DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF MUNICIPAL FACILITIES

Guide to

# COMPREHENSIVE WASTEWATER MANAGEMENT PLANNING

January 1996

Acknowledgments

The preparation of this guidance was undertaken by Kevin Brander, John Correia, and David Burns, staff from the DEP Bureau of Municipal Facilities. The writers would like to thank all those within DEP who provided valuable comments, as well as other groups including the American Consulting Engineers Council, Massachusetts Environmental Policy Act Unit, Department of Environmental Management, Office of Technical Assistance, and the Massachusetts Water Resources Authority, who all provided insightful comments and information. Many improvements were made to the draft as a result of their input.

# FOREWORD

Planning for wastewater treatment and disposal facilities is a critical challenge for each community. Such facilities are inextricably linked to protection of public health, protection of water resources, and comprehensive growth and development plans in each community. As cities and towns are faced with considerable financial demands and a broad range of social and economic issues, they are being forced with increasing frequency to make difficult decisions on the allocation of public funds among competing interests. It is therefore important that decisions made on planning, design, construction and maintenance of wastewater facilities be the most environmentally sound and the most cost effective. Comprehensive wastewater management planning must also reflect the collective input of citizens, local officials and other interested "stakeholders" who are empowered to manage the growth and development in their communities. This guidance is intended to assist communities in developing and evaluating wastewater alternatives to meet their long term needs.

**DEPARTMENT OF ENVIRONMENTAL PROTECTION**

# GUIDE TO COMPREHENSIVE WASTEWATER MANAGEMENT PLANNING

TABLE OF CONTENTS


**1. Introduction**

*1.1 Purpose*
*1.2 The Comprehensive Wastewater Management Planning Process*
*1.3 The Process and the Stakeholders*
*1.4 Regulatory Requirements*
*1.4.1 State Basin Planning*
*1.4.2 Other Water Resources Planning*
*1.4.3 MEPA Requirements*
*1.4.4 Permits*
*1.5 State Revolving Fund*

**2. Preplanning Activities**

**3. Plan of Study**

**4. Comprehensive Wastewater Management Plan**

*4.1 Assess Current Conditions*

*4.1.1 Existing Conditions in Planning Area*
*4.1.2 Existing Wastewater Flows and Treatment*

*4.2 Assess Future Conditions*

*4.2.1 Planning Period*
*4.2.2 Land Use*
*4.2.3 Demographic and Economic Projections*
*4.2.4 Forecasts of Flows and Wasteloads*

*4.3 Wastewater Needs/Problem Identification*

*4.3.1 On-site Wastewater disposal*
*4.3.2 Wastewater Collection Systems*
*4.3.3 Wastewater Treatment and Effluent Disposal*

*4.4 Develop Alternatives*

*4.4.1 Baseline: Optimize Existing Facilities*
*4.4.2 Regional Solutions*
*4.4.3 Wastewater Alternatives*
*4.4.4 Alternative Technology*
*4.4.5 Screening of Alternatives*

*4.5 Evaluate Alternatives*

*4.5.1 Evaluation of Costs*

*4.5.1.1 Present Worth*
*4.5.1.2 Equivalent Uniform Annual Cost*
*4.5.1.3 Cost Effectiveness Analysis*

*4.5.2 Environmental Evaluation*

*4.5.2.1 Direct Impacts*
*4.5.2.2 Indirect Impacts*

*4.6 Additional Guidance on Evaluation of Alternatives*

*4.6.1 Institutional Arrangements*
*4.6.2 Flow and Waste Reduction*
*4.6.3 Decentralized Facilities*
*4.6.4 Sewers*
*4.6.5 Residuals Disposal*
*4.6.6 Location of Facilities*
*4.6.7 Revision of Wasteload Allocation*
*4.6.8 Phased Construction*
*4.6.9 Flexibility*
*4.6.10 Reliability*

*4.7 Plan Selection*

*4.7.1 General*
*4.7.2 Comparison and Ranking of Proposals*

*4.8 Recommended Plan*

*4.8.1 Detailed Recommended Plan*
*4.8.2 Environmental Impacts*
*4.8.3 Institutional Impacts*
*4.8.4 Preliminary Design Criteria*
*4.8.5 Financing Plan*
*4.8.6 Implementation Plan*

*4.9 Public Participation*

*4.9.1 Relationship between Proponent and Public*
*4.9.2 Requirement for Public Hearings*
*4.9.3 Summary of Public Participation*

**References**

**Appendices**

Appendix A Present Worth Calculation Examples
Appendix B Massachusetts Regional Planning Agencies
Appendix C Flow and Waste Reduction
Appendix D MEPA Information

# 1. INTRODUCTION

## 1.1 Purpose

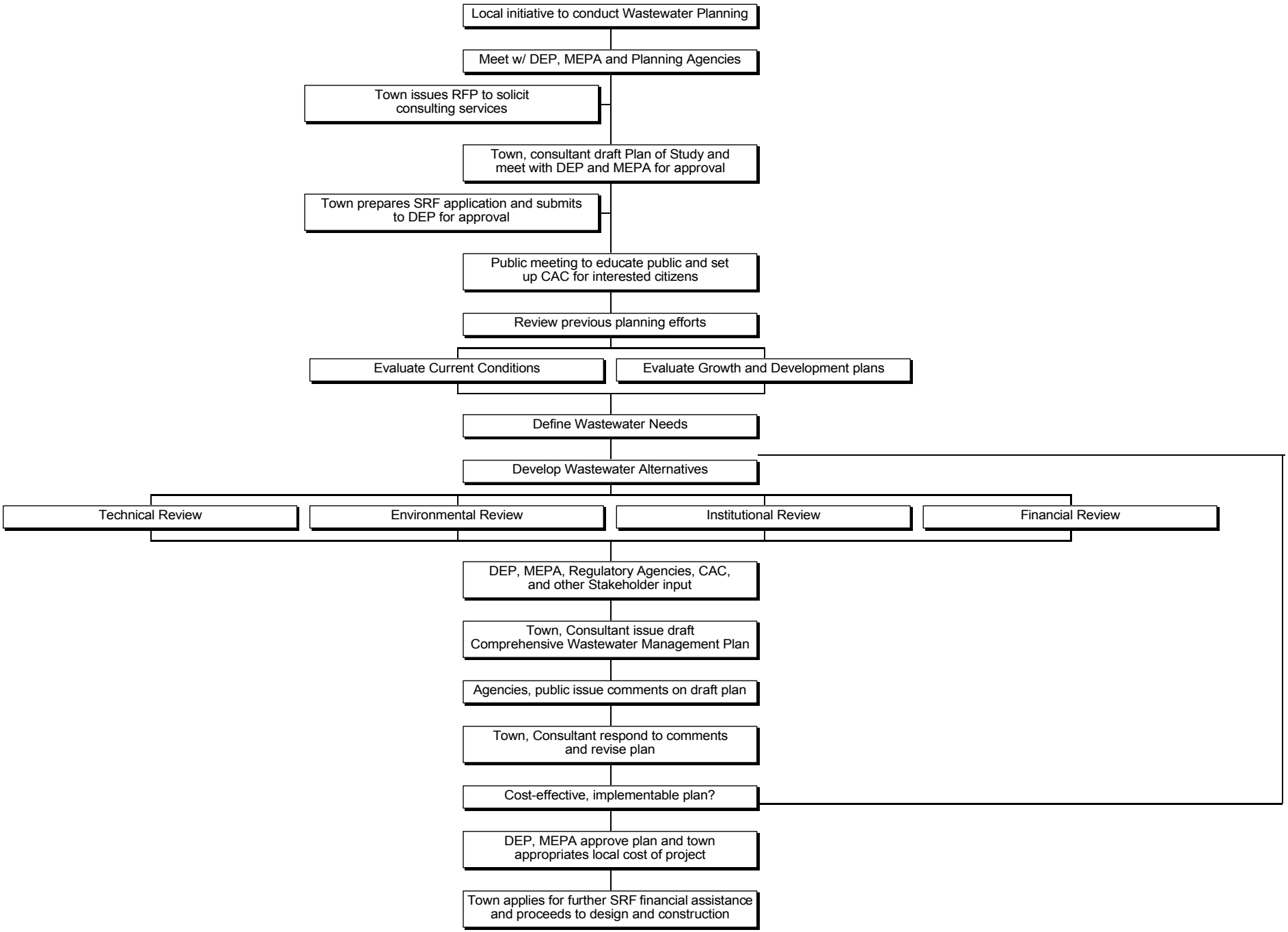
This document is intended to be used as a guide in assisting municipal officials, consulting engineers, citizens groups, and other interested parties in developing comprehensive wastewater management plans. This guidance provides communities with sound procedures for determining appropriate and balanced solutions to their wastewater disposal needs which will allow them to protect their water resources and the public health of their citizens. The solutions to a community's wastewater problems may consist of a decentralized approach using on-site treatment and disposal; a more centralized approach with collection sewers and a wastewater treatment plant and discharges to groundwater or surface water; or, as is more typical, a combination of the two. This guidance also details a planning approach which will serve to comply with the enforceable requirements of the Clean Water Act as well as the requirements of the financial assistance program of the Massachusetts Water Pollution Abatement Trust.

While this guidance presents a comprehensive methodology for producing a wastewater management plan, it must be noted that the level of detail and ultimate scope of the wastewater management plan will depend to a large extent on the nature, scale, and location of the wastewater needs to be assessed. In this regard, communities are encouraged to contact and meet with the Department of Environmental Protection and regional planning agencies to discuss the scope of the work and to utilize all available technical and financial resources.

## 1.2 The Comprehensive Wastewater Management Planning Process

The comprehensive wastewater management planning process is the process whereby current and future wastewater needs are evaluated, wastewater management alternatives are developed which will meet these needs, and a final plan is chosen through careful comparison and evaluation of the alternatives. The process must include the necessary steps in ensuring that the planning effort results in the most cost effective, environmentally sound wastewater management plan. Such a process is shown on the flowchart in Figure 1, and includes the primary tasks necessary in comprehensive wastewater management planning. The initial impetus for wastewater planning may arise from a community wishing to evaluate and meet their wastewater needs, or as the result of some regulatory enforcement action. In either case, the final recommended plan must comply with regulatory requirements and provide for sound wastewater management over the twenty year planning period.

Figure 1 - Comprehensive Wastewater Management Planning



## 1.3 The Process and the Stakeholders

The planning process should elicit participation by all "stakeholder" groups, who will ultimately bear the economic, environmental, and institutional consequences of the recommended plan. A vital component of any planning effort is the ability of the community, environmental agencies, and the consultant to advise, inform, and educate stakeholders on the myriad of technical, environmental, and fiscal issues presented by wastewater management alternatives. The process includes many critical decision points which can become significant obstacles in achieving an implementable plan if stakeholders are not directly involved in the decision-making process. Oftentimes, decisions must be made at the community level with regard to future growth, environmental tradeoffs, and costs that will govern the realm of wastewater management alternatives which may be pursued. DEP, MEPA, and other regulatory agencies provide technical review of facilities planning documents and also ensure that the recommended plan will comply with regulatory requirements which prescribe minimum standards for protection of the environment. While their role is to provide review and guidance, it is important to note that the community, representing the primary stakeholders, are the group that most often decides the fate of wastewater management plans. As such, the participation of groups such as elected officials, planning boards, boards of health, town meeting representatives, and citizens action committees should be brought into the comprehensive wastewater management planning effort as early as possible, and these groups should be continually apprised of the development of the plan.

## 1.4 Regulatory Requirements

### 1.4.1 *State Continuing Planning Process and Basin Plans*

Under the Massachusetts DEP Watershed Management Program, the Office of Watershed Management (OWM) carries out continuing watershed-based resource assessments, including an evaluation of point and non-point pollution sources. This planning initiative expands upon the basin plans developed pursuant to section 303(e) of the 1972 Federal Water Pollution Control Act. The Watershed Management Plan establishes the effluent limitations which must be met by publicly-owned treatment works (POTW) to comply with applicable requirements of federal, state, and local law. All wastewater planning efforts should initially involve a review of the watershed management plan and the final recommended plan must be consistent with the watershed management plan so that water resources are properly protected.

### 1.4.2 *Other Water Resource and Wastewater Planning*

Wastewater management plans should also include a review of other pertinent plans including:

- The Massachusetts non-point source management plan developed pursuant to section 319 of the Clean Water Act;

- Non-point source management plans conducted by regional planning agencies pursuant to section 208 of the Clean Water Act; and

- Local water resource planning developed by the Department of Environmental Management (telephone 617-727-3267).

### 1.4.3 *Massachusetts Environmental Policy Act (MEPA)*

Comprehensive wastewater management plans are subject to the MEPA regulations, (301 CMR 11.00), which establish thresholds, procedures and a timetable for public review of the environmental impacts of activities funded or permitted by state agencies. The MEPA process requires public agencies and project proponents to fully consider the environmental impacts of wastewater collection, treatment, and disposal projects, and to minimize and mitigate adverse impacts. The goal of the MEPA process is to elicit public comment on the direct and indirect environmental impacts of the range of wastewater alternatives, and to ensure that the planning effort is consistent with local and regional planning and applicable environmental regulations. Mitigation measures to minimize any adverse environmental impacts identified through the public participation process may be formally required through the issuance of a Certificate from the Secretary of Environmental Affairs.

The MEPA process includes the preparation and submittal of an Environmental Notification Form (ENF), which provides an overview of the environmental impacts of the project, and may also require an Environmental Impact Report (EIR), which is a more detailed assessment of potential environmental damages and benefits. Wastewater management project proponents may be required to do an EIR if the projects are "categorically included", if any of the thresholds listed in 301 CMR 11.25 are exceeded, or if so determined by the MEPA office based on public comment. In some instances, planning efforts may sufficiently complex as to warrant a determination by the MEPA office that a project is "major and complicated", and the regulations in this case provide special procedure provisions which provide flexibility to shape the plan review process and associated timeframes so as to accommodate special needs or circumstances. MEPA regulations and thresholds should be reviewed so that the MEPA process is appropriately incorporated into the wastewater planning effort. It is important to note that the comprehensive wastewater management plan and the EIR may often be consolidated efforts in the interest of streamlining and efficiency, and draft and final plans can then be issued jointly with the draft and final EIR documents for ease of review, comment, and participation by the public.

Appendix D includes the "MEPA Clock", which summarizes the MEPA process. The project proponent should consult with DEP and the MEPA office (EOEA,

100 Cambridge St., 20th Floor, Boston, MA 02202. Telephone 617-727-5830) at the initial stages of the planning effort to ensure that the appropriate coordination between wastewater management planning and MEPA review occurs.

### 1.4.4 *Permits*

In evaluating alternatives for wastewater management, the wastewater management plan must evaluate and discuss the need for federal, state, and locally issued permits. Depending on the specific alternative, a broad range of federal, state, and local permits may be required for implementation. Table 1 displays a listing of some of the permits, licenses, and approvals which are commonly required for construction of wastewater management facilities. It is important to note that this list is by no means all-inclusive and additional permitting may also be required. The project proponent should meet with DEP and the MEPA unit early on in the planning process to identify key permitting requirements.

## 1.5 Massachusetts State Revolving Fund (SRF)

The Massachusetts State Revolving Fund Program is an outgrowth of the Water Quality Act of 1987, which amended the 1972 Federal Clean Water Act. These amendments terminated the federal construction grants program and established a program for funding revolving loan programs at the state level. Under the current SRF program, the state uses monies to offer no interest or low interest loans to communities to subsidize wastewater projects. The program provides for the funding of comprehensive wastewater management planning to those communities who meet the eligibility requirements and have been placed on the state fundable priority list. The priority list is established each fiscal year based on information submitted by each community detailing their need for planning, design, and construction of wastewater facilities. Project proponents are strongly encouraged to contact the DEP Bureau of Municipal Facilities (BMF) prior to initiating any planning effort to submit a project evaluation form and apply for financial assistance. BMF is located at the DEP Offices at One Winter Street, Boston, MA 02108 and the telephone number is (617) 292-5793.

## TABLE 1

**Permits, Licenses, and Approvals**
**commonly required in design and construction of wastewater management facilities**

### FEDERAL

| Activity/Impacts | Permit | Agency |
|---|---|---|
| Surface Water Discharge | NPDES Permit | EPA |
| Impact on Navigable Waters | ACOE 404 Permit | ACOE |

### STATE

| Activity/Impacts | Permit | Agency |
|---|---|---|
| Wastewater Management Planning | Approval | DEP |
| Wastewater Management Planning | MEPA Certificate | MEPA |
| Surface Water Discharge | State Surface Water Discharge Permit | DEP/BRP |
| Groundwater Discharge | Groundwater Discharge Permit | DEP/BRP |
| Waterways Activities | Chapter 91 Waterways License | DEP/BRP |
| Wetlands Impacts | Ch. 401 Water Quality Certificate | DEP/BRP |
| Air Emissions | Air Quality Permit | DEP/BWP |
| Sewer Extensions | Sewer Extension Permit | DEP/BRP |
| Residuals Disposal | Approval | DEP/BRP |
| Title 5 (large systems, variances) | Approval | DEP/BRP |
| Ocean Sanctuaries Impacts | OSA approval, variance | DEM |
| Coastal Impacts | Consistency Certificate | CZM |
| Natural Heritage/Endangered Species | Approval | DEM |
| Historical/Archaeological Impacts | Section 106/Chapter 9 Compliance | MHC |
| Interbasin Transfer of flows | Approval | DEM |

### LOCAL

| Activity/Impacts | Permit | Agency |
|---|---|---|
| Wetland Impacts | Order of Conditions | CONCOM |
| Title 5 system approval | Disposal Works Construction Permit | BOH |
| Water Supply impacts | Aquifer Protection Bylaw/ordinance | Local |
| Floodplain Impacts | Flood Management Bylaw/ordinance | Local |
| Construction Activities | Building Permit | Local |

## 2.0 PREPLANNING ACTIVITIES

## 2.1 Preplanning Conference

It is strongly suggested that communities meet with DEP, MEPA, and regional planning agencies prior to initiating wastewater management planning. A preplanning conference provides an excellent opportunity for agencies and the community to exchange information and discuss an appropriate plan of study for the planning effort. It also provides a forum for agencies to advise the community of aforementioned regulatory requirements as well as inform them of available technical and financial resources which may assist in their planning efforts. Without adequate information on these important programs, such as the SRF program, communities may unknowingly lose their opportunity for SRF financial assistance.

## 2.2 Coordination with prior planning efforts

In many instances, wastewater management planning will utilize and build upon previous planning efforts and other technical documents, such as facilities plans, water quality studies, sewer system evaluation studies, or on-site system reports. If these documents are technically sound and reflect current conditions, they may often be used to assist the community and its consultants in narrowing down the scope of work to directly address those issues that are necessary to update and complete long-term comprehensive wastewater management planning. In these instances, the planning approach described in this guidance should be suitably modified to stress those tasks which have been determined to be necessary. For example, if previous planning efforts have sufficiently developed the documentation of current conditions or projected future flows, this information could be directly incorporated into the comprehensive plan or simply reviewed and revised as necessary with a minimum level of effort, so that the bulk of the time and money spent would focus on developing and selecting wastewater alternatives. The development of the appropriate scope of work should be discussed and established at the preplanning stage, with the participation of DEP, MEPA, and interested stakeholder groups.

## 2.3 Request for Proposals (RFP)

Communities in most instances, either prior to or after the preplanning conference, will issue a Request for Proposals (RFP) to engage the services of environmental engineering consulting firms to assist them in their planning efforts. The RFP process generally includes an advertisement announcing the planning effort which also includes a sufficiently defined scope which will allow the consulting firms to provide a proposal with a scope of services and a breakdown of associated costs. It is common for communities to interview a small number of the firms to assess their expertise on wastewater management planning matters prior to selecting a consultant. The choice of the most appropriate firm is very important, since the consultant will be a key player throughout the planning process in developing wastewater alternatives which must meet the long-term needs of the community.

## 3.0 PLAN OF STUDY

A Plan of Study (POS) is normally prepared by a community, its consultant, or other proponent prior to initiating a comprehensive wastewater management plan. The POS is reviewed by regulatory agencies to ensure that the scope of work written for the planning effort will adequately evaluate wastewater alternatives and address regulatory requirements. The POS should provide an outline which will describe the scope, schedule, and costs of the comprehensive wastewater management plan. The specifics of each POS will vary, depending on the project. The POS should generally be brief, however, and the level of effort and details in each POS should be commensurate with the anticipated complexity of the wastewater management plan. The POS should outline the work to be undertaken, and often includes the following breakdown of tasks, which are normally included in comprehensive wastewater management plan:

### 3.1 Background

The scope for the project background should include a map showing the planning area, major centers of population, adjacent cities and/or towns, prominent surface waters, service areas of existing sewers and locations of treatment facilities, and current population in the planning area. There should be a brief description of why the facility plan is necessary, including a summary of problems.

### 3.2 Review Prior Planning Efforts

The POS often includes a requirement that any previous planning efforts affecting the planning area be reviewed and the information utilized to enhance current comprehensive wastewater management planning. Such past plans may include wastewater facilities plans, regional facilities plans, I/I reports, CSO reports, septage management reports, water quality studies, or other relevant reports. In some instances, prior planning efforts are sufficiently developed that the POS will define the scope to update and build on past work so that a viable alternative is achieved with a minimum of time and resources.

### 3.3 Assess Current Conditions

Existing conditions in the planning area should be outlined including demographics; surface and groundwater quality; environmental conditions; status of water supply; wastewater flows and loads; infiltration/inflow(I/I); Combined Sewer Overflows(CSOs); collection systems; and performance of existing centralized and decentralized wastewater treatment facilities (including a discussion of effluent limitations).

### 3.4 Assess Future Conditions

Anticipated growth characteristics through the 20-year design period and their effects on the parameters referred to in Current Conditions (3.3 above) should be included. An analysis of the future conditions without the project should also be included.

3.5 Needs Analysis/Problem Identification

The plan of study should include an outline of the elements of the needs analysis that will be conducted to investigate specific areas of concern.

3.6 Develop and Evaluate Alternatives

This task should be broken down into two phases: (1) a preliminary screening phase and (2) a more detailed evaluation of alternatives. The POS should include provisions for screening reports and review sessions at critical check points during the process. Evaluation of alternatives should include a cost-effectiveness analysis and a review of technical, environmental and institutional factors. The alternatives analysis should conclude with the development of a recommended plan.

3.7 Recommended Plan

This task should include a detailed list of the elements of the recommended plan; specifically, it should include a description of the proposed facilities (on-site systems, collection sewers, and treatment and disposal facilities), site layouts, design criteria, environmental impacts, capital and operation and maintenance costs, needed institutional mechanisms, a financial capability analysis and financing plan, and an implementation schedule(including phasing), as appropriate.

3.8 Public Participation

Outline the public participation program. The scope of the public participation process will vary with the nature of the project, but must include, as a minimum, one public meeting and one public hearing. Meetings should be scheduled upon completion of specific milestones in the comprehensive wastewater management plan. Controversial or complex projects should include a more comprehensive public participation process, with the use of citizens advisory committees, educational forums and workshops, and other appropriate activities.

3.9 Schedule and Costs

A calendar schedule should be included for the specific tasks necessary to complete the comprehensive wastewater management plan, together with an estimate of the cost for each task and the total costs of the plan.

## 4. COMPREHENSIVE WASTEWATER MANAGEMENT PLAN

The actual comprehensive wastewater management planning is undertaken upon acceptance of the Plan of Study by regulatory agencies and should be carried out in accordance with the scope, schedule, and costs defined in the plan of study. The following sections present a description of the assessments normally conducted during comprehensive wastewater management planning and which, if carried out appropriately, will result in a recommended plan yielding the wastewater facilities which are the most cost-effective and environmentally sound. This approach should be tailored to address the particular needs presented by the conditions in each planning area.

## 4.1 Assess Current Conditions

### 4.1.1 *Existing Conditions in the Planning Area*

The wastewater management plan should briefly describe the existing conditions in the planning area prior to the needs analysis. Only those conditions which are applicable to the project should be discussed.

The following parameters should be described in order to assess the ambient conditions in the planning area:

a. Planning area description - planning area boundaries; political jurisdictions; and physical characteristics, including climate, geology, soils, and topography.

b. Organizational context - the role of all entities involved in planning, financing and operating any existing wastewater facilities, including collection, treatment, and disposal facilities as well as on-site treatment and disposal systems.

c. Demographic data - the most recent census population, land-use patterns and major employment generating activities.

d. Existing environmental conditions - surface and groundwater quality and resources, water supply, air quality, wetlands, floodplains, endangered species, historical and archaeological sites, agricultural land and any other environmentally sensitive areas.

Sources of information used to compile the above referenced information should be noted.

### 4.1.2 *Existing Wastewater Treatment and Flows*

An inventory of existing wastewater facilities should be done, including:

a. On-site Subsurface Disposal - Describe the number and types of systems. Include a map delineating the locations of these systems.

b. Treatment Plant(s) - Describe the type, age, design capacity, process units, peak and average wastewater flows, present and anticipated effluent limits, a schematic layout of treatment units, flow diagram and a map showing the location of the treatment facility.

c. Collection System - Describe the age, condition, and types of sewers and pump stations including references to by-passes, Combined Sewer Overflows (CSOs) and Infiltration/Inflow (I/I). A map showing the entire sewer system should also be provided.

d. Residuals Disposal - Describe the method of residuals disposal including management of septage, sludge, scum, grit and screenings. Volumes and specific locations of disposal areas should be discussed.

## 4.2 Assess Future Conditions

### 4.2.1 *Planning Period*

The planning period is the timespan over which wastewater management needs are forecast, facilities are planned to meet such needs, and costs are amortized. The wastewater management planning period should extend 20 years beyond the date when the planned facilities are scheduled to begin operation. Since phased construction of facilities will often be a cost-effective approach to meet changing conditions over the planning period, consideration should be given to defining initial flows and incremental flows projected for only a part of the 20 year planning period. However, even if incremental flows are defined, the plan must also define design year flows, so that alternatives will be developed to address flows over the entire planning period.

### 4.2.2 *Land Use*

The wastewater management plan should be carefully coordinated with applicable state, local and regional land-use management regulations, policies and plans. Projected land-use patterns and densities should be used as a basis for determining the optimum capacity, type and location of facilities.

Where land use plans have not been prepared for all or part of the planning area, an estimate of future land use patterns and densities should be prepared in consultation with existing planning agencies, zoning commissions and public officials. The input of local officials is critical to the determination of future land use and development and will play a central role in defining the need for wastewater management. The wastewater management plan should also be compatible with federal, state and local programs for floodplain management.

### 4.2.3 *Demographic and Economic Projections*

Projections of economic and population growth, in conjunction with the land use planning noted above, should be used for estimating future wasteloads and flows. Projections should be based on an analysis of current growth trends and an estimate of future residential, commercial, and industrial growth. The Massachusetts Institute for Social and Economic Research (MISER), regional planning agencies (Appendix B), federal and state census authorities, and any other relevant studies or planning documents should be used as sources of demographic information for communities within the planning area.

All projections should be consistent with the current state implementation plan for air quality. Projections established for water resources management by the DEM Office of Water Resources and other environmental programs should also be evaluated. Reasons for any inconsistencies should be documented.

4.2.4 *Forecasts of Flows and Wasteloads*

It is extremely important to accurately define wastewater flows since this information is critical in developing and assessing wastewater alternatives. A breakdown of flows should be presented which identifies domestic, industrial, institutional, commercial, I/I, and septage flows for existing, initial year (initial flows projected at startup of recommended facilities), and design years. A typical flow table of this type is shown on Figure 2. In many instances, it is also advisable to further breakdown flows geographically in the planning area, since decentralized alternatives may be appropriate in many areas. In estimating wastewater flows and loads, the following factors should be considered:

a. Projections of economic and population growth

Estimates must be made for future residential, commercial, institutional, and industrial flows. To the greatest extent possible, estimates should be based on existing records of wastewater flows or on reliable water supply records adjusted for consumption and other losses. This analysis should result in estimates of per capita flow for residential contributions and legitimate flow estimates for commercial, institutional, and industrial flows. If no wastewater or water use records exist, the rationale for estimation of future flows should be fully documented.

**Figure 2**

Population and Flow Projection

| Parameter | Present Year | Initial Year | Design Year |
|---|---|---|---|
| Total Population | | | |

| | | | |
|---|---|---|---|
| Sewered Population | | | |
| Average Flow (MGD): | | | |
| Domestic | | | |
| Industrial | | | |
| Commercial | | | |
| Institutional | | | |
| I/I | | | |
| Septage | | | |
| Total Average Flow: | _____ | _____ | _____ |
| Peak Hourly Flow: | _____ | _____ | _____ |
| Peak Wet Weather Flow (MGD): | _____ | _____ | _____ |

NOTES:
(1) The basis used for estimating wastewater flows should be noted.
(2) Infiltration flows should reflect the sustained flows to the sewer system during spring high groundwater conditions.

b. An estimate of non-excessive infiltration/inflow

As noted in section 4.1, the wastewater management plan should include an analysis of any infiltration and inflow in the existing sewer system. An infiltration allowance of 200 gallons/day-inch-diameter-mile (gpdim) should be used for estimating initial I/I flows from new sewer lines. Five hundred gpdim should be used when estimating design year I/I flows from these sewers.

c. An analysis of pollutant loads from residential, commercial, and industrial sources in the existing sewer system.

d. An analysis of the rate, duration, pollutant content and location of combined sewer overflows in the existing system during storms of

different magnitude. The analysis should be linked to the drainage area tributary to the combined sewer system. This would facilitate forecasting of flow and wasteload increases from future changes in the nature and extent of the drainage area.

e. A projection of benefits possible from water conservation programs in accordance with the 1992 Water Resources Commission Water Conservation Standards for the Commonwealth of Massachusetts or other selected measures to reduce flow and wastes.

## 4.3 Wastewater Needs/Problem Identification

A wastewater needs analysis should be conducted which evaluates existing problems and projects future conditions. The needs analysis should fully describe the wastewater problems that necessitate the planning effort. The analysis should describe specific areas of need, the severity and nature of the problems and a prioritization of each area of concern.

### 4.3.1 *On-site Wastewater Disposal*

The problems being caused by failing on-site systems should be detailed. The scope of this analysis should include an assessment of system failures, Title 5 violations, sewage breakouts, board of health records, surface and groundwater pollution, soil conditions, septage pumping records, on-site inspections, records from local environmental groups and survey questionnaires. Specific areas of concern should be listed by street and plotted on a map. Results of any water quality sampling should also be presented.

### 4.3.2 *Wastewater Collection System*

- Infiltration/Inflow (I/I)

The plan should describe the specific problems that are suspected as being caused by excessive I/I. Detailed I/I information should be provided including: past engineering studies; maps of both wastewater and storm sewer systems; interviews with officials familiar with the systems; maintenance reports; and treatment plant and pump station flow records. The type of sewerage system (separate or combined) should be established, as well as drainage patterns, bypasses, and surcharges, type and age of sewer lines and manholes, condition of existing facilities, and previous problems, I/I investigations and rehabilitation to the system. Any incidence of high per capita flows, bypassing of pumping or treatment facilities, surcharged manholes, or basement flooding should be detailed. Through analysis of this information, the proponent should determine any areas which may be subject to excessive I/I and the recommended plan should address these concerns. The proponent should also contact the I/I section within

the Bureau of Municipal Facilities (617-292-5793) for additional information and guidance on I/I issues, and to pursue SRF financial assistance for any necessary I/I work.

- Combined Sewer Overflows

If the existing facilities include combined sewers, the wastewater management plan should detail the frequency and type of discharges (dry or wet weather) and include a map showing locations of overflows. The discussion should include a description of receiving water uses and an assessment of the impacts of CSO discharges on the receiving waters, especially on any critical uses such as shellfish harvesting, bathing beaches, recreational areas, or public water supply intakes. This analysis often requires water quality sampling and usually requires monitoring and modeling of the flows in the combined sewer system. The proponents should discuss the scope of this work in detail with DEP so that sufficient information will be compiled to facilitate developing wastewater alternatives and ensure that the identified alternatives will comply with regulatory requirements for CSO control. Any documented water quality violations, administrative orders or other enforcement actions should also be discussed in the plan.

- Sewer Expansion

The needs analysis must justify any extension of sewers through an analysis of on-site systems(Task 4.3.1) and evaluate why on-site treatment is no longer feasible or will not be adequate to accommodate existing or future flows. The capacity in the existing sewer system and wastewater treatment facility should be discussed in detail.

### 4.3.3 *Wastewater Treatment Plant and Effluent Disposal*

The comprehensive wastewater management plan should include justification for expansion or upgrade of treatment facilities and explain deficiencies of specific treatment units. Information should be provided on dry and wet weather flows, wastewater characteristics and wasteloads, effluent limitations, water quality violations, and demographic projections. The discussion should also include residuals (sludge, septage, grit, screenings and scum) processing and disposal.

## 4.4 Develop Alternatives

A detailed assessment of wastewater alternatives must be presented in order to determine the appropriate wastewater facilities which will meet the needs in the planning area and provide the greatest environmental and cost benefit. The evaluation of alternatives should include, at a minimum, an analysis of the following baseline, regional, and other wastewater alternatives.

### 4.4.1 *Baseline: Optimum Operation of Existing Facilities*

The alternative of optimizing performance of existing facilities should be considered first. The level of treatment attainable with optimum performance should serve as a baseline for planning additions or modifications to the existing wastewater management facilities. For communities with centralized facilities, this alternative includes optimization of operation and maintenance of the wastewater collection, treatment, and disposal facilities. For communities where on-site systems are used for wastewater treatment and disposal, this alternative includes optimizing septage management plans, and the continuing maintenance, repair and upgrade of on-site systems in the planning area.

Regardless of the size and type of wastewater facilities in any community, the local authority should aggressively promote water conservation measures and pollution prevention initiatives. It is often the case where the local authority can, with the assistance of state agencies such as DEP, DEM, and the EOEA Office of Technical Assistance (OTA), achieve flow and waste reductions from their dischargers, often effecting changes which result in economic benefit as well as pollution prevention. Appendix C provides information on how communities can receive additional assistance for these important programs.

The implications of the baseline alternative should be set forth with respect to potential effects on: surface water quality; groundwater quality (if applicable); land use limitations; and socio-economic factors (e.g. residential, industrial development and health hazards).

### 4.4.2 *Regional Solutions*

The possibility of a regional solution to wastewater needs should be explored early in the planning process. Regional solutions may include interconnection of facilities, construction of one or more large facilities to eliminate the need for many small facilities and joint management of facilities to improve operation and maintenance and reduce costs. Joint facilities may involve interceptors, treatment plants, septage facilities, or sludge and effluent disposal systems.

Existing plans which address regional options should be referenced and important conclusions summarized in the facility plan. Further analysis of options will not be necessary if regional questions are resolved by existing plans.

The analysis of regional solutions should address the following special considerations:

a. effects of any interceptor locations on land use within and between urban areas, particularly where land is undeveloped.

b. effects of alternative combinations on stream flows in the regions and possible interbasin transfer of flows.

c. possible limitation on future expansion due to unavailability of land.

d. differences in reliability, operation and maintenance of facilities.

e. environmental and economic costs of delays likely to be associated with efforts to achieve a regional solution.

f. any necessary legal or municipal agreements.

Any detailed analysis of regional alternatives should include a map of wastewater collection and treatment system configurations and show the boundaries of political jurisdictions and service areas for each facility.

4.4.3 *Wastewater Alternatives*

A range of wastewater alternatives for each service area should be considered in addition to the baseline and regional alternatives outlined above.

The plan should consider, where applicable, the primary options for:

a. flow and waste reduction, including water conservation and toxics use reduction.

b. the use of decentralized facilities for treatment and disposal of wastewater, including the potential for utilizing on-site systems, package plants, cluster systems, or other systems which may preclude the need for centralized facilities.

c. configuration of sewers and interceptors for wastewater collection, including considerations for alternative sewer systems such as pressure, small diameter and STEP systems.

d. wastewater treatment and disposal of effluent, including reuse and land application alternatives.

e. residuals disposal, including alternatives for reuse and contractual services for processing and disposal.

4.4.4 *Alternative Technology*

The wastewater management plan should contain a full discussion of the possible use of alternative technologies. Alternative technologies are wastewater treatment processes and techniques which provide for the reclaiming and reuse of wastewater, productively recycle wastewater constituents or otherwise eliminate the discharge of pollutants, or recover energy. Specifically, alternative technology includes land application of effluent and sludge; aquifer recharge; containment ponds; sludge composting and drying prior to land application; self sustaining incineration; methane recovery; co-disposal of sludge and solid waste; and innovative, alternative on-site systems. Alternative technologies for collection systems should also be considered, such as STEP systems, pressure sewers, small diameter sewers, and vacuum sewers.

### 4.4.5 *Screening of Alternatives*

The realm of alternatives initially evaluated should include a broad range of wastewater alternatives which have the potential to meet the long-term wastewater needs in the planning area. Options should be rejected if they fail to meet physical constraints of the planning area, such as climate, soils or topography, or if they are incompatible with air and water quality plans. A screening process should be employed to determine those alternatives which appear to provide the greatest environmental and cost benefit. This preliminary screening process will in large part be guided by the wastewater needs particular to the planning area and a preliminary assessment of the major environmental, financial, technical, and institutional considerations of each alternative.

Options for collection, treatment and discharge should, as appropriate, take into account and allow to the extent practicable for the application of technologies at a later date which may provide for the reclaiming or recycling of water or otherwise eliminate the discharge of pollutants.

Following initial screening of the wastewater management alternatives, a limited number of the most feasible options should be evaluated in detail. The following sections outline the cost and environmental evaluations necessary to compare the different alternatives.

## 4.5 Evaluate Alternatives

### 4.5.1 *Evaluation of Costs*

A cost effectiveness analysis should be performed on all alternatives advanced for detailed evaluation. This analysis should be done in accordance with accepted engineering economic principles and include a calculation of the direct monetary costs of each alternative using present worth or equivalent uniform annual cost as a basis. The analysis should include consideration of all project costs over the

planning period. An example employing these methods of cost analysis is included in Appendix A.

- *Present Worth*

Present worth may be thought of as the sum which, if invested now at a given rate, would provide exactly the funds required to make all necessary expenditures during the life of the project. The discount rate established by U.S. Environmental Protection Agency along with appropriate present worth factors are normally used in determining present worth costs for wastewater management alternatives. It is important to note that the EPA discount rate does not include any adjustment for inflation impacts over the planning period. However, since inflation is assumed to impact all alternatives equally, the discount rate is usually effective in evaluating comparative costs among alternatives. If wastewater alternatives being considered include alternatives with high operation and maintenance costs or significant future expansion, the use of a discount rate adjusted for inflation may be appropriate. A formula for calculating such a discount rate, known as an effective discount rate, is included in Appendix A. In any event, the same cost analysis method must be utilized for all wastewater alternatives being considered.

- *Equivalent Uniform Annual Costs*

Equivalent Uniform Annual Cost (EUAC) is the expression of nonuniform series of expenditures as a uniform annual amount. This method will allow the proponent to compare annualized costs for each alternative, which in some instances may be preferable for presentation to the stakeholder groups. The EUAC is calculated by applying the appropriate financial factors to the present worth costs over the designated planning period.

- *Cost Effectiveness Analysis*

The cost effective analysis of each alternative should be developed and should include all costs associated with construction of and operation of wastewater management facilities and other appropriate monetary factors including:

a) Capital Costs - costs of construction of wastewater management facilities (including sludge and septage management) and any costs associated with lease, easement, or acquisition of rights-of-way. The capital cost estimate should utilize and reference the appropriate construction cost index from the Engineering News Record (ENR).

b) Operation and Maintenance Costs - these costs should include costs for labor, utilities, materials, contractual services, expenses and

replacement of equipment and parts to ensure effective and dependable operation during the planning period. The O & M costs should be adjusted to also reflect any revenues received from the sale or distribution of wastewater facility by-products (methane gas, sludge products, etc.).

c) Salvage Value - the salvage value of any wastewater facilities at the end of the planning period should also be considered in the cost-effectiveness analysis. This value is normally based on a straight line depreciation from the initial cost at the time of analysis to the end of the planning period.

### 4.5.2 *Environmental Evaluation*

Alternatives should be evaluated and screened for their environmental impacts. Adverse impacts could be a basis for rejecting an option and, thus, reduce the number of viable alternatives. Other impacts may require further study and should be identified, to the extent possible, early in the planning process. The evaluation should assess both beneficial and adverse direct and indirect environmental impacts. Definition and examples of each type follow:

- *Direct Impacts*

Direct impacts are those directly related to construction and operation of the wastewater facilities. Some examples are:

a. Impacts on historical, archaeological, geological, cultural or recreational areas.

b. Impacts on wetlands, floodplains, agricultural land and any other environmentally sensitive areas.

c. Impacts to zones of contribution of existing and proposed water supply sources.

d. Impacts on surface and groundwater resources.

e. Displacement of households, businesses or services.

f. Noise pollution, air pollution and odor and public health problems associated with construction and operation.

g. Violation of federal, state or local environmental and land-use statutes, or regulations and plans imposed by such statutes and regulations.

- *Indirect Impacts*

Indirect impacts of a project are (1) induced changes in the patterns of land-use and population growth, and (2) other environmental effects resulting from changes in land use and population growth.

Examples of indirect impacts are:

a. changes in the rate, density, or type of development, including residential, commercial, industrial development or changes in the use of open space or other categories of land.

b. air, water, noise, solid waste or pesticide pollution stemming from the induced changes in population and land use.

c. damage to sensitive ecosystems (wetlands, habitats of endangered species) and environmentally protected areas (parks, historic sites) resulting from changes in population and land use.

d. socioeconomic pressures for expansion of existing infrastructure resulting from induced changes in land use and population.

The environmental assessment should determine if indirect impacts will possibly contravene environmental and land use statutes, regulations, or standards. Relevant federal, state and local environmental and land use statutes and local planning initiatives should all be considered.

Potential for mitigation of direct and indirect adverse impacts should be evaluated for each of the alternatives. Such mitigation measures may include: changes in design, size, or location of facilities; rerouting of sewers to avoid sensitive areas; phased construction of facilities; additional controls for noise, odor, and aesthetic impacts; or other measures intended to lessen or eliminate adverse impacts.

## 4.6 Additional Guidance on Evaluation of Alternatives

### 4.6.1 *Institutional Arrangements*

Evaluation of alternatives should include a comparison of existing institutional arrangements and authorities with those necessary to implement each option. The organization to be responsible for management of the wastewater facilities also should be identified with each option. Further, the costs to each jurisdiction for construction, operation and maintenance of the facilities should be estimated. These matters, as well as the total costs and impacts of each proposal,

should be discussed with representatives of local government units, and the views of other interested parties solicited during public review.

### 4.6.2 *Flow and Waste Reduction*

Some types of flow and waste reduction measures are listed below:

a. measures for reducing sewer system infiltration/inflow

b. water conservation measures.

c. land use and development regulations.

d. industrial reuse, recycling and pretreatment programs.

e. continuation of the use on-site (private) facilities such as conventional septic systems as well as alternative systems.

f. Pollution Prevention initiatives.

Opportunities for flow and waste reduction should be evaluated for all alternatives, including the baseline alternative. Appendix C includes additional information on water conservation and toxics use reduction programs and a listing of agencies which provide assistance to communities.

Procedures for determining the cost effectiveness of measures for reducing infiltration/inflow are found in the Bureau's "Guidelines for Performing Infiltration Analyses and Sewer System Evaluation Surveys".

The cost-effectiveness of water conservation measures can be determined by comparing the cost with resultant savings for both waste treatment and water supply.

### 4.6.3 *Decentralized Alternatives*

Decentralized alternatives should be evaluated in meeting long-term wastewater treatment and disposal needs. Conventional Title 5 systems as well as recirculating sand filters, peat systems, attached-growth systems, and other innovative, alternative on-site systems have been shown to provide efficient wastewater treatment and disposal when installed in appropriate locations. The opportunities for utilizing package plants and cluster systems should also be evaluated. The site compatibility, pollutant removal efficiency, groundwater and surface water impacts, and operation and maintenance requirements of these systems should be evaluated along with the other alternatives.

### 4.6.4 *Sewers*

Alternative arrangements of interceptors and trunk lines should be compared to determine the most cost-effective configuration. Sewers in developing areas should be planned on the basis of anticipated changes in land use and density.

Analysis should be made, whenever possible, of the residential, commercial and industrial land use changes that a centralized project will induce.

The sizes of interceptors should be based on projected flows and a cost-effectiveness analysis of alternative pipe sizes. The analysis should reflect the expected useful life of the pipe, all costs related to future pipe installation, and induced growth effects of initial provision of substantial excess capacity.

The cost effectiveness analysis for collector sewers should compare conventional gravity sewers with alternative systems such as pressure, small diameter and STEP systems. Preliminary routing should be done on a map which delineates the areas most likely to require sewers over the life of the project.

### 4.6.5 *Residuals Disposal*

Options for sludge and septage disposal generally include: stabilization and subsequent land application; stabilization and landfilling; sludge incineration and disposal of resulting ash; or contract services for sludge processing and disposal. Stabilization methods include digestion (aerobic or anaerobic), drying, composting, lime stabilization, and other methods which significantly reduce pathogens. All stabilization and land application alternatives are subject to 310 CMR 32.00, and the comprehensive wastewater management plan should evaluate the potential sludge classifications of the sludge or septage products. Wherever feasible, DEP supports beneficial reuse of wastewater residuals as achieved in land application alternatives. Incineration alternatives should be evaluated with considerable emphasis on air quality controls, operation and maintenance constraints, ash disposal, and site compatibility issues. Additionally, the wastewater management plan should evaluate the potential for utilizing regional facilities or contractual services for sludge and septage processing and disposal.

### 4.6.6 *Location of Facilities*

Evaluation of sites for treatment plants, interceptors, transmission lines, outfalls, pumping stations, and other major works should take into account the following factors:

a. minimize odors and locate away from residential areas which would be affected by odors.

b. minimize aesthetic problems through proper design and landscaping at facility sites.

c. locate outfalls where they will not affect public water supplies, shellfishing beds or primary contact recreational waters. Where alternative sites are unavailable, special precautions must be taken.

d. locate treatment plants and other facilities in general outside of environmentally sensitive areas.

4.6.7 *Revision of Wasteload Allocation*

Wasteload allocations are the basis for determining effluent limitations to be achieved by a treatment plant. They are normally prepared as part of the state watershed management plan and are reflected in the NPDES or groundwater discharge permit. Comprehensive wastewater management planning may result in a change in the discharge locations and the wasteload distribution among the locations. The wasteload allocation and future permit requirements, in this case, should be reviewed by the DEP Office of Watershed Management to ensure consistency with the watershed management plan.

4.6.8 *Phased Construction*

Adding capacity in phases during a planning period may be more cost-effective in some cases than providing sufficient capacity in initial construction for the entire planning period. A cost analysis of phased development should be included in the wastewater management plan. Factors to be considered are:

a. relative cost of providing excess capacity initially compared with the present worth of deferred costs for providing capacity when needed.
b. uncertainties of projected long-term wastewater flows, and possible technological advances or flow and waste reduction measures which may limit need for excess capacity.

Modular development of operable components of wastewater management facilities is advisable in areas where high growth rates are projected, where treatment requirements may become more stringent later in the planning period, or where existing facilities are to be used initially but phased out later.

4.6.9 *Flexibility*

Wastewater management planning should assess wastewater alternatives in providing sufficient land to allow for expansion of the wastewater facilities to handle unforeseen increases in wastewater flows and/or pollutant loads. Facility sites, land areas, and layouts should all be considered.

4.6.10 *Reliability*

The reliability of wastewater facilities should be included as part of the evaluation. This is especially important where any proposed discharge could impact sensitive areas, such as shellfishing areas, where additional reliability (and/or redundancy) must be included in the plan. Emphasis on reliability should focus on the most critical processes.

## 4.7 Plan Selection

4.7.1 *General*

This section discusses the principal considerations for selecting a plan. It assumes that each of the alternatives being compared would, if implemented, result in compliance with all the applicable regulatory requirements (i.e., effluent limitations, load allocations, compliance schedules, and so forth). The selected plan must, except for alternative technologies, be cost effective and should be demonstrated to be the most economical means of meeting the applicable effluent, water quality and public health requirements over the design life of the facilities while recognizing environmental, technical and institutional considerations.

4.7.2 *Comparison and Ranking of Proposals*

Plan selection will involve making choices among alternatives based on a comparison of the significant costs, environmental impacts and benefits of each. While costs of alternatives may be directly compared, the comparison of environmental, institutional, and social impacts of each alternative may not be as straightforward. Sound judgment on the overall impacts of the alternatives will be critical in selecting the plan with the greatest overall benefit.

The impacts should be considered, wherever possible, in quantitative terms, and be based on the supporting analysis elsewhere in the plan. Where quantification is not possible, the comparison should be made by brief narrative description.

The alternatives may be ranked after they are presented to aid final selection of a plan. It is important that the stakeholders be included in the ranking process, so that the ultimate rankings of alternatives stress the parameters of greatest importance to the community and affected groups. Public meetings should be held at this critical stage of the planning effort so that the alternatives reflect the interests of the community and sufficient support is engendered for the comprehensive wastewater

management planning process. The following are suggestions on the ranking procedure:

a. Environmental impacts: All significant direct and indirect impacts should be weighed to derive a value judgment as to the net overall effect of each alternative relative to other plans. Alternatives which have indirect impacts with a high potential for contravening an environmental or land-use statute or regulation, or plan imposed by such statute or regulation should be ranked below those which do not.

b. Monetary costs: The costs of each alternative should be presented and compared.

c. Implementation capability: The ability of and agreement among the State, regional and local governmental units or management agencies to implement the alternatives should be weighed
carefully. The necessary institutions must exist or be created in time to carry out the plan, and the local governmental unit must be capable of bearing the local share of the costs.

d. Other considerations: Each plan must meet applicable regulatory requirements, and design and reliability criteria. Other considerations including the contribution to water quality objectives beyond regulatory requirements, reliability, flexibility, use of resources and energy, and public acceptability should also be evaluated in selecting the alternative which provides the greatest overall benefit.

## 4.8 Recommended Plan

The evaluation process outlined above should be utilized to determine the wastewater alternative with the greatest environmental and cost benefit. The comprehensive wastewater management plan should contain a section which details the critical components of the recommended plan and which also provides the environmental impacts, preliminary design criteria, financing analysis, and implementation schedule for the recommended plan.

### 4.8.1 *Detailed Recommended Plan*

A complete detailed discussion of all of the proposed wastewater facilities which comprise the recommended plan should be included. Modifications to existing facilities as well as new facilities should be presented.

### 4.8.2 *Environmental Impacts*

The direct and indirect environmental impacts of the recommended plan should be discussed. This should include a discussion of impacts on surface and groundwater quality, water supply, air quality, noise levels, wetlands, floodplains, endangered species, historical and archaeological sites, agricultural land, and any other applicable environmentally sensitive areas. Any measures intended to mitigate adverse impacts should also be described.

### 4.8.3 *Institutional Impacts*

Any institutional requirements for implementing the recommended plan should also be presented. Such considerations may include intermunicipal agreements, establishment of Sewer Districts or Septage Management Districts, or the requirement for any special state or local legislative or regulatory action.

### 4.8.4 *Preliminary Design Criteria*

Preliminary engineering designs should be prepared for those wastewater facilities proposed for initial construction and scheduled for preparation of drawings and specifications. Such information would include, as appropriate, a schematic flow diagram, unit processes, plant site plans, sewer plans and profiles, and design data regarding detention times, flow rates, and sizing of units. It would also include a summary of requirements for operation and maintenance of the treatment works. Cost estimates for final design, preparation of plans and specifications, and construction of the treatment works, together with a schedule for completion of all such work, should be presented.

### 4.8.5 *Financing Plan*

The financial requirements necessary for implementation of the recommended plan should be presented. This should include a presentation of the costs of the plan to the community and a discussion of the availability of any federal, state, or private assistance for reducing such costs. A breakdown should be included indicating the costs per household and the method of distribution of such costs as shown in Figure 3. The plan should also summarize any increased costs to be borne by commercial and industrial users and provide an analysis of the financial and/or economic impacts to the planning area.

### 4.8.6 *Implementation Plan*

The wastewater management plan should present a schedule for implementation of the recommended plan, which should include a detailed schedule for the design and construction of wastewater facilities and include any plan to phase construction of facilities. Any "critical path" items which are necessary to facilitate reasonable progress in initiating design, construction, and operation of wastewater facilities should be identified. The implementation plan should provide for

wastewater facilities meeting the needs in the planning area while also providing the greatest benefit to the community in financing wastewater improvements.

**Figure 3**

Breakdown of Annual Costs Per Household

| Household | (1) Betterment or Connection Fee | (2) House Connection | (3) General Taxes | (4) User Charge | (5) Septic System Upkeep | (6) Total |
|---|---|---|---|---|---|---|
| New Sewer User | | | | | | |
| Existing Sewer User | | | | | | |
| Household not on Sewer | | | | | | |

NOTES:
(1) Fees assessed to property owners who have access to sewer system.
(2) May be financed over a number of years (provide documentation).
(3) Charges accessed through taxation (provide basis).
(4) User charges at rates established by sewer authority (provide rates).
(5) Costs of septage treatment plus property tax assessment.
(6) Total Costs should include existing and projected O&M and capital cost debt service. Existing annual costs for O&M and service for the average household should be provided.

## 4.9 Public Participation

The public participation program must include as a minimum one public hearing to discuss the alternatives and their environmental impact and a public hearing on the recommended plan and its environmental impact. However, as indicated throughout this guide, the public should participate from the beginning in comprehensive wastewater management planning so that interests and potential conflicts may be identified early and considered as planning proceeds. The importance of building a consensus among citizens and stakeholders is extremely critical, as the fate of many planning efforts is decided by the willingness of the public to accept the plan and to take action to appropriate the necessary funds for design and construction of facilities.

### 4.9.1 *Relationship between Proponent and Public*

The proponent should define issues and analyze information so that the public will clearly understand the costs and benefits of alternatives considered during the planning process. Efforts should be made to ensure that the interests of a broad spectrum of the public are represented in the planning process (including interests of neighborhood groups directly impacted by the proposed project, local businesses, environmental groups and political entities). Projects that are complex or controversial will require a more comprehensive public participation program.

The public can be informed and their input solicited through a variety of means, including the following:

-Advisory groups -correspondence
-depositions -exhibitions
-information contacts -interviews
-liaison with citizen groups
-mailings -newsletters
-news media -polls
-public meetings -seminars
-speeches -surveys
-task forces -workshops

### 4.9.2 *Requirement for Public Hearings*

A public hearing must be held on the comprehensive wastewater management plan. The location of the hearing should be easily accessible and facilitate attendance and testimony by a cross-section of interested or affected organizations and interests. Notice of the public hearing should be given 45 calendar days prior to the hearing date to elicit formal comments of all concerned interests. The notice should be advertised in a local paper(s). The notice should include a

reference that the draft comprehensive wastewater management plan will be made available for public review at a specific location 30 days prior to the hearing.

### 4.9.3 *Summary of Public Participation*

A report summarizing public participation should be prepared and submitted as part of the final comprehensive wastewater management plan. It should as a minimum include a responsiveness summary of the views expressed at the public hearing and a written transcript of the hearing. It also may describe other measures taken to provide for public input and encourage concerned interests; and the disposition of the issues raised.

# REFERENCES

1. "Guidance for Preparing a Facility Plan", revised May 1975, US EPA.

2. "Construction Grants - 1985", Municipal Wastewater Treatment, US EPA, July 1984.

3. "Handbook of Procedures", Construction Grants Program for Municipal Wastewater Treatment Works, US EPA July 1989.

4. 310 CMR 41.00, "Financial Assistance for the Costs of Water Pollution Control Abatement Projects", DEP regulations, effective January 1993.

5. 310 CMR 15.00, "State Environmental Code Title 5", DEP regulations, effective September 1994.

6. "The Massachusetts Watershed Management Program", DEP Office of Watershed Management.

7. "Regulatory Issues Affecting Innovative/Alternative On-Site Systems", Bryant Firmin, DEP, Conference on Alternative On-site Wastewater Treatment, November 1994.

8. "Sewerage Facilities Planning", Pennsylvania Department of Environmental Resources, November 1992.

9. "Water Conservation Standards for the Commonwealth of Massachusetts", October 1992, Massachusetts Water Resources Commission.

10. "Technical Decision Making using Life Cycle Cost Analysis", Prepared by Steve Davenport, Dave Kubiak, Kelly 0'Day, Lise Paul, and Celia Strickler for the Massachusetts Water Resources Authority, 1993.

# APPENDIX A

# PRESENT WORTH CALCULATION EXAMPLES

## Present Worth Cost Analysis

A present worth cost analysis is the most common cost analysis used to compare the costs of wastewater alternatives. The analysis involves utilizing a "discount rate" which considers the current value of future expenditures. The discount rate may be obtained from the U.S. Environmental Protection Agency or may be developed by the community or consultant to reflect the most appropriate rate. This rate does not consider any future impacts of inflation.

The discount rate is used in combination with present worth factors to determine current values. These present worth factors are readily available in any engineering economic text which often list in tabular form the values of the factors for a number of rates and timeframes (in years). The most commonly used factors are the single payment present worth factor, which reflects current value of a future single payment; uniform series present worth factor, which reflects the current value of a series of equal future payments; and the gradient series present worth factor, which reflects the current value of a uniformly increasing series of payments.

Examples 1 and 2 which follow detail the use of these factors and the discount rate to calculate the present worth of two wastewater alternatives.

## Consideration of Inflation Impacts

In cases where wastewater alternatives involve significant costs which are projected for future years or where Operation and Maintenance costs are significant, the community or the consultant may wish to consider the estimated effects of future inflation. This will necessitate an estimate of the annual inflation rate over the planning period. When such an estimate is developed the discount rate can be adjusted to consider the impacts of inflation using the following formula:

$$\text{Effective Rate} = \frac{(\text{disc. Rate} - \text{inflation rate})}{(1 + \text{inflation rate})}$$

The resulting *Effective Rate* is then used in place of the discount rate in the present worth cost analysis and thereby takes into account impacts of inflation.

### Example 1: Phase construction of sewage treatment plant

Wastewater Alternative:

sewage treatment plant
capacity: year 1-10, 10 MGD; years 10-20, 10 MGD
average flow: increases linearly from 2 MGD to 10 MGD over 20 year period
planning period: 20 years
salvage value at end of 20 years: $750,000
capital cost of plant (5 MGD): $2,000,000
future capital cost at year 10 to expand: $1,500,000

Operation & Maintenance Costs:
a) constant annual O&M Cost, years 1-10: $84,000;
b) variable annual O&M Cost, years 1-10; increases linearly from 0-$29,000 in year 10;
c) constant annual O&M Cost, years 11-20: $165,000
d) variable annual O&M Cost, years 11-20: increases linearly from 0 -$29,000 in year 20.

Determine Present Worth and Equivalent Uniform Annual Cost of alternative over 20 years.

Method: Present Worth equals capital cost plus present worth of the operating and maintenance costs. Calculate O&M costs from year 10 and O&M costs for years 11 through 20 separately. Also add present worth of expansion and subtract present worth of salvage value from present worth of other costs. Equivalent Uniform Annual Costs equals the present worth times the appropriate capital recovery factor. Discount rate for calculation should be used which reflects current rate (may be obtained from BMF). Discount rate of 8 1/8% used in this example.

Step 1: Initial capital cost = $2,000,000

Step 2: Present worth of expansion cost which occurs at year 10, times single payment present worth factor @8 1/8% for 10 years:

$1,500,000 x (.458) = $687,000

Step 3: Calculate present worth of O&M costs:

a. Present worth of constant annual O&M costs, years 1-10 equals cost times uniform series present worth factors @ 8 1/8% for 10 years:

$84,000 x (6.672) = $560,450

b. Present worth costs of variable O&M costs, years 1-10 equals gradient series ($2,900) times present worth factor of a gradient series @ 8 1/8% for 10 years:

$2,900 x (25.769) = $74,730

c. Present worth of constant O&M costs, years 11-20 are first calculated as in (a) above using given cost for years 11-20. This, however, yields present worth in year 11 which must be converted to present worth in year 1. This is accomplished by multiplying present worth (year 11) times single payment present worth factor @ 8 1/8% for 10 years (.458). Thus, present worth in year 1 equals:

$165,000 x (6.672) x (.458) = $504,200

d. Present worth of variable O&M costs years 11-20 are first calculated as in (b) above using gradient series for years 11-20 which is $2,900. This yields present worth in year 11 which again must be converted to present worth in year 1 by multiplying present worth (year 11) times single payment present worth factor @ 8 1/8% for 10 years (.458):

$2,900 x (25.769) x (.458) = $34,230

Step 4: Present worth of salvage value at end of 20 years equals that value times single payment present worth factor @ 8 1/8% for 20 years:

$750,000 x (.210) = $157,500

Step 5: The sums of values obtained in steps 1,2, and 3 minus the value obtained in step 4 equals the present worth of the alternative:

| | |
|---|---|
| initial capital cost | $2,000,000 |
| present worth of expansion | $ 687,000 |
| present worth O&M years 1-10: | |
| constant | $ 560,450 |
| variable | $ 74,730 |
| present worth O&M years 11-20: | |
| constant | $ 504,200 |
| variable | $ 34,230 |
| Total | $3,860,610 |
| Subtract present worth salvage | $ 157,500 |
| Total Present Worth of Alternative | $3,703,110 |

Step 6: Multiplying present worth of alternative times the capital recovery factor@ 8 1/8% for 20 years will yield the equivalent uniform annual cost:

$3,703,110 x (.1028) = $380,680

Example 2: Present Worth of On-site System Alternative

Wastewater Alternative:

Individual on-site treatment systems
Planning period: 20 years

a. rehabilitation, upgrading, or replacement of on-site systems for 200 existing homes;
b. major rehabilitation of 10 on-site systems per year;

c. construction of 100 on-site systems for new homes
d. salvage value at end of 20 years: $120,000
Capital Costs:
a. rehabilitation, upgrading, replacement of 200 existing systems: $400,000
b. rehabilitation of 10 systems per year: $20,000/year.
c. construction of 100 new systems (5 per year for 20 years): $13,000 per year.

Average annual operation and maintenance costs (on-site management program for 500 systems): $25,000/year
Discount Rate utilized for example: 8 1/8%

Method: present worth equals initial capital cost plus present worth of future capital cost plus present worth of operation and maintenance costs. Subtract present worth of salvage value. Equivalent Uniform Annual Cost equals the present worth times the appropriate capital recovery factor.

Step 1: Initial Capital Cost = $400,000

Step 2: Calculate present worth of annual capital costs as follows:

a. annual capital costs equal $20,000 per year plus $13,000 per year equals $33,000 per year.
b. present worth of annual capital cost equals given cost times the uniform series present worth factor @8 1/8% for 20 years:

$33,000 x (9.728) = $321,000

Step 3: Present worth of annual O&M costs times the uniform series present worth factor @8 1/8 % for 20 years:

$25,000 x (9.728) = $243,200

Step 4: Present worth of salvage value at end of twenty years equals that value times the single payment present worth factor @8 1/8% for 20 years:

$120,000 x (.210) = $25,200

Step 5: The sum of values obtained in steps 1,2, and 3 minus the value obtained in step 4 equal the present worth of the alternative:

| | |
|---|---|
| initial capital cost | $400,000 |
| Present worth of future capital costs | $321,000 |
| present worth of O&M costs | $243,200 |
| Total | $964,200 |
| less present worth salvage value | $ 25,200 |

Present Worth of alternative $939,000

Step 6: The present worth times the capital recovery factor@ 8 1/8% for 20 years will yield the equivalent uniform annual cost:

$939,000 x (.1028) = $96,530

# APPENDIX B

# MASSACHUSETTS REGIONAL PLANNING AGENCIES

# MASSACHUSETTS REGIONAL PLANNING AGENCIES

Massachusetts Association of Regional Planning Agencies
c/o Metropolitan Area Planning Council
60 Temple Place
Boston, MA 02111
(617) 451-2770

Berkshire County Regional
Planning Commission
10 Fenn Street
Pittsfield, MA 01201
(413) 442-1521

Metropolitan Area
Planning Council
60 Temple Place
Boston, MA 02111
(617) 451-2770

Cape Cod Commission
P.O. Box 226
3225 Main Street
Barnstable, MA 02630
(508) 362-3828

Montachusett Regional
Planning Commission
1427 R. Water Street
Fitchburg, MA 01420
(508) 345-7376

Central Massachusetts Regional
Planning Commission
20 Washington Square, Suite 300
Worcester, MA 01604
(508) 756-7717

Nantucket Planning and
Economic Development Comm.
1 East Chestnut Street
Nantucket, MA 02554
(508) 228-7237

Martha's Vineyard Commission
P.O. Box 1447
Oak Bluffs, MA 02557
(508) 693-3453

Northern Middlesex Commission
115 Thorndike Street
Lowell, MA 01852
(508) 454-8021

Pioneer Valley
Planning Commission
26 Central Street, 3rd Floor
West Springfield, MA 01089
(413) 781-6045

Old Colony Planning Council
70 School Street
Brockton, MA 02401
(508) 583-1833

Merrimack Valley
Planning Commission
160 Main Street
Haverhill, MA 01831
(508) 374-0519

Southeast Mass. Regional
Planning Commission
88 Broadway Street
Taunton, MA 02780
(508) 824-1367

# APPENDIX C

# FLOW AND WASTE REDUCTION

# FLOW AND WASTE REDUCTION

Flow and Waste reduction measures can play a significant role in reducing the flow and loads to existing and proposed treatment facilities and ultimately to the environment. Every facilities planning effort should strive to identify areas which may present additional opportunities to reduce flow and wastes. There are existing state agencies which can provide assistance to communities in pursuing both water conservation and pollution prevention measures.

## A. Pollution Prevention

The Office of Technical Assistance for Toxics Use Reduction (OTA), part of the Executive Office for Environmental Affairs, is a nonregulatory state agency whose purpose is to assist Massachusetts industry in making viable changes in their production practices aimed at reducing or eliminating the use of toxic substances and the generation of toxic by-products. Since OTA was founded, a cornerstone of its technical assistance outreach program has involved working with municipal and regional sewage treatment authorities, often through training of pretreatment coordinators, so that pollutant loads can be reduced and any permit requirements can be met. OTA has had great success in the past in eliciting process changes which afford the users cost savings while at the same time significantly lowering the pollutant loadings of the discharger. The OTA is located at 100 Cambridge Street, Suite 2109, Boston, MA 02202 and the telephone number is (617) 727-3260.

The Department of Environmental Protection, Bureau of Waste Prevention (BWP), established regulations under the Massachusetts Toxics Use Reduction Act which require large quantity toxics users to report certain information to DEP. BWP also promotes pollution prevention techniques and can be helpful to wastewater management authorities in identifying sources of pollution from wastewater discharges. BWP is located at One Winter Street, Boston, MA 02109, telephone
(617) 292-5853.

## B. Water Conservation

Implementing water conservation measures in a community will not only result in preserving safe levels of water supply resources but will also result in reducing wastewater flows, potentially resulting in cost savings in designing and operating wastewater facilities. Communities are encouraged to pursue public education, surveys of water use, use of water saving fixtures, and proper management of water supply systems as means in achieving water conservation. The Water Resources Commission within the Executive Office of Environmental Affairs issued the Water Conservation Standards for the Commonwealth of Massachusetts and can provide addition information on water conservation. They are located at 100 Cambridge Street, Boston, MA 02202, telephone (617) 727-3268.

# APPENDIX D

# MEPA REQUIREMENTS (MEPA CLOCK)

# Massachusetts Environmental Policy Act

What is MEPA?

MEPA is a staff section of the State Executive Office of Environmental Affairs. There are 6 staff members working out of 100 Cambridge St., 20th Floor, Boston, MA 02202. The telephone number is (617) 727-5830.

What does MEPA do?

By state law and regulation, projects which receive state funding or which require permits issued by state agencies in most cases will be subject to an environmental review by both public agencies and citizens.

What can't MEPA do?

MEPA does not directly either stop or support projects. MEPA cannot require master planning but may call for individual developers to consider other growth already announced or already reviewed by MEPA.

Does MEPA treat big projects differently from small ones?

Yes. Projects generally fall within three groups:

- Projects which are so small that they do not require any MEPA submittal.
- Projects which are sufficiently large that they trigger one of the thresholds which categorically require the submittal of an Environmental Impact Report (EIR).
- Projects which are large enough to require a MEPA submittal , but may or may not require the preparation and submittal of an Environmental Impact Report. The final decision on whether or not to require preparation of an EIR rests with the Secretary of Environmental Affairs.

Are there any limits to what issues MEPA can look at?

Yes. MEPA is constrained by law to review only environmental issues. For state projects, all environmental issues are reviewed. For private projects, MEPA is limited to a review of issues relating to state permits or state funding. Purely private actions are exempt from MEPA requirements, unless a local Order of Conditions is appealed to DEP. However, MEPA makes every attempt to require only review of important environmnetal issues, and unimportant or irrelevant issues are put aside.

What is the "scope" for an Environmental Impact Report?

The "scope" is a table of contents which addresses environmental issues which MEPA considers important. A meeting is normally held to receive input on issues to be addressed in the scope.

What does an EIR do?

An EIR evaluates alternatives to the project, accurately describes the environmental impacts of the project (and the alternatives) as called for in the scope, and also considers reasonable mitigating measures to reduce the impact.

How are public comments responded to?

Generally, comments on the ENF/scope are covered in the Draft EIR, and comments on the draft EIR are addressed in the final EIR.