

The Nexus Between Sustainability and Safety: Avoiding Unintended Consequences



Emerging Water Contaminants Impact on Premise Plumbing Systems



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Introduction



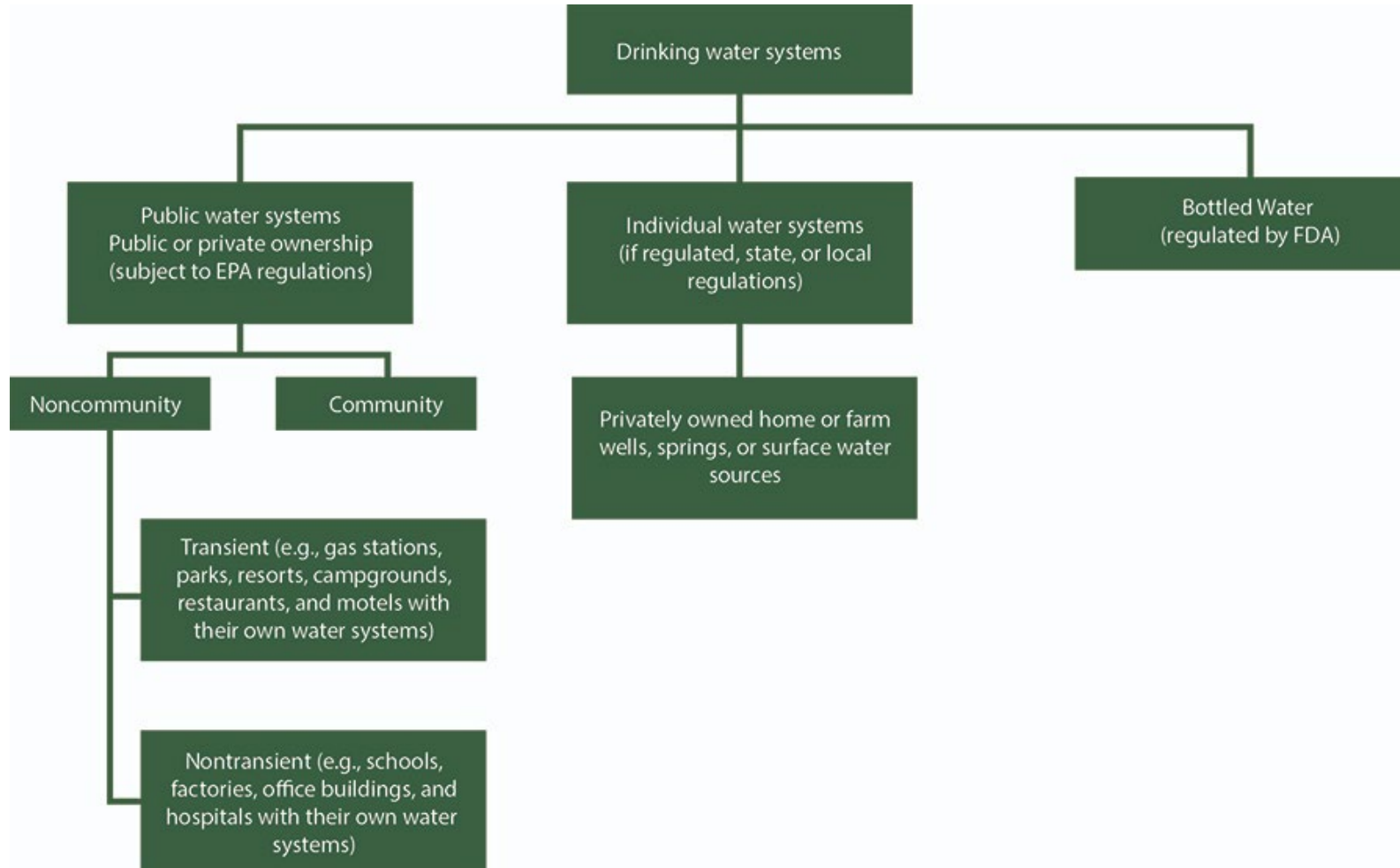
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Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) of 1974 and its subsequent 1986 and 1996 amendments authorize the USEPA to set national standards to protect public drinking water and its sources against naturally occurring or human-made contaminants. SDWA standards include health-based maximum levels for microbiologic, chemical, and other contaminants in drinking water. They also include water treatment performance criteria for removing or inactivating contaminants. If needed, USEPA can issue guidance or a health advisory instead of a regulation.

Who is Regulated



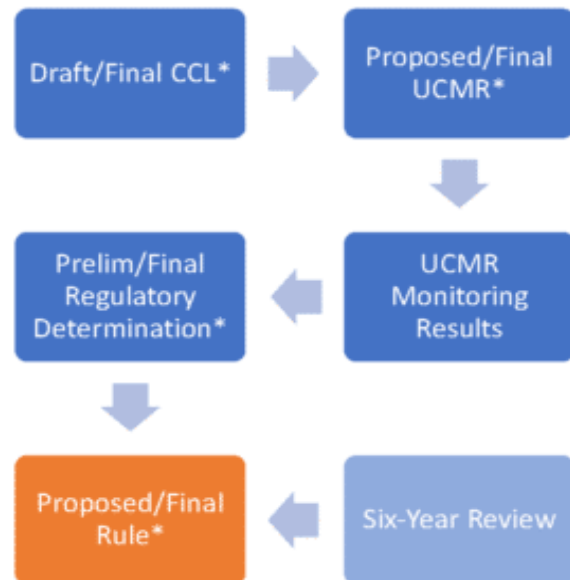
Round One

- **Interim Primary Drinking Water Standards 1975**
- **National Primary Drinking Water Standards 1985**
- **SDWA Amendments 1986**
- **Surface Water Treatment Rule (SWTR) 1989**
- **Total Coliform Rule (TCR) 1989**
- **Chemical Contaminant Rules Phase I 1989**
- **Lead and Copper Regulations 1990**
- **Chemical Contaminant Rules Phase II 1992**
- **Chemical Contaminant Rules Phase IIB 1993**
- **Chemical Contaminant Rules Phase V 1994**

SDWA Amendments

The 1996 Amendments to the Safe Drinking Water Act (SDWA) provided a step-by-step framework for both the development of new drinking water regulations and the review of all existing regulations. The development of a new regulation follows a multi-step process, with each step on five-year cycles:

1. Contaminant Candidate List (CCL)
2. Regulatory Determination (RegDet)
3. Regulation/National Primary Drinking Water Regulation (NPDWR)



The process diagram to the left shows how these steps fit together, along with the Unregulated Contaminant Monitoring Rule (UCMR). Opportunities in the process for public input and comment are marked with an asterisk. A separate but related regulatory effort is the review of all existing regulations every six years (Six-Year Review) that evaluates new data to assess whether a regulation needs to be revised.

Round Two

- **Information Collection Rule** 1996
- **Interim Enhanced SWTR** 1998
- **Stage 1 – Disinfectants and Disinfection By-Products (D-DBP) Regulations** 1998
- **Drinking Water Contaminant Candidate List** 1998
- **Unregulated Contaminant Monitoring Regulations** 1999
- **Radionuclides Rule** 2000
- **Lead and Copper Rule — “Action Levels”** 2000
- **Filter Backwash Recycling Rule** 2001
- **Long Term 1 Enhanced SWTR** 2002
- **Unregulated Contaminant Monitoring Regulations** 2002
- **Drinking Water Contaminant Candidate List 2** 2005
- **Long Term 2 Enhanced SWTR** 2006
- **Stage 2 D-DBP Rule** 2006
- **Ground Water Rule** 2006
- **Aircraft Drinking Water Rule (ADWR)** 2009
- **Drinking Water Contaminant Candidate List 3** 2009
- **Revised Total Coliform Rule (RTCR)** 2013

Contaminants of Emerging Concern (CECs)

- There are many CECs and pharmaceuticals and personal care products (PPCPs) that act as so-called endocrine disruptors (EDCs). EDCs are compounds that alter the normal functions of hormones resulting in a variety of health effects. EDCs can alter hormone levels leading to reproductive effects in aquatic organisms. Evaluating these effects may require testing methodologies not typically available along with endpoints not previously evaluated using current guidelines.

Two Biggies

- Perchlorate

Perchlorate is used as an oxidizer in solid rocket fuel and other propellants and to a lesser extent, in fireworks, explosives and air-bag inflators, and chlorine generators.

- 1,4 dioxane

1,4-Dioxane may be a contaminant in certain ingredients used in cosmetics, detergents, shampoos, and some pharmaceuticals. 1,4-Dioxane is not intentionally added but may occur as an unintentional byproduct in some ingredients.

Disinfection Byproducts (DBPs)

- DBPs are formed in drinking water from the reaction of disinfection agents with other compounds (precursors) occurring in raw water as: NOM, bromide and iodide, and anthropogenic compounds (pharmaceuticals, antibacterial agents, textile dyes, pesticides, surfactants and cyanotoxins, etc.).
- Given the number of known DBPs and its continuous growth, to prevent their occurrence and development, operational parameters and drinking water characteristics should be carefully monitored. Implementing technologies that can remove DBPs and to prevent their re-emergence in the distribution network is highly necessary.

Premises Plumbing

- Premise plumbing is the portion of the drinking water distribution system beyond household connections (pipes connecting buildings to water mains) and inside buildings (e.g., schools, hospitals, public, and private housing), the key characteristics of which include low disinfectant residual, small pipe diameter, high surface/volume ratio, long stagnation/retention time, and warm temperature.
- Depending on the building type, premise plumbing ranges in length from tens to several thousand feet, e.g., a hospital may have 2 miles of warm water plumbing and 1 mile of cold water plumbing. In total, there are over 6.1 million miles of premise plumbing in the United States connected to 1.0 million miles of community water system distribution mains

C8 – PFC – PFAS

Per- and Polyfluoroalkyl Substances

What Are PFAS? Per- and polyfluoroalkyl substances (PFAS) are chemicals that resist grease, oil, water, and heat. They were first used in the 1940's and are now in hundreds of products including stain- and water-resistant fabrics and carpeting, cleaning products, paints, and fire-fighting foams.

Where do they go?

- Soil
- Air
- Water
- Food

What does it do?

Studies indicate that PFOA and PFOS can cause reproductive and developmental, liver and kidney, and immunological effects in laboratory animals. Both chemicals have caused tumors in animals.

- **The most consistent findings are increased cholesterol levels among exposed populations, with more limited findings related to:**
 - **low infant birth weights,**
 - **effects on the immune system,**
 - **cancer (for PFOA), and**
 - **thyroid hormone disruption (for PFOS).**

Possible PFAS Premises Plumbing Issues

- **Equipment & Appliance Filters (TSCA/CERCLA/RCRA)**
- **Design Concerns**
- **Maintenance Matters**
- **Waste Disposal Issues**
- **Water Discharge Issues**

Treatment Techniques

- **Granular Activated Carbon**
- **Ion Exchange Resin**
- **Reverse Osmosis Membrane**

Premise Plumbing Systems & Water Quality

- Capture & Concentrate
- Dead-ends
- Temperatures
- Water & Indoor Air Connection
- Corrosion
- The Constantly Changing Environment

Regulatory & Legal Issues

- **Lead, Copper & Materials Corrosion**
- **Other Materials (Teflon)**
- **Water Age & Biofilm Formation**
- **Indoor Air**
- **Cross Connection Control**
- **General Maintenance**

Questions

