerage service areas are expected to increase to meet the needs of increased population.
3. The rivers and Boston Harbor require pollution abatement to meet the standards set for their designated uses. In Boston Harbor the primary concerns are the various combined sewer overflows and uncontrolled discharges. Conclusions pertaining to each of the various sections of the Harbor are as follows:
  - *Dorchester Bay.* This is the primary water contact recreation area in Boston Harbor with attendance well in excess of 10,000 persons per day. Its protection is of immediate importance and criteria used must relate to the objectives of maintaining water contact recreation there.
  - *The Charles River Basin.* This basin with its shoreline parks, adjacent parkways and bridges, is the most visible water resource. Along with this is the high volume of small boat activity providing an important public recreational use. Another critical resource in the basin area receiving combined sewer overflows is the Back Bay Fens. It also is a high visibility resource. Regulation objectives of overflows in the basin area must, therefore, include the removal of solids and floating matter along with an overall reduction of pollution discharges.

- *Neponset River Estuary. Due to its potential effects on the beach and shellfish areas of Dorchester Bay and because of its classification as an area available for water contact recreation and restricted shellfishing, objectives must be addressed to those uses.*
- *Inner Harbor. The Inner Harbor is considered lowest in priority of importance in remedial actions related to combined sewer overflows. Its classification will not permit water contact recreation or shellfishing. Since its use is primarily for commercial shipping and its shoreline is developed with piers and high walls, housing, shops, parks, historic buildings, restaurants and marinas, objectives of visual pollution abatement are most important. However, the potential effects of Inner Harbor discharges on the nearby beach areas must also be considered in deciding on solutions.*

*The combined sewer overflows in the Constitution Beach area are a special case in the Inner Harbor grouped overflows. Protection objectives there must be similar to those in Dorchester Bay.*

- *In addition, recent Federal legislation (PL 92-500) requires upgrading of the MDC Deer Island and Nut Island treatment plants to provide a minimum of secondary treatment.*
4. Many interceptors, pumping stations, and the Nut Island treatment plant have reached their installed capacity and many of the

mechanical facilities in the MSD system have reached their useful life. In addition, problems of salt-water intrusion primarily through local sewer systems plague the Deer Island Treatment Plant and infiltration/inflow from sewerage systems tributary to both treatment plants affect the capacity of interceptors and plants.

5. Studies of satellite sewerage concepts indicate that:

- *Treatment plants in the upper Charles River Basin should be developed in accordance with on-going activities, namely plants in Medfield, Medway and Milford.*
- *A small (2 mgd) highly advanced treatment plant to augment flows in the Aberjona River would be extremely expensive and that other sources for flow augmentation should be investigated.*
- *A treatment plant discharge into the Sudbury River in the Framingham area would not be as environmentally effective as one discharging into the middle reach of the Charles River. This is primarily due to the extent of the large storage potential in the flat swampy areas downstream in the Sudbury River.*
- *A plant located in the downstream sections of the Charles River would be too close to the lower basin area to be beneficial for flow augmentation and may be detrimental due to the storage capacity in the basin.*

- *A plant located in the middle Charles River area discharging immediately below Cochrane Dam would be beneficial for flow augmentation.*

- *Any plants located on the Neponset River should be as far upstream as possible to provide maximum flow augmentation benefit to the river and to take advantage of the greater slope in the river bed in the upstream section.*

6. For satellite treatment plants both regionalization of sludge disposal facilities and disposal in combination with refuse appear to be more cost effective and environmentally sound than through sludge processing at each plant.

7. The present structure of MDC with respect to sewerage service and in relation to other agencies involved in water pollution control suffers from:

- *fragmented and poorly defined authority and responsibility for wastewater management at all government levels;*
- *restrictive statutes, legislative controls, and administrative regulations;*
- *lack of sufficient opportunity for direct citizen participation in planning and policy formulation;*
- *trend away from MDC's "regional" identity as a holding company for cities and towns; and*
- *lack of flexibility to respond to*

*new trends, conditions, or resources.*

8. MDC methods of assessing member communities for sewerage service costs must be implemented to conform with Federal Law and with recently passed State Legislation (Massachusetts General Laws, Chapter 814 of the Acts of 1975) to become effective July 1, 1976.

#### Recommendations

After studying the problem of wastewater disposal for the 109 EMMA communities, it appears feasible to expand the MSD service area from its present 43 communities to 51 communities by adding the following towns when they decide that local systems are required:

|           |              |
|-----------|--------------|
| Dover     | Sharon       |
| Hopkinton | Sherborn     |
| Lincoln   | Southborough |
| Lynnfield | Weston       |

1. The Recommended Plan, as selected by the Technical Subcommittee is as follows:

- *Boston Harbor. The Deer Island Treatment Plant would serve three more communities than at present, and be upgraded to provide secondary treatment for an average flow of 400 mgd by the year 2000. The Nut Island Treatment Plant would serve eight fewer communities than at present plus part of Dover. It would be upgraded to provide secondary treatment and expanded to handle an average flow of 130 mgd by the year 2000. The sludge from both*

these plants would be incinerated at Deer Island incorporating a waste heat recovery system. Combined sewer overflows would be regulated to capture small overflows and treat large flows prior to discharge. These facilities would improve water quality, help safeguard public health and enhance water-oriented recreation. The major projects relating to the regulation of combined sewer overflows are located along Dorchester Bay, the Charles River, the Neponset River and the Inner Harbor following a decentralized approach to combined sewer overflow regulation.

- *Neponset River. An advanced treatment facility with a 25 mgd capacity in the Canton-Norwood area would serve the following five upstream towns:*

|         |           |
|---------|-----------|
| Canton  | Stoughton |
| Norwood | Walpole   |
| Sharon  |           |

*This would also reduce the flow to the Nut Island plant and retain reclaimed wastewater to improve river flows in the dry summer months.*

- *Charles River. An advanced treatment facility with a 31 mgd capacity in the middle reach of the river would serve the following eight towns upstream of Needham:*

|            |              |
|------------|--------------|
| Ashland    | Natick       |
| Dover      | Sherborn     |
| Framingham | Southborough |
| Hopkinton  | Wellesley    |

*It would reduce flows to Nut Island and retain reclaimed wastewater in the basin.*

2. In addition to these major facilities, there will be significant improvements relating to the reconstruction or replacement of various pumping stations, the construction of relief interceptors and the extension of new interceptors to serve the previously mentioned communities that are expected to be added to the MSD by the year 2000. The approximate locations of the major projects are shown on Figure 3-2.
3. The construction program necessary to build these facilities is expected to cost approximately \$855 million at present prices, ENR (Engineering News Record) Index 2200. Operating costs are expected to increase from \$8.3 million in 1974 to \$13.4 million, \$27.5 million and \$29.5 million for 1980, 1990 and 2000, respectively, also at present prices. All work is expected to be completed by the year 2000 as shown in Table 3-1.

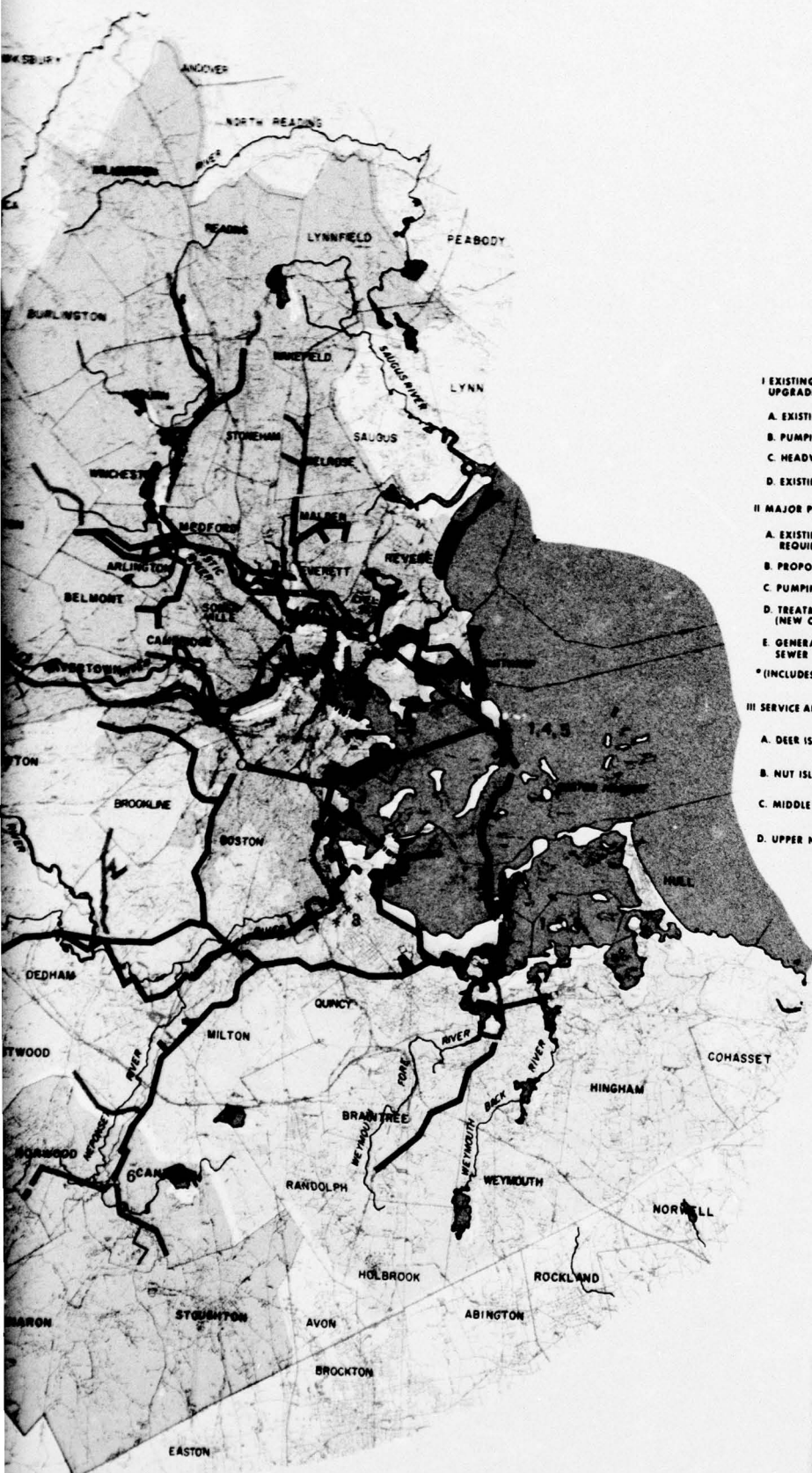
Prior to arriving at this construction staging program, the Technical Subcommittee had adopted a different sequence for the construction of the recommended projects. The original program reflected the construction first of projects judged to be needed most, in case funds for the entire program were not available at this time. On this basis, the provision of secondary treatment at the Deer Island and Nut Island treatment plants would follow the

**TABLE 3-1. COSTS AND COMPLETION DATES FOR MAJOR PROJECTS**

| <i>Project</i>  | <i>Completion date</i> | <i>Cost, millions of \$(1)</i> |
|---|------------------------|--------------------------------|
| 1. Elimination of sludge discharges into the Harbor from the Deer Island and Nut Island treatment plants  | 1980                   | \$ 26                          |
| 2. Combined sewer overflow abatement in Dorchester Bay  | 1981                   | 77                             |
| 3. Nut Island primary expansion and addition of secondary treatment   | 1984                   | 137                            |
| 4. Deer Island primary expansion and addition of secondary treatment  | 1984                   | 192                            |
| 5. Additional facilities for secondary sludge management  | 1984                   | 28                             |
| 6. Satellite treatment plants discharging to the middle Charles and upper Neponset Rivers, (or transport to and further expansion of Nut Island Treatment Plant)(2) | 1984                   | 91                             |
| 7. Combined sewer overflow abatement in the Charles River (Back Bay Fens and Muddy River)   | 1983                   | 84                             |
| 8. Combined sewer overflow abatement in the Neponset River  | 1983                   | 23                             |
| 9. Combined sewer overflow abatement in the Inner Harbor  | 1986                   | 86                             |
| 10. Others: Interceptors and pumping stations   | 1975-2000              | <u>111</u>                     |
| <b>Total</b>  |                        | <b>\$855</b>                   |

1. Costs shown are in millions of dollars based on January 1975 (ENR 2200) prices and include engineering and contingencies.
2. Costs are given for the former case.





- LEGEND**
- I EXISTING FACILITIES NOT REQUIRING RELIEF OR UPGRADING AS PART OF THE RECOMMENDED PLAN**
- A. EXISTING MSD SEWERS
  - B. PUMPING STATIONS
  - C. HEADWORKS
  - D. EXISTING CITY OF BOSTON FACILITIES
- II MAJOR PROJECTS IN RECOMMENDED PLAN\***
- A. EXISTING MSD SEWERS REQUIRING RELIEF
  - B. PROPOSED EXTENSION SEWERS
  - C. PUMPING STATIONS
  - D. TREATMENT PLANTS (NEW OR UPGRADED)
  - E. GENERAL LOCATION OF COMBINED SEWER REGULATION FACILITIES
- \* (INCLUDES ONGOING PROJECTS)
- III SERVICE AREAS UNDER THE RECOMMENDED PLAN:**
- A. DEER ISLAND PLANT
  - B. NUT ISLAND PLANT
  - C. MIDDLE CHARLES PLANT
  - D. UPPER NEPONSET PLANT

**FIG. 3-2 TREATMENT PLANT SERVICE AREAS AND MAJOR PROJECTS IN THE RECOMMENDED PLAN**

- *Recognizing the more complex nature of wastewater treatment systems to be implemented along with a more stringent requirement for good performance, increased authority by the MDC over the operation of local sewerage systems is proposed. This additional authority will become available to MDC on July 1, 1976 as a result of the passage of Chapter 814 of the Acts of 1975. Additional enforcement authority may be acquired from the U. S. EPA and the Massachusetts DWPC through delegation of authority provided to these agencies by Public Law 92-500, and Chapter 21 of the Massachusetts General Laws, respectively.*
  - *In spite of the concern for insuring MDC's role as a regional entity, it is proposed that the District remain as a State Department to retain the advantages of stature and financial resource availability.*
6. Recognizing the possibility of lack of Federal funds eligible for carrying out the Recommended Plan in accordance with Federal Law, other options and their associated costs are presented for consideration. These options address the most critical problems first and allow postponement of certain projects, such as the provision of secondary treatment at the Deer Island and Nut Island treatment plants and the construction of satellite treatment plants. A further option addresses a lower cost solution for discharge of effluents from the Harbor treatment plants recognizing the considerations being given to

changing Federal Law with respect to ocean discharge requirements. This involves improved primary treatment and discharge of effluents through extended deep ocean outfalls for the Deer Island and Nut Island treatment plants. In all cases, however, the discharge of sludge into Boston Harbor would be stopped.

Cost comparisons of these options relative to the Recommended Plan are shown in Table 3-2.

#### Next Steps

There are several steps involved in achieving the wastewater management objectives of the study. Approval of the construction staging program by the U. S. EPA and the Massachusetts DWPC is being sought. The EPA is preparing to issue the final environmental impact statement (EIS) associated with the primary sludge management facilities for the Deer Island and Nut Island Treatment Plants; the MDC is in the process of contracting with consultant engineering firms to have the infiltration/inflow analyses conducted for their interceptor systems to provide them with information for sewer system upgrading needs; the EPA is in the process of initiating an Environmental Impact Statement on the issues raised in this study and has organized a Citizens Advisory Committee (Boston Harbor Advisory Committee) to assist in this effort. In addition, site selection committees including representatives from local communities have been organized by the MDC to identify and investigate feasible locations for the two proposed satellite treatment plants.

The MDC intends to file with the



TABLE 3-2. OTHER OPTIONS

| <i>Option</i>   | <i>Capital cost, millions of \$<sup>(1)</sup></i> | <i>Operation and maintenance cost, millions of dollars per year<sup>(1)(2)</sup></i> |
|---|---|--|
| Recommended plan  | \$855.3   | \$25.6   |
| Total ocean discharge   | 737.9   | 16.9   |
| <p>No satellite treatment plants. All flows discharged in deep waters after receiving primary treatment at the Harbor plants.</p>   |   |  |
| Ocean discharge in lieu of secondary treatment  | 755.7   | 22.3   |
| <p>Satellite treatment plants constructed. Primary treatment at the Harbor plants with deep ocean discharge.</p>  |   |  |
| Deletion of satellite plants  | 872.4   | 20.9   |
| <p>No satellite treatment plants. All flows receiving secondary treatment at the Harbor plants.</p>   |   |  |
| Postponing of satellite plants  | 884.8   | 20.3   |
| <p>Delayed construction of satellite plants. Upgrading of primary treatment at the Harbor plants followed by extending of treatment capabilities at the Harbor plants to secondary along with construction of satellite plants.</p> |   |  |

1. Costs shown are in millions of dollars based on January 1975 (ENR 2200) prices.
2. Costs on the basis of future flows (year 2000).

State Legislature for authorization and funding of the recommended projects in three phases as follows:

*Phase 1 (1975-76) has already been filed (House Bill 98) and will cover the facilities planning and design of all major projects plus the construction of combined sewer overflow regulation facilities in the Dorchester Bay area and the construction necessary to upgrade primary treatment facilities at Nut Island.*

*Phase 2 (1978-79) will cover construction of the major projects along with certain additional facilities*

*planning and design.*

*Phase 3 (1982-83) will include completion of the remaining activities in the schedule.*

Each project that is approved will be implemented in three steps (1) facilities planning, (2) preparation of construction drawings and specifications, and (3) construction.

The process of open planning will continue with numerous opportunities for public input and review in addition to those formal contacts shown on Figure 3-3.



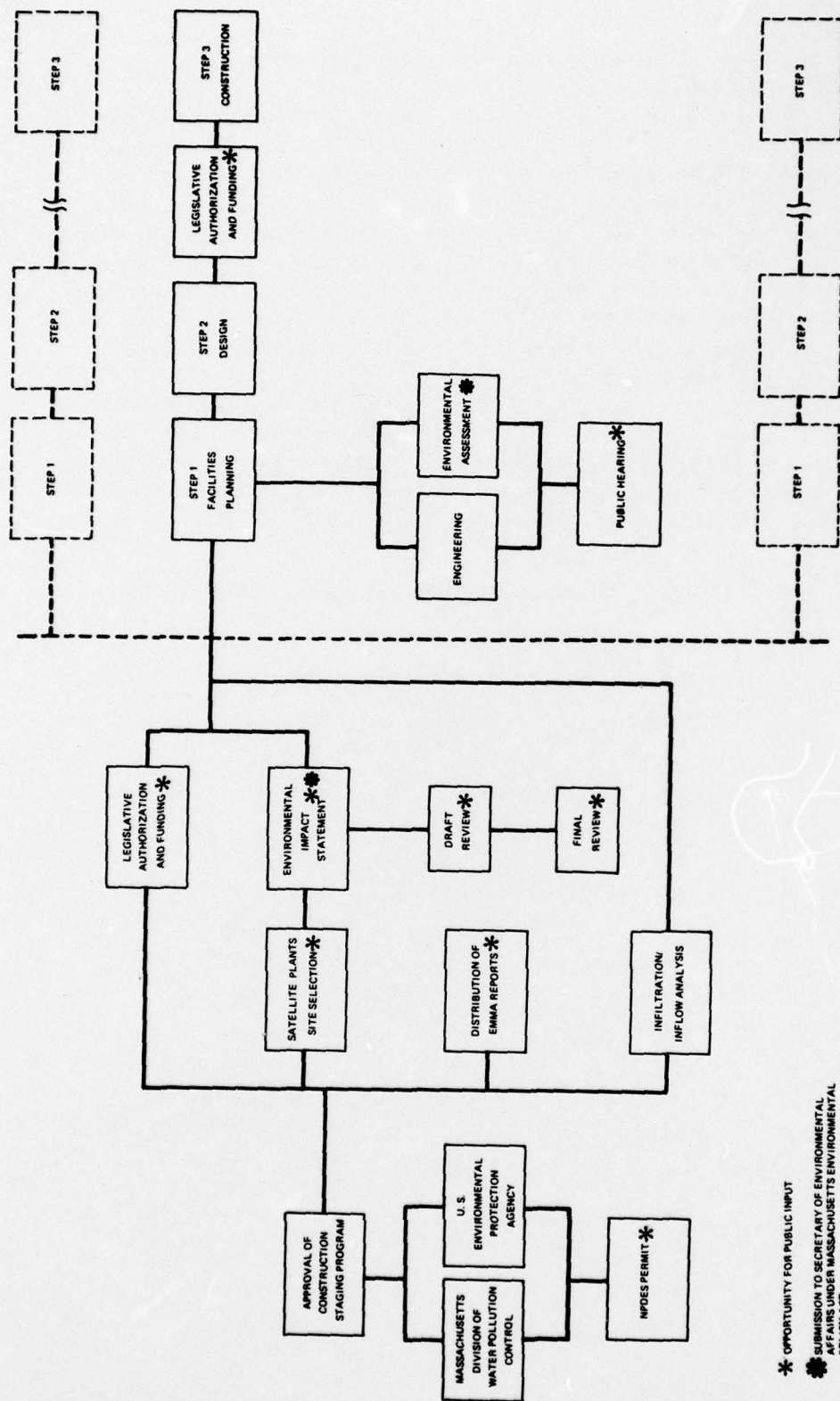


FIG. 3-3 PROCEDURE FOR PROJECT IMPLEMENTATION

\* OPPORTUNITY FOR PUBLIC INPUT  
 \* SUBMISSION TO SECRETARY OF ENVIRONMENTAL AFFAIRS UNDER MASSACHUSETTS ENVIRONMENTAL POLICY ACT

## CHAPTER 4

### STATUS AND RELATIONSHIPS OF OTHER RELATED PROGRAMS

#### General

Since the EMMA study was conceived prior to passage of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), it does not follow any one of the planning activities of the Act, but rather follows the planning needs for the MDC in order that decisions on facility upgrading can be made.

The status and relationships of other related programs and the planning sections of the Act relating significantly to the EMMA study are discussed briefly in this chapter.

#### Sludge Management

As indicated earlier in this report, management studies for sludge generated from the existing primary treatment plants at Deer Island and Nut Island began prior to this project. Facilities planning for these has now been completed. This plan calls for the construction of a sludge incinerator with waste heat recovery capabilities on Deer Island to dispose of primary sludge from both of the Harbor plants.

A draft environmental impact statement pertaining to these facilities has been written and given a public hearing by the EPA. The Commonwealth has recommended that it be modified and expanded before it is accepted. Present scheduling calls for final completion of the statement in September 1976.

#### Areawide Waste Treatment Management Planning

The concept of areawide waste treatment management planning, developed under Section 208 of the Act, brings together all of the variables necessary to provide a water quality/waste control mechanism for total planning and management within a defined study area.

The objective of the 208 process is to input to an ongoing land use activity to permit more comprehensive decision making on final land use matters. This is particularly significant in the area of *nonpoint source* pollution aspects.

#### Facilities Planning

The concept of facilities planning (Step 1) developed under Section 201 of the Act formalizes a planning process within the 3-Step construction grants program (Planning, Design, Construction). This concept is aimed at assuring "systematic economic and environmental evaluation of feasible alternatives and public involvement in the choice among the alternatives" relative to building new and improving existing publicly-owned treatment works.

Although it bears great similarity to previous approaches used in the planning of wastewater management systems, certain requirements of the Act as detailed in the regulations, have enlarged upon the scope of the problem to be considered. In particular, the provision for applying the Best Practicable Waste Treatment Technology (BPWTT); analyzing the sewer system for possible excessive infiltration/inflow; conducting a

two-way program of public participation; preparing an environmental impact assessment, (to be evaluated by the EPA to determine the necessity for a full EIS or a negative declaration); performing a cost-effectiveness analysis; and developing user charge and cost recovery systems have made the planning process a far more comprehensive undertaking.

Facilities planning is intended to follow areawide planning and address detailed aspects of the facilities needed on a project by project basis rather than the overall areawide controls developed as part of the 208 planning process. It is a prerequisite to obtaining funds for the construction of facilities related to water pollution control.

#### **Other Facets of the Act**

Many other parts of the Act relate to the EMMA study. Most notably is Section 303e, which relates to river basin water quality management planning.

Section 303e planning has been conducted by the Massachusetts DWPC to determine the treatment requirements at water pollution control plants, such as the MDC Harbor plants and the recommended satellite inland treatment plants.

Another important part of the Act relates to the issuance of National Pollution Discharge Elimination System (NPDES) permits by the EPA and the DWPC. In accordance with the requirements of the Act that all point discharges must be identified and regulated by permit, the EPA and DWPC issued NPDES permits to the

MDC on April 2, 1975. These permits required that the MDC submit a construction schedule (see Figure 6-10, Main Report) by July 1, 1975 regarding the upgrading of its two Harbor plants from primary to secondary treatment capabilities.

This proposed construction schedule has been submitted to the EPA. As the result of this, discharge permits were drafted and a public hearing regarding these permits was held in February 1976. Final permits are expected to be issued shortly.

#### **Relationship of Other Programs to the EMMA Study**

The Metropolitan Area Planning Council (MAPC) is presently studying the wastewater disposal needs of 92 of its 101 member communities within the framework and guidelines of Section 208. These communities are all located within the EMMA study area and maximum use of the EMMA plans, materials and recommendations will be made unless additional data developed during the 208 study prompts a need for further reconsideration and possible modification of those recommendations.

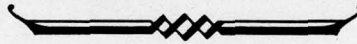
As indicated, the terms of this 208 study are set by EPA guidelines which define the relationship between 208 program work and local and subregional 201 facilities plans. In this latter case, the 208 program is to formally incorporate the completed 201 facilities plans as they relate to the various communities within the study area.

The EPA has determined that a full environmental impact statement should

be undertaken on treatment alternatives because of their highly controversial nature, and their desire is to have this done before MDC proceeds with facilities planning for the various projects. This statement is intended to begin October 1, 1976, and be completed within 12 months. "Statements" may also be required for certain elements of the EMMA plan before final design and construction can take place. Final judgments related to EMMA must await the results of the "environmental impact statement."

The EMMA report thereby presents a number of outstanding wastewater treatment issues of Metropolitan Boston. First, the issue of whether

secondary treatment of wastewater discharged to the ocean is environmentally beneficial. Second, the issue of sludge disposal. Third, the issue of when and how to expand and extend the Deer Island and Nut Island treatment plants for secondary treatment. Fourth, the importance of regulating the pollution from local combined sewer overflows. Fifth, the issue of whether, and where, to locate advanced treatment plants along the Charles and Neponset Rivers. And finally, how and when these many vital issues can be intelligently resolved and construction begun in order that the legal requirements of the Act are met and the necessary facilities that will provide cleaner waters are provided.





\* \* \* OUR NATURAL RESOURCES \* \* \*



## EMMA TECHNICAL SUBCOMMITTEE

### Metropolitan District Commission

Martin F. Cosgrove, Chief Engineer, MDC; *Chairman*  
Martin Weiss, Director of Environmental Planning; *Project Manager*  
Francis T. Bergin, Chief Engineer, Engineering Division  
Libby Blank, Chief Planner  
Alfred F. Ferullo, Director of Environmental Quality  
Allison C. Hayes, Director of Sewerage Division & Chief Sewerage Engineer

### U. S. Army Corps of Engineers, New England Division

Joseph L. Ignazio, Chief, Planning Division  
James E. Callahan, Chief, Urban Studies Branch  
Davis C. Kenyon, Agricultural Engineer

### Department of Environmental Quality Engineering, Commonwealth of Massachusetts

(Division of Water Pollution Control)  
John R. Elwood, Supervising Sanitary Engineer  
John Baird Erdmann, Assistant Sanitary Engineer  
Russell A. Isaac, Environmental Bio-Engineer

(Division of General Environmental Control)  
Paul T. Anderson, Director

(Formerly Resource Management Policy Council and Office of State Planning and Management)  
Daniel P. McGillicuddy, Program Manager

### U. S. Environmental Protection Agency

Walter M. Newman, Chief, Water Quality Branch  
William J. Butler, Chief, Massachusetts Planning Section

### Metropolitan Area Planning Council

James A. Miller, Deputy Executive Director  
John R. Harrington, Director of Environmental Planning

### EMMA Citizens Advisory Committee

|                    |  |
|--------------------|--|
| Rita Barron        | Charles River Watershed Association – Chairman             |
| Arthur Barnes      | Norumbega Associates                                       |
| Catherine Donaher* | Boston Harbor Associates                                   |
| N. Bruce Hanes     | Tufts University   |
| Waldo Holcombe     | Neponset Valley Conservation Association                   |
| Madeleine Kolb     | Sierra Club  |
| A. Richard Miller  | Lake Cochituate Watershed Association                      |
| Daniel Travers     | South Middlesex Area Chamber of Commerce                   |
| Gerald R. Mimno*   | South Middlesex Area Chamber of Commerce                   |
| James K. Rogers    | Raytheon Company or Associated Industries of Massachusetts |
| Deborah V. Howard  | Massachusetts Audubon Society                              |

\*Not presently representing organization.