

The Drinking Water State Revolving Fund (DWSRF) program was established by the 1996 Safe Drinking Water Act (SDWA) Amendments and authorizes grants to states to capitalize revolving loan funds. The states provide low-interest loans to eligible systems for infrastructure improvements needed to ensure compliance with the SDWA and protect public health. The DWSRF program can play a significant role in helping systems, especially small systems, to meet the challenges of complying with new drinking water standards.

The Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR), published in January 2002, requires all water systems serving fewer than 10,000 people and using surface water or ground water under the direct influence of surface water to improve public health protection through the control of microbial contaminants, particularly *Cryptosporidium*. These systems must achieve 2-log (99%) removal of *Cryptosporidium* by complying with strengthened combined filter effluent (CFE) turbidity performance requirements, complying with individual filter turbidity requirements, meeting disinfection profiling and benchmarking requirements, and constructing only covered finished water storage facilities. The LT1ESWTR will impose a financial burden on some water systems. The DWSRF can provide assistance to systems to help ease this burden, increase compliance, and protect public health.

WHY DID EPA CREATE THIS RULE?

The 1989 Surface Water Treatment Rule (SWTR) focused on preventing waterborne diseases through filtration and disinfection. In 1998, the Interim Enhanced Surface Water Treatment Rule (IESWTR) strengthened protection from microbial contaminants for systems serving at least 10,000 people. The requirements of the LT1ESWTR were based on the IESWTR, but have been modified to reduce the burden on small systems. It is estimated that the LT1ESWTR will reduce the number of gastrointestinal illnesses from *Cryptosporidium* and other pathogens through improvements in filtration. The rule will also reduce the likelihood of endemic illness from *Cryptosporidium* by an estimated 12,000 to 41,000 cases annually.

TO WHOM DOES THIS RULE APPLY?

The LT1ESWTR applies to all systems that use surface water or ground water under the direct influence of surface water (GWUDI) and serve fewer than 10,000 people. These systems must comply with all applicable LT1ESWTR provisions by January 2005.

Source Type	System Type	Population Type
Surface Water ✓	CWSs ✓	< 10,000 ✓
Ground Water ✓	NTNCWSs ✓	10,000 - 100,000
GWUDI ✓	TNCWSs ✓	> 100,000

CRITICAL RULE DEADLINES & REQUIREMENTS

FOR SYSTEMS		FOR STATES
March 15, 2002	Construction of uncovered finished water reservoirs is prohibited.	
July 1, 2003	Systems serving between 500 and 9,999 persons must begin developing a disinfection profile, unless system has shown the state that total trihalomethane (TTHM) levels are # 0.064 mg/L and five haloacetic acid (HAA5) levels are # 0.048 mg/L.	
January 1, 2004	Systems serving fewer than 500 persons must begin developing a disinfection profile, unless system has shown the state that TTHM levels are # 0.064 mg/L and HAA5 levels are # 0.048 mg/L.	
	State primacy applications due, if no extension granted.	January 14, 2004
July 1, 2004	Systems serving between 500 and 9,999 persons must complete a disinfection profile (unless the state has determined it is unnecessary).	
January 1, 2005	Systems serving fewer than 500 persons must complete a disinfection profile (unless the state has determined it is unnecessary).	
January 14, 2005	Systems serving fewer than 10,000 people must comply with the applicable LT1ESWTR provisions (e.g., turbidity standards, individual filter monitoring, <i>Cryptosporidium</i> removal requirements, updated watershed control requirements for unfiltered systems).	

HOW WILL THIS RULE IMPACT SYSTEMS?

The LT1ESWTR provisions will impose significant costs on small water systems. Total capital costs for investments in treatment technology and infrastructure are estimated to be \$174 million (see Figure 1). In addition, EPA estimates that annual operation and maintenance (O & M), monitoring, reporting, profiling, and benchmarking costs will add up to almost \$20 million. All of these capital costs will be borne by systems serving fewer than 10,000 people (see Figure 2).

Figure 1: TOTAL LT1ESWTR PRICE TAG (in millions of 1999 \$)		Total Capital Costs for Treatment Modifications by System Size	
Capital Costs		< 100	\$7
Treatment Modifications	\$173.6	101-500	\$11
Covered Finished Water Storage	\$0.8	501-1,000	\$32
CAPITAL COST GRAND TOTAL \$174.4		1,001-3,300	\$47
Annual O & M Costs	\$14.5	3,301-10,000	\$77
Annual Monitoring & Admin Costs	\$5.2		

The two primary methods for treating drinking water for microbial contaminants are chemical disinfection (inactivation) and physical removal. The main goal of the LT1ESWTR is to improve the physical removal of microbial contaminants through the enhancement of turbidity treatment processes. Provisions such as disinfection profiling and benchmarking will help ensure that this increased protection against microbial risks is not compromised as systems alter their disinfection practices to meet the new disinfection byproduct (DBP) standards.

The provisions of the LT1ESWTR that will generate most of the capital needs are the *Cryptosporidium* removal provisions implemented through the CFE turbidity performance standards. Of the 11,411 systems subject to the LT1ESWTR, 8,991 filter their water and will be subject to these turbidity provisions. The EPA estimates that 2,207 of these systems will need to modify their water treatment process to comply with the new standards. In addition, 2,327 will need to install individual filter turbidimeters to meet the individual filter effluent turbidity monitoring requirement. An estimated 314 small systems will need to comply with the covered finished water reservoir provision. Although thousands of systems will need to develop disinfection profiles and benchmarks, this will not require systems to make capital improvements.

To be in compliance by January 2005, systems will need to make capital investments over the next three years. Most of the systems that will have to modify treatment serve more than 1,000 people (see Figure 2). Figure 3 shows how much it will cost systems annually (on average) to modify treatment to meet new turbidity standards. For most systems, the annual O & M costs imposed by the LT1ESWTR will be at least as significant as the annual capital costs. In order to comply with the rule, systems will have to make a range of investments, from flocculation basin structural improvements to additional filter media (see Exhibit 1).

Approximately 6.3 million households are served by water systems subject to the LT1ESWTR provisions. EPA estimates that 99% of these households will see an increase in their bills of less than \$10 per month. The increase in costs per household to meet the LT1ESWTR standards will depend on the size of the water system and the treatment changes needed.

Figure 2: Number of Systems That Will Need to Modify Treatment Practices to Meet New Turbidity Requirements

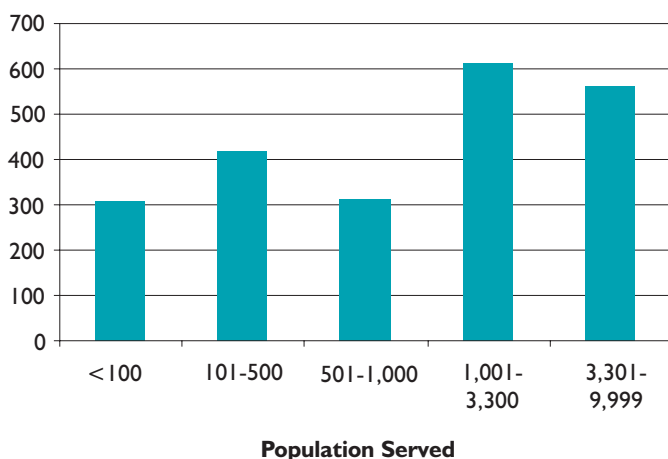
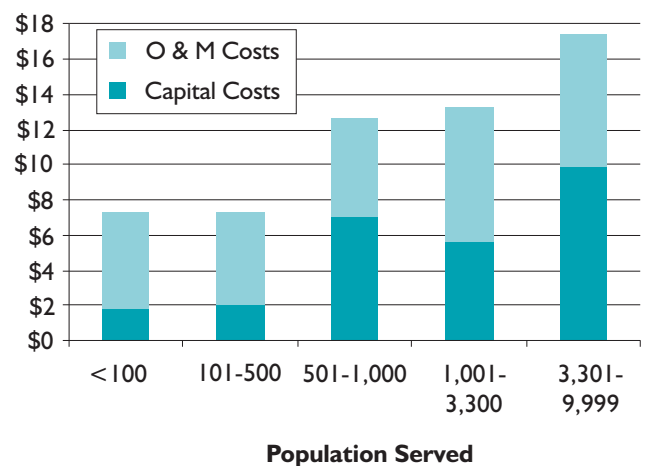


Figure 3: Average Annual Cost per System Needing to Modify Treatment Practices to Meet New Turbidity Requirements (in thousands of 1999 \$)

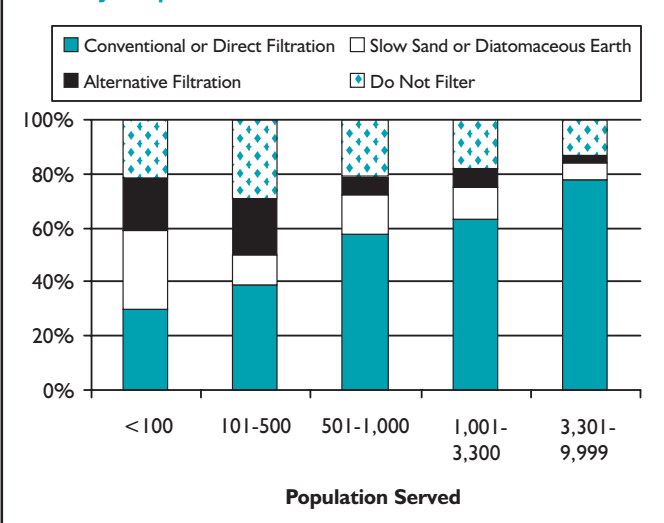


Note: Capital costs based on total costs amortized over 20 years at a 3% discount rate.

WHAT TYPE OF TREATMENT WILL SYSTEMS HAVE TO PUT IN PLACE?

The LT1ESWTR contains several significant turbidity provisions. The CFE standards apply only to systems that use filtration and differ based on the type of filtration technology used (see Figure 4). For conventional and direct filtration systems, LT1ESWTR requires the turbidity level of a system's representative CFE samples to be less than or equal to 0.3 nephelometric turbidity units (NTUs) in at least 95% of the measurements taken each month and cannot exceed 1 NTU at any time. Slow sand and diatomaceous earth filtration systems are presumed to achieve at least 2-log removal of *Cryptosporidium* by meeting existing filter performance requirements established in the SWTR. Systems using alternative filtration (i.e., membrane filtration, cartridge filtration) must demonstrate to their state that their system achieves 2-log removal of *Cryptosporidium*, 3-log removal of *Giardia lamblia*, and 4-log removal and/or inactivation of viruses.

Figure 4: Percentage of Small Systems Subject to CFE Turbidity Requirements



The LT1ESWTR also requires systems that use conventional or direct filtration to conduct continuous turbidity monitoring at each filter. Systems that do not already have turbidimeters at each filter will be required to install them (systems with 2 filters can conduct continuous monitoring of CFE in place of individual filter monitoring).

Exhibit 1: Potential System Modifications to Meet LT1ESWTR Turbidity Provisions (in 1999 \$)

Potential System Modifications	Example Costs for Systems Serving 1,001-3,300*		Total Number of Small Systems that Need this Change**
	Total Capital Costs	Annual O & M Costs	
Chemical Addition			
coagulant aid polymer feed capability	\$8,000	\$1,900	990
backwash water polymer feed	\$8,000	\$1,800	291
install pH adjustments	\$8,100	\$3,900	740
Coagulation Improvements	\$8,000	\$1,900	1,163
Rapid Mixing Improvements			
mechanical	\$3,200	\$900	740
structural	\$9,700	\$1,900	232
Flocculation Improvements			
mechanical	\$28,400	\$1,700	1,009
structural	\$64,400	\$1,900	291
Settling Improvements			
equipment modification	\$6,100	\$1,100	1,009
add tube settlers	\$69,800	\$1,100	291
Filtration Improvements			
filter media additions (2-6" typical)	\$1,200	\$0	773
filter media replacement	\$169,900	\$0	622
backwashing-increase flow/velocity	\$65,300	\$5,000	523
backwashing-install surface wash	\$125,300	\$3,200	972
post backwash filter-to-waste	\$18,700	\$2,700	291
filter control systems	\$35,700	\$3,500	946
filter turbidimeter installation	\$4,700	\$800	2,327

*Projected costs to meet 0.3 NTU

**Projected total number of systems that serve fewer than 10,000 people that would modify treatment to meet 0.3 NTU, 1 NTU maximum.

Exhibit 1 details the treatment and process modifications that conventional and direct filtration systems may need to implement to meet the CFE standards of the LT1ESWTR. Very few systems will need to make all of the listed improvements. The necessary improvements will depend on the design of the system, the system's source water quality, and the skill level of the system's operators. For instance, systems with very high turbidity levels may need to install expensive backwash upgrades.

The costs of the improvements listed in Exhibit 1 are estimates for a system with an average flow serving the median population between 1,001 and 3,300 people. Some of these improvements, like adding additional filter media, are relatively inexpensive. Other changes, like flocculation improvements and filter media replacements, can require tens of thousands of dollars in capital investment. The last column provides an estimate of the total number of small systems that will need to make each improvement to be in compliance with the LT1ESWTR. For instance, 2,327 systems will need to install individual filter turbidimeters with recorders at a cost (on average) of \$4,700 per system.

In addition to the turbidity provisions, small systems subject to the LT1ESWTR are required to cover all new finished water reservoirs, holding tanks, or other storage facilities to protect finished water from contamination. The cost of covering new facilities is approximately \$2 per square foot. On average, capital costs to cover new finished water reservoirs range from \$188 for systems serving under 100 people to \$10,000 for systems serving 3,301-9,999 people. Approximately 5% of systems subject to the LT1ESWTR will construct a new finished water storage reservoir over the next 20 years.

HOW CAN THE DWSRF ASSIST SYSTEMS?

States use DWSRF capitalization grant monies to provide low-interest loans to publicly- and privately-owned public water systems for infrastructure improvements needed to continue to ensure safe drinking water. States may offer principal forgiveness, reduced interest rates, or extended loan terms to systems identified by the state as serving disadvantaged communities. States also have the ability to reserve a portion of their grants (i.e., set-asides) to finance activities that encourage enhanced water system management and help to prevent contamination problems through source water protection measures. Based on the fiscal year 2002 appropriation of \$850 million, capitalization grants ranged from \$8.0 million to \$82.4 million per state.

Most capital projects – including adding new technologies and improving existing facilities – needed to comply with the new LT1ESWTR requirements are eligible for funding under the DWSRF (see Exhibit 2). In addition, the construction of covered finished water storage facilities and the installation of individual filter turbidimeters are eligible.

States can use set-aside funds from the DWSRF to assist systems directly as well as to enhance their own program management activities (see Exhibit 2). A state may use set-asides to make administrative improvements to the entire drinking water program, which faces increased costs in implementing LT1ESWTR. States can provide training to small systems on meeting the

Castle Mountain Creeks Subdivision, Idaho

A small development in the hills of Idaho faced difficulties in meeting the Surface Water Treatment Rule due to a lack of filtration capabilities in its water system. The 200-lot neighborhood received a \$400,000 DWSRF loan to design and construct a diatomaceous earth pressure filtration system, a pipeline chlorine contact chamber, and a new 100,000-gallon storage tank. The subdivision was able to complete all phases of the project under budget at a cost of \$323,341.

requirements of LT1ESWTR as well as

technical assistance in identifying appropriate technologies. States can provide assistance to small systems to cover the costs of project planning and design for infrastructure improvements. States can also use funds to support their sanitary survey program.

Since the DWSRF program is managed by states, project and set-aside funding varies according to the priorities, policies, and laws within each state. Given that each state administers its own program differently, the first step in seeking assistance is to contact the state DWSRF representative which can be found on the EPA DWSRF website.

Exhibit 2: Projects/Activities Eligible for DWSRF Funding to Comply With LT1ESWTR

Type of Project/Activity	Eligible Under Infrastructure Fund	Eligible Under Set-Asides
Treatment		
Chemical Addition System	Yes	No
Coagulant Improvements	Yes	No
Rapid Mixing Improvements	Yes	No
Flocculant Improvements	Yes	No
Settling Improvements	Yes	No
Filtration Improvements	Yes	No
Planning & Design Activities	Yes	Yes*
Turbidimeters	Yes	No
Covered Finished Water Storage	Yes	No
System Administrative Improvements		
Profiling and Benchmarking	No	No
Hire Staff	No	No
Staff Training	No	Yes
Public Outreach	No	Yes
Monitoring	No	No
Rate Increase Process	No	Yes
State Administrative Improvements		
Hire Staff	No	Yes
Staff Training	No	Yes
Public Outreach	No	Yes
Compliance Oversight	No	Yes
Enforcement	No	Yes
Pilot Studies	No	Yes
Sanitary Surveys	No	Yes

*For small systems only.

FOR MORE INFORMATION...

DWSRF and LT1ESWTR

DWSRF Website:

<http://www.epa.gov/safewater/dwsrf.html>

LT1ESWTR Website:

<http://www.epa.gov/safewater/mdbp/Lt1eswtr.html>

General Information

SDWA Hotline

1-800-426-4791

EPA's Ground Water & Drinking Water Website:

<http://www.epa.gov/safewater/>

Office of Ground Water and Drinking Water (4606M)

EPA 816-F-02-005

June 2002