



DECENTRALIZED WASTEWATER TREATMENT: A SENSIBLE SOLUTION



Many communities are considering decentralized wastewater treatment and the economic and environmental advantages these types of systems can offer. Today, decentralized treatment can provide the safety and reliability of conventional large scale treatment, and can also offer many additional benefits to communities. The papers included here provide examples where decentralized treatment can play an effective role in a community's wastewater treatment and represent the views of the EPA Decentralized MOU Partnership.

WHAT IS DECENTRALIZED WASTEWATER TREATMENT?

Decentralized wastewater treatment consists of a variety of approaches for collection, treatment and dispersal/re-use of wastewater for individual dwellings, industrial or institutional facilities, clusters of homes or businesses, and entire communities. These systems can be managed as standalone facilities or be integrated with centralized sewage treatment systems. They provide a range of treatment options from simple, passive treatment with soil dispersal, commonly referred to as septic or onsite systems, to more complex and mechanized approaches such as advanced treatment units which collect and treat waste from multiple buildings and discharge to either surface waters or the soil. They are typically installed at or near the point where the wastewater is generated.

These systems can:

- Serve on a variety of scales including individual dwellings, businesses, or small communities,
- Treat wastewater to levels protective of public health and water quality,
- Comply with municipal and state regulatory codes, and
- Work well in rural, suburban and urban settings.

WHY DECENTRALIZED WASTEWATER TREATMENT?

Decentralized wastewater treatment can be a smart alternative for communities considering new systems or modifying, replacing, or expanding existing wastewater treatment. For many communities, decentralized treatment is:

- **Cost Effective and Economical**
 - Avoiding large capital costs
 - Reducing operation and maintenance costs
 - Promoting business and job opportunities
- **Green and Sustainable**
 - Benefiting water quality and availability
 - Enhancing the soil
 - Using energy and land wisely
 - Responding to growth
 - Preserving green space and natural water flow
- **Safe and Protects Public and Environmental Health and Water Quality**
 - Protecting the community's health
 - Reducing conventional pollutants, nutrients, and emerging contaminants
 - Mitigating contamination and health risks associated with wastewater

THE BOTTOM LINE

Decentralized wastewater treatment can be a sensible solution for communities of any size and demographic. Decentralized systems, like any others, must be properly designed and well maintained and operated to provide optimum benefits. Where they are a good fit, decentralized systems help communities reach the triple bottom line of sustainability: good for the environment, good economically and good for the people.

The EPA Decentralized Wastewater Memorandum of Understanding (MOU) Partnership has served as an ongoing cooperative relationship between the EPA and 16 Signatory Organizations since 2005 to effectively and collaboratively address management and performance issues pertaining to decentralized systems.

WHERE IT'S WORKED

Loudoun County, VA

Loudoun Water, in Loudoun County, Virginia (a Washington, D.C., suburb) has adopted an integrated approach that includes purchased capacity from a centralized plant, a satellite water reclamation facility, and several small, community cluster systems. The approach has allowed the county to maintain its rural character and created a system in which growth pays for growth. Developers design and construct cluster wastewater facilities to Loudoun Water standards at their own cost and transfer ownership of the system to Loudoun Water for continued maintenance. The program is financially self-sustaining via rates that cover expenses. <http://www.loudounwater.org/>

Rutherford County, TN

Consolidated Utility District (CUD) of Rutherford County, TN provides sewer services to many of its outlying customers through an innovative system. The system being used often referred to as the "STEP" system (an acronym for Septic Tank Effluent Pumped) allows for high density development (Subdivisions) in areas of the county where City sewer is not available or soil types are not conducive to conventional septic tank and drain field lines. The 1500 gallon septic tank is equipped with a pump and control panel located at each residence for controlled discharge of wastewater to a centralized wastewater collection system which provides further treatment before it is discharged to the soil. For more information: <http://www.cudrc.com/Departments/Waste-Water.aspx>

Package plant



Drip irrigation field



ADDITIONAL RESOURCES

Environmental Protection Agency – Office of Wastewater Management Decentralized Program www.epa.gov/owm/onsite

Water Environment Research Foundation – Decentralized Systems http://www.werf.org/AM/Template.cfm?Section=Decentralized_Systems

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DECENTRALIZED WASTEWATER TREATMENT PROTECTS PUBLIC AND ENVIRONMENTAL HEALTH AND WATER QUALITY



Decentralized wastewater treatment protects public and environmental health and water quality in homes and communities by:

- *protecting the community's health,*
- *providing a highly-effective wastewater treatment method which reduces conventional pollutants, nutrients, and emerging contaminants, and*
- *mitigating contamination and health risks associated with wastewater.*

HOW DOES IT PROTECT PUBLIC AND ENVIRONMENTAL HEALTH AND WATER QUALITY?

Protects the community's health –

Decentralized systems offer just as much public health and environmental protection as centralized treatment. Like centralized treatment, decentralized treatment systems must be properly designed and constructed and well maintained. More than ever, these systems include good monitoring and backup that help prevent adverse discharges. The modern decentralized treatment system is capable of being every bit as reliable as other waste treatment alternatives.

Reduces conventional pollutants, nutrients, and emerging contaminants

– Decentralized treatment can produce a quality of effluent equal to or higher than other wastewater disposal options. This is because they are able to use the same advanced treatment technologies as discharging systems and by using the treatment capacity of the soil, achieve a high quality treatment at a lower cost. Cluster or community systems as they are sometimes referred, allow for centralized management of the wastewater, via contract by a third party – a Responsible Management Entity (RME). Some communities have entered into agreements with nearby public utilities or even local cooperatives.

Mitigates contamination and health risks associated with wastewater –

Sewage pathogens cause many human illnesses, including typhoid fever, gastroenteritis, cholera, dysentery, infectious hepatitis, aseptic meningitis and encephalitis. Using decentralized systems allows for multiple layers of treatment including advanced treatment and disinfection which mitigates the risk of transmission or human exposure. Small systems in single family homes can include secondary treatment from a variety of treatment technologies (e.g. aerobic treatment, recirculating filters, etc.). Larger neighborhood systems may be designed using high level treatment and pressure dispersal of highly treated wastewater to utilize marginal soils. Decentralized systems can be designed to overcome the potential health risks posed by septic systems in areas often considered unsuitable for development due to limited permeability, limited vertical depths and high water tables.

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Caroline County, VA

Caroline County, Virginia In the late 1990s, the Virginia Department of Health noted public health issues arising in the Dawn area of Caroline County, Virginia. Residents were suffering from failing or unreliable drain fields due to poor soils in the area. The County sought a declaration of "public health emergency" from the Virginia Department of Health. Early plans to correct with a centralized wastewater treatment plan proved cost-prohibitive, so the County turned to a decentralized solution. To finance the Dawn Project, non-local funding, including Community Development Block Grant funds, an EPA State and Territorial Assistance Grant as well as other grants and loans were pursued. Three years later, the first homes were fully connected to the working decentralized system (advanced control units, STEP tanks, and FAST units; see photo) in the summer of 2007, and within the next 18-months, 182 homes and businesses were connected to the Dawn Decentralized Wastewater Treatment System, thereby eliminating reliance upon conventional septic systems and eliminating the health risks for failing systems. Over half of the connected homes are owned by low-to-moderate

Recirculating sand filter, courtesy KOWA



income deed holders. The community was fully engaged throughout the process of this project, through surveying and construction, and by the completion of the project the community felt its needs were addressed. For more information: http://www.foresterpress.com/ow_0701_taming.html

ADDITIONAL RESOURCES

Source Water Protection Practices Bulletin: Managing Septic Systems to Prevent Contamination of Drinking Water – http://www.nesc.wvu.edu/pdf/www/septic/epa_septicwater_protection.pdf

Healthy Septic Systems – <http://www.cdc.gov/healthywater/emergency/septic/septic.html>

Crites, Ronald and George Tchobanoglous. 1998. Small and Decentralized Wastewater Management Systems. McGraw-Hill.

U.S. Environmental Protection Agency. 2002. Onsite Wastewater Treatment Systems Manual. EPA/625/R-00/008

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DECENTRALIZED WASTEWATER TREATMENT IS GREEN AND SUSTAINABLE



Decentralized wastewater treatment meets the triple bottom line of protecting the environment, being efficient and contributing to community well-being by:

- *benefiting water quality and availability,*
- *enhancing the soil,*
- *using energy and land wisely,*
- *responding to growth, and*
- *preserving green space and natural water flow.*

HOW IS DECENTRALIZED WASTEWATER TREATMENT GREEN?

Benefiting water quality and availability – Decentralized wastewater treatment effectively and efficiently treats domestic sewage to protect water quality and support local water supplies. The wastewater from decentralized systems stays in the local watershed as it returns to the drain field, dispersing into the underlying soil and eventually recharging ground water and/or reentering the local watershed. Advanced decentralized treatment systems can achieve treatment levels comparable to centralized wastewater treatment systems while minimizing the level of phosphates and nitrogen entering the ground water. Discharging to the soil can further remove contaminants so as to maintain water quality. Decentralized systems can be designed to meet specific treatment goals, to deal with unusual site conditions, and to address local environmental protection requirements.

Enhancing the soil – Decentralized wastewater treatment can make soils healthier. The slow percolation of wastewater in the soil can add valuable nutrients. Decentralized systems can also be designed to improve soil function by encouraging increased oxygen in the soil and other improvements such as promoting beneficial bacteria growth.

Using energy and land wisely – Most decentralized systems take advantage of gravity flow rather than using energy to pump the wastewater. Additionally, decentralized wastewater treatment systems often incorporate septic tanks at the wastewater source resulting in reduced costs and energy for treatment of septage prior to land dispersal.

Responding to growth – Decentralized systems can be flexible and scaled to a desired size or footprint. For example, decentralized systems can easily be scaled to a needed size for communities with rapid growth and/or where installing pipelines a long distance to a central waste facility can be too expensive. Decentralized systems can be designed to meet specific growth goals through planning for where and how the community will grow.

Preserving green space and natural water flow – Decentralized systems tend to have small, minimally intrusive environmental footprints and often have the benefit of creating green spaces in communities. Decentralized systems provide good opportunities to recover and reuse water and nutrients, especially in ways that mimic natural processes. This ability to use the natural environment can help reduce the level of difficult and costly to treat pollutants, such as nutrients, from entering lakes, rivers, and streams while also enriching local soil conditions. Using decentralized systems may also make it easier for a community to employ water reuse techniques and, as a result, reduce the demand for treated drinking water.

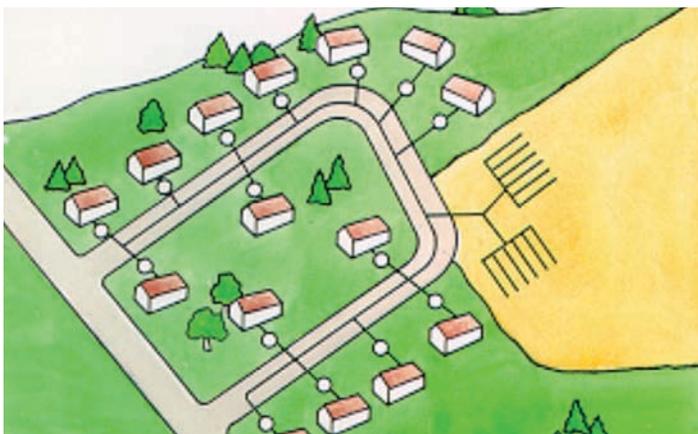
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WHERE IT'S WORKED

Shannock Woods Cluster Subdivision, RI

This steep sloped community selected a 7,200 gallon per day cluster system for the wastewater treatment of this 16-lot cluster subdivision rather than installing multiple individual systems to minimize soil erosion, maintain scenic views, and protect the drinking water as is located in a highly permeable aquifer recharge area. By centralizing the treatment components it drastically reduced the land area needed for the individual lots, preserving 50% for open space, and protected the individual drinking water wells from contamination. The system selected was able to remove 50% of the nitrogen.

Schematic of a cluster system



Lamont, MS

The community of Lamont Mississippi used decentralized wastewater treatment including a Septic Tank Effluent Gravity collection system. This system was more affordable than conventional treatment and better served the rural community because of its simple operation and maintenance, low energy requirements and low operation and maintenance costs. What makes this project a 'green' is that it uses energy wisely and allows the community to reuse its wastewater in beneficial ways.

Ground breaking ceremony for Lamont Demonstration Project



ADDITIONAL RESOURCES

Environmental Protection Agency – Office of Wastewater Management Decentralized Program www.epa.gov/owm/onsite

Smart, Clean and Green: 21st Century Sustainable Water Infrastructure – www.werf.org/smartcleangreen

New Approaches in Decentralized Water Infrastructure – <http://www.decentralizedwater.org/documents/04-DEC-5SG/04DEC5Highlights.pdf>

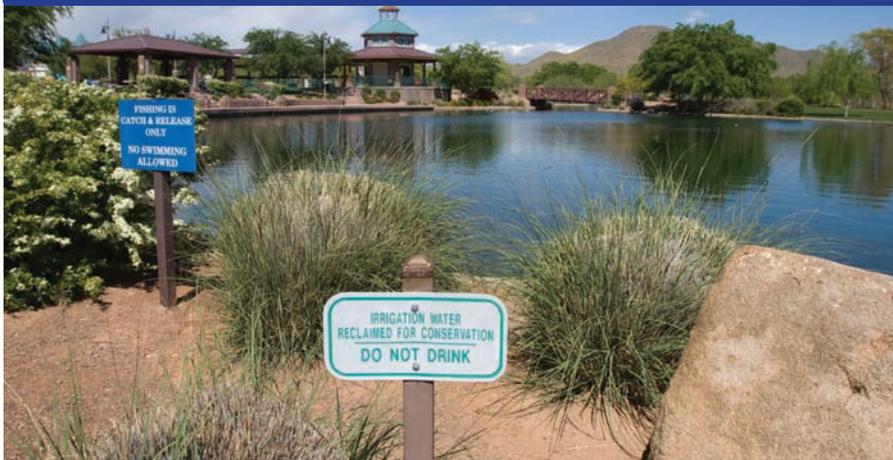
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DECENTRALIZED WASTEWATER TREATMENT CAN BE COST EFFECTIVE AND ECONOMICAL



Decentralized wastewater treatment can provide a long-term and cost-effective solution for communities by:

- *avoiding large capital costs*
- *reducing operation and maintenance costs*
- *promoting business and job opportunities*

HOW IS DECENTRALIZED WASTEWATER TREATMENT COST EFFECTIVE AND ECONOMICAL?

Avoiding large capital costs – For new and upgraded service, decentralized systems typically involve a small initial investment for a community relative to larger systems. Decentralized systems can be built “just-in-time” to meet local demands and take advantage of the latest cost-saving technology. Decentralized systems typically require less expensive and easy to install small piping. These systems can help communities delay or avoid costly infrastructure capacity upgrades to larger facilities. The costs of transporting waste over longer distances to reach existing facilities can also be avoided. As a bonus, decentralized systems can be recognized as “green” and thus may be eligible for special funding opportunities such as the green project reserve under the Clean Water State Revolving Fund.

Reducing operation and maintenance costs – Decentralized systems typically use small and relatively simple equipment that can be easy and affordable to operate, maintain, and replace. Additionally, because these types of systems treat wastewater close to the source of generation and often use some passive treatment such as soil dispersal, these systems may offer substantial savings in energy costs. A 2002 Electric Power Research Institute (EPRI) report concluded that at least 4% of energy use in the U.S. is directly associated with water transport and treatment. On a community level, this can translate to about 25% of a community’s energy use. Finally, because systems frequently serve a relatively small number of users, disruptions and costs associated with malfunctions are also relatively small.

Promoting business and job opportunities – Use of decentralized systems can generate local economic opportunity not only for service providers such as inspectors, installers, designers, etc. Engineers with local experience can be incredibly valuable in designing decentralized systems to ensure safe and efficient treatment of wastewater. In addition, jobs can be generated for service providers such as installers and pumpers as well as manufacturers—through increased demand). Financing of these systems can be on a small scale that provides opportunities for use of local financial institutions

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WHERE IT'S WORKED

Mobile, AL

The Mobile Area Water and Sewer System (MAWSS), the city of Mobile, Alabama together with South Alabama Utilities in Mobile County manage two centralized plants and more than 15 cluster systems serving residential, commercial, and school properties. In addition, a sewer mining demonstration project provides reclaimed water for landscape irrigation. Faced with significant growth and aging infrastructure, MAWSS decided to begin using cluster facilities to serve new residential developments. In this way, MAWSS improved service to residents, provided a new business and revenue source, and protected water quality using professionally managed decentralized systems, while saving money on costly sewer extensions. The sewer mining project demonstrated the feasibility and cost-effectiveness of integrating decentralization into an urban centralized system, as well as reuse of treated wastewater to conserve community water supplies. South Alabama Utilities has provided decentralized wastewater treatment service to growing parts of Mobile County where centralized wastewater service was not available or cost effective.

Advantage treatment units



Olympia, WA

The Lacey, Olympia, Tumwater, and Thurston County (LOTT) Alliance is a water and sewer utility serving an urban area. The Alliance wanted to meet the needs of a growing population with a system providing greater environmental benefits. The 20-year plan calls for construction of three satellite reclaimed water treatment plants that promote wastewater reuse, wisely managed community resources, and it also takes advantage of the latest advances in technology. The utility's plan includes a strong educational component, highlighting the benefits of water reclamation and reuse.

Wastewater lagoon



ADDITIONAL RESOURCES

Decentralized Water Resources Collaborative – www.decentralizedwater.org/research_by_category.asp

The Consortium of Institutes for Decentralized Wastewater Treatment – <http://www.onsiteconsortium.org/decentmgmt.html>

The Water Environment Research Foundation – www.werf.org/decentralizedcost

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