Using DWSRF Funds to Comply with the New Arsenic Rule

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 Environmental Protection Agency (EPA) published revisions to the Arsenic Rule in 2001 which further reduce exposure to arsenic in drinking water by adopting a new arsenic maximum contaminant level (MCL) of 10 ppb. The new MCL 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?

EPA established the previous MCL of 50 ppb for arsenic in 1975 based on a Public Health Service standard originally established in 1942. The 1996 SDWA Amendments required EPA to finalize a new arsenic rule by January 2001. A 1999 report by the National Academy of Sciences concluded that the 50 ppb standard did not adequately protect human health. EPA set the new MCL of 10 ppb to protect the public against the effects of long-term, chronic exposure to arsenic in drinking water. The new MCL will decrease non-fatal and fatal bladder and lung cancers and will reduce the frequency of other health effects such as diabetes, developmental problems, gastrointestinal illness, and heart disease.

TO WHOM DOES THIS RULE APPLY?

The new 10 ppb arsenic MCL becomes enforceable on January 23, 2006 for community water systems (CWSs) and nontransient noncommunity water systems (NTNCWSs). Of all affected systems, 97% are small systems that serve fewer than 10,000 people. Higher levels of arsenic tend to be found in ground water rather than surface water sources (i.e., lakes and rivers). Compared to the rest of the United States, the occurrence of arsenic in ground water tends to be higher in western states and states in the Great Lakes region.

Source Type		System Type		Population Type	
Surface Water	✓	CWSs	✓	≤ 10,000	✓
Ground Water	✓	NTNCWSs	✓	10,001 - 100,000	✓
GWUDI	✓	TNCWSs		≥ 100,001	✓

CRITICAL RULE DEADLINES & REQUIREMENTS

FOR SYSTEMS*		FOR STATES
	EPA meets and works with states to explain new rules and requirements and to initiate adoption and implementation activities.	Spring 2002
July 1, 2002	Systems that detect arsenic concentrations between 10 ppb and 50 ppb must include health effects language in all Consumer Confidence Reports beginning on this date through July 1, 2006. Systems that detect arsenic concentrations between 5 ppb and 10 ppb must include an educational statement in all Consumer Confidence Reports beginning on this date.	
	State primacy revision applications due, if no extension is requested.	January 22, 2003
January 22, 2004	All new systems/sources must collect initial monitoring samples for all inorganic contaminants (IOCs), synthetic organic contaminants (SOCs), and volatile organic contaminants (VOCs) within a period and frequency determined by the state.	
	State primacy revision applications due from states that received 2-year extensions.	January 22, 2005
January 23, 2006	The new arsenic MCL of 10 ppb becomes enforceable. All systems must begin monitoring or submit data that meets grandfathering requirements (if allowed by the state).	
December 31, 2006	Surface water systems must complete initial monitoring or have a state approved waiver.	
December 31, 2007	Ground water systems must complete initial monitoring or have a state approved waiver.	

* Deadlines for specific systems may be affected by variances or exemptions granted by the state.

HOW WILL THIS RULE IMPACT SYSTEMS?

The costs systems will face to meet the new arsenic standards are significant. Total capital costs for investments in treatment technology and infrastructure are estimated to be almost $900 million (see Figure 1). In addition, annual operation and maintenance (O & M) costs for systems and monitoring and administrative costs for states implementing the rule will top $120 million. Most of the capital costs will fall on the shoulders of a relatively small number of ground water systems (see Figure 2).

Figure 1: TOTAL ARSENIC PRICE TAG (in millions of 1999 $)		
Capital Costs		
CWSs	$843	
NTNCs	$35	
CAPITAL COST GRAND TOTAL		$878
Annual O & M Costs		$118
Annual Monitoring & Admin Costs		$2.7

CWSs Capital Costs by System Size	
< 100	$27
101-500	$57
501-1,000	$34
1,001-3,300	$110
3,301-10,000	$118
10,001-100,000	$316
>100,000	$180

Of the 74,000 systems subject to this new MCL, EPA estimates that 3,000 CWSs and 1,100 NTNCWSs will need to install treatment for compliance. To be in compliance by January 2006, capital investments will need to be made over the next four years. A majority of the systems that will have to modify treatment serve less than 500 people (see Figure 3).

Figure 2: Percentage of All Affected Systems Exceeding New Arsenic MCL

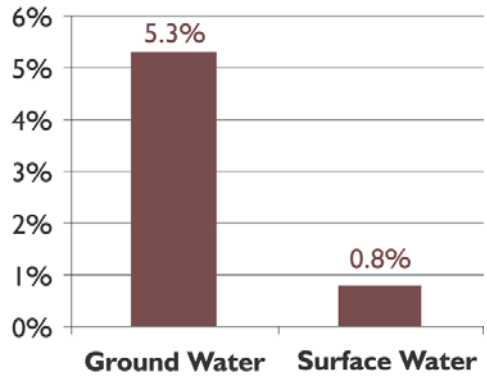


Figure 4 shows how much it will cost systems (on average) to meet the new MCL. In order to comply with the rule, most systems will have to add new technologies, upgrade existing technologies, consolidate their systems into larger systems, or develop new water sources.

The average increase in costs per household to meet the new arsenic standard depends on the size of the water system and how many people are served by that system. The estimated compliance cost per system is considerably lower for small systems than for large systems because less water must be treated. However, the burden on small system households is significantly higher because the costs must be paid from a much smaller revenue base. EPA estimates that the average annual household water bill for systems out of compliance may increase by $32 per year, but that the cost will be substantially higher (ranging from $58-$327) for systems serving less than 3,300 people.

Figure 3: Number of CWSs That Will Need to Install Treatment to Comply with New Arsenic MCL

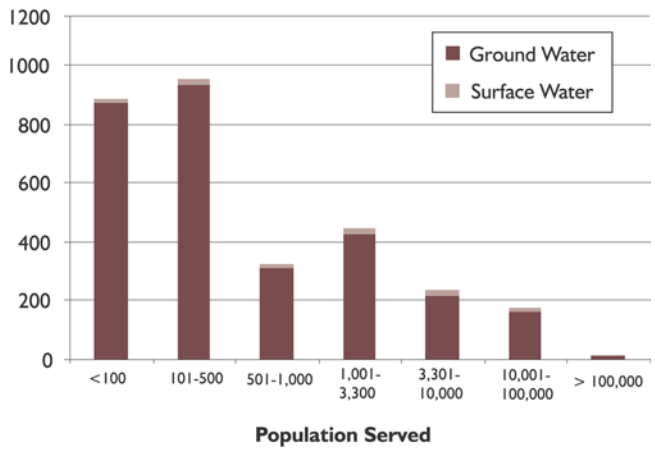
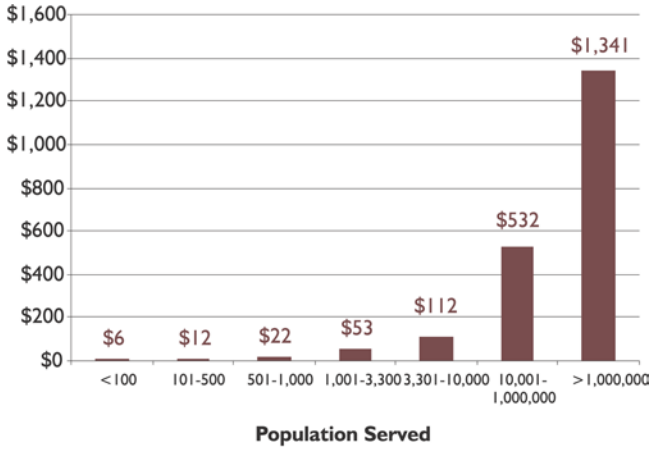


Figure 4: Average Annual Cost per CWS Exceeding New Arsenic MCL (in thousands of 1999 $)



Note: 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?

Arsenic is present in two forms: arsenate (As^{5+}) and arsenite (As^{3+}). Surface water typically contains much more arsenate, while ground water typically contains higher levels of arsenite (which is harder to remove). Arsenite is easily oxidized to arsenate using conventional oxidation methods (e.g., chlorination). As a result, up to 50% of ground water systems that install treatment for arsenic may need to install pre-oxidation. In order to determine if pre-oxidation will be needed, systems should first perform a test to determine what form of arsenic they have.

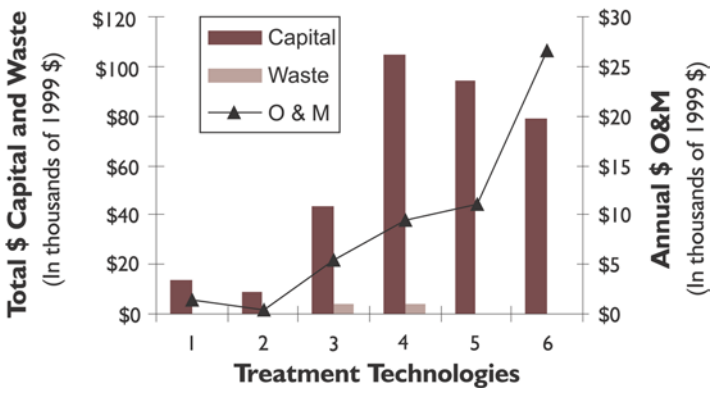
The characteristics of a system's source water (especially the pH level and presence of other contaminants), the skill level of its operators, and other compliance considerations will greatly impact which treatment train is most appropriate and the ultimate cost of compliance. Systems with treatment trains in place that can remove arsenic will face lower compliance costs than those without sufficient treatment. For instance, most surface water systems already have treatment in place that is capable of removing arsenic, though very few utilize reverse osmosis, ion exchange, or activated alumina. Among ground water systems, larger systems are more likely to have arsenic treatment technology in place.

Exhibit 1: Arsenic Treatment Technologies

	Type	Removal Efficiency	Other Contaminants Removed
1 Modified Lime Softening	BAT, SSCT	90%	Metals, IOCs
2 Modified Coagulation/Filtration	BAT, SSCT	95%	Physically large contaminants
3 Anion Exchange	BAT, SSCT	95%	Anions
4 Oxidation Filtration (Greensand)	BAT, SSCT	50%	Metals
5 Activated Alumina	BAT, SSCT	95%	Anions
6 POU Reverse Osmosis	SSCT	90%	IOCs and large organics
7 POU Activated Alumina	SSCT	90%	Anions
8 Coagulation Assisted Microfiltration	SSCT	90%	Physically large contaminants

EPA has identified a number of Best Available Technologies (BATs) and Small System Compliance Technologies (SSCTs) for arsenic (see Exhibit 1). For all BATs, most of which are developed with large systems in mind, removal is much more efficient for arsenate. When considering SSCTs, EPA looks at the affordability of the technology (since per household costs for central treatment tend to be higher for smaller system customers) and technical complexity (since many small systems do not have access to well-trained water system operators). The SSCTs represent technologies that are affordable and achieve compliance with the arsenic MCL across the small system size categories (25-500; 501-3,300; and 3,301-10,000 people). Reverse osmosis and activated alumina point-of-use (POU) devices are viable options for small systems, especially those serving fewer than 200 persons. EPA assumes that the most common treatment technology for small systems will utilize an adsorptive media.

Figure 5: Representative Costs for Ground Water Systems Serving Populations of 101-500



Note: All costs are based on average flows (design flow of 123,670 gpd and average flow of 33,200 gpd) for the median population. Capital and waste costs are total (not annualized). O & M costs are annual. Costs do not reflect the need for pre-oxidation or corrosion control.

Systems may have other treatment alternatives to the treatment technologies listed in Exhibit 1, such as granular ferric hydroxide (GFH). GFH is a technology that may combine very long run length without the need to adjust pH. Ongoing studies should provide more information about whether GFH will be affordable and viable.

To ensure cost-effective compliance with the arsenic MCL, systems will need to evaluate their treatment technology options as a first step. All other factors being equal, systems will most likely choose the cheapest treatment option that ensures compliance with the new MCL. The costs in Figure 5 are best-case estimates for an average ground water system with an arsenic influent level of 50 ppb and a target treatment concentration of 8 ppb. Several of these central treatment technologies have associated waste disposal costs, which are also depicted in the graph.

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. Where funding is not adequate for all systems that require treatment, states may choose to offer extended compliance schedules through exemptions, where appropriate, to some systems.

Most capital projects – including adding new technologies and upgrading existing technologies – needed to comply with the new arsenic standards are eligible for funding under the DWSRF (see Exhibit 2). Consolidation and restructuring of systems can be a cost-effective option for small systems that are affected by the arsenic rule. The DWSRF can fund consolidation, including situations where a supply has become contaminated or a system is unable to maintain compliance for technical, financial, or managerial reasons. POU devices will be an attractive option to small systems because of cost. The DWSRF can fund these devices as long as the units are owned and maintained by the water system.

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 the new arsenic rule. States can provide training to small systems on meeting the requirements of the arsenic rule as well as technical assistance in identifying appropriate technologies. In addition, states can provide assistance to small systems to cover the costs of project planning and design for infrastructure improvements.

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 Arsenic Rule

Type of Project/Activity	Eligible Under Infrastructure Fund	Eligible Under Set-Asides
Treatment		
Precipitative Processes	Yes	No
Adsorption Processes	Yes	No
Ion Exchange Processes	Yes	No
Membrane Filtration	Yes	No
POU Devices	Yes*	No
Planning & Design Activities	Yes	Yes**
System Consolidation	Yes	No
System Restructuring	Yes	Yes
System Administrative Improvements		
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

*Must be owned and maintained by system.
**For small systems only.

Camp Verde, Arizona

In 1998, a $1.3 million low-interest loan was given to the Camp Verde water system to address a long-standing problem of high arsenic levels in the drinking water source. The system had been working to get financing for many years, but could not afford improvements until the DWSRF program was implemented in the state. The loan provided the funding to install a pipeline from a new source to provide safe drinking water to 2,000 people.

FOR MORE INFORMATION...

DWSRF and Arsenic Rule

DWSRF Website:
http://www.epa.gov/safewater/dwsrf.html

Arsenic Implementation Website:
http://www.epa.gov/safewater/ars/implement.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)

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