

Choices for Communities

By David Branham

As the cost of collecting, treating, and disposing of human waste continues to spiral out of control, many factors enter into the fray. Mandatory wastewater rules and regulations have changed considerably from the days of the **big boom** of rural infrastructures that took place during the 1970s and 1980s. Thanks to major federal funding, during this period, installation of centralized wastewater systems to meet citizens' needs was not only common, but expected.

During the '70s and '80s, most rural communities considered only two options to meet their wastewater management needs:

- Continue using poorly maintained traditional septic systems, or
- Install an extensive pipe network that collects wastewater to a centralized, highly maintained wastewater treatment plant.

These centralized systems have been termed as the "big pipe" approach. Involved in this approach is an intensive network of large sewer pipes throughout a community to collect wastewater and bring it to a central treatment plant, followed by disposal in a stream or body of water.

Historically, wastewater treatment has been viewed as a disposal process, but today's emphasis is leaning more and more towards the emphasis being placed on reuse and recycling and thus **Decentralized Options Abound**.

Today there are multiple alternatives to centralized sewerage other than the conventional septic system, and this holds especially true where soil conditions are not favorable towards usual types of conventional septic systems. Some of these include.

- Sand filters
- Peat filters
- Pressure distribution system
- Drip-irrigation system

- Disinfection system

These types of systems are considered Cluster Systems and usually serve communities of about 5 to 100 houses. These systems bring the effluent to a common treatment and disposal area. One of the main cost considerations that make these systems attractive is that they use small-diameter gravity sewers and pressure systems that are less expensive to install than the large pipes used in the centralized approach.

While these land-based, alternative wastewater systems are recognized as viable options, the treatment strategies are relatively new and are not often recommended by some of the private sector. And in times past, these treatment techniques were not considered to be mainstream options that communities could depend on.

Fortunately, times have changed and land-based systems have been judged to be the most cost-effective and environmentally sound wastewater treatment options for rural communities, now and in the future. These systems pose minimal environmental impacts on streams and rivers; however, the regulatory community must still require assessment of land based alternatives. Bear in mind, that land-based systems require extensive planning and stepwise implementation depending on the area to be served.

Management, maintenance and inspection are the key for the success of the decentralized approach. It is imperative that a management program is established which assures that the systems are regularly inspected and maintained. Also, trained and certified system operators will ensure that systems function effectively. The centralized management can be provided on a community, county or multiple county area.

A New Long-Term Strategy is Needed

The clean water act of 1972 provided federal money for planning, design and construction of public wastewater infrastructure. From 1972

until 1993 when the Federal Construction Grant program existed, millions upon millions were spent in federal money. Even with these expenditures, it was clear that billions in unmet water and wastewater infrastructure needs still needed to be addressed. After 1993 other federal and state agencies stepped up to the plate and provided lots of grant monies for the systems, and all seemed well, until after the turn of the century.

A couple important things happened after that. Almost all grant monies disappeared; and not the least to worry about, the 1972 built systems had reached their life expectancy, leaving many systems in dire need of repair or replacement.

Expansion of sewers throughout rural areas using the centralized approach is fast becoming an option that is out of reach for many communities, without grant money availability it has simply become too costly. In many cases the cost of the collection system alone accounts for 70% to 90% of the construction costs for a community-wide sewer project. *Figure taken from (GAO, 1994).* The expense of constructing an extensive community collection pipe network becomes most costly in less densely developed communities.

Therefore, a comprehensive strategy needs to be developed for the timely and cost-effective treatment of municipal wastewater, especially in rural areas.

What are the Wastewater Treatment Options?

Wastewater can be treated and disposed of using either surface or subsurface land-based technologies or surface-water discharge systems. Land-based systems include land application systems that discharge on top of the ground (called nondischarge systems) and those that discharge underground into the soil (called subsurface disposal systems).

Nondischarge systems are permitted through the Department of Environmental Quality, Division

of Water Quality. These systems operate under what is known as a Water Pollution Control Facility (WPCF) permit. Systems that discharge to surface waters are permitted through the National Pollutant Discharge Elimination System (NPDES) program administered through the Department of Environmental Quality (DEQ).

Land-based systems are judged to be the most cost-effective and environmentally sound for rural communities under present and anticipated future conditions. Communities must determine the most cost-effective balance between on-site and cluster or community systems when utilizing land-based technologies. Because of minimal environmental impacts on streams and rivers, the regulatory community seems to prefer the land-based alternatives.

Comparison of the Centralized and Decentralized Approaches

Few cases exist where the decentralized approach to wastewater management has been compared evenly with the centralized approach. However, recently Congress asked the U.S. Environmental Protection Agency (EPA) to evaluate the capabilities and cost effectiveness of the decentralized approach to wastewater management and to identify barriers and solutions to implementation of this approach. According to the EPA Response to Congress (EPA, 1997), decentralized systems;

- Protect public health and the environment
- Are appropriate for low density communities
- Are appropriate for varying site conditions
- Provide additional benefits for ecologically sensitive areas, and
- Can provide significant cost savings while recharging local aquifers and providing other water reuse

opportunities close to the points of wastewater generation.

In its assessment, the EPA developed a detailed analysis of costs in a hypothetical rural community, comparing the decentralized approach with the traditional centralized approach to establish a wastewater management infrastructure. The rural community was assumed to have 450 people living in 135 homes. These homes were located on one-acre lots or larger that were serviced by conventional septic systems. It was assumed that 50% of the septic systems were failing. Three wastewater management options considered for the rural community were installation and long-term operation and maintenance of:

- (1) a centralized system
- (2) cluster system
- (3) managed on-site system

Expenditures included the capital costs necessary to install the system and annual costs to operate and maintain them. Costs are presented in 1995 dollars in the following table.

A special note about these figures: The monetary figures are in 1995 dollars. By today's standards, I believe the differential amounts to be much greater.

Communitywide management of on-site systems rarely has been utilized in the United States. Infrastructure limitations, however, are rapidly changing due to the realization that land-based treatment technologies are frequently the most cost-effective and environmentally productive methods for handling municipal wastewater in rural and small communities.

Today a multitude of infrastructure choices that range from centralized to decentralize and all options in between are available to serve communities' needs. In our state land-based option such as on-site systems, cluster systems; and especially, in Oregon, the use of land application systems is being widely adapted.

Land-based options such as cluster systems, and land application systems are frequently a more environmentally friendly approach where surface waters are particularly valuable or vulnerable to contamination. Plans for future growth, cost issues and water quality as well as quantity concerns regarding nutrient-sensitive watersheds, is of great concern, and available funding should be utilized to provide economically sound, dependable solutions to the largest number of communities possible. More rural communities will be positively impacted if land-based wastewater treatment options are embraced to meet future community needs.

Summary of hypothetical EPA rural community technology costs			
Technology option	Total capital cost (1995 \$)	Annual O&M cost (1995 \$)	Total annual cost (annualized capital plus O&M* – 1995 \$)
Centralized systems	\$2,321,840 - \$3,750,530	\$29,740 - \$40,260	\$216,850 - \$342,500
Alternative SDGS** Collections and small Cluster systems	\$598,100	\$7,290	\$55,500
On-site systems	\$510,000	\$13,400	\$54,500
NOTE: The rural community consists of 450 people in 135 homes * O&M means operation and maintenance ** SDGS stands for small-diameter gravity sewers			
(Adapted from EPA, 1997)			