Report to Congress

on

Alternative Decentralized and Centralized Wastewater Treatment Technology

U.S. Environmental Protection Agency

Office of Water

July 2021

Table of Contents

Introduction

Purpose of the Report

The U.S. House of Representatives Committee on Transportation and Infrastructure and the U.S. Senate Committee on Environment and Public Works request that the U.S. Environmental Protection Agency (EPA) provide information as directed under America's Water Infrastructure Act of 2018 (AWIA), Section 4102, codified in 33 USC 1314a: Wastewater technology clearinghouse. This Report to Congress responds to Section 4102(2)(b), which requests the following:

(1) *The type and amount of information to units of local government and nonprofit organizations regarding alternative wastewater treatment and recycling technologies*;
(2) *The states and regions that have made greatest use of alternative wastewater treatment and recycling technologies; and*
(3) *The actions taken by the Administrator to assist states in the deployment of alternative wastewater treatment and recycling technologies, including onsite and decentralized systems.*

EPA's response to (1) *the type and amount of information to units of local governments and nonprofit organizations regarding alternative wastewater treatment and recycling technologies* includes publications, programs, and collaborations on decentralized and centralized wastewater technologies provided by EPA that states and nonprofit organizations utilized. For this report, EPA accessed all publicly available resources, including financing mechanisms focused on alternative wastewater treatment and recycling technologies. See Section 1 for more information.

EPA's response to (2) *the states and regions that have made greatest use of alternative wastewater treatment and recycling technologies* includes data on investments awarded to states through EPA loan and grant programs and information on technical assistance programs that EPA conducts for small facilities. For this report, EPA included the use of alternative wastewater treatment by states that have distributed funds specifically for these projects and programs. See Section 2 for more information.

EPA's response to (3) *the actions taken by the Administrator to assist states in the deployment of alternative wastewater treatment and recycling technologies, including onsite and decentralized systems*, includes a list of projects, programs, and platforms on decentralized and centralized wastewater technologies provided by EPA that facilitate their advancement and adoption. For this report, EPA interprets actions taken by the Administrator to refer to EPA-instructed programs and policies to assist in the adoption of alternative wastewater and recycling technologies.

The Wastewater Technology Clearinghouse, as mandated in AWIA, Section 4102(a), codified in 33 USC 1314a, is one of the platforms that assists states in the deployment of alternative wastewater treatment and recycling technologies. The Clearinghouse was launched in 2021 and available to the public. More information is described in Section 3 of this report.

Definitions

The following terms are defined as follows:

- "Alternative technologies" are fully proven wastewater treatment systems that reclaim or reuse wastewater, productively recycle wastewater components, recover energy, or eliminate pollutant discharge. Specific alternative technologies include onsite treatment or alternative wastewater conveyance systems for small communities, land treatment of wastewater and sludge, direct reuse (non-potable) of treated wastewater, aquifer recharge, composting, co-disposal of sludge and refuse, and methane recovery and use. Alternative technologies typically provide cost savings compared to conventional treatment because of lower operation and maintenance costs or cost recovery through productive use of wastes (EPA, 1989).

- "Advanced treatment" includes costs necessary to attain a level of treatment that is more stringent than secondary treatment or produces a significant reduction in nonconventional or toxic pollutants present in the wastewater treated by a facility. A facility is considered to have Advanced Wastewater Treatment if its permit includes one or more of the following: Biochemical Oxygen Demand (BOD) less than 20 mg/l, nitrogen removal, phosphorous removal, ammonia removal, metal removal, and synthetic organics removal; additionally, such facilities may be large or small (EPA, 2017).

- "Decentralized wastewater treatment system" or decentralized system is used as a general term to include a wide range of decentralized wastewater systems such as, but are not limited to, septic systems, onsite wastewater treatment systems, or onsite sewage disposal systems for use by an individual household. More specific definitions on the types of decentralized systems are found at https://www.epa.gov/septic.

- "Innovative technologies" are wastewater treatment processes or components that are not fully proven in the circumstances of their intended use, but based upon documented research and demonstration projects, appear to offer the promise of benefits that outweigh the potential risks of failure. Projects are designated as innovative on a case-by-case basis if they are significantly different from proven conventional or alternative technologies and if they offer the potential to significantly advance the state-of-the-art in terms of lifecycle costs, environmental benefits, or more efficient use of energy and resources (EPA, 1989).

- "Water efficiency" includes the costs associated with projects that reduce the demand for publicly owned treatment works (POTW) capacity through reduced water consumption. Examples include water meters, plumbing fixture retrofits or replacements, water efficient appliances, water efficient irrigation equipment (*e.g.,* moisture and rain sensing equipment), and educational programs (EPA, 2017).

- "Water reuse" includes the costs associated with the treatment and conveyance of treated wastewater that is being reused (*i.e.*, recycled water), including associated rehabilitation/replacement needs. Examples include distribution lines and equipment for application of effluent. The costs associated with additional unit processes to increase the level of treatment to

potable or less than potable but greater than that normally associated with surface discharge needs are reported as Advanced Treatment (EPA, 2017).

Summary

EPA's Office of Water is responsible for sharing information on the financing of alternative wastewater treatment and recycling technologies. Implementation of these effective and affordable technologies can reduce costs, improve efficiency, and protect public health and the environment.

EPA regularly provides information to the public on wastewater treatment systems and recycling technologies, including decentralized and onsite systems, water reuse, energy and water, nutrient removal, disinfection, and others. This Report to Congress describes the type and amount of information provided to local governments and nonprofit organizations, those states and regions that have made the greatest use of this information, and EPA's actions to assist states in the deployment of alternative wastewater treatment and recycling technologies.

A primary driver for innovative and alternative wastewater treatment technology came in 1977 from the Construction Grants Program, which promoted and created incentives for utilities to invest in these technologies. Of the more than $60 billion available through the Program for construction of public wastewater treatment projects, EPA utilized about $4.4 billion to finance nearly 2,700 projects involving alternative or innovative technologies. The Construction Grants Program later became the EPA's Clean Water State Revolving Fund (CWSRF) to support water and wastewater infrastructure through low-interest loans.

The 51 CWSRF programs have utilized information, funding, and technical assistance for eligible innovative and alternative treatment and recycling technologies. Since 1988, EPA has provided $46.8 billion in capitalization through the CWSRF, which all 50 states and Puerto Rico have used to provide over $145.4 billion in CWSRF assistance for water quality projects; 93 percent of those projects involved centralized wastewater treatment. The remaining 7 percent went to projects that addressed stormwater, promoted energy and water conservation, and mitigated nonpoint source pollution.

Congress also enacted the Water Infrastructure Finance and Innovation Act (WIFIA) in 2014 to further support water and wastewater infrastructure. The WIFIA program accelerates investment in water infrastructure by providing long-term, low-cost supplemental loans for regionally and nationally significant projects.

This report also discusses the dissemination of innovative and alternative treatment and recycling technology information through an EPA-developed Wastewater Technology Clearinghouse. The Clearinghouse is an information-sharing platform, providing resources on the cost-effectiveness and performance of innovative, alternative, and reuse wastewater technologies. One of its goals is to help fill a critical information gap for small, midsize, and decentralized communities that need access to information on proven innovative and alternative technologies to help inform their local solutions.

Section 1: Types and Amount of Information Provided to Local Governments and Nonprofit Organizations

This section presents EPA's efforts to promote alternative and cost-effective wastewater treatment technologies to the public and how it disseminates this information. For purposes of this report, the information is categorized into publications, programs, and collaborations. Specific descriptions of the information are provided in the following sections. Supporting details are also included in Sections 2 and 3, as appropriate.

Publications

EPA has produced numerous factsheets, reports, design manuals, and journal publications that promote decentralized, centralized, cost-effective, alternative wastewater, and recycling technologies. A list of these EPA publications is provided in Appendix B, Table 4.

Programs

EPA has supported alternative and innovative technologies through a variety of mechanisms that include grants, technology evaluation programs, and funding and financing vehicles. This section highlights the contributions made by past and current programs.

Construction Grants Program

The 1977 Amendment to the Clean Water Act (CWA) established the Innovative and Alternative Technology Program as a three-year term within the Construction Grants Program. This program, together with its implementing regulations, required all communities receiving federal construction grants to consider innovative and alternative technology incentive grants. For projects not performing to design expectations, the program offered the possibility of up to 100 percent modification or replacement grants. As a result, the Construction Grants Program encouraged many facilities to implement innovative and alternative technologies, which led to their adoption as a valid form of treatment. The success of this program led Congress to make it a permanent feature of the Construction Grants Program in 1981. It supported the use of innovative and alternative technologies for both decentralized and centralized wastewater treatment. The 1987 Amendments to the CWA designated 1990 as the last year of funding for the Construction Grants Program. The program is discussed further in Sections 2 and 3.

National Small Flows Clearinghouse (NSFC)

NSFC was funded by EPA in 1993 to help the nation's small communities and individuals solve their wastewater problems through objective information about onsite, decentralized wastewater collection and treatment systems. The NSFC products and information were the only national resource of its kind at the time that dealt with small community wastewater infrastructure. The NSFC program is no longer active.

Section 319 of the CWA

Congress enacted Section 319 of the CWA in 1987, establishing a national program to control nonpoint sources (NPS) of water pollution. Through Section 319, EPA provides funds and guidance to all 50 states, as well as territories and tribes, to implement their NPS programs. The projects are guided by state-specific NPS management program plans. These resources can support a wide variety of activities including regulatory or nonregulatory programs, technical assistance, financial assistance, education, training, technology transfer, watershed projects, and monitoring to assess the success of specific NPS

implementation projects. Section 319 funds are used to implement on-the-ground projects to improve water quality from a wide variety of NPS impacts or to protect water quality from potential impacts (*i.e.,* watershed implementation projects). NPS categories cover a spectrum of sources, such as agriculture, urban, silviculture, abandoned mine drainage, and decentralized wastewater treatment systems. Collectively, this work has restored over 10,000 miles of stream and more than 250,000 acres of lakes since EPA began tracking progress in 2005. Section 319 is one of the grant programs that still provides funding to address decentralized wastewater treatment needs. Decentralized projects funded through the NPS program are outlined in Section 2, Figure 1 of this report.

CWSRF Programs

The 1987 Amendments, under 33 U.S. Code Section 1383 to the CWA, established the CWSRF as a financial assistance program for a wide range of water infrastructure projects. The CWSRF replaced EPA's Construction Grants Program, described previously. States have the flexibility to fund a range of projects that address their highest priority water quality needs.

The 51 CWSRF programs, including Puerto Rico's program, function like banks by providing low-interest loans to eligible recipients for water infrastructure projects. As money is paid back into the state's revolving loan fund, the state makes new loans to other recipients for high priority water quality activities. Repayments of loan principal and interest earnings are recycled back into individual CWSRF programs to finance new projects that allow the funds to "revolve" at the state level over time. Eligible projects under CWSRF include the construction of POTWs; nonpoint source; national estuary program projects; decentralized wastewater treatment systems; stormwater**;** water conservation, efficiency, and reuse; watershed pilot projects; and energy efficiency. Section 2 provides state-specific information on use of the CWSRF for decentralized and centralized wastewater projects. This is an active program.

WIFIA Program

The Water Infrastructure Finance and Innovation Act of 2014 established the WIFIA program, a federal credit program administered by EPA for eligible water and wastewater infrastructure projects. WIFIA began providing loans in 2017. State-specific WIFIA funding for alternative wastewater treatment and recycling technologies is provided in Section 2. This is an active program.

Environmental Technology Verification (ETV) Program

The ETV Program was a public-private partnership between EPA and nonprofit organizations involving testing and evaluation. ETV verified the performance of innovative technologies from 1995 to 2014. It provided credible data on nearly 500 technologies, enabling purchasers, regulators, and others to make decisions on the adoption of these new technologies. ETV moved to a vendor/collaborator-paid program in 2007, with EPA providing in-kind technical support, quality assurance, program evaluation, and outreach. The program ended in 2014. In its 18 years, ETV verified 179 technologies for air, water, and soil or surface monitoring. The program also verified the following number of technologies listed by sector: 70 for air pollution control; 52 for drinking water treatment; 32 for greenhouse gas reduction or mitigation; 37 for ground and surface water quality protection; and 27 for pollution prevention.

Section 405 of the CWA

AWIA Section 4102(a)(2)(B) requires EPA to provide information on Section 405 which provides guidelines for the disposal and/or reuse of sludge. Section 405 specifies factors to determine the measures and practices applicable to each such use or disposal. Section 405 sets the framework for sewage sludge (biosolids) regulations and in 1993 brought the management of residuals from the

wastewater treatment processes to reside under the National Pollutant Discharge Elimination System (NPDES) permit program.

EPA played an important role in biosolids research, implementation of pilot projects, rulemaking, and funding. A summary of alternative projects that were funded through the Innovative and Alternative Wastewater Treatment Program on Sewage Sludge are categorized by state in Appendix D, Table 11.

Collaborations

EPA created a Decentralized Wastewater Memorandum of Understanding (MOU) Partnership in 2005 with federal agencies, state organizations, non-profits, and industry partners. The partnership began with eight partners and now includes 20 partners from across the decentralized community. One of the MOU's objectives is to improve decentralized wastewater treatment system performance through improved practitioner competency, management practices, research, and technology transfer. The MOU Partnership is renewed every three years; most recently in 2020. See Section 2 for more information on the MOU.

EPA has also partnered with wastewater associations to support "Utility of the Future" and "Effective Utility Management," which highlight organizational transformations of utilities through supporting innovation and fostering collaboration in the sector. EPA is planning a new collaborative initiative to create a Clean Water Technology Center. The Center will help communities make informed decisions on innovative and alternative technology solutions for a resilient and sustainable water future. EPA is assessing this collaboration based on available resources.

EPA has used websites, webinars, clearinghouses, conferences, collaborative efforts with state and non-profit organizations, and technical assistance programs to disseminate the above information. Some of the specific platforms are discussed in Section 3.

Section 2: State and Regions Use of Information Provided by EPA

EPA has played an important role in providing resources to states and regions on the use of alternative technologies. The following activities, organized by projects and programs, illustrate the use of EPA resources by states and regions. In general, there is limited data to quantify state or region-specific use of alternative technologies, but information is provided where available.

Projects

Section 319 of the CWA

Section 1 of this report describes specific Section 319 project eligibilities. From 2002 to 2019, 352 distinct projects associated with decentralized wastewater management were funded by Section 319. Many of these projects had broader watershed-wide goals and objectives and were not solely focused on managing decentralized wastewater treatment systems. For example, a single project might use Section 319 funds for both agricultural best management practices and septic system repairs or replacements. Appendix A, Table 3 shows a state ranking by the number of Section 319 projects associated with decentralized wastewater (EPA, 2019).

Figure 1 shows the distribution, by activity type, among all Section 319-funded projects associated with decentralized wastewater treatment systems. The data show that 319 funds support many types of decentralized wastewater projects.

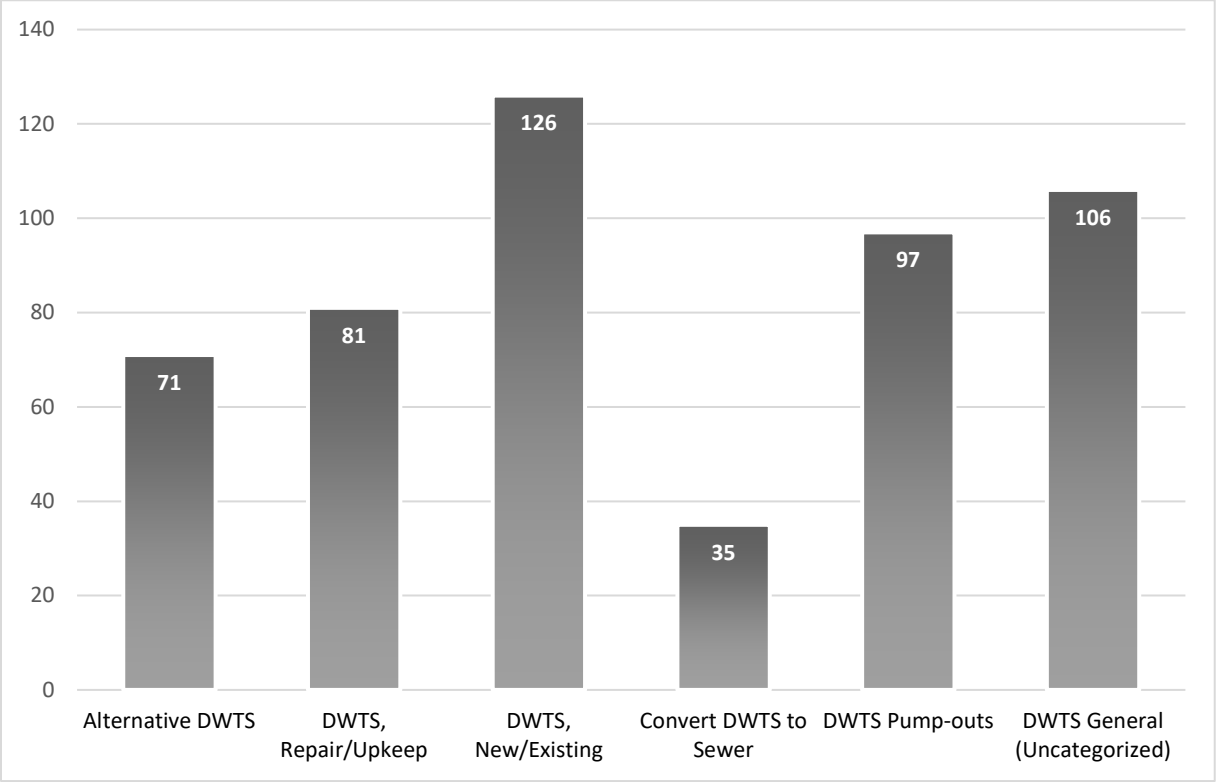

Figure 1: Section 319-Funded Decentralized Wastewater Treatment System (DWTS) Projects by Activity Type, 2002-2019

National Community Decentralized Wastewater Demonstration Projects

EPA responded to a 1997 request from Congress to assess the benefits, costs, and the applicability of decentralized wastewater treatment technology and management to help address the nation's water quality problems. EPA published the report, "Response to Congress on Use of Decentralized Wastewater Treatment Systems," which set the stage for several initiatives at the federal level to support advancements in the field and provide guidance to state and local officials and experts across the country. For example, as described in Section 1, EPA created the Decentralized Wastewater MOU Partnership to improve the overall performance and management of decentralized systems. The decentralized partnership provides facilitated collaboration between EPA, state and local governments, and national organizations representing practitioners in the industry. The MOU partners have effectively worked together to facilitate information exchange on system technology, collaborate to support training efforts, promote public awareness on septic system care and maintenance, and produce materials on decentralized systems.

The 1997 Response to Congress also resulted in funding a series of National Community Decentralized Wastewater Demonstration Projects in 1999 through congressional earmarks. Congress designated 19 sites, from 14 states, at funding levels ranging from $570,000 to $5.5 million. These demonstration projects were intended to jump start technology transfer of improved treatment methods and

management approaches. EPA selected these projects to provide a diversity of climate, soil, and ecosystem types, while focusing on different challenges or aspects of innovative technology and or management. A detailed list of projects is in Appendix A, Table 2.

Programs

Construction Grants Program

As mentioned previously, provisions in the 1977 CWA established the Innovative and Alternative Technology Program as part of the Construction Grants Program. Appendix D, Table 9, shows the funds obligated to states through this program and the number of projects completed. Appendix D, Table 10 and Table 11, provide a detailed summary of the innovative and alternative technologies used.

CWSRF Programs

As described in Section 1, eligible projects for CWSRF funds include the construction of POTWs; nonpoint source; national estuary program projects; decentralized wastewater treatment systems; stormwater**;** water conservation, efficiency, and reuse; watershed pilot projects; and energy efficiency. The majority of CWSRF funds (93 percent) go towards centralized wastewater projects. Appendix C presents the states who have used CSWRF loan cumulative funds toward water reuse projects, advanced treatment systems, water efficiency, and decentralized projects. The top five states from 1988 to 2020 that utilized CWSRF funds for these purposes are California ($4,771,608,683), Florida ($2,161,803,540), Texas ($1,429,986,213), Virginia ($1,321,162,170), and North Carolina ($1,236,278,262).

WIFIA Program

As described in Section 1, WIFIA began providing loans in 2017 to eligible water and wastewater infrastructure projects. Table 1 includes a list of the states and total WIFIA funds that have distributed. All loans have been closed since December 2020 (EPA, 2020). While WIFIA has broad program eligibilities, a significant number of funded projects have included innovative, alternative wastewater treatment and recycling technologies.

Table 1: State Use of WIFIA Funding as of December 2020

State	WIFIA Funding
California	$3,259.9M
Florida	$745.4M
Oregon	$638.2M
Rhode Island	$458.7M
Indiana	$436.0M
Utah	$348.6M
Washington	$346.7M
Georgia	$326.9M
Kansas	$280.9M
Virginia	$225.8M
Maryland	$202.0M
Tennessee	$176.7M
Wisconsin	$137.1M
Nebraska	$69.7M
Missouri	$47.7M

New York	$16.2M
Total	**$7,716.0M**

Section 3: Actions Taken by the Administrator to Assist States in the Deployment of Alternative and Recycling Technologies

This section highlights the major EPA actions to assist states in the deployment of alternative wastewater treatment and recycling technologies, including onsite and decentralized systems. The relevant projects, programs, and platforms are described and supporting information is provided in the identified tables. A more detailed description of the Wastewater Technology Clearinghouse is also provided.

Projects

The National Decentralized Water Resources Capacity Development Project

The Decentralized Water Resources Collaborative (DWRC), more formally known as the National Decentralized Water Resources Capacity Development Project (NDWRCDP), was a cooperative effort funded by EPA to support research and development of decentralized wastewater and stormwater systems. The project committed to advancing knowledge, science, and training in decentralized systems to build the capacity of organizations and individuals to appropriately implement them. The program supported 70 different research projects during Phase 1 (1997-2003) and Phase 2 (2003-2010).

The Wastewater Information System Tool (TWIST)

EPA created the Wastewater Information System Tool (TWIST) in 2006. It is an off-the-shelf, user-friendly management tool for state and local health agencies to catalogue and manage small wastewater treatment systems. TWIST is designed to track information on homes and facilities served, permits, site evaluations, types of systems, inspections, and complaints. TWIST is no longer funded but the tool and user guide are available at: https://www.epa.gov/septic/wastewater-information-system-tool-twist

Programs

Construction Grants Program

As mentioned in Sections 1 and 2, the 1977 Amendment to the CWA established the Innovative and Alternative Technology Program, which was successful at promoting the use of alternative technology. From 1979 to 1987, EPA invested nearly $23 billion in approximately 6,750 municipal wastewater treatment projects. During this same time period, almost $3.3 billion went towards nearly 2,100 alternative technology projects and about $1 billion toward almost 600 innovative projects. Thus, over those eight years, 14 percent of the total dollars invested by EPA for municipal wastewater systems were for alternative projects. In summary, these 2,100 alternative technology projects were: (1) more than 30 percent of the total number of projects; (2) nearly 50 percent for communities with less than 3,000 people; (3) nearly two-thirds for communities with less than 10,000; and (4) for 236 decentralized projects. Appendix D presents the number of projects (categorized by state and territory) that were funded through the Construction Grants Innovative and Alternative Technology Program.

Wastewater Operator Training Program

In 1982, through the CWA Section 104(g)(1), EPA implemented a wastewater operator training program. The training program helped small communities protect public health, address noncompliance, maintain water quality standards, and support the development of a qualified wastewater workforce. It provided timely on-site technical assistance to efficiently operate and maintain wastewater treatment facilities and make water infrastructure sustainable. The program provided grants from 1982 through 2007, to states or training centers to assist over 200 facilities a year meet the NPDES compliance requirements or improve performance.

Section 319 of the CWA

EPA's Nonpoint Source Program, Section 319, provided guidance on the management of decentralized wastewater treatment systems in 1993, 2005, and 2010. The following EPA guidance documents are available:

- "Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters" was produced in 1993, as required under the Coastal Zone Management Act Reauthorization Amendments (CZARA) of 1990. Chapter 4 of this document included two management measures for onsite disposal systems: one for new onsite systems and another for operating onsite systems. Those states with coastal nonpoint source programs developed under CZARA must have programs that implement these two management measures. Thus far, this guidance applies to 34 state and territory coastal nonpoint source programs. To date, EPA, in conjunction with the National Oceanic and Atmospheric Administration (NOAA), have fully approved 23 state and territory coastal nonpoint source programs. These agencies continue to work closely with the 11 remaining states to complete the development of their coastal nonpoint source programs (EPA, 1993).

- EPA published the "National Management Measures to Control Nonpoint Source Pollution from Urban Areas" in 2005. Chapter 6 of this document included a management measure on new and existing onsite wastewater treatment systems. This voluntary guidance was an update to the 1993 CZARA guidance and written for audiences at the national level, not just coastal states and territories.

- As required under Section 502 of the Executive Order 13508, EPA produced "Guidance for Federal Land Management in the Chesapeake Bay Watershed" in 2010. This guidance presented the most effective tools and practices to address nonpoint source pollution from federal land management activities in the Chesapeake Bay watershed. Chapter 6 of this document presented five implementation measures to minimize nitrogen from decentralized wastewater treatment systems (EPA, 2010). This document served as the basis for "The Model Program for Onsite Management in the Chesapeake Bay Watershed" published by EPA in 2013. Along with these guidance documents, EPA's NPS Program co-published an "Onsite Wastewater Treatment Systems Manual" with EPA's Office of Research and Development in 2002. The manual provided information on onsite wastewater treatment system siting, design, installation, maintenance, and replacement. It reflected identified advances to help onsite systems become more cost-effective and environmentally protective. In addition to providing a wealth of technical information on a variety of traditional and new system designs, the manual promoted a performance-based approach to selecting and designing onsite systems.

Technical Assistance Programs

EPA's Office of Water provides approximately $1 million annually for on-site training and technical assistance for small wastewater and decentralized treatment systems, from the appropriated Environmental Program Management Funds. The grant recipient conducts technical, managerial, and financial assessment of small facilities, and provides technical assistance to meet compliance issues due to limited funding sources and improper operation of complex treatment systems. The grant recipient also conducts classroom trainings and webinars to improve the operational and managerial skills for small wastewater treatment and decentralized treatment systems. The recipient assists small, tribal, and rural communities to receive funds from various sources like EPA, U.S. Department of Agriculture, and other state and regional agencies, and provide guidance to managers of these communities.

Effective Utility Management (EUM) Program

EPA's Office of Water manages the EUM Program, which helps utilities of all sizes assess their current effectiveness. The assessment is based on a series of "Attributes of Effectively Managed Utilities" and used to develop a roadmap for improving their effectiveness in priority areas, such as energy and water efficiency, workforce development, asset management, and other critical aspects of their operations. The EUM Program has sponsored over 20 workshops and webinars to train utilities on how to use EUM to improve their performance. EPA also partners with a range of professional water associations that support EUM.

Water Conservation and Efficiency Savings

EPA produced the "Best Practices to Consider When Evaluating Water Conservation and Efficiency as an Alternative for Water Supply Expansion" in December 2016. This document helped water utilities and federal and state governments assess the potential for future water conservation and efficiency savings and avoid or minimize the need for new water supply development. It also may be used by a utility or a third party to conduct assessments on how the utility is managing its water resources from a technical, financial, and managerial perspective. The document consisted of six major practices, with suggested metrics to guide evaluations of progress. No single metric was intended to serve as a stand-alone test. Instead, the combined information on water conservation and efficiency implementation, with emphasis on planned measures, can inform evaluations of a project's purpose and need, in addition to analysis of alternative projects.

Interagency Agreement (IA) between EPA and the Indian Health Service (IHS) for Technical Assistance, Training and Education for Tribal Wastewater Utilities

The Consolidated Appropriations Act of 2017 (Public Law 115-31) funded the Clean Water Indian Set Aside (CWISA) at $30 million, including a provision that up to $2 million of CWISA funds could be used for technical assistance, training, and educational programs related to the operation and management of treatment works for tribes. Since 2018, EPA has maintained an IA with IHS, at $2 million per year, to implement the technical assistance, training, and education of tribal wastewater utilities, including decentralized wastewater systems. The IA includes two primary tasks: (1) onsite training and technical assistance; and (2) operator certification and group training. The intent is to build tribal capacity to manage and operate their systems and provide technical assistance and training when requested by a tribe. IHS facilitates certification opportunities for personnel operating wastewater utilities in Indian country. IHS also provides classroom training opportunities to enhance the ability of tribal management entities to operate and maintain their wastewater facilities. This IA advances the missions of IHS and EPA to assist the 567 federally recognized tribes and Alaskan native villages to ensure their built wastewater infrastructure meets its design expectations.

Platforms

EPA Decentralized Wastewater Program Website

The EPA Decentralized Wastewater Program website (https://www.epa.gov/septic) includes information for homeowners and technical resources, such as case studies, guidance, and learning modules. To keep up with new alternative technology and information, EPA's Decentralized Program hosts webinars on related topics (https://www.epa.gov/septic/webcasts-about-onsite-wastewater-treatment).

National Water Reuse Action Plan

Over the past few decades, agriculture, industry, and communities have demonstrated the value of reusing water, largely in response to various forms of water crises, such as drought or source water contamination. Water reuse can increase water security, sustainability, and resilience, especially when considered at broader scales (*e.g.,* watershed, basin, regional) through integrated and collaborative water resource planning approaches. Stakeholders were engaged across the water sector to develop the National Water Reuse Action Plan in 2019. The plan aimed to accelerate the consideration of water reuse approaches and build on existing science, research, policy, technology, and both national and international experiences (EPA, 2019).

Other EPA Efforts

EPA continues to support states in the deployment of alternative wastewater treatment and recycling technologies through understanding the available information platforms and identifying gaps in resources and technologies. EPA provides program support, develops guidance and technical assistance documents, provides funding opportunities, and aligns with sector needs by providing tools to address barriers to technology adoption.

Currently, the Office of Water continues to develop technical information focused on alternative and innovative technologies and has several reports under development.

Wastewater Technology Clearinghouse

EPA launched a Wastewater Technology Clearinghouse, per AWIA Section 4102(a), to assist in sharing information and deploying alternative, recycling, and reuse wastewater technologies. The Clearinghouse includes sections for both decentralized and centralized treatment technologies. It also provides information on cost-effectiveness, where available. EPA is engaged with key industry partners and stakeholders (*e.g.,* water associations, utilities, state CWSRF programs, academics, and regulators) to better understand the current innovative technology information dissemination needs and how the Clearinghouse can best meet them. The goal of the Clearinghouse is to help fill a critical information gap for small, midsize, and decentralized communities that need access to information on proven innovative and alternative technologies to help inform their local solutions. The website for the wastewater technology clearinghouse can be found at this link.
https://ofmpub.epa.gov/apex/wfc/f?p=259:1:10752547968605:::::

Conclusion

Sustainable wastewater infrastructure is essential for environmental protection, financial viability, and economic development of communities across the U.S. For nearly 50 years, EPA has played a significant leadership role in the water sector by helping communities protect public health and the environment through the sustainable management of their systems.

In order to meet Section 4102(2)(b) of AWIA, historical and current data were gathered from grant and loan programs, in addition to a review of existing EPA materials. EPA reports, publications, funding programs, and technical assistance documents were compiled to show the types and amount of information provided to units of local government and nonprofit organizations regarding alternative wastewater treatment and recycling technologies. EPA provided data on investments awarded to the states through EPA-funded loan, grant, and technical assistance programs to show which states and regions have made the greatest use of alternative wastewater treatment and recycling technologies. An overview of programs initiated through EPA seed money, including grant programs, technical assistance tools, guidance documents, and other resources were compiled to show which actions taken by the Administrator have assisted states in the deployment of alternative wastewater treatment and recycling technologies.

Through past and current EPA programs, collaborations with utilities, states, tribes, local governments, associations, and other federal agencies, EPA's ongoing efforts to develop and share resources on the performance and cost effectiveness of innovative and alternative wastewater treatment and recycling technologies are readily visible.

Appendix A: Decentralized Projects

Table 2: Decentralized Demonstration Projects

Project Description (Year Completed)	Location	Grantee	EPA Grant	Type of Demonstration
Integration of Decentralized Wastewater Management Concepts into an "Urban Centralized" Infrastructure (2007)	Mobile, AL	Mobile Area Water & Sewer System	$1,140,305	System Installation
Importance of Responsible Management Entity (RME) and Various Advanced Treatment Technologies in Areas of Poor Soil (2007)	Table Rock Lake, MO	Table Rock Lake Water Quality, Inc.	$1,940,000	System Installation
The Alabama Center for Rural Enterprise (ACRE) Model for Rural Communities (2014)	Lowndes County, AL	Alabama Center for Rural Enterprise	$571,300	Community Assessment
A Local Approach to Wastewater Regulation and Management (2013)	Colchester, VT	Town of Colchester	$1,530,200	Community Assessment
Improved stormwater runoff pollution through Low Impact Development (LID) and decentralized wastewater technologies (2016)	Upper Pawtuxent Watershed, MD	Prince George's County Government	$993,500	System Installation
Dealing with E. coli Issues Through Use of Advanced Wastewater Treatment Systems in the Left Fork Watershed (2010)	Mud River, WV	Lincoln County Commission	$993,486	System Installation
Demonstration of Stormwater Management Techniques in A Suburban Setting (2014)	South Burlington, VT	City of South Burlington	$1,500,000	Stormwater Improvements/ Installation
Use of an “Eco-Machine” to Treat Stormwater and River Water on the Blackstone River at Fisherville Mill (2012)	Town of Grafton, MA	Town of Grafton	$671,000	Stormwater Improvements/ Installation
Protection of Groundwater Resources in the Upper Deschutes Watershed (2005)	La Pine Sub-Basin, OR	Deschutes County	$5,500,000	System Installation
A Rural Community Approach to Decentralized Wastewater System Management (2005)	Town of Warren, VT	Town of Warren	$1,500,000	System Installation
A Blueprint for Community-based Wastewater Management (2007)	Block Island and Green Hill Pond Watershed, RI	Town of South Kingstown	$3,000,000	System Installation

Rodale Institute's Next Generation Decentralized Wastewater Treatment System: The Water Purification Eco-Center (2013)	Kutztown, PA	Rodale Institute	$695,450	System Installation
Restoring Urban Watersheds Using Decentralized Water Resources Management (2009)	Philadelphia, PA	Pennsylvania Water Department	$942,750	Stormwater Improvements/ Installation
An Innovative Approach to Solving Wastewater Treatment Problems in Low-Income Communities (2009)	Lower Rio Grande Valley, TX	The Rensselaerville Institute	$867,300	System Installation
An Innovative Approach to Solving Wastewater Problems in Chepachet Village (2012)	Glocester, RI	City of Glocester	$671,000	System Installation
Hyatt Wetlands Stormwater Treatment (2015)	Boise, ID	City of Boise	$975,838	Stormwater Improvements/ Installation
Demonstration of Innovative Approaches to Distributed Stormwater Management in Northeast Ohio (2011)	Chagrin River, OH	Chagrin River Watershed Partners, Inc.	$745,600	Stormwater Improvements/ Installation
The Demonstration of New Advanced Wastewater Treatment Technologies at the Skaneateles Lake Watershed (2009)	Skaneateles Lake, NY	City of Syracuse	$665,095	System Installation
Decentralized Wastewater Treatment with a Centralized Management Approach in the Florida Keys (expected 2021)	Monroe County, FL	Florida Keys Aqueduct Authority	$3,648,679	System Installation

Table 3: Number of Decentralized Section 319 Demonstration Projects by State

State	Number of Projects	State	Number of Projects	State	Number of Projects
Virginia	69	Nebraska	10	Connecticut	2
Kentucky	30	Wyoming	10	Hawaii	2
South Carolina	21	Minnesota	9	New York	2
Tennessee	20	North Carolina	9	Idaho	1
Missouri	19	North Dakota	7	Michigan	1
West Virginia	19	Alabama	6	New Hampshire	1
Indiana	17	Florida	6	New Mexico	1
Kansas	17	Maryland	6	Ohio	1
Texas	14	Rhode Island	6	South Dakota	1
Oklahoma	12	Arizona	5		
Georgia	11	Louisiana	4		
Iowa	11	California	2		
Total Number of 319-Funded Decentralized Demonstration Projects Nationwide = 352					

Appendix B: Wastewater Technology Clearinghouse Publications

Table 4: List of EPA Publications on Treatment Technologies

Decentralized and Onsite Systems	Cost-Effective Treatment Technologies	Alternative Treatment Technologies	Recycling Treatment Technologies
Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems (2003)	Holistic Analysis of Urban Water Systems in the Greater Cincinnati Region	Emerging Technologies for Wastewater Treatment and In-Plant Wet Weather Management (2013)	Guidelines for Water Reuse: 1980, 1992, 2004, 2012
1980 Onsite Wastewater Treatment and Disposal Systems (Design Manual)	Energy and greenhouse gas life cycle assessment and cost analysis of aerobic and anaerobic membrane bioreactor systems: Influence of scale, population density, climate, and methane recovery	Emerging Technologies for Biosolids Management (2006)	2017 Potable Reuse Compendium
2002 Onsite Wastewater Treatment Systems Manual	Life cycle assessment of a rainwater harvesting system compared with an AC condensate harvesting system	Emerging Technologies for Conveyance Systems New Installations and Rehabilitation Methods (2006)	Constructed Wetlands for Greywater Recycle and Reuse
Introduction to Decentralized Wastewater Treatment: A Sensible Solution	Effect of Nutrient Removal and Resource Recovery on Life Cycle Cost and Environmental Impacts of a small-scale water resource recovery facility	Evaluation of Energy Conservation Measures for Wastewater Treatment Facilities (2010)	Emergy Analysis for the Sustainable Utilization of Biosolids Generated in a Municipal Wastewater Treatment Plant
Decentralized Wastewater Treatment Can Be Cost Effective and Economical	Cost-Effectiveness of Nitrogen Mitigation by Alternative Household Wastewater Management Technologies	Municipal Nutrient Removal Technologies Reference Document, Vol I & II (2008)	Life cycle assessment of a rainwater harvesting system compared with an AC condensate harvesting system
Decentralized Wastewater Treatment Can Be Green and Sustainable	Holistic Analysis of Urban Water Systems in the Greater Cincinnati Region: (1) Life Cycle Assessment and Cost Implications	Land Application of Sewage Sludge and Domestic Septage (1995)	A Review of Polymeric Membranes and Processes for Potable Water Reuse

Decentralized Wastewater Treatment Can Protect the Environment, Public Health, and Water Quality	Comparing the Life Cycle Energy Consumption, Global Warming and Eutrophication Potentials of Several Water and Waste Service Options	Nutrient Control Design Manual (2010)	Municipal Wastewater-A rediscovered resource for sustainable water reuse
Fact Sheet: Distributed Systems Overview	Environmental and cost life cycle assessment of disinfection options for municipal wastewater treatment	Comammox functionality in Diverse Engineered Biological Wastewater Treatment Systems	Review of pathogen treatment reductions for onsite non-potable reuse of alternative source waters
Fact Sheets: Composting Toilets	Life Cycle Assessment and Cost Analysis of Water and Wastewater Treatment Options for Sustainability: Influence of Scale on Membrane Bioreactor Systems	Influence of wastewater disinfection on densities of culturable fecal indicator bacteria and genetic markers	Human health impact of non-potable reuse of distributed wastewater and greywater treated by membrane bioreactors
Fact Sheets: Incinerating Toilets	Life Cycle Assessment and Cost Analysis of Distributed Mixed Wastewater and Graywater Treatment for Water Recycling in the Context of an Urban Case Study	Design and Evaluation of Degassed Anaerobic Membrane Biofilm Reactors for Improved Methane Recovery	Suspect screening and prioritization of chemicals of concern (COCs) in a forest-water reuse system watershed
Fact Sheets: Oil Recirculating Toilets		Mineralizing urban net-zero water treatment: Phase II field results and design recommendations	Characterization of the relative importance of human- and infrastructure-associated bacteria in grey water: a case study
Fact Sheets: Aerobic Treatment		Ozone-UV net-zero water wash station for remote emergency response healthcare Units: Design, operation, and results	Application of the CANARY Event Detection Software for Real-Time Performance Monitoring in Water Reuse Systems
Fact Sheets: Evapotranspiration		Phosphate Removal using Modified Bayoxide®E33 Adsorption Media	Comparison of emerging contaminants in receiving waters downstream of a conventional wastewater treatment plant and a forest-water reuse system

Fact Sheets: Low Pressure Pipe Systems		Abiotic Transformation of Estrogens in Synthetic Municipal Wastewater: An Alternative for Treatment?	Nutrient recovery from municipal wastewater for sustainable food production systems: An alternative to traditional fertilizers
Fact Sheets: Mound Systems		Disinfection of Wastewater with Peracetic Acid and UV Combined Treatment: A Pilot Study	Determining pathogen and indicator levels in Class B municipal organic residuals used for land application
Fact Sheets: Septage Treatment /Disposal		Evaluation of a Gravity Flow Membrane Bioreactor for Treating Municipal Wastewater	A Spike Cocktail Approach to Improve Microbial Performance Monitoring for Water Reuse
Fact Sheets: Septic Systems Tanks		Management options for reducing the release of Antibiotics and Antibiotic Resistance Genes to the environment	Simulation of enteric pathogen concentrations in locally collected greywater and wastewater for microbial risk assessments
Fact Sheets: Septic Systems Leaching Chamber		Effects of vegetation, limestone and aeration on nitrification, anammox and denitrification in wetland treatment systems	Method Development and Application to Determine Potential Plant Uptake of Antibiotics and Other Drugs in Irrigated Crop Production Systems
Fact Sheets: Ultraviolet Disinfection		Treatment of reverse osmosis concentrate using an algal-based MBR combined with ozone pretreatment	De Facto Water Reuse: Bioassay suite approach delivers depth and breadth in endocrine active compound detection
Fact Sheets: Septic Tank for Large Flow Applications		Whole community metagenomics in two different anammox configurations-process performance and community structure	Arsenic mobilization and attenuation by mineral–water interactions: implications for managed aquifer recharge
Fact Sheets: Septic Tank-Soil Adsorption Systems		Sewage Reflects the Distribution of Human Faecal *Lachnospiraceae*	Water Chemistry Impacts on Arsenic Mobilization from Arsenopyrite Dissolution and Secondary Mineral Precipitation: Implications for Managed Aquifer Recharge

Fact Sheet: Small Diameter Gravity Sewer		Evaluation of *Bacteroides fragilis* GB-124 bacteriophages as novel human-associated faecal indicators in the United States	Human Health Impact of Cross-Connections in Non-Potable Reuse Systems
Fact Sheet: Types of Filters		Bacteriophages as indicators of fecal pollution and enteric virus removal	Assessing the impact of wastewater treatment plant effluent on downstream drinking water-source quality using a zebrafish (*Danio Rerio*) liver cell-based metabolomics approach
Fact Sheet: Control Panels		Quantifying the Effects of Surface Conveyance of Treated Wastewater Effluent on Groundwater, Surface Water, and Nutrient Dynamics in a Large River Floodplain	Food Waste to Energy: How Six Water Resource Recovery Facilities are Boosting Biogas Production and the Bottom Line
Fact Sheet Recirculating Sand Filters		Quantitative Real-Time PCR Analysis of Total Propidium Monazide - Resistant Fecal Indicator Bacteria in Wastewater	Thermo-Oxidization of Municipal Wastewater Treatment Plant Sludge for Production of Class A Biosolids
Fact Sheet: Septic Tank Polishing		Human infective potential of *Cryptosporidium spp.*, *Giardia duodenalis* and *Enterocytozoon bieneusi* in urban wastewater treatment plant effluents	Demonstration of a Graywater Management Project at a Community Level on the Island of Puerto Rico
Fact Sheet: Distributed Systems Overview		Comparative Human Health Risk Analysis of Coastal Community Water and Waste Service Options	Identifying Current Needs and Innovative Solutions to Lead to Marketable Products and Services for Collection and Non-Potable Reuse of Rainwater and Stormwater Runoff

Nitrogen control through decentralized wastewater treatment: Process Performance and Alternative Management Strategies		Peak Stress Testing Protocol Framework	Fact sheet: Energy Conservation (2006)
Quantification of Norovirus and Adenovirus in Decentralized Wastewater and Graywater Collections:		ESTCP Final Report - Anaerobic Membrane Bioreactor for Sustainable Wastewater Treatment	
Implications for Onsite Reuse		Wastewater Disinfection with Peracetic Acid (PAA) and UV Combination: A Pilot Study at Muddy Creek Plant	
		Evaluation of Combined Peracetic acid and UV treatment for Disinfection of Secondary Wastewater Effluent	

Appendix C: Summary Tables: Complete Clean Water SRF Cumulative Funding (1988-2020) on Decentralized and Advanced Treatment Systems, Water Efficiency and Water Reuse

Table 5: Cumulative State Revolving Funds Used for Water Reuse (1988-2020)

State	Cumulative Fund
California	$981,138,445
Florida	$280,710,583
Nevada	$108,074,247
Texas	$101,131,271
Arizona	$65,044,791
Puerto Rico	$41,390,828
Hawaii	$23,766,879
Virginia	$23,221,483
North Carolina	$20,359,575
Georgia	$19,073,139
New Mexico	$16,583,937
North Dakota	$11,377,890
Idaho	$9,171,206
Michigan	$7,468,484
Washington	$6,702,573
Oregon	$5,922,578
Tennessee	$4,844,027
Massachusetts	$4,622,776
Rhode Island	$3,676,250
Colorado	$2,000,000
Ohio	$1,909,681
Delaware	$1,051,620
New Jersey	$918,303

Wyoming	$875,000
Minnesota	$212,965
New Hampshire	$100,000
Kansas	$70,500
Nebraska	$45,250
Total	$1,741,464,281

Table 6: Cumulative State Revolving Funds Used for Advanced Treatment (1988-2020)

State	Cumulative Fund
California	$3,747,226,615
Florida	$1,880,872,957
Virginia	$1,288,088,303
Texas	$1,280,797,915
North Carolina	$1,215,918,687
Maryland	$1,198,210,683
Iowa	$1,196,017,502
New York	$1,128,714,656
Minnesota	$1,083,882,255
Ohio	$999,636,078
Indiana	$929,662,697
Connecticut	$857,721,519
Georgia	$839,778,738
Illinois	$773,129,086
South Carolina	$688,867,202
Colorado	$661,908,490
New Jersey	$635,004,452
Massachusetts	$634,052,991
Oklahoma	$486,330,918
Alabama	$457,752,933

Arizona	$402,641,633
Tennessee	$397,577,600
Pennsylvania	$390,158,453
Rhode Island	$339,783,914
Washington	$336,620,309
Missouri	$311,075,588
Utah	$289,295,500
Kansas	$287,355,414
Mississippi	$284,187,020
Louisiana	$270,989,236
Montana	$259,098,924
New Hampshire	$235,980,229
Arkansas	$229,102,426
Wisconsin	$195,779,317
Nebraska	$188,420,797
Idaho	$182,452,257
Delaware	$178,412,407
West Virginia	$167,732,560
Nevada	$166,529,007
Kentucky	$163,096,689
New Mexico	$142,203,960
Puerto Rico	$122,124,368
Michigan	$104,892,939
South Dakota	$102,301,141
Vermont	$79,593,408
Hawaii	$71,777,309
North Dakota	$55,421,023
Oregon	$54,707,470

Maine	$21,327,762
Wyoming	$21,061,021
Alaska	$3,000,000
Total	$28,038,274,358

Table 7: Cumulative State Revolving Funds Used for Water Efficiency (2017-2020)

State	Cumulative Fund
New Jersey	$50,679,637
Texas	$47,635,000
California	$36,040,954
Oklahoma	$21,187,035
Arizona	$10,100,000
Louisiana	$9,694,593
Nebraska	$7,000,000
Massachusetts	$3,843,783
South Dakota	$2,079,241
Puerto Rico	$2,000,000
West Virginia	$1,982,850
Alaska	$1,250,000
New Mexico	$1,000,000
Pennsylvania	$721,112
New Hampshire	$685,246
Idaho	$480,707
Ohio	$465,121
North Dakota	$422,000
Florida	$220,000
Total	$197,487,279

Table 8: Cumulative State Revolving Funds Used for Decentralized Systems (1988 - 2020)

State	Cumulative Fund
Massachusetts	$129,847,555
Minnesota	$103,780,669
Ohio	$70,250,848

Washington	$47,968,675
West Virginia	$19,500,829
Connecticut	$18,616,681
Iowa	$18,263,951
New Jersey	$15,059,993
Pennsylvania	$14,085,201
Missouri	$13,720,056
Virginia	$9,852,384
Hawaii	$9,830,789
Delaware	$9,589,664
California	$7,202,669
Tennessee	$3,925,000
Oregon	$3,860,150
Maine	$2,731,522
Indiana	$1,777,395
Vermont	$1,017,533
Idaho	$550,000
Maryland	$502,518
Utah	$469,000
Texas	$422,027
New York	$402,345
New Hampshire	$301,539
Alaska	$122,100
New Mexico	$63,000
Total	$503,714,093

Appendix D: Summary of Construction Grant Innovative and Alternative Technologies

Table 9: Summary of Innovative/Alternative Technology Utilization by State (1979-1987)

STATE	Innovative Technologies			Alternative Technologies		
	Total I [SET ASDE[1] (79-85)]	Utilization Index[2] (%)	Total Number of Projects	Total A [SET ASDE[1] (79-85)]	Utilization Index[2] (%)	Total Number of Projects
Alabama	$1,625,146	100	31	$7,552,033	100	15
Alaska	$400,951	66	6	$2,128,615	76	10
Arizona	$727,907	100		$3,736,072	100	24
Arkansas	$693,326	100	13	$3,583,147	100	24
California	$8,326,699	100	19	$43,472,726	100	103
Colorado	$847,818	79	7	$4,381,580	80	9
Connecticut	$1,078,444	62	3	$5,716,436	65	17
Delaware	$397,399	2	3	$2,142,015	73	11
Florida	$4,098,369	100	12	$22,912,715	100	33
Georgia	$1,785,397	100	5	$7,241,307	100	34
Hawaii	$774,770	10	1	$4,034,164	41	3
Idaho	$468,833	98	3	$2,488,996	100	42
Illinois	$4,688,946	100	26	$24,523,663	100	130
Indiana	$2,596,990	93	18	$13,328,904	90	48
Iowa	$1,298,131	68	12	$6,817,165	72	47
Kansas	$875,924	76		$4,588,922	78	34
Kentucky	$1,300,617	100		$4,763,919	74	23
Louisiana	$1,406,699	22	13	$684,846,058	52	14
Maine	$709,593	100	15	$2,767,171	100	22
Maryland	$2,629,801	71	12	$13,961,401	97	66
Massachusetts	$2,796,904	100	10	$14,848,532	100	33
Michigan	$3,961,693	100	8	$21,181,860	63	44
Minnesota	$1,982,296	92	26	$10,752,901	100	107
Mississippi	$894,522	100	12	$4,715,052	100	22
Missouri	$2,404,978	100	16	$13,077,657	100	101
Montana	$531,198	100	8	$2,378,459	100	28
Nebraska	$539,001	100	4	$2,800,668	100	55
Nevada	$540,253	83	3	$2,905,624	100	23
New Hampshire	$786,753	13	1	$4,176,810	70	18
New Jersey	$3,381,336	100	13	$17,961,234	100	27
New Mexico	$519,368	100	3	$2,346,206	100	13
New York	$10,055,388	100	28	$63,383,231	100	86
North Carolina	$1,975,037	100	16	$10,002,955	100	36
North Dakota	$491,418	20	1	$2,650,559	62	47
Ohio	$3,366,161	96	30	$29,034,547	91	68
Oklahoma	$922,553	100	18	$4,902,028	100	86
Oregon	$1,228,320	78	7	$6,521,051	100	49

Pennsylvania	$4,576,335	78	19	$24,391,497	88	64
Rhode Island	$497,236	100	3	$2,639,783	88	4
South Carolina	$1,099,466	100	13	$5,634,503	100	18
South Dakota	$467,218	80	6	$2,478,197	95	45
Tennessee	$4,137,117	100	25	$18,995,640	100	39
Texas	$3,914,024	100	18	$20,472,190	100	75
Utah	$491,276	100	2	$2,608,601	100	8
Vermont	$291,357	60	3	$1,714,580	100	20
Georgia	$1,355,829	100	23	$9,852,445	100	43
Washington	$7,674,620	69	3	$3,890,423	62	23
Washington, DC	$398,763	20	4	$2,011,685	39	1
West Virginia	$1,694,976	56	11	$3,998,487	100	35
Wisconsin	$2,003,485	100	12	$11,388,222	100	51
Wyoming	$518,558	100	9	$2,840,539	100	11
Guam	$69,842	0	0	$358,666	52	2
Puerto Rico	$1,163,300	0	0	$6,266,825	6	1
Virgin Islands	$41,176	0	0	$227,712	0	0
American Samoa	$71,036	0	0	$389,372	0	0
Trust Territories Pacific	$133,122	0	0	$687,906	66	8

[1] SET ASDE: set aside money for alternative and innovative technologies by state.
[2]The utilization index is equal to the obligate I or A funds divided by the total I or A set-aside, respectively.

Table 10: Summary Tables of Alternative Technologies from Construction Grants

Summary of Alternative Technologies (First Table)														
STATE	On-Site Treatment								Land Treatment					
	Septic Tank / Soil Absorption (Single Family)	Mounds	Evapotranspiration Beds	Aerobic Units	Sand Filters	Septic Tank / Soil Absorption (Multiple Families)	Septage Treatment and Disposal	Other On-Site Treatment	Aqua-Culture /Wetlands Marsh	Overland Flow	Rapid Infiltration	Slow Rate Irrigation	Pre-application Treatment or Storage	Other Land Treatment
Alabama												2		
Alaska						2					1		1	
Arizona												12	1	
Arkansas	1						1		3	2	14	4	2	
California		1				7	3					20	24	1
Colorado									3		1	2	1	
Connecticut					1	2	7				1			1
Delaware						2				1	2			
Florida										2		20		
Georgia											2	20		
Guam														
Hawaii											1	2		
Idaho					2			1	1		1	9	10	1
Illinois	5	1			13					3		3		3
Indiana		2				2								1
Iowa					1				3		1	2	3	
Kansas									1			16	9	
Kentucky	1				2	2			2	1		2		
Louisiana				1						6		2	2	
Maine	3				5	5						1		
Maryland	3				2		3	1	2	2	1	5	4	2
Massachusetts		2			1		19				2	1		
Michigan	2					6				1	3	13		
Minnesota	8				2	5		1	1		1	14	11	
Mississippi		8								11		2		
Missouri					1					9		15		
Montana		1									3	8		
N Mariana Islands														
Nebraska											2	5	5	
Nevada									1		5	6		
New Hampshire					4	3	7			2			1	
New Jersey						1	11						5	
New Mexico												6		

New York	1				12	2	4			2	3			
North Carolina		2						1				21		
North Dakota							3			1		6		1
Ohio	2	4		1								1		
Oklahoma								1				31	16	
Oregon			2		3				2		1	6	9	1
Pennsylvania	3			1	1	2			2		1	5	2	1
Puerto Rico		1												
Rhode Island							2					9		
South Carolina											1	1	3	
South Dakota									5		8	1	4	
Tennessee	2									2		11	10	1
Texas	2									1	1			
Trust Territories						6		1				3		
Utah												1	2	
Vermont					2	1								
Virgin Islands												1		
Virginia							3			3	1	3	4	2
Washington						2			1					
Washington, DC		1												
West Virginia	1							1						
Wisconsin											8			9
Wyoming		2									3	2		
Total	34	25	2	3	52	50	63	7	27	49	68	294	129	24

Table 11: Summary Tables of Alternative Technologies from Construction Grants, Continued

Summary of Alternative Technologies (Second Table)														
STATE	Collection Systems				Energy Recovery/Sludge		Sludge Treatment				Other			
	Pressure Sewers / Effluent Pump	Pressure Sewers / Grinder Pump	Small Lipometer Gravity Sewers	Vacuum Sewers	90% Methane Anaerobic Recovery	Self-Sustaining Incineration	Land Spreading of POTOW Sludge	Pre-Application Treatment	Composting	Other Sludge Treatment of Disposal	Aquifer Recharge	Direct Reuse	Total Containment Ponds	
Alabama	1	2	3		3		2		2					
Alaska	1		1		1	1	1		1	1				7
Arizona					3		1			1		1	1	
Arkansas		10	2		1		2							15
California	8		4	1	5	1	2	2	1	2		2	1	
Colorado		1			1		2				1			5
Connecticut					4	1			1					
Delaware		2	1				2	1	2					8
Florida					3			1	2		1	3		
Georgia	2		1		3		5							11
Guam														
Hawaii													1	1
Idaho	2		2		3		6						1	
Illinois	5	2	18		13		47	7		5		4		101
Indiana	2	4	13		5		19							
Iowa	2	3	1		6		24	2						38
Kansas					5	2	20		1	2			27	
Kentucky	2	4	5	2	2		13							28
Louisiana	1		1				1							
Maine	1	1							6					8
Maryland	2	21	3	2	2		4		5					
Massachusetts			1		2	2	1		4					10
Michigan	1	2	1		4		10							
Minnesota	8	6	7		9		24	1	2					57
Mississippi	1	3	1				3			1				
Missouri	6	18	15		1		27			8				75
Montana					2		9			1			5	
N Mariana Islands			1											1
Nebraska					3		5			2			32	
Nevada					3								4	7
New Hampshire														
New Jersey		2		2			1	3	2	1				11
New Mexico					1					1				
New York	3	16	16	2	16	1	2		1	1				58
North Carolina	1	2	1		6		4	3	5	1				
North Dakota	3	2	14										12	31
Ohio	2	5	2		11		34		2					

Oklahoma						1	5						29	35
Oregon	5		4		5		4			2			1	21
Pennsylvania	6	15	11		3		5	3	3	2				48
Puerto Rico								2	1					3
Rhode Island						1		3	1					5
South Carolina			2		1		5		4					12
South Dakota	1	1	2		4		11	1	1			1	7	29
Tennessee	5	6	10	2			5		1	1				30
Texas	3	4	1		6		20	8		1		4	1	48
Trust Territories			1											1
Utah					1		1		1					3
Vermont		3	1				12		1					17
Virgin Islands														0
Virginia	3	2	2		5	2	9	1	3	3		5		35
Washington	2	1	1		2		1	1					2	10
Washington, DC									1					1
West Virginia	6	10	5	10	2									33
Wisconsin	1	3	3		4	1	15			1				28
Wyoming					1		2						3	6
Total	86	151	157	21	152	13	366	39	54	37	2	20	127	1,225

[1] These totals include the Summary of Alternative Technologies sum totals from Table 10 and Table 11.

Table 12: Summary of Innovative Technologies

STATE	Wastewater Treatment										Sludge Treatment				Misc.[1]	Totals
	Aeration / Mixing	Clarifiers	Disinfection	Energy Conservation and Recovery	Filtration	Lagoons	Land Treatment	Nitrification	Nutrient Removal	Oxidation Ditches	Drying Beds/ Land Application	Incineration	Composting	Digestion		
Alabama	11	4	1		1	5				5	1		1		2	31
Alaska						1					1	1		2	1	6
Arizona		1	2	1		1			1		1				1	8
Arkansas		1	1		2	2	3		2						2	13
California		2	1	3	3	1		1	1		4			1	2	19
Colorado	2		1		1			1	1		1					7
Connecticut	1		2													3
Delaware	1	1														2
Florida	2					5			1				1		3	12
Georgia	1	1		2			1									5
Guam																0
Hawaii															1	1
Idaho	1	1			1	1				1				1	2	8
Illinois	1	3	1		3	12	2		1	1	1				1	26
Indiana	2	1				10		1			1				3	18
Iowa	2	1	1	1					3	1				3		12
Kansas	1	1	3			2				1	2				1	11
Kentucky	1	7			1	2	2				1		1		2	17
Louisiana		4	1			3	1			4						13
Maine	2	1	3	1	1	3	1								3	15
Maryland	1	1	4						4					2		12
Massachusetts	1		2	1				2	1						3	10
Michigan	1	1			1				1	1					3	8
Minnesota	1	1	5	7	1	1	1	1	3	1	1			2	1	26
Mississippi		1				8	1		1						1	12
Missouri	2	4	2	1	2							1			4	16
Montana		1	1				1		2					1	2	8
N Mariana Islands																0
Nebraska									1		1				2	4
Nevada				1					2							3
New Hampshire			1													1
New Jersey							1			1	3				8	13
New Mexico	1				1										1	3
New York	6	2	4	1	1			1	2	5		1	1		4	28
North Carolina	8				1					2	1	1		1	2	16
North Dakota							1									1
Ohio	3	4	3	3	3					1	1		1		11	30
Oklahoma	1	2	2	1	1		1			2	2			4	2	18
Oregon	1	1		1			1				1		1		1	7
Pennsylvania	3	1			2		1		4	2		1		2	3	19
Puerto Rico																0

Rhode Island	2			1												3
South Carolina	1	1		1	1	1	1			1	1		2	2	1	13
South Dakota	3					1	1								1	6
Tennessee	11	3			1	2	1		1	3				1	2	25
Texas	1	1				2	3			1	2				8	18
Trust Territories																0
Utah		1					1									2
Vermont			1	1											1	3
Virgin Islands																0
Virginia	2	3	2		3	1	1	1	1	6	1				2	23
Washington			1	1											1	3
Washington, DC															4	4
West Virginia	3	4							1	1				1	1	11
Wisconsin	2	2	1	3	1										3	12
Wyoming	1		4		1	1									2	9
Total	83	63	50	31	33	65	26	8	34	40	27	5	8	23	98	594

[1]Miscellaneous category includes both sludge and wastewater management technology which could not be separated using available data.

References

Angoli, T. *National onsite wastewater treatment: A national small flows clearinghouse summary of onsite systems in the United States, 1993*. United States: N. p., 1998. Web.

Environmental Protection Agency. (2013). *A Model Program for Onsite System Management in the Chesapeake Bay Watershed*. [online] Available at: https://federalleadership.chesapeakebay.net/130627_ches_bay_tech_assist_manual.pdf

Environmental Protection Agency. (2016). *Best Practices to Consider When Evaluating Water Conservation and Efficiency as an Alternative for Water Supply Expansion*. [online] Available at: https://www.epa.gov/sites/production/files/2016-12/documents/wc_best_practices_to_avoid_supply_expansion_2016_508.pdf

Environmental Protection Agency. (1993). "Chapter 4: Management Measures for Urban Areas." [online] Available at: https://www.epa.gov/sites/production/files/2015-09/documents/czara_chapter4_urban.pdf

Environmental Protection Agency. (2010). "Chapter 6. Decentralized Wastewater Treatment Systems." *Guidance for Federal Land Management in the Chesapeake Bay Watershed*. [online] Available at: https://www.epa.gov/sites/production/files/2015-10/documents/chesbay_chap06.pdf

Environmental Protection Agency. (2017). *Clean Water SRF Program Data Definitions for Individual State and National Summary Reports*. [online] Available at: https://www.epa.gov/sites/production/files/2018-03/documents/cwdefinitions.pdf

Environmental Protection Agency. (2020). *Decentralized Wastewater Management Memorandum of Understanding Among the U.S. Environmental Protection Agency and Partner Organizations*. [online] Available at: https://www.epa.gov/sites/production/files/2020-09/documents/2020_mou_agreement.pdf

Environmental Protection Agency. (2010). *Guidance for Federal Land Management in the Chesapeake Bay Watershed*. [online] Available at: https://www.epa.gov/sites/production/files/2015-10/documents/chesbay_guidance-all.pdf

Environmental Protection Agency. (1993). *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. [online] Available at: https://www.epa.gov/sites/production/files/2015-09/documents/czara_-frontmatter.pdf

Environmental Protection Agency. *Grants Reporting and Tracking System*. Section 319 Grant Data. Polluted Runoff: Nonpoint Source Pollution. [Accessed 3 December 2019].

Environmental Protection Agency. *IGMS Construction Grants Overview*. [online] Available at: https://www.epa.gov/enviro/igms-construction-grants-overview

Environmental Protection Agency. (2005). *National Management Measures to Control Nonpoint Source Pollution from Urban Areas*. [online] Available at: https://www.epa.gov/sites/production/files/2015-09/documents/urban_guidance_0.pdf

Environmental Protection Agency. (2002). *Onsite Wastewater Treatment Systems Manual*. [online] Available at: https://www.epa.gov/sites/production/files/2015-06/documents/2004_07_07_septics_septic_2002_osdm_all.pdf

Environmental Protection Agency. (1989). *Report to Congress on The Effectiveness of The Innovative and Alternative Wastewater Treatment Technology Program*. NEPIS. [online] Available at: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=20011K6Z.txt

Environmental Protection Agency. (1997). *Response to Congress on Use of Decentralized Wastewater Treatment Systems*. NEPIS. [online] Available at: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=200047VF.txt

Environmental Protection Agency. *The Wastewater Information System Tool*. Septic Systems. [online] Available at: https://www.epa.gov/septic/wastewater-information-system-tool-twist . [Accessed 25 January 2021].

Environmental Protection Agency. *Water Reuse Action Plan*. [online] Available at: https://www.epa.gov/waterreuse/water-reuse-action-plan [Accessed 16 December 2019].

Environmental Protection Agency. *WIFIA Closed Loans*. Water Infrastructure Finance and Innovation Act (WIFIA). [online] Available at: https://www.epa.gov/wifia/wifia-closed-loans [Accessed 16 December 2020]

Legal Information Institute. *33 U.S. Code § 1383 - Water Pollution Control Revolving Loan Funds*. Cornell University. [online] Available at: https://www.law.cornell.edu/uscode/text/33/1383#:~:text=33%20U.S.%20Code%20%C2%A7%201383%20%2D%20Water%20pollution%20control%20revolving%20loan%20funds,-U.S.%20Code

United States. Congress, Senate. *America's Water Infrastructure Act of 2018*. Section 4102. 115th Cong., Section 3021. 2018. [online] Available at: https://www.congress.gov/bill/115th-congress/senate-bill/3021/text

United States. Congress, Senate. *America's Water Infrastructure Act of 2018*. Section 4107(b). 115th Cong., Section 3021. 2018. [online] Available at: https://www.congress.gov/bill/115th-congress/senate-bill/3021/text

United States. Congress, House. *33 USC 1314a: Wastewater Technology Clearinghouse*. Section 1314. [online] Available at: https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title33-section1314a&num=0&edition=prelim