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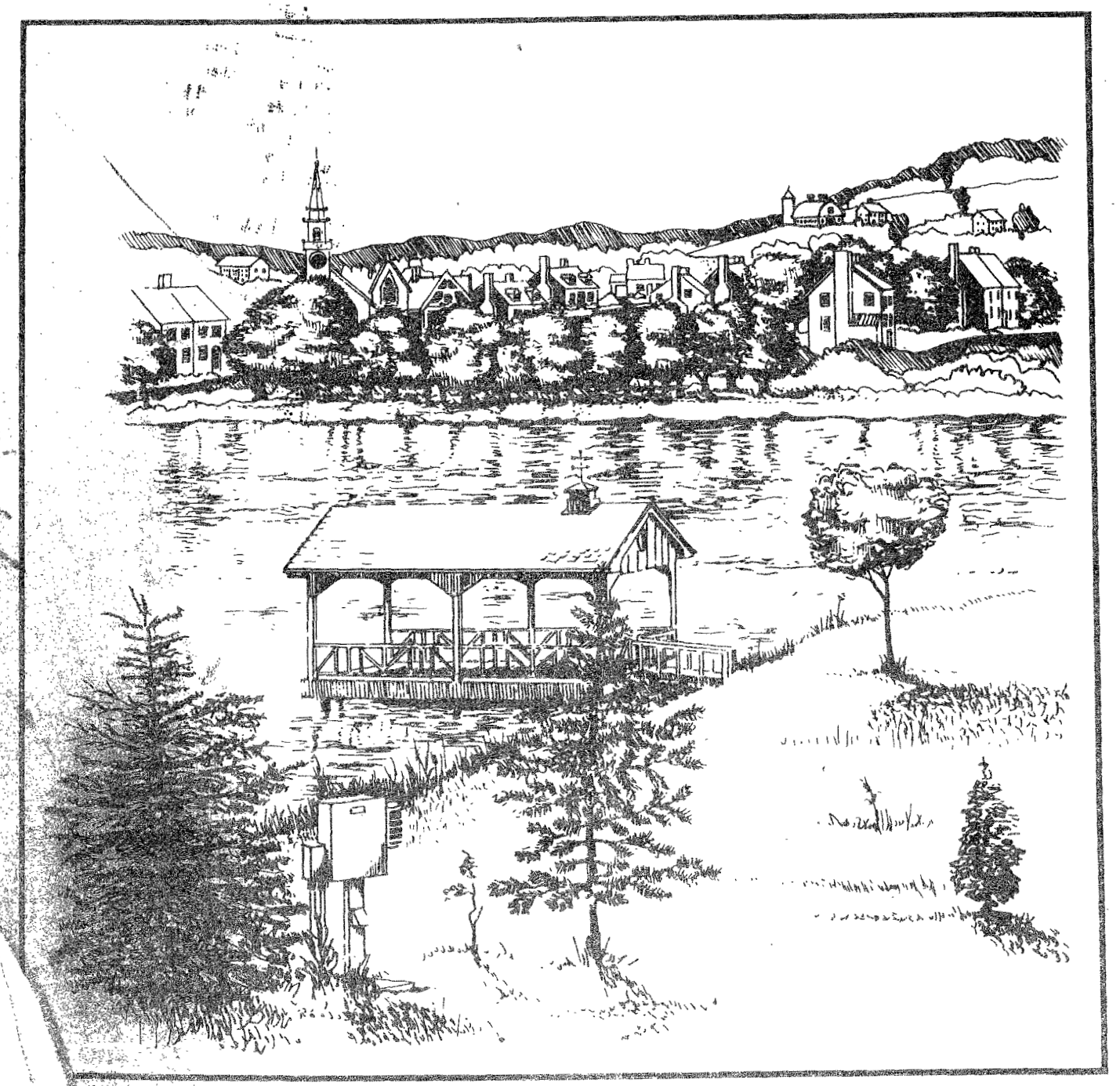
July 1982

Wastewater Handbook

Research and Development

EPA

Management of On-Site and Small Community Wastewater Systems



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MANAGEMENT OF ON-SITE AND SMALL COMMUNITY WASTEWATER SYSTEMS

by

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FOREWORD

The U.S. Environmental Protection Agency was created because of increasing public and government concern about the dangers of pollution to the health and welfare of the American people. Noxious air, foul water, and spoiled land are tragic testimony to the deterioration of our natural environment. The complexity of that environment and the interplay between its components require a concentrated and integrated attack on the problem.

Research and development is that necessary first step in problem solution, and it involves defining the problem, measuring its impact, and searching for solutions. The Municipal Environmental Research Laboratory develops new and improved technology and systems for the prevention, treatment, and management of wastewater and solid and hazardous waste pollutant discharges from municipal and community sources, for the preservation and treatment of public drinking water supplies, and to minimize the adverse economic, social, health, and aesthetic effects of pollution. This publication is one of the products of that research; a most vital communications link between the researcher and the user community.

There is an increasing awareness for the need to properly manage small wastewater system design, installation, and operation to assure adequate long-term system performance. The Clean Water Act of 1977 (PL 95-217) recognized that on-site and small community wastewater systems, which are properly designed, installed, and maintained (i.e., managed) could be the most cost-effective and environmentally-acceptable wastewater approach for small communities and urban fringe areas. While Federal and state agencies are promoting the use of small wastewater systems where they are cost-effective, several significant institutional, attitudinal, and technological barriers inhibit their widespread application.

Providing guidance for developing the institutional framework for a comprehensive, well-structured management program is a major objective of this document.

Francis T. Mayo
Director, Municipal Environmental
Research Laboratory

ABSTRACT

The document represents a relatively simple, yet comprehensive guide to small communities and their engineers to develop an effective and, hopefully, optimal management program for alternative technologies which are appropriate to solving their wastewater pollution problems. Although it is prepared to respond to the requirements of the U.S. EPA Construction Grants Program, the text is applicable to all existing small communities wishing to optimize the performance of existing or planned on-site or small community wastewater treatment and disposal systems. By presenting optimum management program selection in a simple step-by-step fashion, this guide permits the user to design the appropriate program based on technical processes and physical, economic and administrative constraints extant in the service area.

This report was submitted in fulfillment of Contract No. 68-03-2753 by Roy F. Weston, Inc., under the sponsorship of the U.S. Environmental Protection Agency. This report covers the period December 1978 to July 1981, and work was completed as of November 1981.

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DEFINITIONS

Brief definitions of the common terms and phrases utilized in this report are provided below:

1. Small Wastewater Systems/Small Flows System -- Small wastewater systems include a broad range of technologies that provide for the collection, treatment, and/or disposal of wastewater, including on-site, individual, alternative, cluster, and small community systems.

2. Management -- The act or process of controlling, directing, and handling a resource, facility, or a group of people. The management of small wastewater systems includes any actions taken to ensure the proper design, installation, and operation of these systems.

3. Management Program -- In the context of this report, the organized provision of services related to the collection, treatment, and disposal of wastewater. A management program is developed after a number of technology and management options have been evaluated.

4. Management Plan -- A strategy for implementing a management program emphasizing the geographical, cultural, governmental, and physical setting of the study area, as well as technology requirements. A wastewater management plan has both technical (or engineering) and institutional components.

5. Management Functions -- Basic elements of a wastewater management plan. They essentially represent a range of services and responsibilities related to the implementation of technical methods of treating and disposing of wastewater.

6. Management Agency -- The lead or principal institutional entity which is designated to carry out key management functions. The management agency is essentially the formal administrative entity which will make decisions, handle financial matters, and supervise operation and maintenance activities.

7. Institutions -- Organizations such as general purpose governmental, or nongovernmental entities, and private interests involved in wastewater management.

8. Institutional Arrangements -- Combinations of existing or new governmental, or nongovernmental utilities required to implement wastewater management functions.

ACKNOWLEDGEMENTS

This project was sponsored by the U.S. Environmental Protection Agency's Small Flows Research Program of the Municipal Environmental Research Laboratory (MERL) located in Cincinnati, Ohio. Mr. Don Niehus (formerly with the Small Flows Program and currently with the Facilities Requirements Division, Office of Water Program Operations in Washington, DC) originally served as Project Officer. Mr. James Kreissl, the Small Flows Research Program Manager, has been a special project advisor from the beginning of the study. Both Mr. Niehus and Mr. Kreissl have provided valuable assistance and guidance in the preparation of this report.

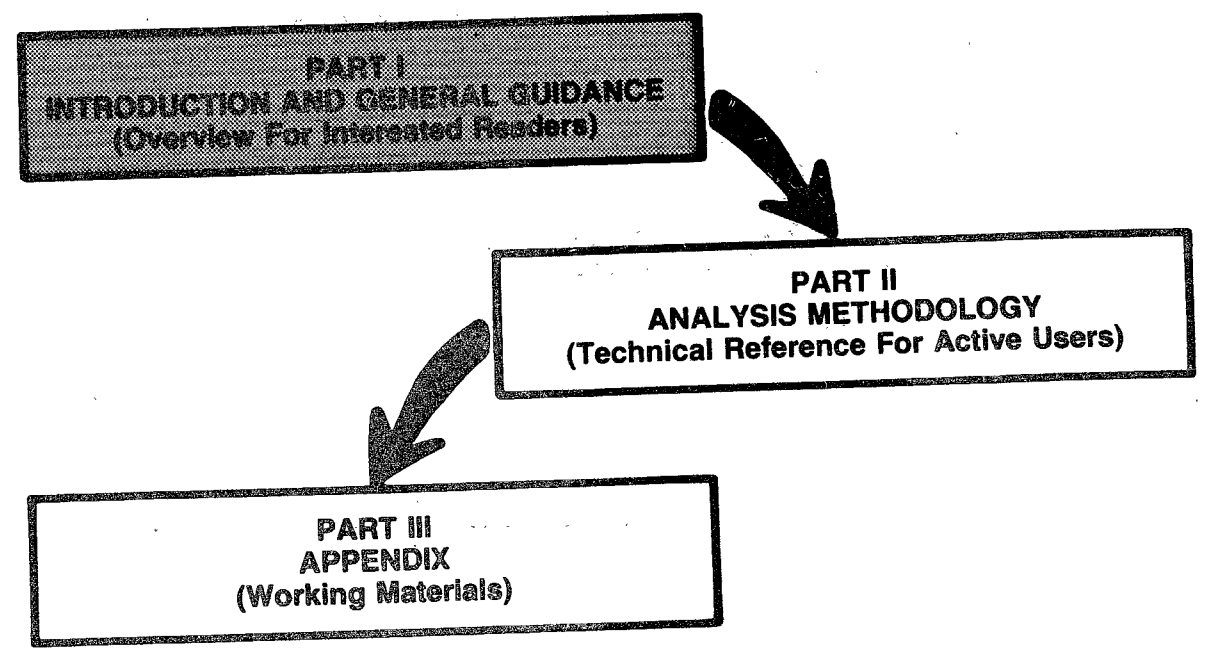
Much of the information in this publication is based on actual field experience in small wastewater systems management. The numerous people interviewed during the case study phase of this project deserve special thanks for their time, interest, and knowledge. Their help and advice is appreciated. We hope that the information presented meets their expectations, and more importantly, assists in the implementation of small wastewater systems management programs.

This document was prepared by Mr. Peter A. Ciotoli, AICP, principal investigator on this project. Mr. Kenneth C. Wiswall, P.E., was a major contributor to the preparation of this report, offering ideas, comments, and guidance along the way. Mr. Glenn M. Johnson, P.E. was the Project Manager, and the late Dr. Andrew Breidenbach was the Project Director. The following people also provided technical advice on preparation of the document: Dr. Thomas J. Tuffey (now Project Director), Mr. Van Dyke Polhemus, Mr. Thomas Cadwallader, P.E., and Dr. Richard S. Greeley. Ms. Pat Saia was the principal report editor. Mr. Robert Dzedzy, Ms. Teresa Wischerath, and Mr. Dale Thompson prepared the report graphics. Mr. Irv Taylor, Ms. Gail Wilmer, and Ms. Mary Anne Miller provided the word processing services for the document.

PART I: INTRODUCTION AND GENERAL GUIDANCE

Chapter 1: Introduction and Background
Chapter 2: Management Program Development Process

This part of the report gives an overview of the basic elements of the management program formulation process and offers some general observations and recommendations to persons interested in forming management programs. An example is utilized to illustrate the steps and decisions normally made in developing a management program.



OTHER SOURCES OF INFORMATION

It is not expected that this document alone will provide all the information which might be required to understand the institutional elements of small wastewater systems management. Other sources of information are available and should be reviewed in conjunction with this report in addressing these issues, within the broader context of wastewater management. Sources of information that supplement and complement the material presented herein are referenced in a recently prepared EPA strategy paper, "A Strategy for Small Alternative Wastewater Systems." Copies can be obtained from:

Office of Water Program Operations (WH-595)
U.S. Environmental Protection Agency
Washington, DC 20460

Another source of information on the technical literature and EPA publications, as well as data on actual projects being implemented under the Construction Grants Program is:

EPA Small Wastewater Flows Clearinghouse
West Virginia University
Morgantown, West Virginia 26506
(800) 624-8301

The Clearinghouse was established by Congress as part of the 1977 Amendments to the Clean Water Act, and is funded and directed by EPA.

CHAPTER 1

INTRODUCTION AND BACKGROUND

There has been a growing interest in the concept of small wastewater systems management over recent years. Due to the increasing costs of constructing and maintaining conventional sewerage systems, the use of the nonconventional forms of wastewater management is being promoted, particularly in small communities and rural areas.

NEW INSERT

In recognition of the growing interest in small wastewater systems, the EPA and other Federal and state agencies have devoted much attention to developing and refining the state-of-the-art in small systems technology. Considerable research effort has been devoted to the study of performance characteristics and design criteria for various types of small wastewater systems and for septage handling technologies. The scope of these Federal and state research efforts has been expanded to address the institutional and regulatory issues involved in applying alternative wastewater technologies.

PURPOSE OF THE REPORT

This report is devoted to investigation of the institutional aspects of small wastewater systems management. Its underlying theme is that through proper management, small wastewater systems can provide cost-effective, permanent methods of wastewater disposal in rural and developing areas. Institutions at the Federal, state, and local level play a critical role in the management of these systems. Federal and state agencies provide a wide variety of small systems regulatory and management activities, including technical and financial assistance, policy setting, promulgation of rules, regulations and legislation, and code enforcement. The direct responsibility for regulating and managing small wastewater systems has traditionally been delegated to local government units (e.g., counties, municipalities, and special purpose agencies), property owners, and the private sector (e.g., septic system installers, septage haulers, and developers).

Given this complex institutional framework and the multitude of agencies at different levels of government involved, the topic of institutional analysis is one that deserves special attention by planners, engineers, and others involved in developing small flows wastewater programs. This report explains the legal, financial, administrative, and regulatory capabilities of these institutions, as well as describes their typical and potential involvement in managing small wastewater systems. The intent of the report is to assist participants in the EPA 201 Construction Grants Program and related Federal, state, and local water quality wastewater and land use management programs in developing effective institutional arrangements to manage small wastewater systems.

This report provides information and guidance to persons interested in developing and evaluating programs to manage small wastewater systems. These management programs involve the application of various types of institutional arrangements which specify who will design, build, operate, maintain, and finance these small wastewater systems.

BACKGROUND

The impetus for this study resulted from a series of Federal statutes and policies addressing small flow systems, and the related need to develop and refine the available information base concerning the synthesis of institutional arrangements for small wastewater systems management. Much of the information presented in this document is a result of a series of case studies prepared during the first phase of the study. The background discussion presents highlights of the appropriate Federal guidance and case studies.

The subject of institutional arrangements for managing small wastewater systems is now recognized as a critical component in the process of formulating and implementing a wastewater management plan for a community.

Until recently, conventional centralized sewerage facilities were generally considered to be the most reliable and most logical means of dealing with a community's wastewater services needs. As centralized facilities were constructed and operated over the years, it became apparent that large projects or traditional designs might not be the most cost-effective solution in some cases. For many small rural and suburban communities, the necessary capital and operating costs for conventional systems can create undue financial burdens on individual homeowners, as well as the community at large.

This problem was recognized to some degree in the 1972 amendments to the Federal Water Pollution Control Act (PL 92-500) which charged the EPA Administrator with investigating appropriate rural wastewater management alternatives. Subsequent areawide water quality management planning efforts (specified in Section 208 of PL 92-500) clearly identified the need for better managed individual on-site wastewater systems and lower cost small community systems. Certain 208 studies specifically proposed on-site and small community systems as alternatives, to centralized treatment facilities. EPA had already expanded its studies of various aspects of on-site and small community treatment technology to define the state-of-the-art for different technologies related to this field.

The impact of conventional sewerage project costs on small communities was first officially recognized by the EPA Construction Grants Program in 1976 through a Program Requirements Memorandum (PRM 76-3) which called for disclosure of individual user costs. This issue was also addressed in several EPA memoranda dealing with the grant eligibility of individual systems, and the encouragement of less costly treatment systems for small communities.

Individual and alternative systems were given further attention by certain provisions of PL 95-217, the 1977 Clean Water Act. Incentives for considering such systems were provided primarily through funding individual systems, and the allocation of state-level "set-aside" funds for innovative and alternative wastewater system construction grants for small communities. PRM 79-8 provided further clarification of PL 95-217 and the EPA Construction Grants Program regulations pertaining to small wastewater systems.

Given these incentives, many states are actively encouraging the application of alternative wastewater management systems. A number of states had established programs dealing with individual and/or small community systems prior to the Federal program

incentive actions. However, even with these ongoing state programs, Federal incentives, and the currently changing attitude toward alternative systems, the actual implementation of alternative wastewater management systems is occurring only gradually.

Recent Federal guidance on small wastewater system management issues is presented in two EPA strategy papers:

1. "1990 Preliminary Draft Strategy for Municipal Wastewater Treatment," Office of Water and Waste Management, Washington, D.C., January 1981.

2. "A Strategy for Small Alternative Wastewater Systems," Office of Water Program Operations, Washington, D.C., December 1980.

The objective of the 1990 strategy is to develop a management and funding approach to the Construction Grants Program in the 1980's, that would achieve state self-sufficiency in funding and overall management capability, and maintain the national perspective of the program among the states. This strategy is based on the premise that small communities need guidance and assistance from EPA and state agencies in wastewater facilities planning, funding, and related management activities.

The Small Alternative Wastewater Systems (SAWS) Strategy develops a comprehensive planning and management approach to promote the implementation and improve the performance of small flows systems.

Available Federal guidance and past experience in many communities demonstrate the need to carefully design the process for wastewater management planning to account for the special qualities, characteristics and sensitivities of the local residents and agencies; i.e., institutional concerns.

Much of the information presented in this report is a result of 18 case studies; nine community case studies and nine state case studies, conducted by the authors.[1] Many of the management experiences and planning approaches applied in these case studies have been incorporated into this report.

The case studies included field visits to a range of state and local management programs that were funded by the EPA Construction Grants Program, as well as those that were funded locally, or by state or Federal agencies. The insights gained through these case studies, and supplemental literature reviews point out the necessity of clearly defining institutional and organizational responsibilities in order to achieve successful and viable wastewater management programs. A successful management program is characterized by a combination of technical, institutional, and financial elements.

Key factors to success in formulating small community wastewater management programs include:

1. **Public acceptance and local political support.**
2. **Funding availability -- reasonable costs.**
3. **Visibility and accountability of local leaders.**
4. **Capability and skills of technical/field staff.**
5. **Availability of creative, professional advisors.**
6. **Clear and concise legal authority, regulations, and enforcement mechanisms.**

Satisfying these key ingredients in a successful management program can be a difficult and involved process. Many small communities are unincorporated and have unpaid and part-time officials, who may not have strong technical knowledge in wastewater management, nor adequate understanding and experience in

[1] For state and local case study summaries, refer to the Interim Study Report, Management of On-Site and Small Community Wastewater Systems, U.S. EPA Municipal Environmental Research Laboratory, M687, by Roy F. Weston, Inc., November 1979.

dealing with other levels of government. These factors and others discussed in this report influence how the planning process must be approached.

MANAGEMENT PROGRAM DEVELOPMENT

A program to manage small wastewater systems may be developed for many reasons. The program may be developed in response to a specific water pollution condition, or prepared to avoid such problems in the future. In either case, the community must decide what wastewater services must be provided. It must then develop a program that provides the institutional structure with which to carry out these essential services. The institutional structure (an arrangement of public and private organizations) will constitute the mechanism for setting and enforcing regulations, performing system inspections and maintenance, and monitoring program performance.

Wastewater management services are provided through a program — a mix of institutions and procedures, developed through a series of major phases, i.e., initiation, planning, implementation, and facility start-up.

To develop a workable management program, it is essential that rural wastewater facilities be simple in design, operation, and maintenance, and that the management system also be simple. Furthermore, the management system must:

1. Have sufficient local support and legal authority.

2. Be flexible enough to adapt to changing demands.

3. Have a reasonable homeowner cost structure.

4. Be effective in achieving the desired objectives.

Developing a management program to serve the requirements described may not be a simple task. The program development process can be described as four distinct phases of program analysis and change. These phases represent different stages of planning and implementation that apply in general to any management program. They are illustrated on Figure 1, and described as follows:

1. Initiation Phase -- Actions and activities leading to the preparation of a "Plan of Study" which documents the wastewater management needs of a community and presents a general methodology for developing technical and management solutions. Specific activities include:

   a. Organizing a program development team.

   b. Developing program goals and objectives.

   c. Preliminary assessment of need; plan of study.

   d. Initiating public participation activities.

   e. Acquisition of planning funds.

2. Planning Phase -- Detailed study of alternative wastewater systems and institutional arrangements (including legal, financial, and organizational requirements), and development of recommended management plan. This phase is synonymous with Step 1 of the 201 facilities planning process, whereby a recommended wastewater management plan is prepared, and more importantly, an institutional framework is established where changes to the management system can evolve to meet changing requirements as the wastewater system is being designed, built, and ultimately put into operation. The following are typical planning phase activities:

   a. Assessment of existing wastewater system performance, physical area constraints, and institutional/regulatory characterization.

   b. Identification and preliminary evaluation of technical options.

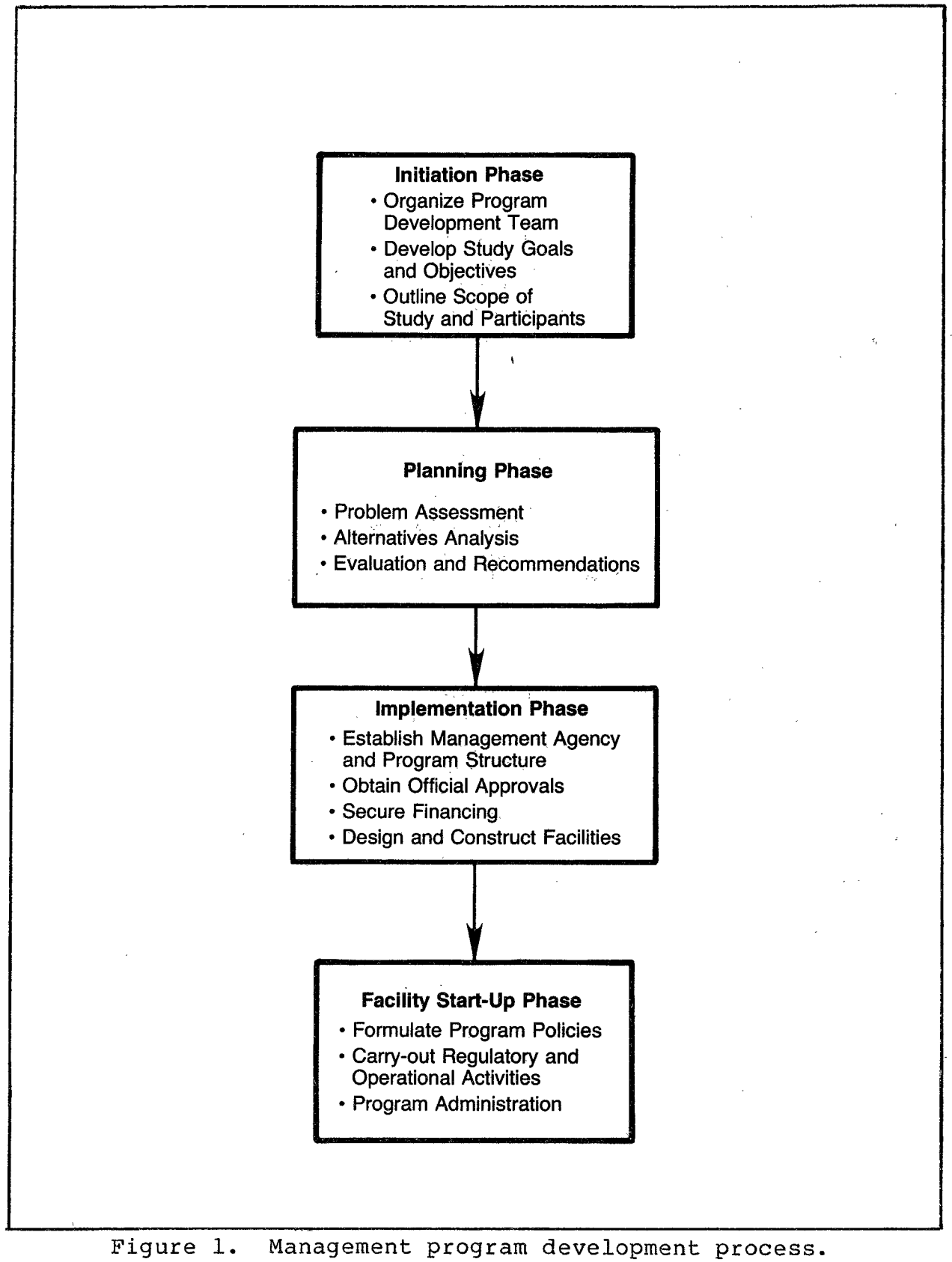


Figure 1. Management program development process.

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c. Identification and preliminary evaluation of institutional options.

d. Formulation and evaluation of wastewater management alternatives.

- Operations plan.
- Financial plan.

e. Final plan recommendations.

- Implementation plan.

3. Implementation Phase -- Design and construction of wastewater facilities, securing financing, and creation of new management entities as required. These activities take place during the Steps 2 and 3 design-construction phase of the Construction Grants program. It is important in this phase of program development to refine the elements of the management system as the following activities are accomplished: X

a. Establish the management program.

b. Obtain official approvals and legal agreements.

c. Secure financing for design-construction.

d. Design and build the wastewater facilities.

4. Facility Start-Up Phase -- Day-to-day program administration and system operations involved in carrying out regulatory and operation and maintenance functions. Typical activities include:

a. Develop and refine operational, financial, regulatory, and administrative policies.

b. Enforce regulations.

c. Implement policies.

d. Inspect, maintain, and repair wastewater systems.

e. Initiate capital improvement projects.

f. Finance system operations; collect user charges.

The emphasis of this report is on the planning phase of program development, i.e., all activities involved in preparing a management plan.

The focus of this report is to assist in the preparation of a wastewater management plan, i.e., the planning phase. During the preparation of the plan, various technical and institutional issues will be evaluated in tandem. The sequence of planning activities is displayed on Figure 2. The chapters in Part II of this report provide guidance in formulating the institutional arrangements necessary to perform the required activities in the planning phase, particularly addressing:

1. Institutional/regulatory characterization (i.e., a profile of existing agency responsibilities, activities, and legal authority).

2. Description of management functions.

3. Identification and description of alternative institutional arrangements to perform management functions.

4. Procedures for analyzing alternative institutional arrangements.

5. Plan implementation requirements and mechanisms for implementing plan recommendations.

These requirements are discussed in detail in Part II of this report, in terms of the operations plan, the financial plan, and the implementation plan. Illustrative examples of these plans are developed for a hypothetical community in Chapter 2.

INSTITUTIONAL FACTORS IN WASTEWATER MANAGEMENT

Developing a sound, comprehensive wastewater management program involves consideration of applicable wastewater technologies and effective institutional arrangements. The analysis of technical options and institutional arrangements is typically a major part of the Step 1 facilities planning process. These

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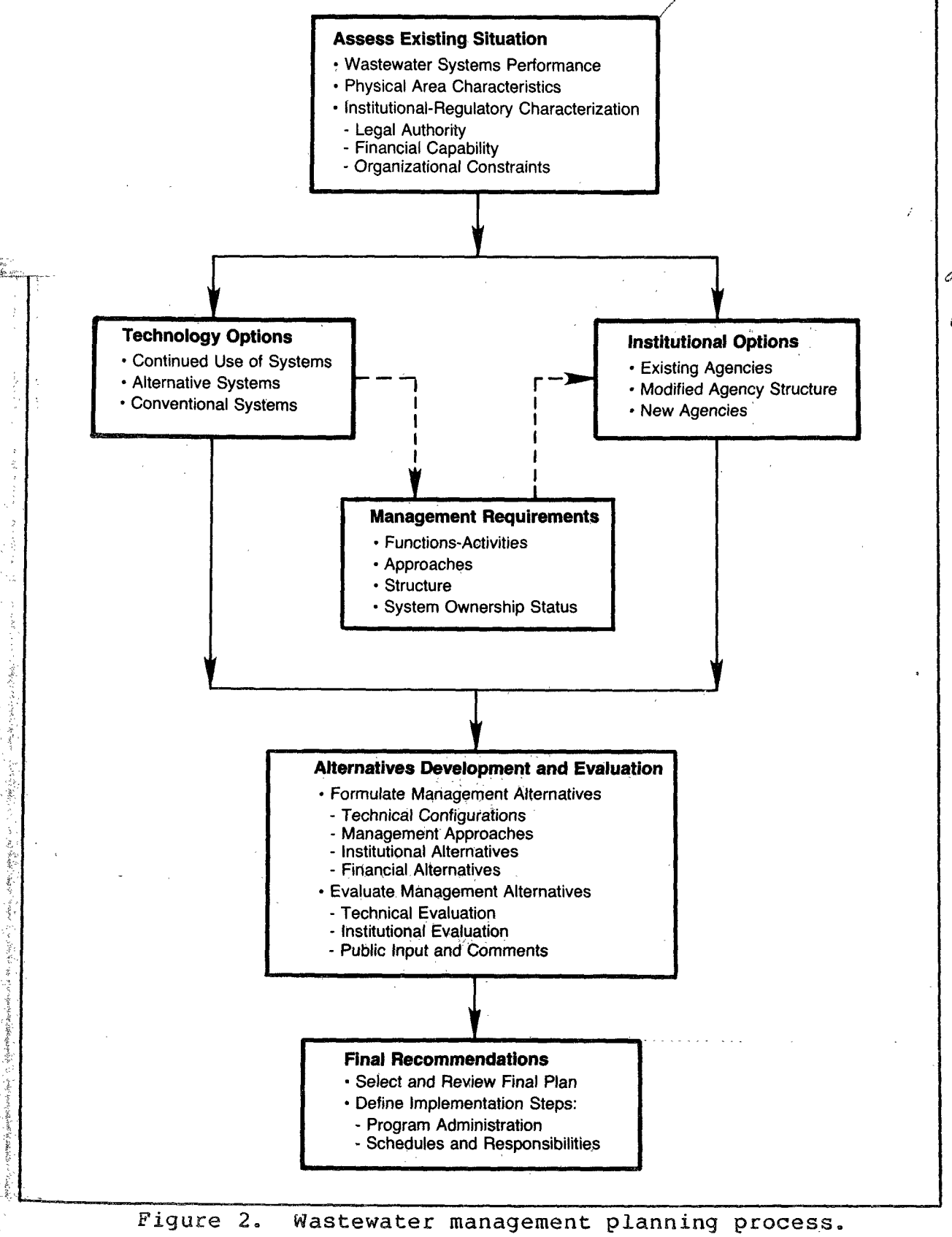

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Figure 2. Wastewater management planning process.

analyses form a major part of the array of complete wastewater management alternatives which are evaluated on the basis of cost-effectiveness and environmental impact to select a recommended plan for the community. The organizational structure developed in the process will form the basis of a wastewater management program. This program will identify the methods for operating, maintaining, and financing the chosen wastewater facility.

An institutional analysis must define the appropriate dimensions of a management program, given the technical requirements of a particular wastewater system.

Several important factors must be analyzed when assessing these technical and institutional considerations. They include service area characteristics, type of wastewater system applied, scope of management functions, and alternative management approaches. These factors are listed in Table 1, as key parameters for determining appropriate management agency responsibilities. The assessment of these critical factors will help to define the dimensions and comprehensiveness of the management program.

Technical/Institutional Interactions

The successful management of on-site and small community wastewater systems involves the interface of technical and institutional issues, requiring engineering, environmental, legislative, socioeconomic, and administrative considerations. The analysis and significance of these concerns will vary on a community basis. Each state and substate political unit (township, county, village) may have unique institutional approaches for managing small community wastewater systems based on needs, perceptions, and circumstances. The formation of specific management programs for a particular community will evolve as a complex set of issues addressed by local public officials, citizens, and state regulatory agency personnel. Figure 3 illustrates the critical relationships between these tecnnical and institutional issues which are commonly addressed in the planning process.

Management Dimensions

The initial assessment of institutional arrangements in selecting a particular management approach is one of the critical steps in formulating a program for managing small wastewater

TABLE 1. PARAMETERS FOR SELECTION OF MANAGEMENT ENTITY RESPONSIBILITIES

Service Area Characteristics

- Multiple or single jurisdictional area.
- Land use and p ulation distribution.
- Growth rospects.
- Govern ntal structure and organizational arrangements.
- Willingness of local agencies to accept new responsibilities.
- Willingness of private homeowners to assume certain responsibilities.
- Socioeconomic characteristics of service area.
- Performance of existing wastewater systems.

Type of Wastewater Technology

- On-site or cluster versus community treatment and disposal.
- Surface versus subsurface disposal.
- Level of operation/maintenance requirements.
- Design and construction requirements.
- Domestic waste flows versus industrial and commercial wastewater generated.

Scope of Management Responsibility

- Short-term ~~or~~ and long-term responsibility.
- Remedial versus preventive solutions.
- System ownership/liability responsibilities.
- Regulatory or advisory perspective by management entity.
- Degree of public ector involvement in management.

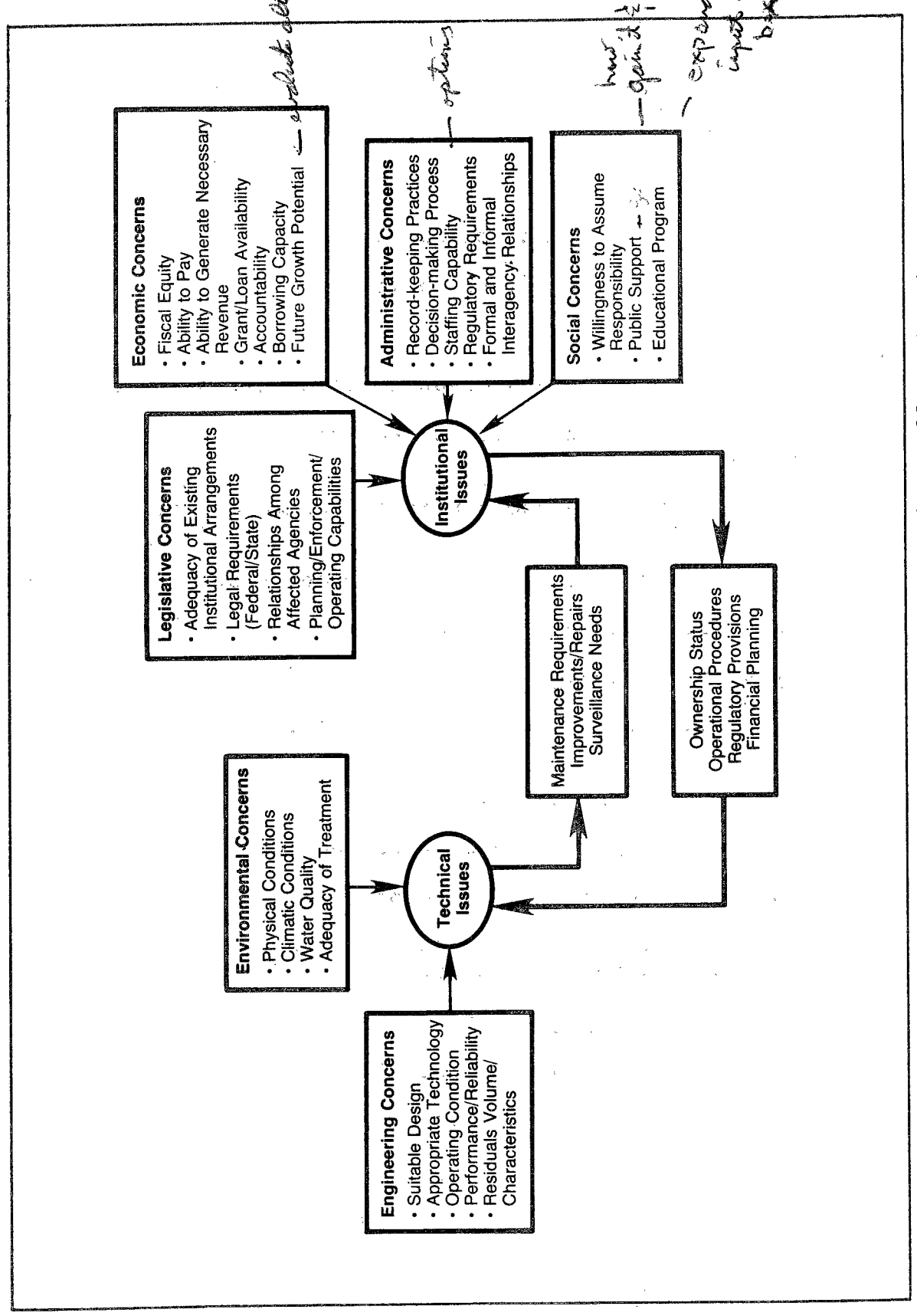


Figure 3. Technical/institutional issues in small wastewater systems management.

systems. The assessment of institutional arrangements should define the various dimensions of the management program. The dimensions to be defined are shown in the following table.

TABLE 2. MANAGEMENT DIMENSIONS

Dimensions	Range in Concepts	
Time Frame	Interim solutions	Long-term solutions
Size	Local jurisdiction	Regional jurisdiction
Purpose	Limited purpose	Broad-based/ comprehensive purpose
Structure	Existing agency	New agencies
Authority/ Liability	Private sector/home- owner responsibilities ...	Public sector responsibilities
Staging	Phased implementation ..	Immediate start-up
Agreements	Service agreements - memoranda of under- standing ...	Special legislation, codes and regulations

The time frame dimension suggests that management programs have the flexibility to provide services on either a temporary or permanent basis. Certain economic, political, and technical decisions must be made in assessing the benefits of managing wastewater systems to avoid system failures and prolong system performance life, against the risk of recurring future failures without such management. These decisions will determine when a management program should be instituted, and establish the short- and long-term objectives to be achieved.

Time Frame:

1. **Will the management program be a permanent solution or an interim measure?**
2. **Where in the process of plan development and program formulation is the user situated?**

The type of management agency and the geographical area (i.e., size) to be served are not totally independent. Service area size, together with the scope of services offered, will determine management staff needs. This in turn affects the choice of a management agency. Figure 4 illustrates the concern for size, choice of management agency, and services provided. A special district created by a rural community, for example, may not be well suited to provide technical support services to a county or watershed. At the same time, consolidation of responsibilities in a single entity can offer a mechanism for providing expertise and skills (normally beyond the means of small communities) to perform system design, installation, operations, and financing duties for the entire region.

Size:

1. **What is the geographic size of the area to be served?**
2. **Is the area compatible with a local public jurisdiction?**
3. **Is sufficient manpower available within an institutional structure to service the area under study?**
4. **Does service area size affect the type of institution required to manage the wastewater systems?**
5. **Does service area size affect the type of technologies to be considered (and, in turn, the needed management functions)?**

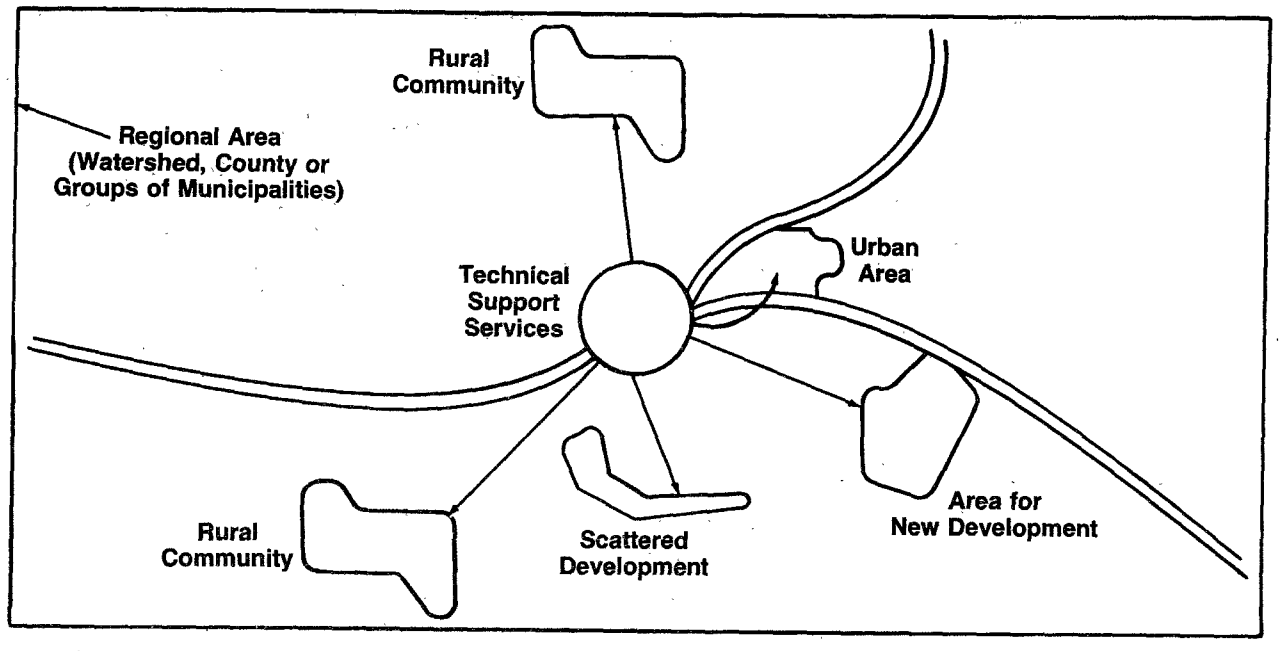


Figure 4. Areawide technical support services for wastewater management systems.

For these reasons, alternative approaches and policies regarding the size of the area to be served and the type of management agency to be formed should be evaluated together.

A management program can have a single or multiple purpose related to providing wastewater, water supply, and septage management services. The program may be one of the general public services a local government provides, or the program can be oriented solely for the purpose of wastewater management. Regardless of the objectives of the program, wastewater management policies should at least be coordinated with the local public service programs and land use policies.

Purpose:

1. **Should the management program be limited to wastewater management, or should other utilities be included (e.g., water supply)?**
2. **What is the range of functions to be provided (i.e., a broad set of management functions or only a few functions)?**

The management program purpose also helps to define the types of functions which constitute its administrative, regulatory, and operational components. (See Figure 5.) Basic choices regarding the type of functions to be provided will affect the responsibilities that management entities must accept.

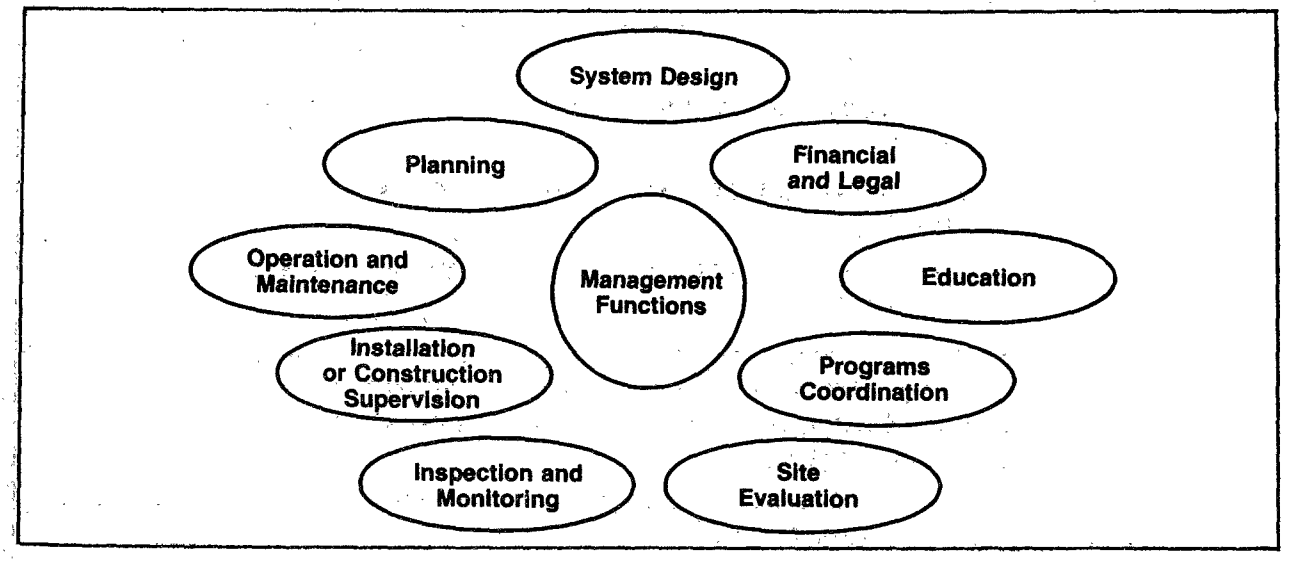


Figure 5. Management functions.

The structure of the organization will depend on pertinent statutory authority and enabling legislation that define the composition and responsibilities of various entities. The de-

termination of structure will also depend on the capability and willingness of existing agencies to perform management functions. New organizations may be created or existing agency functions can be reorganized in determining structural requirements.

Structure:

1. **Can new agencies be created to provide management functions on a localized basis, or can existing ones be modified?**
2. **How will the agency be staffed; full-time employees, part-time employees, volunteers, or contract to private firms?**
3. **What will be the organizational relationship between the management agency and the participating municipalities?**

Local management approaches should explicitly identify authorities and liabilities assumed by management agencies, property owners, installers, septage haulers, consultants, etc. The delegation of authority will affect many management functions. The degree of public sector involvement and authority in performing management functions is a key dimension that distinguishes various wastewater management approaches. The extent of authority assigned the management agency will determine the scope of its duties, the finances required for operation, and the personnel necessary to perform its functions.

Authority/Liability:

1. **Will the wastewater systems be publicly or privately owned?**
2. **How will the wastewater systems be operated and maintained?**
3. **Who will bear the costs of future system repairs and replacements?**
4. **Will existing regulatory entities continue to exercise regulatory authority over wastewater system design and maintenance, or will new regulatory entities be created?**
5. **How will the necessity of replacing an existing on-site system be determined?**
6. **Will both existing and new on-site systems be included in the management program or only new systems?**
7. **What is the extent of authority to be provided; advisory, managerial, or regulatory?** ~3 levels

Liability issues become pronounced when decisions are made regarding local government involvement in wastewater management responsibilities. Many times local governments appear to be reluctant to become directly involved in wastewater management activities, even though they may already have the power to do so. Inspecting both functioning and malfunctioning systems, for example, places a certain degree of liability or risk on the inspecting agency. Agency officials, for example, worry about damaging the wastewater system during the inspection process. They are also concerned that homeowners will blame the inspecting agency for future problems with the system. These inspections can take place in the facilities planning and design process, as well as during operational activities of a management program. f(level)

Many technical decisions must be made before the management design process is completed. Performing all functions related to the implementation of technical plan recommendations, e.g., acquiring easements and land for cluster systems or septage disposal sites, may affect the implementation of the management program. Certain powers may need to be exercised (e.g., property rights acquisitions, condemnation proceedings) before others (e.g., system design and construction), which would affect the management program design and implementation process. Also, additional functions may be added after system construction. The point of intervention of these decisions and actions in the planning process also affects management program design. Assessing where you are in the program formulation process, i.e., in initial planning phases, design-approval phases, or post-construction/operational phases, is a critical concern in influencing the staging of program powers and authority.

Staging:

1. **How will future system extensions be determined?**
2. **When is public agency intervention in the planning process and program formulation process required?** involvement

Assigning responsibilities for wastewater management to certain entities, necessitates the preparation of certain legal agreements (e.g., codes and ordinances). This is a very important step in the management program formulation process, and is one which is not to be taken lightly. Obtaining agreements among agencies, between public and private entities, and adopting the necessary legislation and regulations must be accomplished before the overall composition and structure of the management program can be finalized.

Agreements:

1. **Does adequate legal authority exist?**
2. **Do new or modified interagency arrangements, legislation, or ordinances need to be established?**
3. **Do agreements with property owners need to be acquired?**

This chapter has highlighted the major factors to be considered in developing institutional arrangements for a particular area. The discussion has pointed out several significant institutional, attitudinal, and technological barriers that inhibit the widespread application of small wastewater systems management programs.

Overcoming these institutional and attitudinal barriers necessitates the following actions:

1. The process of allocating grants for wastewater facility planning, design, and construction from numerous Federal agencies to state and local entities should be simplified and publicized to facilitate participation of small communities in wastewater management planning.

2. Educational and public awareness programs are necessary to increase the visibility and applicability of small flows management programs to both the professional and nonprofessional community.

3. Institutional relationships, legislation, and regulations pertaining to small flows systems should be clear and effective.

4. Guidance concerning acceptable management approaches and institutional arrangements should be made available to state and local planners and engineers.

5. The special characteristics of small communities need to be recognized and properly dealt with by state officials and consultants in order to prepare implementable plans.

Providing guidance for developing the institutional requirements for a comprehensive, well-structured management program is a major objective of this document.

CHAPTER 2

MANAGEMENT PROGRAM DEVELOPMENT EXAMPLE

This chapter illustrates a procedure for developing institutional arrangements for managing wastewater treatment and disposal facilities for small communities, utilizing a hypothetical community situation. The purpose of this hypothetical community example is to identify the various institutional conflicts that arise and related decisions that are made during the first two phases of management program development; the initiation phase and the planning phase. These activities are typically addressed in facilities planning, i.e., Step 1 of the Construction Grants Program.

Suggestions on the type of information that should be developed at different points in the planning process and how the information should be applied is also described. The chapters in Part II present more detailed information to support the analysis sequence used for the example presented here.

CASE STUDY BACKGROUND

The example used throughout this chapter will refer to a hypothetical service area consisting of the corporate limits of two neighboring rural communities, Easttown and Westtown. The following are important community features:

1. There are about 450 homes in the two towns, which are predominantly older homes on small lots.

2. The towns are nearly completely built-up and have no growth projected over the next 20 years.

3. On-site systems, including septic tank-soil absorption systems, cesspools, and straight pipe discharges to streams, are currently employed. In Easttown and Westtown, about 20 percent and 15 percent, respectively, of the homes, have failing on-site systems.

4. The towns have a high proportion of households with fixed incomes and limited ability to pay for improved wastewater services.

Due to the perceived health and pollution problems associated with failing on-site systems, the enforcement section of the state environmental protection agency threatened legal action against the town residents whose systems were malfunctioning (as evident through surface breakouts and straight-pipe discharges to the surface water).

The towns entered into a facilities planning process to determine the most feasible, cost-effective method of wastewater treatment and disposal. Several wastewater management options were evaluated in the planning process. A combination of individual and small community systems was determined to be the best technical solution, and a management authority was formed to design, build, and administer the operation of the community systems and manage existing and future individual systems in the service area.

Who was Responsible entity for this part? County? State

INITIATION PHASE

Organizing a program development team was a key activity in this initial phase of the planning process in Easttown and Westtown. Each town set up a sewer advisory committee made up of elected officials and selected local residents. (Persons with engineering, business finance, and law backgrounds were represented on the committee.) Neither town had a full-time professional staff to guide the facilities planning activities. The water resource planning section of the state environmental protection agency (which is in charge of administering the Construction Grants Program) offered assistance to the towns in retaining a consultant and organizing the public participation effort. A county-based cooperative extension service agent served as a special advisor to the towns, and provided an important liaison and coordination role between the towns, and among the other participants -- the state, county, consultant, general public, and news media.

Refer to green book

is this a good thing?

The county agencies decided not to directly participate in the initial planning phase, because of a lack of familiarity with small community wastewater technology and initial reluctance to become involved in performing any of the system management activities. This situation illustrates some of the political difficulties faced by small communities in dealing with other levels of government.

X bad

Details in

Information presented in Chapter 3, "Selecting a Management Agency," and Chapter 6, "Formulating an Implementation Plan," will be helpful in identifying potential participants in the program development team.

PLANNING PHASE

The principal analysis steps in the planning phase (and associated references to Part II of this report), as generally described in the previous chapter, include:

Step	Reference
Step 1 -- An evaluation of the physical characteristics of the community and an assessment of existing and optional wastewater technology.	The technical evaluation steps are conducted as part of the technical plan analysis.
Step 2 -- An institutional analysis of existing agencies and an identification and preliminary evaluation of institutional options.	These institutional analysis steps are conducted in Chapter 3 of this report, "Selection of the Management Agency."
Step 3 -- The formulation and evaluation of wastewater management alternatives.	Information necessary to formulate and evaluate management alternatives is available in Chapters 4 and 5 of this report; "Formulating an Operations Plan," and "Formulating a Financial Plan."
Step 4 -- Implementation plan.	This final step is presented in Chapter 6, "Formulating an Implementation Plan."

Lots to be inserted

Step 1: Identification and preliminary evaluation of technical options.

Based on an assessment of septic system operational performance, soil characteristics, and other physical study area characteristics, technical alternatives are evaluated. In this case the following general technical options were prepared for preliminary consideration:

Option 1 -- Correct Problems on an Individual Basis -- This option requires the individual property owner to make necessary repairs or improvements to his on-site system at his own expense. There would be no Federal or state funding, and in some cases an on-site solution might not be possible due to physical constraints. L

Option 2 -- On-Site/Cluster System -- Serve only problem areas with centralized collection and treatment/disposal facilities, creating "cluster" systems. Homes outside these service areas would continue to rely on on-site systems, but a publicly-operated maintenance program would be required to ensure proper management of individual systems. ✓ mixed

Option 3 -- Communitywide Collection/Treatment System -- Each town would be connected to its own central treatment facility. Some form of sewer collection system would serve all residential and nonresidential units within each town's limits. R

Option 4 -- Joint Collection/Treatment System -- The sewage from both towns would be collected and treated at one central treatment facility. The economies of scale should result in a relatively lower cost per unit served. RR

The wastewater technologies determined to be most appropriate in this case, under the various technical options considered, are given in Table 3.

TABLE 3. APPROPRIATE TECHNOLOGIES FOR EASTTOWN AND WESTTOWN

Option	Type(s) of Wastewater Systems Involved
Correct problems on an individual basis	Standard individual septic tank and drainfield as allowed under existing state regulations. Alternative on-site systems (e.g., mound, pressure dosing, etc.) as approved by state regulatory agency.
On-site/cluster system	Standard and alternative on-site systems as above. Small community collection and treatment/disposal systems (e.g., small diameter gravity, vacuum, or pressure sewers and dosing/mounds) serving clusters of homes.
Separate communitywide collection/treatment systems	Septic tank effluent pump (STEP) pressure sewer system with centralized treatment facility (facultative lagoon and spray irrigation).
Joint collection/ treatment system.	Same as for communitywide system.

Step 2: Institutional analysis of existing agencies and identification and preliminary evaluation of institutional options.

This step begins to address the selection of management agencies. The purpose of this task is to identify and screen likely candidates based on their legal and general administrative capabilities to manage the wastewater technology under consideration. The agencies selected to perform management functions must be vested with the powers necessary to efficiently manage the wastewater systems involved.

Existing agencies and wastewater management responsibilities in the study area include:

1. State Department of Health -- Enforcement of state sanitary code governing on-site and alternative wastewater systems (i.e., non-surface water discharges).

2. State Environmental Protection Agency -- Enforcement of regulations governing surface-water discharges, issuance of NPDES permits, and general water quality protection responsibilities. Administration of the EPA Construction Grants Program.

3. County Departments of Health -- Authority to implement the state sanitary code through permitting on-site systems, inspecting and ordering repairs of failing systems.

Various legal and organizational characteristics of local agencies which are authorized under state enabling legislation to perform wastewater management functions (i.e., incorporated towns, sewer utility districts, and sewer authorities), appear in Tables 4 and 5. Limited interviews with existing wastewater management agencies and a detailed review of enabling legislation, present operating powers, and ordinances will be necessary to complete Tables 4 and 5.

As shown in the tables, each agency generally has sufficient legal authority for providing management requirements. In this example, the County Department of Health, however, is more effective in providing regulatory functions rather than financing functions for the locality. One potential statutory drawback of the district and authority options is the lack of clear legal capability to enter private property to perform on-site system inspections and correct problems. The enabling legislation does define the ability of a district and authority to inspect and maintain sewerage systems (connecting more than one home), but not individual systems. Depending on the legal interpretation of state enabling legislation, the management agencies being considered may not have the specific legal authority to carry out certain necessary functions.

Two approaches to solving this problem are to petition the legislature to either enact special legislation authorizing the creation of entities with explicit on-site management responsibilities, or to change state laws that define the powers of existing central wastewater system management entities (by allowing them to manage on-site systems). If it appears unlikely

TABLE 4. PERTINENT CHARACTERISTICS OF CANDIDATE MANAGEMENT AGENCIES

Institution	Applicable Statute Citation	Jurisdiction - Service Area	Formation	Governing Body	Comments
Incorporated	Town charter	Town limits	Existing agency	Town council	Towns provide limited public services.
County utility district	State code	Any contiguous territory within county	Petition by voters or resolution by county supervisors	County supervisors	Several utility districts already established within the county.
Water or sewer authority	State code	County, city, town, village, or any combination	Resolution by governing body authorizing a local referendum	Board of at least five members, appointed by governing body.	A few authorities exist in county.
County health department	State code and county ordinance	County	Existing agency	County supervisors	Full range of on-site system enforcement authority.

TABLE 5. MANAGEMENT REQUIREMENTS ASSESSMENT MATRIX

Management Requirements	Institutions											
	Towns			Sewer Utility Districts			Sewer Authority			County Health Department		
Administrative Requirements	Yes	No	Partial	Yes	No	Partial	Yes	No	Partial	Yes	No	Partial
• System ownership capability	X			X			X			X		
• Enter contracts	X			X			X			X		
• Acquire property	X			X			X			X		
• Sue or be sued	X			X			X			X		
Regulatory Requirements												
• Set rules and regulations	X			X			X			X		
• Enforce rules and regulations	X			X			X			X		
• License private contractors		X			X			X		X		
• Require connection to facility or participation in management program	X				X			X				X
Operation and Maintenance (O&M) Requirements												
• Access to private property		X			X				X	X		
• Establish O&M standards		X		X					X	X		
• Perform periodic inspections		X			X				X	X		
• Enforce repairs		X			X				X	X		
• Compliance monitoring		X			X				X	X		
Financing Requirements												
• Set user charges and fees	X			X			X					X
• Collect user charges and fees	X			X			X					X
• Accept grants	X			X			X			X		
• Incur debt	X			X			X					X
• Issue revenue bonds	X			X			X			X		
• Issue general obligation bonds	X			X				X				X
• Require performance bonds	X			X			X			X		
• Assess property taxes	X				X							
• Levy special assessments	X			X								
• Establish reserve funds	X			X								

that necessary enabling legislation will be enacted, other management options must be considered. (These options are discussed in subsequent steps of the analysis.)

Other institutional issues identified through the institutional analysis include:

Typical Regulatory Problem

1 The state agencies, and County Department of Health staffs expressed concern over reviewing and approving certain types of innovative and alternative technology, particularly those which were not currently used in the state and were not explicitly addressed in the state regulations.

2 The County Health Department staff suffered from a lack of manpower and expertise in soils science. The staff was also not familiar with alternative wastewater system technology design, installation, or operational requirements. The existing county regulations were also assessed as being in need of updating to require more extensive site evaluations and to provide alternative system designs, particularly in marginal soils.

3. The County Health Department (i.e., County Board of Health) also did not wish to become directly involved in managing an on-site wastewater program for the two communities under study. Existing state legislation, however, allowed the delegation of County Health Department responsibilities to local governments.

4. The County Engineering Department, an existing wastewater management entity, owned and operated wastewater treatment and water supply facilities in other parts of the county. This agency (and county supervisors) did not appear interested, at first, in becoming involved in wastewater management activities in the service area, unless conventional wastewater systems would be used.

5 Neither town had a professional staff which could perform maintenance activities. Easttown had a central water system with one full-time water operator. Westtown relied on individual

private wells for its water supply, and had one full-time town clerk as the only town employee. Both towns had part-time road maintenance employees.

These issues must be taken into account in the delegation of agencies to participate in management program duties as addressed in the next analysis step. Based on the analysis of legal and administrative capability accomplished in this step, each of the four institutional options listed in Tables 4 and 5 would be considered a candidate for the management agency descriptions, subject to further analysis in the steps to follow.

Step 3: Formulation and evaluation of wastewater management alternatives.

This step in the planning phase combines the results of the previous two steps; preliminary technical analysis and preliminary institutional analysis, to generate a number of wastewater management alternatives for detailed consideration. Wastewater management alternatives for a study area can be made up of various service area configurations, a mix of wastewater system technologies, and different institutional arrangements for managing these systems. The number of wastewater management alternatives to be evaluated in this step of the planning process will depend on the various combinations of technology, service area delineations, and institutional arrangements which appear to be feasible.

To simplify this example, a single technical option is assumed to be feasible after the preliminary technical evaluations. The "on-site/cluster system" has been selected as the preferred technical option. Figure 6 shows the general layout of the on-site/cluster system option.

The assessment of the institutional components for the technical option is done through two activities:

1. The definition of institutional arrangements for carrying out certain management functions (operations plan preparation).

2. The determination of the system capital and operating costs (financial plan preparation).

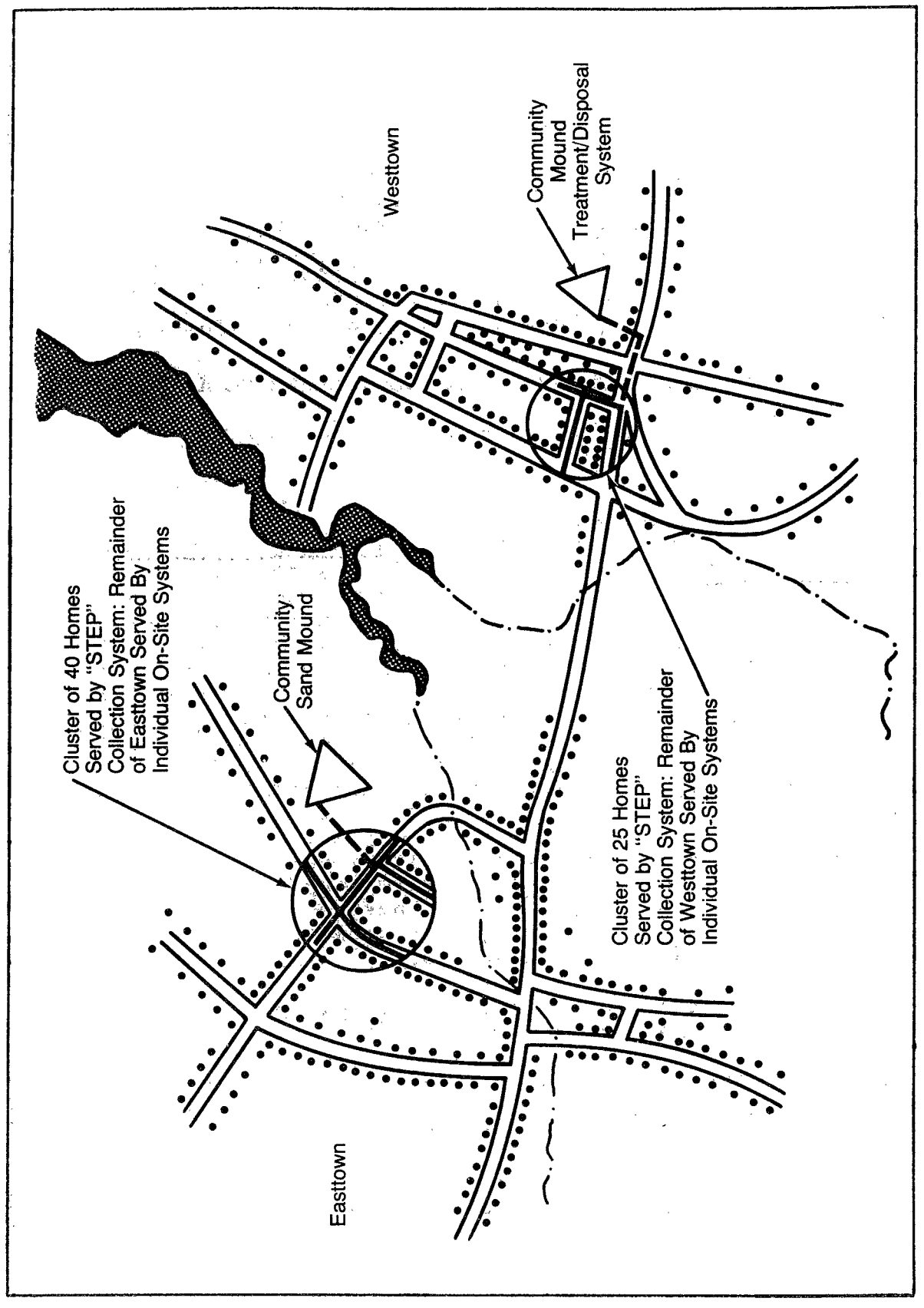


Figure 6. On-site/cluster system for Easttown and Westtown.

These two key institutional analysis activities commonly addressed in evaluating wastewater management alternatives are described in the following discussion of operations plan and financial plan preparation.

Preparation of an Operations Plan

An operations plan describes how design-installation and operation-maintenance functions will be carried out. The plan specifies who will provide these functions, and how they will be carried out. Guidance for preparing an operations plan is contained in Chapter 4, "Formulating an Operations Plan." The preparation of an operations plan involves the following activities:

1 Defining the required management functions.

2. Developing general approaches to system ownership and operation.

3. Assessing administrative and legal capabilities of existing and new agencies to provide management functions.

4. Selecting and formulating institutional arrangements.

The preparation of an operations plan is initiated by the determination of functional requirements of the management program. This is done by identifying specific management requirements for the on-site and small community system technologies.

Approaches to system management can then be developed in a preliminary fashion. On-site and small community systems can generally be owned and operated in the following ways:

1. Privately-owned and operated.

2. Privately-owned and operated within the guidelines of a public entity (e.g., through maintenance permit provision).

3. Privately- ned and publicly-managed.

4. Publicly-owned and managed.

4 levels

The roles and responsibilities of various entities that currently provide on-site system management in Easttown and Westtown are displayed in Table 6. It basically shows the involvement of the County Health Department in various phases of on-site system-installation, while operation-maintenance remains with the property owner. Follow-up discussions with County Health Department staff and County officials helped to demonstrate numerous logistical, manpower, and administrative constraints associated with regulating the maintenance of on-site systems within the case study service area. For this reason, the involvement of a local entity (e.g., town, sewer utility district or sewer authority), particularly in operation and maintenance responsibilities was evaluated in subsequent institutional analysis activities. Management functions that required the participation of local entities (or the property owner) are identified with an asterisk (*) in Table 6.

As noted earlier, explicit legislation creating on-site management districts and allowing a public entity to enter onto private property to conduct on-site systems inspections was not available for application. In lieu of such specific legislation, the following options were reviewed:

1. Obtain a service agreement with each resident with an on-site system. The service agreement would indicate the homeowner's and local entity's responsibilities in system maintenance and would allow the entity access to the on-site system for inspection purposes.

2. Obtain easements to the on-site system.

3. Purchase the on-site system (i.e., public ownership of the system).

4. Require property owners with on-site systems to establish service contracts with private firms. The firms would report results of the inspections and any septage hauling to a designated local entity.

Questions relating to the ownership and operation of the cluster (i.e., community) systems were also key concerns. In this case, it was assumed that the common collection lines would be publicly-owned and operated, while the individual pump units could be either privately-owned and operated, or publicly-owned and operated. For purposes of the operations plan, it was decided that a single agency would be assigned the responsibility for operation and maintenance of the collection lines and effluent disposal sites. It was also necessary that the management

TABLE 6. FUNCTIONAL RESPONSIBILITIES MATRIX -- EXISTING ARRANGEMENT

Identify specific management agency (i.e special district, municipal authority, municipal government, county agencies, regional agencies, State agencies, Federal agencies, private organizations, and other groups) and indicate responsibilities of each agency

	State Health Dept.	County Health Dept.	Towns	Homeowners	Private Firms			Comments
Planning/Administration								
Plan preparation			●					
Plan review coordination	●	●	●					
Research and development	●							
Office and staff management		●						
Site Evaluation								
Guidelines and criteria	●							
Evaluation certification		●						
Site suitability analysis				●				
System Design								
Standards and criteria	●							
Designer certification								Not done
System design				●				
* Design review		●						
Permit issuance		●						
Installation								
* Construction supervision		●						
Installer certification								Not done
* Record-keeping		●						
Permit issuance		●						
Operation and Maintenance								
* Procedures and regulations								Not done
Operator/inspector certification								Not done
* Routine inspections								Not done
* Emergency inspections		●						
* System repair/replacement				●				
* Repair supervision		●						
Performance certification								Not done
System ownership				●				
Residuals Disposal								
Disposal regulations	●							
* Hauler certification	●							
Record-keeping		●						
Equipment inspections		●						
Facility inspections		●						
Facility operation					●			
Financing								
* Secure funding								Not applicable
* Set charges								Not applicable
* Collect charges								Not applicable
Monitoring								
* Reporting system								Not applicable
Sampling	●							
Public Education								
Develop methods	●							
* Disseminate information	●							
* Respond to complaints		●						

* Management functions that require local agency input.

agencies be public entities, since EPA Construction Grant rules specify that property owner associations are private entities and are ineligible for grant funds.

Institutional options for carrying out activities normally defined through an operations plan are described in Table 7 and as follows:

1. All on-site systems would remain under private ownership. The cluster systems would be owned and operated by each town. The County Health Department would regulate system design-installation and operations-maintenance, with the towns participating in some of the system inspection and administrative activities. (Option 1.)

2. A sewer authority would be established to own and operate the cluster systems. The on-site systems would remain in private ownership. The sewer authority could become involved in on-site system regulation and maintenance with the County Health Department. (Option 2.)

3. A county sewer utility district would be established to own and operate the cluster systems. The on-site systems would remain in private ownership. The County utility district could become involved in some on-site system regulation and maintenance activities with the County Health Department. (Option 3.)

The evaluation factors that were used to choose the preferred management arrangement include:

1. Legal authority to provide management functions.

2. Capability and willingness to perform administrative duties.

3. Political acceptability and public support for the arrangement.

After assessing the relative merits and drawbacks of these institutional options, Option 2, the sewer authority arrangement, was determined to be the most feasible.

TABLE 7. INSTITUTIONAL OPTIONS FOR EASTTOWN/WESTTOWN WASTEWATER MANAGEMENT PLAN

Functions	Option 1	Option 2	Option 3
On-site ownership	Homeowner	Homeowner	Homeowner
Cluster ownership	Towns	Sewer authority	County utility district
Design regulation	County Health Department	County Health Department	County Health Department
System inspections	County Health Department/ towns	County Health Department/ sewer authority	County Health Department/ county utility district
Routine maintenance	County Health Department/ towns	County Health Department/ sewer authority	County Health Department/ county utility district
Collect fees	Towns	Sewer authority	County utility district
Advantages	1. Involves a local entity (town) in managing wastewater systems.	1. Provides a common focus of local activities via the sewer authority. 2. Gives the towns equal status in decision-making (via Board of Directors).	1. County utility district gives opportunity to expand wastewater management services to other parts of the county.
Disadvantages	1. Each town must provide services, separately. 2. Towns have limited capability to provide services.	1. Involves the creation of a new agency.	1. County elected officials are reluctant to become involved in small wastewater systems management.

Recommended Operations Plan
On-Site Cluster System

A joint-sewer authority would be established to serve as the principal administrative entity for managing both the on-site and cluster systems in the two towns. The sewer authority would maintain a staff to conduct system inspections, collect fees, and coordinate with the county health department, state regulatory agencies, and local governments to enforce program objectives.

The on-site systems would remain under private ownership. A service agreement would be established with each property owner with an on-site system to enable the sewer authority to conduct its inspections. The cluster system would be owned by the sewer authority, and similar service agreements (and easements) obtained.

The preferred institutional arrangements for managing the on-site cluster system are summarized in Table 8.

Cost information developed in the financial plan will provide the essential information for preparing a final wastewater management plan, and assigning institutional arrangements for system financing.

Preparation of a Financial Plan

A financial plan is designed to provide a mechanism for determining how system costs will be allocated to the service area residents. Vital inputs to the process of developing a financial plan include the results of the operations plan, i.e., the definition of organizational arrangements for system design-installation and maintenance, and the technical plan (particularly for user cost calculations). The analysis conducted in the financial plan refines the decisions made in the operations plan to a certain extent, and develops cost estimates so that system users will be better able to understand the financial impacts of the wastewater management alternatives. It is often on the basis of cost to the user (in addition to system effectiveness and reliability) that certain wastewater management alternatives are ruled out from further consideration.

The activities involved in the preparation of a financial plan include:

1. Calculation of the local share of capital costs.

TABLE 8. FUNCTIONAL RESPONSIBILITIES MATRIX -- PROPOSED ARRANGEMENT

Identify specific management agency (i.e. special district, municipal authority, municipal government, county agencies, regional agencies, State agencies, Federal agencies, private organizations, and other groups) and indicate responsibilities of each agency.

	State Health Dept.	County Health Dept.	Towns	Homeowners	Private Firms	Sewer Authority	Cooperative Ext. Service	Comments
Planning/Administration								
Plan preparation						●	●	
Plan review coordination								
Research and development	●							
Office and staff management						●		
Site Evaluation								
Guidelines and criteria	●					●		
Evaluation certification		●				●		
Site suitability analysis					●			
System Design								
Standards and criteria	●					●		
Designer certification								Not done
System design					●			
Design review		●				●		
Permit issuance		●						
Installation								
Construction supervision						●		
Installer certification								Not done
Record-keeping						●		
Permit issuance		●						
Operation and Maintenance								
Procedures and regulations	●					●		
Operator/inspector certification	●							
Routine inspections						●		
Emergency inspections		●				●		
System repair/replacement				●				
Repair supervision						●		
Performance certification						●		
System ownership				●		●		
Residuals Disposal								
Disposal regulations	●							
Hauler certification						●		
Record-keeping						●		
Equipment inspections		●						
Facility inspections		●						
Facility operation					●			
Financing								
Secure funding						●		
Set charges						●		
Collect charges						●		
Monitoring								
Reporting system						●	●	
Sampling						●		
Public Education								
Develop methods						●	●	
Disseminate information						●	●	
Respond to complaints						●		

2. Estimation of annual operating costs and associated manpower requirements.

3. Calculation of average annual user costs for alternatives comparison, taking into account expected population changes in the service area.

4. Determination of how costs will be allocated to system users.

Procedures to carry out these activities are explained in Chapter 5, "Formulating a Financial Plan."

The results of the first activity for the Easttown/Westtown example, calculation of the local share of capital cost, are summarized in Table 9.

In conducting the second activity, estimating operating costs, it is necessary to know:

1. The functions which are to be provided, their frequency of service, and number of applicable users.

2. The manpower requirements and associated salaries and fees to perform these functions.

3. The property owner versus management agency responsibilities in carrying out functions (particularly system correction and replacement).

Table 10 presents a detailed procedure, using this example, for calculating staff needs for the proposed wastewater management option. The calculations on this table yield estimates of total annual staff for the proposed sewer authority; specified as technician/inspector, managerial, and clerical categories. According to the calculation results, the management program will require the services of a part-time inspector (for approximately one-half of a person-year), and manager (serving about one-half day per week). Part-time clerical support would be necessary.

Workday estimates serve as input to another table, Table 11. Annual operating expenses for the management program are also presented in this second table.

Average annual user cost estimates derived from previous calculations are presented on the following page.

Annual User Costs

Annual local share (Table 9, item 6)	$64,200
Operating costs (Table 11)	21,120
Total annual costs	85,320
Total future users (no growth projected)	450
Average annual cost per user	190

Note: Average user cost estimates do not necessarily reflect actual user charges (see Table 13).

The average user cost does not necessarily reflect the amount a specific user will end up paying in user fees. It may be desirable to convert the average user cost to an actual expected cost to specific users for more accurate assessments. Alternative cost-sharing arrangements which should be investigated to prepare a more realistic representation of user costs include:

1. Service charges for specific services.

2. Fixed and variable charges (including assessments, connection fees, and service fees) to cover a full range of service and capital costs.

3. Property tax assessments to augment or substitute for service charges or user charges.

Determining which financing method to apply depends not only the technology requirements and management approach adopted, but on the extent to which the program costs can be equitably shared among all users. The choice of a particular financing arrangement is, therefore, based on whether the community as a whole wishes to share the costs of program administration, operating expenses, and debt service equally among all users or whether individual users are to pay according to the actual services rendered to their systems. The former approach is one that equalizes the costs of system replacement and operation among all users over the life of the project. The latter

TABLE 9. ON-SITE/CLUSTER SYSTEM CAPITAL COSTS (1980 $)

	Easttown	Westtown	Total
1. Initial Capital Costs	1,194,000	528,000	1,722,000
2. Future Capital Improvements	246,000	243,000	489,000
3. Total Project Costs	1,440,000	771,000	2,211,000
4. Grants	979,000	433,000	1,412,000
5. Total Local Share	461,000	338,000	799,000
6. Annual Local Share	37,000	27,200	64,200

Notes:

1. Total capital costs includes engineering fees, legal fees, land costs, right-of-way costs, etc.
2. Represents the present value of future on-site system rehabilitation and pump replacement over a 20-year planning period.
3. Total project costs represent initial and future capital costs over a 20-year planning period.
4. Grants from EPA and the state covering 85 percent and 10 percent of the eligible initial capital costs.
5. Total local share equals initial capital costs plus future capital improvements (during 20-year planning period) minus grants.
6. Annual local share financed through a bond of 7 percent at 30 years (capital recovery factor of 0.08059).

w Mort, maybe 30yr

TABLE 10. CALCULATION OF MANAGEMENT AGENCY STAFF

Management Activity Description	Implementing Agency	Calculations and Assumptions	Annual Workday Requirement by Staff Type
New Installations Site evaluations Design review Permit issuance Installation supervision	County health department to issue permits and inspect installations. Sewer authority staff will assist in installation supervision. Private contractor and property owner conduct site evaluation and prepare designs.	On-Site Systems Four new septic systems built each year for 20 years. Four new systems x 1 day/system = 4 working days/year for the sewer authority. Cluster System No additional connections assumed.	4 (1)
System Maintenance Periodic inspections Service calls Customer relations Violation notices Permit renewal Recordkeeping	Sewer authority will maintain systems. County health department will issue violation notice based on sewer authority referral. Mandatory maintenance permit approach would be used (with inspections) for on-site systems.	On-Site Systems Inspect every three years. $\frac{400 \text{ systems}}{3 \text{ years}}$ = 133 systems/year Assume inspection rate of three systems per day to schedule, inspect, and report findings. $\frac{133 \text{ systems}}{3}$ = 45 days/year	45 (1)
		Cluster System Biennial inspections of pump units. $\frac{50 \text{ units}}{2 \text{ years}}$ = 25 units/year Assume inspection rate of two units per day to schedule, inpect, and report findings. $\frac{25 \text{ units}}{2}$ = 13 days/year	13 (1)
System Maintenance (continued)		Treatment and Disposal Systems Routine visits, at least twice a week per system (there are two systems). Assume 1 day/week for routine visits and inspections.	52 (1)
System Repair/Rehabilitation Failed system inspections Repair supervision Violation notices	County health department will regulate septic system repairs with sewer authority coordination and supervision of installation.	On-Site Systems Six failed systems/year. Each system investigation and follow-up will take one day. Cluster System Failing pump units and other equipment are taken care of as part of routine maintenance activities.	6 (1)

TABLE 10. (CONTINUED)

Management Activity Description	Implementing Agency	Calculations and Assumptions	Annual Workday Requirement by Staff Type
Residuals Disposal Septage pumping Septage disposal	Private haulers contracted by property owners for individual systems and STEP units. Sewer authority to contract haulers for cluster system (holding tank). Sewer authority to administer and manifest system for private haulers.	Direct manpower limited to manifest system administration. Private haulers to pump holding tanks. Assume cluster system treatment units to be pumped once every year at $100/event; therefore, annual cost of $100 for septage pumping for the cluster unit (see Table 11).	15 (1)
Monitoring Surface-water quality Groundwater quality Special systems monitoring	Sewer authority will sample water quality and state agency will analyze samples taken.	Quarterly sampling at 12 sampling points. Assume 1 day/quarter to sample.	4 (1)
Administration Financial management Office administration Special consulting Compliance reporting	Sewer authority will employ part-time administrator for at least first 2 to 3 years of operation. Part-time clerical assistance is also necessary.	Assume 0.5 day/week for manager. Assume clerical assistance at two days/week.	26 (2) 104 (3)

Total Workday Requirements:

(1) Technician/inspector - 139 workdays/year
(2) Program administrator - 26 workdays/year
(3) Clerical - 104 workdays/year
Total Workdays/Year - 269 (This represents slightly more than one work-year of effort)

TABLE 11. CALCULATION OF OPERATING COSTS (EASTTOWN AND WESTTOWN SEWER AUTHORITY)

Labor Items	Average Annual[1] Salary	Adjusted[2] Salary
Program manager	$15,000	$ 1,500
Assistant manager		
Professional staff		
Field crews, technicians, operators	10,000	5,350
Clerical/bookkeeping staff	7,500	3,000
Total salary costs (from column 2)		9,850
Insurance and benefits (at 20% of total salary costs)		1,970
Total Labor Costs		$11,820
Nonlabor Items		
Treatment system utilities, chemicals, etc.		
Vehicle financing	2,000	
Vehicle maintenance	1,000	
Miscellaneous equipment, tools, etc.	400	
Replacement parts, etc.	500	
Treatment service charges		
Residuals disposal charges	100	
Septage hauling costs		
Private contractor service charge		
Testing equipment		
Laboratory analysis	500	
Office expenses (rent, postage, supplies, utilities, etc.)	3,000	
Staff training		
Training courses, seminars, etc.	300	
Consultant services		
Legal/accountant services	1,000	
Taxes	500	
Insurance (on equipment)	500	
Miscellaneous expenses (e.g., mileage)	500	
Total Nonlabor Costs		$10,300
Total Operating Costs (labor plus nonlabor costs)		$22,120

[1]Total annual salaries for program staff personnel.
[2]Adjusted annual salaries based according to portion of work-year effort devoted to the program (from Table 10).

imposes costs on almost a house-by-house basis, which recognizes the different operation and maintenance needs of wastewater systems and different property owner attitudes toward system care and maintenance within a service area. While satisfying household equity issues, administering a variable rate system could become complicated. The major criteria to be applied in evaluating a specific financing arrangement include:

1. Ease of administration.
2. Equitability of cost sharing among users (i.e., incidence or burden of costs on users).
3. User ability to pay.
4. Effectiveness in raising sufficient revenue.
5. Secondary impacts (e.g., on sewer extension notices, or on household attitudes toward system maintenance).

In the Easttown/Westtown example, the following cost allocation issues were of primary concern to the local officials and general public:

1. The allocation of costs between:
   a. Existing and future residents.
   b. Households on the cluster system and households with on-site systems.
   c. Households with fixed incomes and active-income producing households.
2. The distribution of costs between the two towns. (Should they be shared equally or apportioned by town?)
3. The cost-sharing arrangements made between households with failing on-site systems and households whose systems were functioning properly.

These issues reflect the real concerns of service area residents during the facility planning process, i.e., the allocation of costs of program management and facility operation so that users pay according to benefits received. These major cost concerns are addressed in Table 12, which illustrates the cost allocation method chosen for the towns.

Example A

TABLE 12. ON-SITE/CLUSTER SYSTEM FINANCING ARRANGEMENT ASSUMPTIONS

Major Cost Items	Proposed Financing Method	Alternative Methods Considered
Financing local share of initial capital costs	Initial assessment to property owners who have had their septic systems upgraded or have connected to the cluster system; supplemented with a revenue bond to cover the remaining costs.	Use of loans, bonds, property taxes and other debt financing techniques which spread these costs over a larger base, and over a number of years (i.e., no initial assessments).
Financing of future septic system rehabilitation and STEP system pump replacement	Creation of a reserve fund, financed by all users. An initial assessment would also be levied toward all users whose systems failed. (User would be charged for pump replacement only in cases of user negligence or misuse.)	These costs could be paid for by the property owner when the system needs replacement or major repair is required.
Annual operating costs	Included as part of the user charge levied to all households. Includes all costs for inspections, service calls, installation supervision, and program management. Includes a fee for maintenance permit renewal.	Can be charged on a service fee basis reflecting the need for providing these services. Service fee could be paid to the management agency (i.e., sewer authority) or to the private firm or other entity actually performing the service. Operating costs can be raised through property taxes or other special assessments.
Permits	Permits for system repair/replacement and for new installations are paid for separately and directly to the state regulatory agency.	Can be included as part of a user charge.
Septage pumping	Not included in the user charge. Property owners with septic systems and STEP systems would pay private haulers directly for septage pumping and disposal as determined through the inspections.	Septage pumping and disposal fee can be prorated and added to the user charge. Sewer authority could could also purchase a septage truck and maintain a crew to operate it.
House connections to the STEP unit	Financed by the property owner.	Could be done through a connection fee if management agency hooked up the system to the home.
Future septic system installations (new systems)	Built and paid for by the property owner.	No other alternative was considered.
Electrical power for STEP units	Paid for by the STEP unit property owner as part of his/her monthly electric bill.	Power costs could be paid directly by the sewer authority, with revenue raised through a special assessment or service fee.

As shown in Table 13 the local share of Easttown/Westtown capital costs would be raised through assessments of property owners whose on-site systems were upgraded or who connected to a cluster system. A reserve fund would be established (via sinking fund mechanism) to raise sufficient revenues for future on-site system and pump replacement. All users in the service area would contribute to the reserve fund, thereby assuring a source of funds to support any rehabilitation or replacement which might occur in any given year. The cost of house connections to the STEP unit (for cluster system residents), and septage disposal and permit fees are not included in the user charge. They are paid for separately by the property owner.

Translating these cost-sharing assumptions into estimates of actual user charges for the Easttown and Westtown on-site/cluster system is the purpose of Table 13.

The information presented in this table identifies the three major components of the proposed charge system:

1. Local share of initial capital investment.
2. Future rehabilitation and replacement of pumps and septic systems.
3. Operating costs of the program.

With an initial assessment of $500 for households connecting to the cluster system or having their septic systems upgraded, (in this example), the user charge per household is $146 per year. Septage disposal costs would be paid separately by each property owner (at approximately $50 per event). The costs of permits, power, and connections are also not included in the user charge fee. It was also proposed that the towns adopt the same user charge schedule. Each town, however, can develop its own system to collect user charges from residents within its town.

With the completion of the financial plan an implementation plan can be developed.

TABLE 13. ESTIMATED USER CHARGES FOR EASTTOWN/WESTTOWN ON-SITE/CLUSTER SYSTEM (1980 $)

Cost Components	Net Annual Cost (after grants) $	Annual Cost Per User $
1. Initial capital investment	17,400	39
2. Future system rehabilitation/ pump replacement	26,000	58
3. Operating cost	22,120	49
Total	$65,520	$146

Notes:

1. Calculated debt service using a revenue bond at 7 percent over 30 years for local share of the initial capital costs less initial improvement assessment of $500/unit assessed toward households connecting to STEP collection systems or requiring initial septic system upgrading.

2. Calculated as a reserve fund (via sinking fund mechanism) at 7 percent over 20 years. Amount financed is future value of replacements and rehabilitations less future improvement assessment of $500/unit levied against housing requiring on-site system rehabilitation.

3. Total annual operating costs from Table 11.

Step 4: Implementation plan.

Using the extensive analysis performed on system costs, program operational requirements, technical feasibility, and reliability during the preparation of a Step 1 facilities plan, sufficient information should be available to develop an implementation plan.

An implementation plan outlines the actions that need to be taken in carrying out the recommended management plan. The implementation plan basically develops the framework from which a management program can evolve. Specific elements of an implementation plan include:

1. Summary of agency roles, responsibilities, and funding sources.

2. Description of the mechanism for plan implementation and a schedule for completion.

3. Development of procedures for providing short- and long-term program evaluation.

A timetable for implementation of the Easttown-Westtown sewerage project is presented as Figure 7. Some of the major activities that need to be addressed in the implementation plan and carried out prior to system construction (i.e., the implementation phase) are identified in this example. The specific actions recommended in the Easttown-Westtown implementation plan example include:

How long normally?

1. Create the sewer authority.

2. Obtain the authorization to proceed into Steps 2/3 of the construction grant process and prepare an application for an EPA Step 2/3 grant. Applications for the grants and loans from other agencies would also be prepared and submitted. (The EPA grant application can be made on behalf of the newly created management authority or by one of the towns, representing the two-town study area. Specific requirements of other Federal agencies and state agencies regarding the creation of a new agency should be investigated.)

Generalize to use examples

Redo sequence as necessary

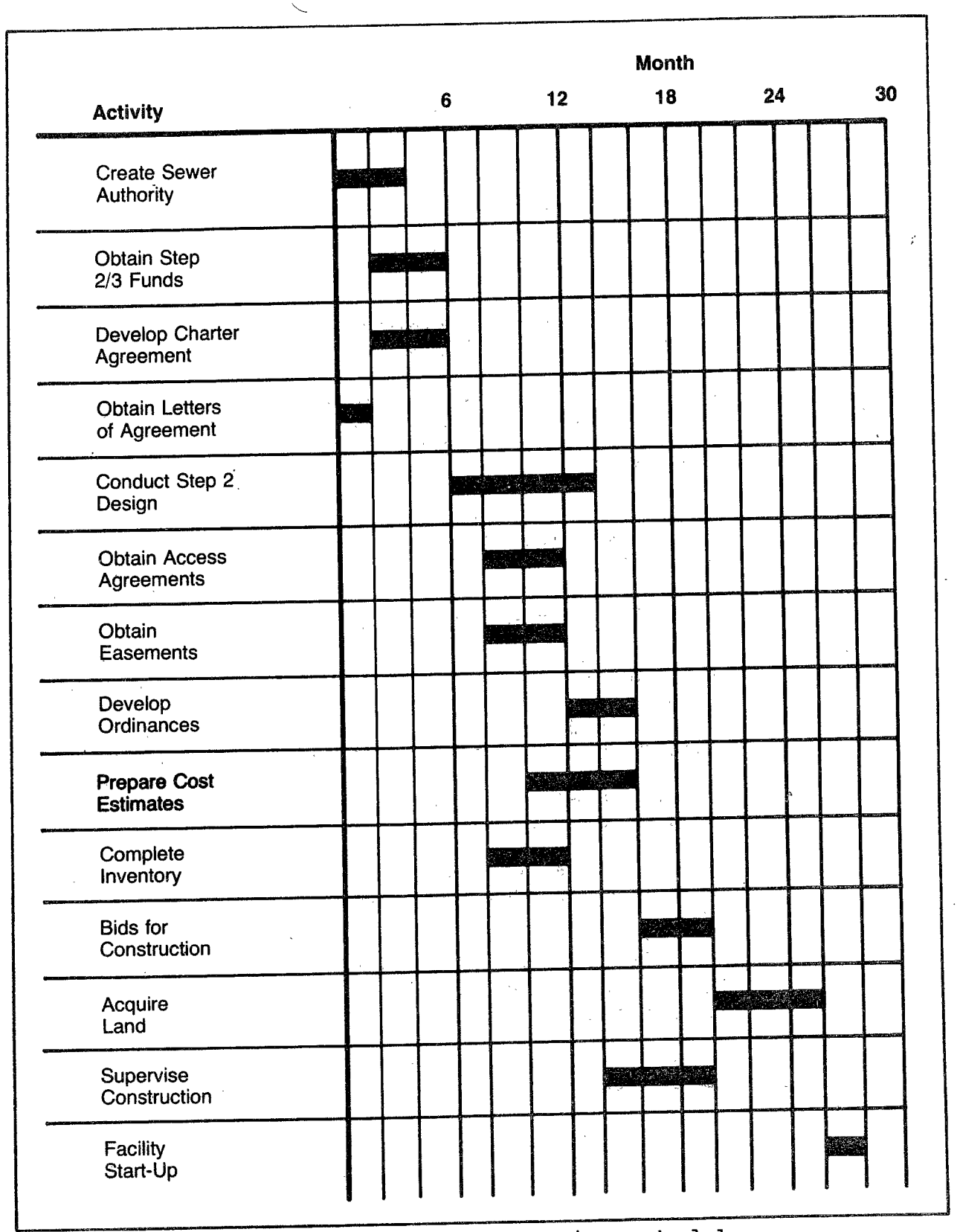


Figure 7. Project implementation schedule.

3. Prepare an operating charter for the joint sewer authority with reviews by appropriate agencies (e.g., EPA and the state environmental protection agency).

4. Obtain appropriate letters of agreement between the two towns.

5. Hire a consultant and initiate the Step 2 design activities.

6. Secure options for purchase of land for the treatment-disposal facility.

7. Obtain rights-of-way (easements) for sewer collection lines and STEP units. Formulate service agreements with property owners using on-site systems.

8. Develop a set of criteria and procedures for the design and maintenance of new and replacement on-site systems. Prepare ordinances and other regulations that might be necessary (e.g., establishment of a maintenance permit requirement).

9. Prepare (as a result of Step 2 design) detailed cost estimates for the project. Hold meetings with state and Federal agencies, town governing bodies, and the general public to present the updated cost estimates and report any modifications to the operation plan and financial plan. Hold a special election to reaffirm the intent to move to Step 3, construction.

10. Complete the inventory of existing on-site systems noting size, location, and operating history of each system.

11. Request bids for construction from contractors. Make a selection and begin work to install the recommended system.

12. Acquire all necessary property for treatment facilities, sewer lines, etc.

13. Supervise construction of the project, review, and authorize any modification to the design plans.

14. Begin operation of the cluster system. (Operation of the on-site system management activities can start earlier, however.)

In the illustrative case presented in this chapter, a wastewater system engineer from a nearby community sewer utility was hired on a part-time basis to serve as the authority's wastewater program manager. This individual helped the towns establish the implementation plan and enter into the final phases of program management; implementation phase and facility start-up phase. It is in these later steps of management program development where elements of the wastewater management plan are actually carried out.

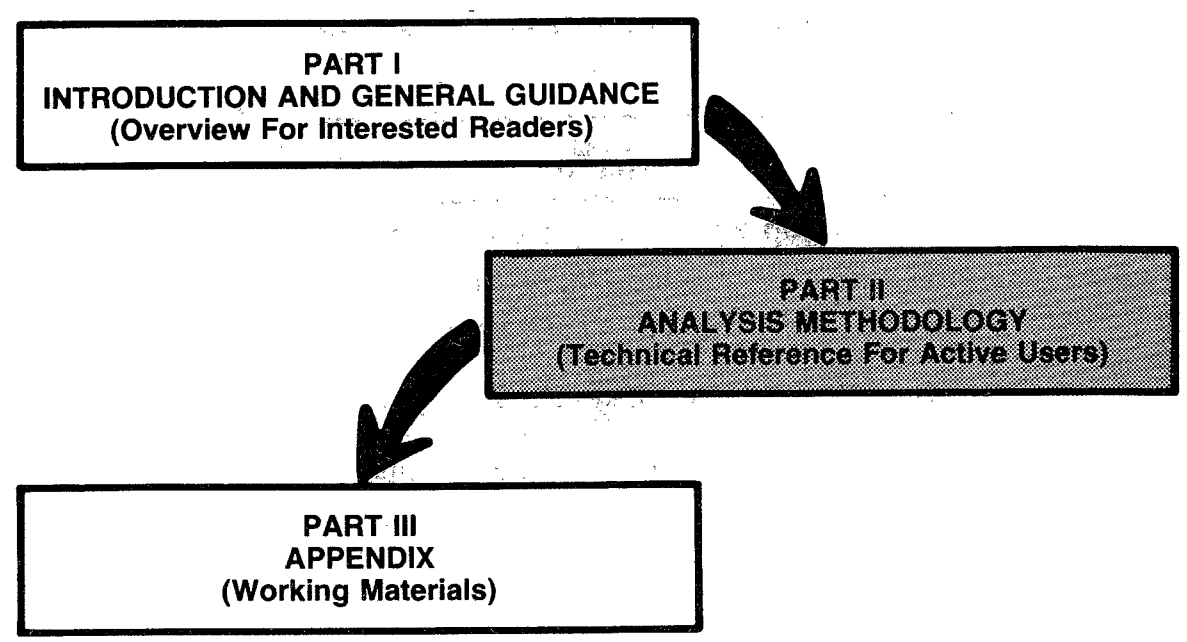
As mentioned at the outset of this chapter, the remaining text provides more specific guidance in developing institutional arrangements for initiation and planning phase activities.

PART II: ANALYSIS METHODOLOGY

Chapter 3: Selection of the Management Agency
Chapter 4: Formulating an Operations Plan
Chapter 5: Formulating a Financial Plan
Chapter 6: Formulating an Implementation Plan

This part of the document is a technical reference which provides a detailed methodology for evaluating and selecting institutional components of wastewater management programs. The emphasis in the section is to describe and evaluate institutional options for implementing management functions. It should be used by persons actually involved in assessing institutional arrangements and developing management programs.

Each chapter begins with a user's guide which presents the analysis steps in the methodology. The user's guide is accompanied in each chapter by sections addressing institutional options for performing various management activities. Case study experiences are included to illustrate and further define the institutional options.



METHODOLOGY OVERVIEW

The institutional components of a wastewater management plan are derived through analysis of technical, economic, legal, and political factors. The principal institutional components of the wastewater management plan that will be derived through the use of the methodology are:

- Operations Plan
- Financial Plan
- Implementation Plan

The following figure provides a schematic diagram of the analysis approach to developing the three institutional components of a management plan.

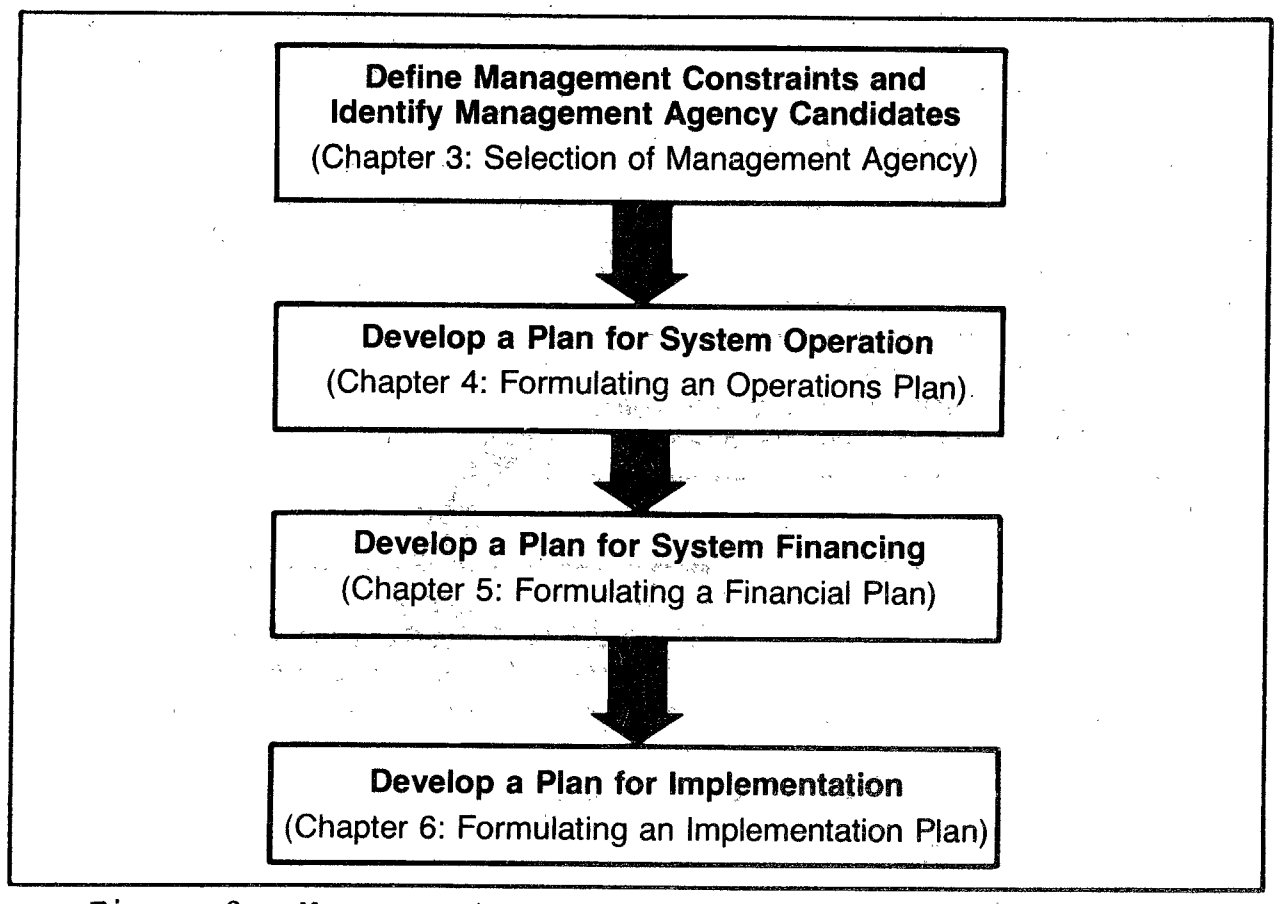


Figure 8. Management program development planning steps.

CHAPTER 3

SELECTION OF THE MANAGEMENT AGENCY

The success or failure of a wastewater management program will largely depend on the choice of a management agency. The agency or agencies selected must have the institutional capability to carry out necessary management functions, the legal authority to enforce appropriate regulations, and the financial resources to support the program. This chapter discusses factors that must be considered in identifying legal, political, and economic constraints to management, and in evaluating institutional options. It introduces the various institutional arrangements that can be applied singly or collectively to manage a small wastewater facility. Subsequent chapters (Chapters 4, 5, and 6) will utilize the results of this preliminary institutional analysis to describe how the elements of a wastewater plan can be constructed.

GUIDE FOR MANAGEMENT AGENCY SELECTION

The process of selecting a management agency should be coordinated with the development of technical or engineering solutions. The evaluation of technical and institutional considerations is a parallel process, having numerous interactions. The selection of a management agency begins with an assessment of management needs. This involves defining specific functions necessary to support the operation of wastewater treatment and disposal systems, and then identifying institutional entities which have the statutory authority and resources to carry out those functions.

The basic steps in selecting a management agency are:

Step 1 -- Define the capabilities and authorities required by a management agency.

Step 2 -- Identify potential management agencies and contact appropriate public and private representatives.

Step 3 -- Evaluate the authority and capabilities of existing and potential agencies.

Step 4 -- Select candidate agencies.

Step 1: Define the capabilities and authorities required by a management agency.

This initial step basically determines what the community wants and needs in the way of small wastewater systems management. The powers and authorities of organizations and the scope of responsibilities to effectively manage small wastewater systems should be defined at this time. These analysis decisions require that the community develop goals for land use growth and development, water quality protection, and wastewater system performance. The integration of these community goals will serve as a framework for developing a strategy for wastewater system management, upon which subsequent institutional and technical decisions will be based. Tables 14 and 15 provide the necessary information to develop a communitywide wastewater management strategy.

Table 14 summarizes the range of capabilities and powers a management agency can possess. The extent to which specific powers and capabilities must be satisfied will depend on the scope of a particular management program. (Statutory requirements for establishing a management agency are included in the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), Section 208(b) and (c), and the Code of Federal Regulations, 40 CFR 131.11(n) and (o).)

Table 15 lists various dimensions of a management program which will help to define the scope of management responsibilities. The parameters embodied within the dimensions of a program, e.g., purpose, structure, authority, etc., are the basic characteristics that every management agency should possess, and are the fundamental units (i.e., building blocks) in formulating alternative management approaches.

Step 2: Identify potential management agencies and contact appropriate public and private representatives.

The purpose of this task is to identify potential management agencies, authorized by state legislation, which can fulfill desired management functions, capabilities, and powers. Contact should be made with existing agencies and related private interests which may also participate in developing and (eventually) implementing the institutional plan.

State legislation defines the powers and capabilities of various governmental entities (i.e., institutions) in performing wastewater management-related functions. State governments com-

monly delegate the authority to perform certain functions (including wastewater management functions) to regional/local entities (regional agencies, counties, cities, towns, etc.). At this point in the planning process, it is necessary to identify which governmental entities and private interests can generally provide the required management functions. Institutions to be considered as potential management agencies include, but are not necessarily limited to, the following types of entities:

1. State agencies.
2. County government.
3. Municipalities.
4. Regional planning agencies.
5. Special purpose groups.
6. Nonprofit organizations.
7. Private enterprise.

Relevant private and public interests (listed in Table 16) should be contacted and asked to become involved in the planning process. Their participation will help to better define their capability and willingness to provide management functions, and at the same time ensure effective plan implementation.

Step 3: Evaluate the authority and capabilities of existing and potential agencies.

The assessment of institutional capability should include the evaluation of the legal basis, statutory authority, and functional capability of existing institutions, as well as the administrative and political feasibility of creating new agencies. Local attitudes toward governmental intervention, ownership of the wastewater system, local autonomy, availability of grant assistance, program accountability, and consistency with other plans, policies, and area objectives should also be considered in selecting the appropriate institutional arrangements to fulfill required management program functions. Many of these concerns are summarized in Tables 17 and 18 to serve as a guide for conducting institutional analyses. (Subsequent assessments of institutional and financial aspects of system operation and financing are oriented toward providing the information listed in these tables.)

Pertinent characteristics of institutions available for wastewater management should first be listed for comparison, as shown in Table 17. Table 18 represents a matrix of the managing powers provided in the statutes (either expressly or implicitly. Tables 17 and 18 are suggested formats for presentation purposes; the user should review these displays and modify them according to specific needs.

Step 4: Select candidate management agencies.

The selection of the management agency, its responsibilities, and supporting agencies and interests will be conducted in concert with most of the technical analysis, and primarily through preparation of the operation, financial, and implementation plans. Throughout the entire process of management plan development, the evaluation criteria set forth in Table 19 should be used to assure:

1. That the institutional arrangements can be implemented.

2. That these arrangements will be effective in carrying out the prescribed management functions.

3. That the costs incurred in the program are not a burden to any single group.

These evaluation criteria can also be used early in the planning process to screen potential management agencies. Those agencies that receive poor ratings in this initial screening should be eliminated from further consideration. The potential capability and willingness of agencies to accept management responsibilities will be more specifically evaluated in developing the operational, financial, and implementation elements of the management plan.

Table 20 suggests a presentation format for assessing capabilities of alternative management agencies. This presentation can be used to evaluate legal, administrative, and economic factors associated with candidate management agencies.

The next section in this chapter, "Institutional Options," presents a more thorough discussion of possible management agencies and their roles in fulfilling general management functions.

Potential / Possible

TABLE 14. POWERS AND AUTHORITIES OF MANAGEMENT ORGANIZATIONS

- The power to issue and enforce regulations.
- The authority to own and operate wastewater facilities.
- The right of access to private property to inspect systems and correct malfunctions.
- The ability to raise revenues by setting and collecting user charges and fees, and levying assessments and taxes on benefited properties.
- The authority to acquire by purchase, grant, and/or lease, both real and personal property.
- The power to declare and abate nuisances, to require and recommend correction procedures, and to perform corrections and bill the property owner if he fails to repair the system.
- The authority to plan and control how and when wastewater services will be provided within the community.
- The ability to receive state and Federal grants to build wastewater facilities, to incur debt obligations by borrowing or issuing bonds, and to sue and be sued.
- The ability to contract and delegate responsibilities to qualified persons or firms for the performance of any or all management functions.
- The ability to license, train, or certify persons involved in system design, installation, maintenance, and residuals disposal.

TABLE 15. MANAGEMENT DIMENSIONS

Time Frame

- Will the management program be a permanent solution or an interim measure?
- Where in the process of plan development and program formulation is the user situated?

Size

- What is the geographic size of the area to be served?
- Is it compatible with a local public jurisdiction?
- Is sufficient manpower available within an institutional structure to service the area under study?
- Does service area size affect the type of institution required to manage the wastewater systems?

Purpose

- Should the management program be limited to wastewater management or should other utilities be included (e.g., water supply)?
- What is the range of functions to be provided (i.e., coverage of all necessary management functions or only the required minimum functions)?

Structure

- Can new agencies be created to provide management functions on a localized basis or can existing ones be modified?
- How will the agency be staffed; full-time employees, part-time employees, volunteers, or by contract with a private firm?
- What will be the organizational relationship between the management agency and the participating municipalities?

Authority/Liability

- Will the wastewater systems be publicly or privately owned?
- How will the wastewater systems be operated and maintained?
- Who will bear the costs of future system repairs and replacements?
- Will existing regulatory entities continue to exercise regulatory authority over wastewater system design and maintenance or will new regulatory entities be created?
- How will the necessity of replacing an existing on-site system be determined?
- Will both existing and new on-site systems be included in the management program or only new systems?
- What is the extent of authority to be provided; advisory, managerial, or regulatory?

Staging

- How will future system extensions be determined?
- When is public agency intervention in the planning process and program formulation process required?

Agreements

- Does adequate legal authority exist?
- Do new or modified interagency arrangements, legislation or ordinances need to be established?
- Do agreements with property owners need to be acquired?

TABLE 16. AGENCIES AND GROUPS THAT MAY PARTICIPATE IN MANAGEMENT PLAN DEVELOPMENT

Federal Agencies

- Environmental Protection Agency (EPA)
- Farmers Home Administration (FmHA)
- Department of Housing and Urban Development (HUD)
- Economic Development Administration (EDA)

State Agencies

- Health departments
- Environmental protection agencies

Regional/Local Agencies

- Regional, county, and municipal government agencies (planning, health, engineering, public works, etc.)
- Sewer and water authorities, utilities, or districts
- Soil and water conservation districts
- Association of local governments.

Private Interests

- Professionals (engineers, planners, lawyers, bondsmen, soil scientists, etc.)
- Contractors (septic system installers and septage haulers)
- Local home builders associations
- Organized private interest groups (homeowner associations, nonprofit organizations, and other environmental groups)

TABLE 17. PERTINENT CHARACTERISTICS OF INSTITUTIONS AVAILABLE FOR WASTEWATER MANAGEMENT

Institution[1]	Applicable Statute Citation	Jurisdiction - Service Area	Formation	Governing Body	Operational Status[2]

SAMPLE FORMAT

[1]List appropriate agencies and institutions identified earlier in this column.
[2]Identify whether the agency is an existing operating entity or if a similar entity has been established elsewhere in the region or state.

TABLE 18. MANAGEMENT REQUIREMENTS ASSESSMENT MATRIX

Management Requirements	Institutions[1]								
	County[2]			Township			•	•	•
	Yes	No	Partial	Yes	No	Partial			
Administrative Requirements									
• System ownership capability									
• Enter contracts									
• Acquire property									
• Sue or be sued									
Regulatory Requirements									
• Set rules and standards for system design and operation									
• Enforce rules and regulations									
• License private contractors									
• Require connection to facility or participation in management program									
• Enforce system repairs									
Operation and Maintenance (O&M) Requirements									
• Access to private property									
• Establish O&M procedures									
• Perform periodic inspections									
• Perform maintenance									
• Compliance monitoring									
Financing Requirements									
• Set user charges and fees									
• Collect user charges and fees									
• Accept grants									
• Incur debt									
• Issue revenue bonds									
• Issue general obligation bonds									
• Require performance bonds									
• Assess property taxes									
• Levy special assessments									
• Establish reserve funds									
Comments[3]									

SAMPLE FORMAT

[1]List the institutions identified earlier across the top of the matrix.
[2]Indicate legal authority to provide management requirements for each identified institution.
[3]Subjective comments on all of the above factors and any others which may affect the choice of management agency.

See Tables 6/8 also

TABLE 19. EVALUATION CRITERIA FOR SELECTION OF MANAGEMENT AGENCIES

Political and Public Acceptability

- Does the agency authority enable it to coordinate with other management agencies through administrative, regulatory, or policy channels? Have sufficient coordinative mechanisms been provided?
- Does the agency provide for public participation through representation on decision-making boards, through public hearings or meetings, through participation with professional or organized societies, or through public disclosure?
- Is the agency accountable to publicly-elected officials, and to the affected area residents?
- Does the approach maintain local autonomy, or does it shift responsibilities to higher levels of government?
- Is the program responsive to other areawide goals and objectives? Is it compatible with the objectives and capabilities of operating agencies within the area?
- Is there sufficient legal authority to implement program elements? Is existing enabling authority vague or uncertain as to its applicability to on-site or small community systems management?

Institutional Feasibility

- Are existing institutions used to the fullest extent? Are adequate enforcement powers available?
- Does the program call for extensive changes to the current institutional structure?
- Are extensive legislative changes required?
- Has the track record of the agency supported its ability to organize an efficient and effective management program?

Administrative Efficiency

- Does the management program have the potential for voluntary compliance?
- Are the administrative procedures cumbersome or complex?
- Does the agency jurisdiction correspond to the geographic boundaries of the problem?
- Does the agency have the technical expertise for providing management functions?
  - Can the agency contract directly to obtain professional assistance?
  - Does the agency have specific staff positions with competitive salary structures for needed technical expertise?
  - Are technical manpower support services available in the existing labor market?
- Are the agency's staff resources overloaded with other assignments?

Economic Equity

- Is the program economically equitable? Is the incidence of user costs a burden to any one group (rural or urban, population groups, between municipalities)?
- Is the program economically efficient? Does it take full advantage of economies of scale, elimination of duplicate services and unnecessary permit delays, balancing of structural and nonstructural controls?
- Does it cause substantive changes in the land use or neighborhood character of the area (i.e., secondary socioeconomic effects)?
- What are the financial impacts on each participating community?

TABLE 20. MANAGEMENT AGENCY RANKING MATRIX

Evaluation Criteria	Management Agency Alternatives 1	2	3	4	Comments
Political and Public Acceptability					
• Coordinative capacity					
• Public acceptability					
• Public accountability					
• Local authority					
• Responsiveness to areawide goals					
• Legal authority					
Institutional Feasibility					
• Use of existing agencies					
• Institutional changes					
• Legislative changes					
• Past record of management agency					
Administrative Efficiency					
• Potential for voluntary compliance					
• Efficient administrative procedures					
• Service area jurisdiction					
• Technical expertise					
• Agency staffing					
Economic Equity					
• Incidence of costs					
• Economic efficiency					
• Impact on land use					
• Financial impacts					

SAMPLE FORMAT

Legend:

+ Positive impact
0 No impact
- Negative impact

INSTITUTIONAL OPTIONS

As noted in the previous discussion, there are several institutional options for designating a management agency. This section contains a description of the various types of institutions that can assume management responsibilities. The intent here is to develop a understanding of the structure and potential authority various entities can assume. The public and private organizations that participate in small wastewater management include:

1. Federal agencies.
2. State agencies.
3. Local public entities
   a. Counties.
   b. Incorporated municipalities (cities, towns, villages, etc.).
   c. Sanitary or utility districts (special purpose agencies, public authorities).
4. Nonprofit institutions.
5. Private firms.

These entities have a broad role to play in the planning, administration, regulation, financing, and operation of wastewater programs. Several Federal agencies offer financial and technical assistance to state and local management efforts. States are responsible for the administration of funding, regulatory and technical assistance programs for local governments. Local public bodies and private entities are responsible for planning and operating wastewater facilities and enforcing applicable regulations.

The precise roles and responsibilities these entities will assume in a wastewater program will depend on the preference, capabilities, and circumstances found in a given community situation. Due to the variation in state enabling legislation and organizational structure, the form, jurisdiction, and authority of local public entities to manage small wastewater systems varies from state-to-state.

Each of the alternative organizations is described in the subsections that follow. Table 21 displays several generic characteristics of state, ~~local,~~ and private entities. This information is presented in a manner which enables the comparison of attributes and capabilities among these institutional alternatives.

Federal Agencies

Federal agencies, particularly the Environmental Protection Agency (EPA), Farmers Home Administration (FmHA), and the Department of Housing and Urban Development (HUD) offer technical assistance and funding to states and local governments for implementing wastewater management projects. The availability of funds and staff from these agencies to provide assistance changes frequently. Persons involved in the wastewater management planning process should investigate all potential sources of Federal funds and technical assistance by contacting regional and national representatives of these agencies, or by consulting the Federal Assistance Program Retrieval System (FAPRS) through the Office of Management and Budget (OMB). Inquiries regarding this system may be directed to OMB in Washington, DC or the Agricultural Extension Service located at state land grant colleges.

State Agencies

State involvement in implementing on-site and small community wastewater management programs to a large extent parallels that of the Federal government by promulgating and enforcing regulations, and providing financial and technical assistance to individual communities. State agencies offer technical assistance in evaluating and designing wastewater systems; administer financing programs to build new systems and replace failing systems; set and enforce standards for system design, installation, and maintenance; and conduct research on system performance. Each state is organizationally different in regulating small wastewater systems, and in offering technical assistance and financing of these systems.

TABLE 21. WASTEWATER MANAGEMENT CAPABILITIES

	State Agency	County	Municipality
Description	State agencies such as environmental protection agencies, health departments, and public utility commissions are involved in wastewater management activities.	A county is the most basic political subdivision within a state. It is generally made up of incorporated (municipalities) and unincorporated areas.	Municipalities are cities, towns, villages, and townships.
Service Area	State agency program enforcement can be handled on a substate (regional) basis.	A county can provide services throughout its jurisdiction, or to defined areas via improvement districts.	A municipality can provide services throughout its jurisdiction or to defined areas via improvement districts.
Governing Body	State legislature is principal governing body. State agencies can report directly to the governor, legislature, or to an autonomous board of directors.	Depending on the state statutes, county population, and other local circumstances, county governments can take several forms: commission, council-administrator, or council-elected executive. The elected county board in each of the three forms of government is the principal legislative branch of government.	There is great diversity in municipal organizational structure. Basic forms of municipal government include mayor-council, commission, and council-manager. The council or commission is usually an elected body with primary decision-making authority.
Responsibilities	Many states are directly involved in code enforcement of on-site and small community wastewater design, installation, and operation standards. States also provide special technical and financial assistance to small communities.	Counties serve as coordinators of municipalities in its jurisdiction. They can provide special services to municipalities on a contract basis. They can serve as a fiscal agent for the other local units of government.	Municipalities provide a wide range of services.
Financing Capabilities	Broad-based financial support to programs is possible through Federal grants and state general revenues. States will assume a major role in administering the construction grants program.	A county can fix charges for sewerage sources and finance facility construction from taxation, general funds, special assessments, general obligation bonds, revenue bonds, and permit fees. Improvement districts can be used as the primary mechanism of raising revenues for wastewater management services.	Municipalities are vested with a broad range of fiscal powers to finance public improvements (similar to counties).
Advantages	States have financial and regulatory advantages over local governments, and are more aware of local needs than Federal agencies. States can effectively coordinate wastewater management activities administered by substate entities. State enforcement of codes can provide insulation from local political pressures. Through more specialized staffing capabilities, states can administer training and certification programs for persons involved in wastewater management activities.	Counties are in an advantageous geographical position to interact with states and local governments on many issues. Counties are sometimes looked upon as administrative arms of state government. Counties provide an efficient resource base for providing public services.	Municipalities can better react to local perceptions and attitudes.
Disadvantages	Each state is organized differently with respect to small wastewater system programs; the experiences of one state are sometimes difficult to implement in another. States may become too distant from local needs unless regional offices or a specific state agency group specializing in small wastewater systems activities is established.	County governments are sometimes not willing to become involved in providing specialized public services to a defined service area. Local governments are sometimes also unwilling to allow county government to provide services for them, unless the localities are assured some role in the decision-making process. Community debt ceilings could restrict the use of general obligation bonds.	Small towns and villages may not have the administrative capability, staff, or willingness to operate small wastewater facilities or regulate system design and installation. Financing opportunities may be limited by small resource base or municipal debt limits.

TABLE 21. (CONTINUED)

	Special District	Improvement District	Public Authority
Description	Special districts are quasi-municipal entities having a wide range of functions prescribed by state enabling legislation. Special districts can provide single or multiple services.	A device used by counties or municipalities to provide services to a part of the local government jurisdiction.	A special purpose type of government or corporation, authorized to administer a revenue-producing public enterprise (e.g., water and sewerage services). This type of organization is similar in concept to a special district.
Service Area	The territory served by a special district is flexible.	Usually part of a single jurisdiction. Can have several improvement districts within a single jurisdiction.	A public authority's jurisdiction of coverage is flexible; it can be comprised of a municipality, group of municipalities, county, or group of counties.
Governing Body	The governing body of a special district is a board of directors who can be: • Elected by voters in the service area. • Appointed by a government agency. • Composed of members of a government agency.	The governing body of the creating unit of government is the governing body of the improvement district.	The governing body of a public authority is a board of directors. The board members can be: • Elected by residents within the service area. • Made up of members of the governing body of the local government.
Responsibilities	Special districts can perform all wastewater management functions, similar to a local governmental entity. State enabling legislation defines the function and scope of special districts.	State statutes define the extent of authority of improvement districts. Their authority is usually applied to finance public service improvements.	A public authority can provide a wide range of functions. It is used predominantly for its financing capabilities.
Financing Capabilities	Special districts can use local taxation, special assessments, service charges, grants, loans, general obligation bonds, and revenue bonds to finance projects. Special districts are sometimes created to circumvent financial restrictions placed on local governments.	Can apply special property assessments, user charges, and other fees, and sell bonds to finance improvements. The principal use of this mechanism is to assess property owners for benefits received. Shares similar financing capabilities as counties and municipalities.	Its revenue-raising capability is limited to revenue bonds, user charges, and connection fees.
Advantages	A special district is a flexible method of providing wastewater services. There is equity of services rendered; only those persons receiving services pay for them. Special districts are simple, independent forms of government that can provide specialized services.	Ability to extend public services without major expenditure of public funds. Persons within the benefitted area usually favor the improvement.	Public authorities are useful where local governments cannot provide public services because of financial, administrative, or political problems. A public authority has a certain degree of autonomy and independence from municipal budgetary and administrative controls.
Disadvantages	Special districts can promote a proliferation of local government and duplication and fragmentation of public services. Fiscal problems could result from overextended use of special districts. Some problems with accountability to service area residents may result.	Contributes to fragmentation of local government services. There can be significant administrative delays in establishing the district.	A public authority cannot tax property; its financing ability is limited to revenue bonds. Therefore, it is difficult to assure that debt obligations can be met without a certain degree of local government support. Public authorities are frequently criticized for lack of public accountability and a self-serving nature (largely due to their dependence on revenue bond financing). The marketability of revenue bonds depends on the confidence of the bond market.

TABLE 21. (CONTINUED)

	Public Nonprofit Corporation	Private Nonprofit Corporation	Private (For Profit) Corporation
Description	The purpose of a nonprofit corporation is to provide water or wastewater services on behalf of local governments.	A private nonprofit corporation can be established by the users of a facility to assist in facility financing and operation.	Private enterprises in the form of small private firms or private companies and utilities can design, run, operate, or maintain sewerage facilities.
Service Area	The concept is flexible; it can be applied to a single community, group of communities, or on a statewide basis.	The service area can include subdivisions, small communities, and rural areas.	The service area for a private corporation is flexible. It can range from a single homeowner to a small community. Franchise rights and licensing requirements can restrict service area boundaries.
Governing Body	The directors of the corporation are usually municipal or state officials. The governing body of the sponsoring government must approve projects and accept the corporation's assets after the indebtedness has been amortized and paid off.	The corporation is governed by a board of directors elected by stockholders or by property owners in a property owners' association. Stock can be issued to the members of the corporation at a nominal fee.	The single or sole proprietorship is the simplest form of business organization. A single proprietor (or partnership) simply invests his capital and begins to do business. A private utility or corporation has stockholders or investors as the principal supporting group.
Responsibilities	Nonprofit corporations tend to serve strictly as financing mechanisms for sewerage and water facilities. Local governments provide the necessary regulatory activities, such as acquisition of rights of way. A nonprofit corporation can also be used to provide technical assistance to small communities.	The corporation can provide financing and operational functions.	The private sector has an active and flexible role to play in managing small wastewater systems.
Financing Capabilities	Revenues are derived from user charges and service fees and sales of stocks and tax-exempt bonds. Can accept some Federal grants and loans.	Nonprofit corporations are eligible for some Federal grants and loans, and are regulated by state public utility commissions.	The state public utility commission (PUC) has jurisdiction over private companies providing sewerage services in most states. The PUC exerts a certain degree of control over the adequacy of service rates charged.
Advantages	A nonprofit corporation offers a great deal of flexibility in establishing wastewater management facilities, and financing wastewater facilities by state and local governments. Financing methods do not affect local debt limitations. Several states have already established nonprofit corporations to help finance local water and sewer projects.	This approach is promoted by the National Demonstration Water Project in rural areas as part of a self-help program for management of water and sewer facilities. It provides public services where local governments are unwilling or unable to provide them.	The participation of the private sector in various aspects of wastewater management frees the local public sector from providing these services. Competition among firms will help to ensure that adequate services are provided and reasonable prices are charged.
Disadvantages	Local governments may be reluctant to apply this concept.	The major concern by regulatory agencies is that services would be terminated, or that services would not be provided efficiently or satisfactorily. Third party arrangements can help avoid this problem.	The biggest disadvantage of this arrangement is the threat that the private entity will go out of business. Private corporations are also not eligible for most Federal and state grants and loans for wastewater projects.

States are assuming more direct responsibility in administering EPA's construction grants program. Chapter 6 discusses some of the ways state programs can assist small communities in facility planning and implementation activities.

Counties

The size, purpose, and authority of counties varies from state-to-state according to each state's statutes and laws. The role of county government in providing wastewater management services is equally diverse. A county can provide certain functions, such as on-site system regulation, within its geographical jurisdiction, or it can supplement and support existing city, town, or village wastewater management programs, with technical, financial, or administrative assistance.

Counties have at their disposal a wide range of financing mechanisms to raise revenues for small wastewater system planning, regulatory and operational activities. In offering these services, counties can simply provide the service to its constituents through its normal operational mechanisms (e.g., a county department or agency), or it can create a special district (sometimes referred to as an improvement district) to provide specialized services to a defined service area. (See also the discussion of improvement district capabilities.)

Incorporated Municipalities

Municipalities (generally including cities, towns, boroughs, and villages) are an important general-purpose unit of local governments. (Although townships are not considered incorporated municipalities in most states, they may possess authority similar to small municipalities for providing wastewater services.) As incorporated communities, municipalities operate under local charters which are either set forth or approved by state legislative action, or prepared under self-executing home rule provisions. The municipal charter and state municipal statutes generally outline the authority of these local governments in providing wastewater services. Similar to counties, municipalities provide a wide variety of services, depending on geographic size and resource base.

Special Purpose Agencies

Special purpose agencies are created to provide public services which are not provided or cannot be provided by local government. There are two different forms of special purpose agencies that can carry out wastewater management functions -- special districts and improvement districts.

A special district is an agency of government which operates outside the regular government to perform single or multiple services. The territory serviced by the district is flexible; it may consist of a single community, a part of a single community, a group of communities, or parts of several communities. State enabling legislation outlines the major governmental characteristics of the districts, such as service area function, organizational structure and financial authority, as well as set the conditions of their performance. The procedural steps required to create a special district are simple, although wide variation exists among state enabling legislation. The basic methods of forming a special district include:

1. The state legislature can pass a special act for the formation of a special district in a certain location, or generally permit such districts with given powers under specified conditions.

2. A local government (e.g., county) can create a special district by resolution of the governing body.

3. Service area property owners and residents, or service area residents (without necessarily being registered voters or property owners) can petition (usually the governing body of a public agency) to form a district. The requirement for creating the district is typically a simple majority of the votes cast.

An improvement district, on the other hand, is a mechanism used by counties and municipalities to provide public services which benefit only those residents residing within the defined service area. Public improvements, such as providing wastewater management services, are provided through the fiscal resources of benefitted properties. The governing body of an improvement district is the governing body of the local government which created it. An improvement district can be created by the local government by resolution of the governing body, at the request of the local service area residents, or on the basis of a perceived need by local decision-makers.

Public Authorities

A public authority is a corporate body, chartered by the state legislature, with powers to own, finance, construct, and operate revenue-producing public facilities. Public authorities are also referred to as commissions, public benefit corporations, municipal authorities, and sewerage authorities.

A public authority can be used in a variety of ways to construct, finance, and operate a public facility. The authority can:

1. Construct, own, operate, and finance improvements to provide public sewers to a municipality, group of municipalities, a county, or group of counties.

2. Finance and construct the public facility, and turn it over to the appropriate unit of government.

3. Offer financing for publicly-owned improvements.

Another significant feature of the public authority (in some states) is that despite considerable freedom during the operational phase, the properties of the authority can revert to the creating local government when their indebtedness is amortized and paid. There is a tendency, however, for new obligations to be incurred, and thus, termination under this provision seldom occurs.

Nonprofit Corporations

Nonprofit corporations can be classified as public or private entities; i.e.,the corporation can be formed by a state or local government (public nonprofit corporation) or a developer (private nonprofit corporation). Special districts and public authorities can generally be classified as public nonprofit corporations. The authority of this type of entity would be contained in the applicable public utility law of that particular state, and in articles of incorporation approved by member jurisdictions. The rules governing the formation and operation of nonprofit corporations vary from state-to-state, however, these corporations may be subject to state public utility commission (or public service commission) regulations.

A public nonprofit corporation can be formed by cooperating communities for the purpose of providing a public service, such as wastewater disposal or water supply. The participating communities hold stock and shareholder rights in the corporation, and the entity functions autonomously. A private nonprofit corporation can be established to perform the same functions. However, the ownership is vested with the stockholders or property owners forming the corporation. Typical private nonprofit corporations include rural cooperatives and property owners associations.

NRECA members

In a property owners association, it is desirable to incorporate when the land is initially developed. This facilitates the delineation of utility easements and deed restrictions which provide continuous membership in the association in the event the property is sold. This is usually accomplished by requiring membership in the association to run with the land. Typically, such convenants and utility easement locations are recorded at the time of subdivision plat approval.

Private (For Profit) Corporations

The private sector has an active role to play in the management of small wastewater systems. As noted in the preceding discussion, private nonprofit corporations, made up of property owners or community residents, can be set up to own, operate, and maintain sewerage facilities. Likewise, private enterprise, in the form of small private firms or private companies and utilities, can design, install, own, operate, or maintain sewerage facilities. Septage haulers, plumbing contractors, septic system installers, and private utilities are included in this institutional category.

Private (for profit) corporations or utilities that own, operate, and maintain sewerage facilities are regulated by a state public utility commission.

Various legal mechanisms can be used to assure continued acceptable service at reasonable rates for both private (for profit) corporations and private (nonprofit) corporations. While the Public Utility Commission does exert a certain degree of control over the adequacy of service and rates charged, other methods of protecting the consumer are usually applied to private corporations (both profit and nonprofit). Among these mechanisms are:

1. Trust deed.
2. Third party beneficiary contract.
3. Franchises from governmental authority.

A description of these mechanisms can be found in the appendix to this report (see Service Agreements, Section III-2). These mechanisms are required to ensure that private organizations will be:

1. Financially secure.
2. Provide continuous and permanent service.
3. Accountable to its customers.

Despite the potential problems with private organizations, the presence of a private utility or experienced private controller relieves the burden of providing wastewater services (such as septage disposal and facility operation) by local governments. Competition and profits will help to assure that adequate services are provided. Renewable competitive contracts or franchises will help to guarantee quality service and control costs.

Institutional Overview

The preceding discussion has outlined the roles, responsibilities, and powers of various institutional options for managing small wastewater systems. All levels of government, Federal, state, county, and local, were highlighted. In many cases it was difficult to precisely outline the powers of a particular entity because of the wide variation in enabling legislation and political organization from state-to-state. The discussion that was presented, however, serves to introduce these institutional concepts, which are applied to developing operation, financial, and implementation plans (described in the three chapters that follow).