Chapter 1

INTRODUCTION

PURPOSE

This document addresses the Congressional House Appropriations Committee's request that EPA report on

(1) the Agency's analysis of the benefits of decentralized wastewater system alternatives compared to current (i.e., centralized) systems;
(2) the potential savings and/or costs associated with the use of these alternatives;
(3) the ability of the Agency to implement these alternatives within the current statutory and regulatory structure; and
(4) the plans of the Agency, if any, to implement any such alternative measures using funds appropriated in fiscal year 1997.

Appendix F addresses the Committee's request to analyze the ability of rural electric cooperatives to upgrade facilities in rural areas. A separate response addresses privatization of municipal wastewater facilities, also requested by the Committee.

Responses to areas 1 through 4 are presented below. Following this Introduction is an analysis of the benefits of implementing decentralized treatment options (#1 above). It focuses on the factors that influence the selection of a wastewater system in a community and the conditions under which a decentralized or centralized system would be the best option. This is followed by an analysis of the potential costs and savings (#2 above) which examines comparative costs for centralized and decentralized wastewater systems using two hypothetical scenarios. Next, the document highlights barriers that inhibit the expanded use of decentralized systems and suggestions for overcoming the barriers. A section follows describing EPA's ability and plans to implement the findings (questions #3 and #4 above), with appendices supplementing the text.

The House Appropriations Committee request highlighted several alternative approaches for managing wastewater, including:

- Targeted upgrades of treatment systems failing at individual homes.
- Innovative, high-performance technologies for pretreatment on lots characterized by shallow soils or other adverse conditions.
- Small satellite treatment plants or leaching fields in high-density areas.
- Detailed watershed planning to specify precise standards for sensitive versus non-sensitive zones.

- Maintenance, inspection, and water quality monitoring programs to detect failures in onsite systems.

These approaches are discussed throughout this document, particularly in the "Analysis of Benefits" section. Targeted upgrades of failing onsite systems are discussed in a variety of contexts, including the section on "Lower Capital Costs for Low Density Communities", which discusses why decentralized systems are most applicable for upgrading failing systems in small, rural communities and in ecologically sensitive areas. Examples of innovative or alternative technologies that provide additional treatment for sites with shallow soils and a variety of other hydro geological conditions are given in the section "Adaptable to Varying Site Conditions" and many such systems are described in Appendix A, "Definitions and Descriptions of Wastewater Systems." Small satellite treatment plants or leach fields which have low cost collector sewers are referred to as "cluster systems" or "package plants" throughout this report. Watershed planning and standards for targeting ecologically sensitive areas are discussed in the section on "Additional Benefits" and in Appendix B under "Comprehensive Planning." Maintenance, inspection, and monitoring programs are described in several sections related to management systems and Appendix C on "Management Systems."

SELECTED DEFINITIONS

Appendix A provides detailed definitions of many terms used in this document. There are several terms which are used extensively throughout this document and are defined here as well as in Appendix A.

- A **decentralized system** is an onsite or cluster wastewater system that is used to treat and dispose of relatively small volumes of wastewater, generally from individual or groups of dwellings and businesses that are located relatively close together. Onsite and cluster systems are also commonly used in combination.

- An **onsite system** is a natural system or mechanical device used to collect, treat, and discharge or reclaim wastewater from an individual dwelling without the use of community-wide sewers or a centralized treatment facility. A conventional onsite system includes a septic tank and a leach field. Other alternative types of onsite systems include at-grade systems, mound systems, sand filters and small aerobic units.

- A **cluster system** is a wastewater collection and treatment system where two or more dwellings, but less than an entire community, are served. The wastewater from several homes may be pretreated onsite by individual septic tanks or package plants before being transported through low cost, alternative technology sewers to a treatment unit that is relatively small compared to centralized systems.

maintained. Subsequently, in the 1980's, the Innovative and Alternative (I&A) Technology and Small Community set-asides of the Construction Grants program resulted in the construction of hundreds of small community technologies using centralized and decentralized approaches. Both programs provided some information on performance and costs of newer decentralized systems.

Circumstances changed in 1990, when the federal Construction Grants and I&A programs were eliminated. These programs were replaced by the Clean Water State Revolving Fund program, which provides communities with low interest loans. These programs have only been able to meet a small portion of the total needs. EPA's 1992 Needs Survey estimated the nation's documented wastewater needs to be $137 billion, with an increase of 39 percent from 1990 to 1992 (EPA, 1993). Small community needs comprised approximately 10 percent (over $13 billion) of total unmet needs in 1992. Furthermore, EPA estimated that replacing failing septic systems with new centralized system sewers and treatment facilities accounted for 40 percent of the small community needs (EPA, 1993).

Managed decentralized wastewater systems are viable, long-term alternatives to centralized wastewater facilities where cost-effective, particularly in small and rural communities. Decentralized systems already serve one-quarter of the population nationwide, and 50% of the population in some states. These systems merit serious consideration in any evaluation of wastewater management options for small and mid-sized communities and new development. In some cases, combinations of decentralized and centralized arrangements will be useful to solve diverse conditions.

HISTORY OF WASTEWATER MANAGEMENT

Onsite wastewater systems have been used since the mid-1800s, with technological advances improving the systems from simple outhouses to cesspools, to septic tanks, to some of the more advanced treatment units available today. In the 1970s and 1980s, large Federal investments in the construction of wastewater facilities focused primarily on large, centralized collection and treatment systems rather than on decentralized systems. Federal funds for wastewater systems increased significantly in 1972, as authorized in the Federal Water Pollution Control Act (later called the Clean Water Act). Municipalities used funds from the new Construction Grants program to build sewers and centralized treatment facilities to meet national standards for discharged pollutants (GAO, 1994). Between 1972 and 1990, the federal government spent more than $62 billion in this program for constructing or upgrading treatment facilities (Lewis, 1986).

The initial decision to install a particular system (i.e., hookup to a centralized system or use onsite systems) was primarily made in the private sector by the developer of a property, based on affordability or profitability. In small communities, developers often chose more affordable onsite systems which could be easily installed for each dwelling. Once installed, the onsite system was usually not examined again unless an emergency situation arose, with wastewater either backing up into backyards or streets even though in many cases, they were contributing to pollution of ground water and nearby surface waters. In most small communities, outdated state and local regulatory codes still promote the continued use of poorly maintained conventional onsite systems (a septic tank and leach field). In many of these communities, these systems are providing adequate public health and environmental protection, but in many cases, they are not.

The 1990 Census indicates that 25 million households use conventional onsite systems or cesspools. Data on the failure rate associated with these systems is limited; a national estimate is not available. However, during 1993 alone, a total of 90,632 failures were reported, according to a National Small Flows Clearinghouse survey of health departments across the country. Failure rates as high as 72 percent have been documented, such as in the Rouge River National Demonstration Project. Nationwide data show that failures of onsite wastewater systems are primarily due to improper siting (e.g., in low-permeability soils), improper design, poor installation practices, insufficient operation and maintenance of the systems, and lack of enforcement of codes. Some communities, such as Stinson Beach, CA (see Appendix E) and Warwick, RI, explored ways to prevent future failures, including managing decentralized systems to ensure that they were operated and maintained appropriately, and using alternative types of systems where site conditions made conventional onsite systems marginally applicable. During the 1970's, a number of state and local governments, including Gardiner, NY and Wood County, WV, with the support of the U.S. EPA Research and Development programs, experimented with different types of decentralized systems that could accommodate a variety of site and community conditions and meet environmental protection goals if properly operated and