ARSENIC

Where Does Arsenic Occur?

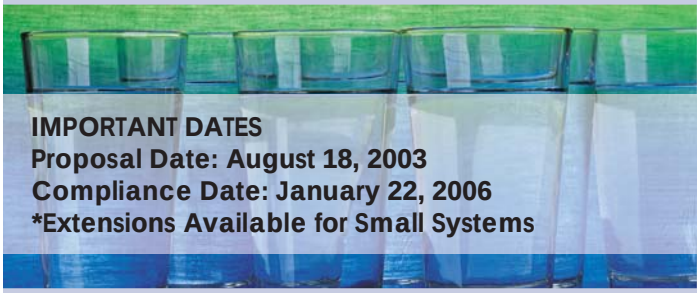
Arsenic occurs naturally in rocks, soil, water, air, plants, and animals. It is the earth's twentieth most abundant element and is also the 12th most common element in the human body.

Arsenic is mainly used for industrial processes such as the decolorization of glass, paint manufacturing, treatment and preservation of wood products, and smelting operations. Human exposure to arsenic also comes from herbicides, pesticides, pharmaceuticals, and other industrial sources.

Higher levels of arsenic tend to be found more in groundwater sources than in surface water sources. When groundwater is the drinking water source, the demand from municipal systems and private drinking water wells may cause water levels to drop and release arsenic from rock formations.

What are the Health Effects?

Adverse health effects that have been attributed to arsenic exposure include skin, liver, bladder, kidney, and lung cancer, skin lesions, nervous system effects, hearing impairment, heart and circulatory effects, vascular problems (blackfoot disease), diabetes, developmental effects, and gastrointestinal system effects.



IMPORTANT DATES
Proposal Date: August 18, 2003
Compliance Date: January 22, 2006
***Extensions Available for Small Systems**

Insight Into the Regulation:

Since 1975, Community Water Systems have been subject to an arsenic Maximum Contaminant Level (MCL) of 50 parts per billion (ppb). This MCL applied only to Community Water Systems and was based on a Public Health Service standard set in 1942.

Following several delays due to political debate and additional review of the science and costs associated with the 10 ppb standard, on October 31, 2001, the United States Environmental Protection Agency (USEPA) announced that a new standard of 10 ppb originally finalized in January 2001 would be implemented. The Arsenic Rule applies to both Community Water Systems and Non-Transient Non-Community Water Systems.

As published on January 22, 2001, compliance for systems of all sizes is required by January 22, 2006, although the States have been given the ability to grant additional time extensions for small systems with arsenic concentrations less than 35 ppb.

There are three general options to consider when dealing with potential arsenic violations, including:

1) Source Water Modification
   - -Optimization of existing source
   - -Find new source
2) Treatment
   - -Optimize existing treatment
   - -Construct traditional treatment
   - -Construct advanced treatment
3) Consecutive User
   - -Regional/Community system

To assist water systems in evaluating their arsenic problems, an arsenic compliance alternative evaluation tool is provided within this handout. Additionally, an Arsenic and Clarifications to Compliance and New Source Monitoring Rule: A Quick Reference Guide can be found at www.epa.gov/safewater/arsenic/pdfs/quickguide.pdf.

AE2S
Think Big. Go Beyond.

If you have any questions on the information provided in this handout or additional questions concerning USEPA drinking water regulations, contact Wayne Gerszewski, PE at 701-746-8087 (Grand Forks), Russ Sorenson, PE at 701-221-0530 (Bismarck), Grant Meyer, PE at 763-463-5036 (Minneapolis), Nate Weisenburger, PE at 406-268-0626 (Great Falls), or Brian Bergantine, PE at 218-299-5610 (Moorhead).

ARSENIC

ARSENIC COMPLIANCE ALTERNATIVE EVALUATION

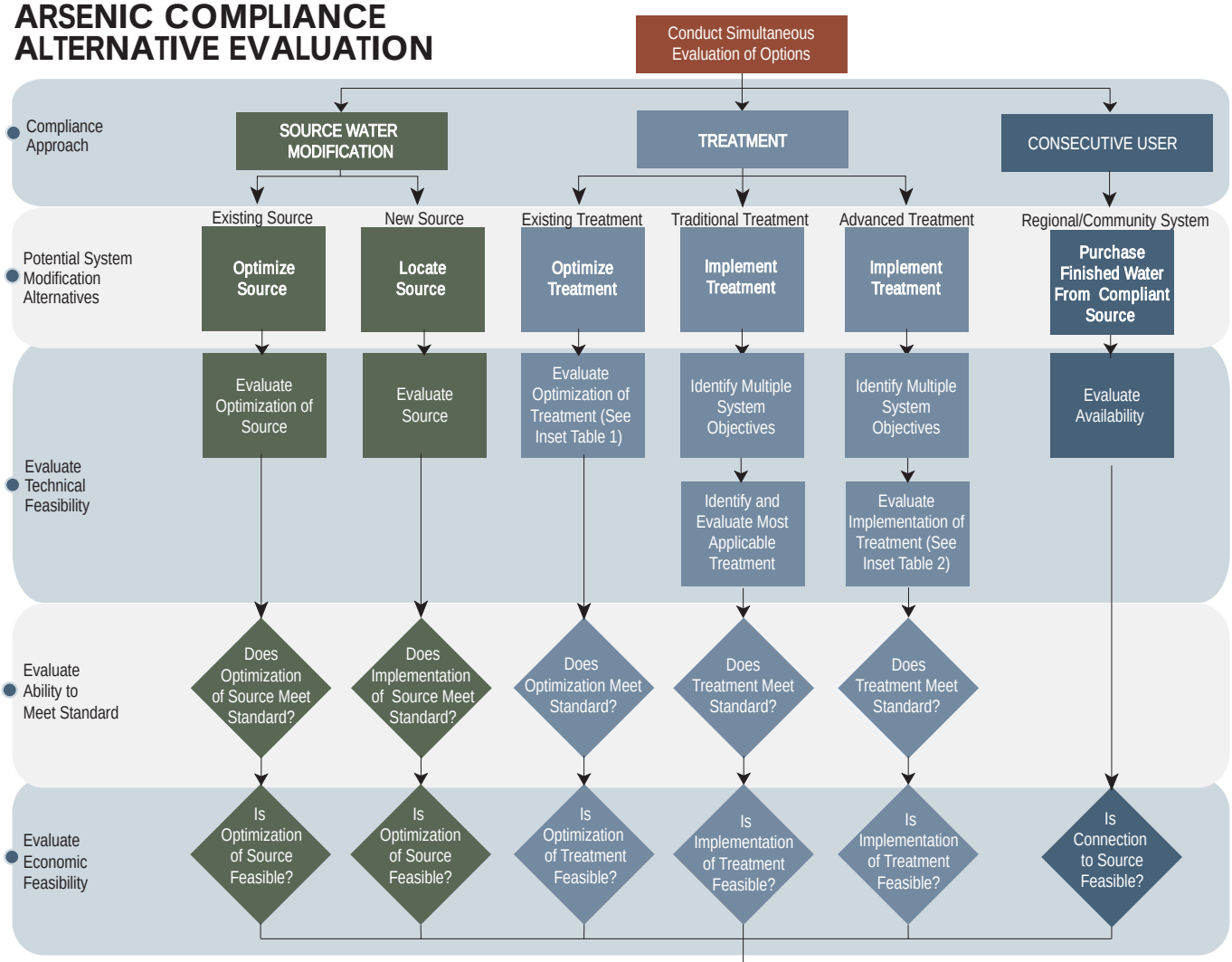


TABLE 1:

Treatment Technology	Optimization Possibilities
Coagulation and Filtration	-Add Oxidant -Optimize Oxidant Dose -Improve Particle Removal -Add Iron or Aluminum Coagulant -pH Adjustment -Minimize Aluminum Solubility -Increase Detention Time -Conventional Filtration -Greensand Filtration -Polishing (optional)
Lime Softening	-Add Oxidant -Optimize Oxidant Dose -Improve Particle Removal -Increase pH -Add Iron or Aluminum Coagulant -Polishing (optional)

TABLE 2:

Sulfate Concentration	Advanced Treatment *(Technologies appropriate to bench/pilot test)*
< 250 mg/L	Activated Alumina Anion Exchange Reverse Osmosis - Nanofiltration
> 250 mg/L	Activated Alumina Reverse Osmosis - Nanofiltration