The Big Guide for Small Systems: A Resource for Board Members

RCAP

RURAL COMMUNITY ASSISTANCE PARTNERSHIP

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Regulatory Responsibilities

In the United States, we enjoy safe and protected public drinking water supplies and effective wastewater treatment technologies. All of us receive benefits from these services every day—and multiple times each day. Every time we drink a glass of water from the tap, it does not taste foul, or when we flush the toilet, we do not have to deal with the waste. On a more basic level, these individual and collective benefits are the result of public drinking water and wastewater infrastructure that protects and preserves public health and undergirds economic vitality in your community.

The number one concern for you as the governing body of your water utility is to protect the public's health while maintaining **compliance** with state and federal regulations. Your certified operator is on the front lines of these protection and compliance efforts, making sure that your treatment facility operates in accordance with state and federal regulations and that all required tests, reports, public notification and recordkeeping procedures are followed. As a board member, it is your duty to support the operator as he or she carries out these functions and to be knowledgeable of the consequences for failing to do so. Board members of water and wastewater treatment facilities are bound by law to follow requirements spelled out in several U.S. Environmental Protection Agency (EPA) regulations. An illustration of how EPA regulations are developed is in Appendix B.

Safe Drinking Water Act

The **Safe Drinking Water Act** (SDWA) was passed by Congress in 1974 and was amended in 1986 and 1996. It applies to **public water systems** (PWS) serving 15 or more connections or an average of 25 people or more each day for at least 60 days per year. The owner or operator of the water system is responsible for meeting the requirements of the SDWA. There are three types of PWS:

- **Community water systems** (CWS) supply water to the same population of residents year-round.
- **Non-transient, non-community water systems** (NTNCWS) supply water to at least 25 of the same people at least six months each year, but not their residences. Examples of NTNCWS include factories, schools or daycares that have their own water supplies.
- **Transient, non-community water systems** (TNCWS) provide water in a place where people do not live continuously, like restaurants, motels, rest stops or campgrounds with their own water supplies.

Water systems use a "multiple-barrier approach" to protect public health. The first barrier is to have a safe, protected water source. To give water utilities and community members the information they need to decide how to protect their drinking water sources, the SDWA requires that the states develop EPA-approved programs to carry out

assessments of all source waters in the state. The source water assessment is a study that defines the land area contributing water to each public water system, identifies the major potential sources of contamination that could affect the drinking water supply, and determines how susceptible the public water supply is to this potential contamination. Public utilities and customers can then use the publicly available study results to the take actions to reduce potential sources of contamination and protect drinking water through use of a **source water protection plan**. The second barrier is treatment of the water source by a certified operator. The third barrier is the proper operation and maintenance of water-storage facilities and distribution systems by licensed operators. And the fourth barrier is providing information to consumers on the quality of the water and health effects.

The SDWA requires water systems to prove that they are using the multiple-barrier approach effectively by mandating water sampling and testing for:

- inorganic chemicals
- microbiological contaminants
- organic chemicals
- radiological contaminants
- turbidity
- unregulated contaminants
- disinfection chemicals and disinfection byproducts

These chemicals and contaminants are assigned **maximum contaminant levels** (MCLs) allowed in drinking water. MCLs are enforceable standards for the highest level of a contaminant allowed in drinking water. If the amount of the chemical or contaminant is technically difficult to measure, or if the cost of the measurement is excessive for small systems, a **treatment technique** (TT) may be necessary. A TT is a required process intended to reduce the level of a contaminant in drinking water. Examples of TTs are the Lead and Copper Rule requirements and the Surface Water Treatment Rule requirements. Tables that describe MCLs or TTs for the various regulated contaminants are included in Appendix C.

Most water system records are considered public information. Personnel files and information that is confidential due to security concerns are *not* public information. Customers have the right to inspect public water system records, and copies of the records must be provided on demand. Each state has unique “Public Information” laws that dictate what records are deemed public information so it is advisable for you to be aware of these requirements for your state. Providing a comprehensive **consumer confidence report** (CCR) can assist your system in keeping customers informed and confident that their system is providing them with quality service. A sample CCR may be found in Appendix I. The following records must be kept in the water treatment facility:

- copies of laboratory results, including the name of the person who collected the samples
- dates and locations of sampling points
- records of **contaminant level violations** and specific steps taken to correct the violations
- sanitary survey reports
- all other water-quality information and/or operator’s logs

Public notification is required by the SDWA when the water system violates any regulation. There are two classifications of violation. Tier 1 violations include maximum contaminant level violations, treatment technique violations, and non-compliance with variance or exemption schedules. Tier 2 violations include non-compliance with monitoring requirements, testing

procedures, or **variances** or **exemptions**. A variance or exemption is a *very* rare occurrence. It is when the EPA or state drinking water regulatory agency allows a drinking water system having extreme technical or financial problems to provide water to the public for a limited time. The supplier must prove that having the variance or exemption poses no threat to public health. RCAP believes that there should be no dual standards—everyone is entitled to universally high standards protective of public health. Variances generally allow a water system to provide drinking water that may contain contaminants at levels above the MCL on the condition that the quality of the drinking water is still at a level to protect public health. An exemption, on the other hand, is intended to allow a system with compelling circumstances an extension of time before the system must comply with applicable SDWA requirements.

A Tier 1 violation is more serious than a Tier 2 violation. Tier 1 violations may be addressed by your state with civil suits that could cost your water systems millions of dollars or require plant and distribution system improvements. The following table illustrates how public notification is to be performed for various violations.

Public Notification Requirements

VIOLATION OR CONDITION	REQUIRED NOTIFICATION		
	Mail	Newspaper	Broadcast
Acute violation of MCL (Tier 1)	X	X	X
Non-acute violation of MCL (Tier 1)	X	X	
Failure to follow compliance schedule (Tier 1)	X		
Failure to monitor (Tier 2)	X		
Failure to use approved testing procedure (Tier 2)	X		
System granted a variance or exception (Tier 2)	X		

The SDWA requires the following recordkeeping in support of public information:

- Bacteriological analyses are kept for a minimum of five years.
- Chemical analyses are kept for a minimum of ten years.
- Written reports (such as engineering analyses and sanitary surveys) are kept for a minimum of ten years following completion.
- Variances and exemptions are kept for a minimum of five years following their expiration.
- Actions taken to correct a violation are kept for a minimum of three years after the last action.

Since the last amendment to the SDWA, various federal rules and regulations have been passed to clarify and strengthen the SDWA. Following are brief descriptions of rules and regulations pertaining to water.

Arsenic can enter water supplies from natural deposits in the earth or from agricultural or industrial runoff. If the amount of arsenic in the source water is less than the MCL of 10 µg/L (**parts per billion**, or ppb), the Arsenic Rule requires water systems that have surface water as their source to sample for arsenic once a year, and those that have groundwater as their source to sample once every three years. If the amount of arsenic in the source water is greater than the MCL, the system must sample quarterly until the system is reliably and consistently below the MCL. Plus, if the sample is above 10 µg/L, the system must find alternative sources of water (which could include **blending**) or conduct treatment to remove arsenic to below the MCL. This rule has been in place since 2006.

Inorganic chemicals, synthetic (human-made) organic chemicals, and volatile organic chemicals are regulated under the Chemical Phase Rules. Your water system may have to monitor for these chemicals once every three years, or it may have received a waiver for one or more of the chemicals from your state regulatory agency, based on a determination that your system is not susceptible to contamination or that the chemicals were not used in your area.

The Lead and Copper Rule was enacted in 1991 to protect consumers from metals that leach into drinking water from home plumbing. Water systems monitor lead and copper at consumers' faucets. If lead concentrations exceed an **action level** of 15 µg/L (ppb) or copper concentrations exceed an action level of 1.3 mg/L (**parts per million**, or ppm) in more than 10 percent of customer taps sampled, the system must undergo additional actions to control corrosion and must rule out their source water as a significant contributor of lead. If the action level for lead is exceeded, the system must also inform the public about steps they should take to protect their health. The system may also have to replace lead service lines under their control. In addition, a CWS or NTNCWS may be required to keep records of all lead and copper results and water quality parameters for at least 12 years.

Vulnerable community water systems had to monitor for radionuclides at each entry point in their distribution systems to get a baseline for the Radionuclides Rule, which originally was passed in 1977 and was updated in 2000. If the samples contain radionuclides equal to or below the MCL, the systems have to be monitored every three, six or nine years (depending upon which contaminant is present and its amount). If the samples contain radionuclides above the MCL, system samples are required quarterly. Your state will be able to provide you with information on if and how often your system will have to monitor for these contaminants.

The Filter Backwash Rule was established in 2001 and is intended to protect consumers from microbial contamination, especially ***Cryptosporidium***. Recycled flow from filter backwashing operations, thickener supernatant and liquid from dewatering processes have to re-enter water treatment plants at the beginning of treatment (or at an alternate, state-approved point of treatment).

Groundwater systems may be subject to fecal contamination, which contains microorganisms and viruses (specifically, **rotavirus** and **echovirus**). Such systems are regulated with the Ground Water Rule of 2006. Periodic sanitary surveys of systems require the evaluation of eight critical elements of a public water system:

- source
- treatment
- distribution system
- finished water storage
- pumps, pump facilities, and controls
- monitoring, reporting, and data verification
- system management and operation
- operator compliance with state requirements

Sanitary surveys also require the identification of significant deficiencies (for example, a well located near a leaking septic system). Source water monitoring is triggered when a system that does not already treat drinking water to remove 99.99 percent (also known as 4-log removal) of viruses identifies a positive sample during its Total Coliform Rule monitoring and assessment monitoring (at the option of the state) targeted at high-risk systems. Corrective action is required for any system with a significant deficiency or source water fecal contamination. Compliance monitoring is required to ensure that treatment technology installed to treat drinking water reliably achieves 99.99 percent inactivation or removal of viruses.

The Long-Term I Enhanced Surface Water Treatment Rule (also known as LT1) was finalized in 2002 and applies to both systems that use surface water and systems that use **groundwater under the direct influence of surface water** (abbreviated GWUDI). All small water systems must achieve a 99 percent (also known as 2-log) removal of *Cryptosporidium*. Filtered systems must comply with combined filter effluent turbidity performance requirements to meet the removal criteria, and conventional and **direct filtration** systems must continuously monitor turbidity at each filter. Systems have to monitor their effluent to show that disinfection byproduct (DBP) levels are less than 80 percent of the MCL, or they have to develop a profile of microbial inactivation levels (a **disinfection profile**) for their treatment process. If a system changes its method of disinfection, the state must give prior approval. New, finished water reservoirs must be covered. If the system is unfiltered, the system's watershed control plan must specifically mention *Cryptosporidium* as a "pathogen of concern."

The Long-Term II Enhanced Surface Water Treatment Rule (also known as LT2), came into effect for small systems in 2008 and improves the control of microbial pathogens, specifically *Cryptosporidium*, ***E. coli***, and ***Giardia lamblia***. Filtered water systems are classified in one of four treatment categories (called "bins" in the regulations) based on their monitoring results. If your water system was classified in the lowest bin, you have no additional requirements. Systems classified in higher bins must provide additional water treatment to further reduce *Cryptosporidium* levels by 90 to 99.7 percent (1.0 to 2.5-log), depending on the bin. Systems will select from different treatment and management options in a "microbial toolbox" to meet their additional treatment requirements. All unfiltered water systems must provide at least 99 or 99.9 percent (2 or 3-log) inactivation of *Cryptosporidium*, depending on the results of monitoring. Systems that store treated water in open reservoirs must either cover the reservoir or treat the reservoir discharge to inactivate 99.99 percent (4-log) virus, 99.9 percent (3-log) *Giardia lamblia*, and 99 percent (2-log) *Cryptosporidium*. Systems must conduct a second round of monitoring six years after completing the initial round to determine if source water conditions have changed significantly.

If your water system uses ultraviolet light for disinfection, or if it has a waiver from your state, you don't have to complete monitoring or treatment to comply with the Stage 1 Disinfectants and Disinfection Byproducts Rule (also known as Stage 1 DBP). Otherwise, small systems have

had to be in compliance with this rule since 2004. If your system adds chlorine, chlorine dioxide, or ozone to disinfect water supplies, the chemicals can react with naturally occurring organic chemicals to produce unintended byproducts that may cause cancer. The maximum residual disinfectant level (MRDL) for each of these chemicals is listed in Appendix C. And conventional water systems are required to remove some of the organic chemicals (known as disinfection byproducts precursors) from their raw water using enhanced coagulation, enhanced softening, or an alternative compliance technology.

The Stage II Disinfectants and Disinfection Byproducts Rule (also known as Stage 2 DBP) applies only to CWS and NTNCWS, not to TNCWS. Compliance monitoring of total **trihalomethanes** (TTHM) and **haloacetic acids** (HAA5) to meet the requirements of this rule begins on October 1, 2013. Small groundwater systems that serve fewer than 10,000 people monitor DBPs at two sites in their distribution systems once each year. Small surface water systems that serve fewer than 500 people do the same. Surface water systems that serve between 500 and 3,300 people are required to take individual samples of TTHM and HAA5 (instead of a dual sampling set) at the locations with the highest concentration of trihalomethanes and haloacetic acids, respectively. Surface water systems that serve between 3,301 and 10,000 people monitor DBPs at two sites in their distribution systems once each quarter.

Effective in 1990, the Total Coliform Rule requires monthly sampling for total **coliforms**. Coliform bacteria may enter water systems through cross-connections, backflow incidents, line breaks or compromised water sources. The EPA uses coliform bacteria as indicator organisms—that is, their presence indicates that the system is vulnerable to pathogens and a warning that your water system may be contaminated with fecal material. The number of routine samples required ranges from one per month for systems serving fewer than 1,000 people to ten samples per month for systems serving 10,000 people. If coliform bacteria are present in a sample, repeat sampling is required.

TIP

Check the EPA website (*www.epa.gov*) for new regulations and guidance at least once every six months.

Clean Water Act

The Clean Water Act (CWA), originally called the Federal Water Pollution Control Act, was placed into law in 1948, and was the first major U.S. law to address water pollution. It was reorganized and expanded in 1972 and amended in 1977. The CWA amendments in 1977 included:

- establishing the basic structure for regulating **pollutants** discharged into the waters of the United States
- giving EPA the authority to implement pollution-control programs, such as setting wastewater standards for industry
- maintaining existing requirements to set water quality standards for all contaminants in surface waters
- making it unlawful for any person to discharge any pollutant from a **point source** into navigable waters, unless a permit was obtained under its provisions
- funding the construction of sewage treatment plants under the construction grants program
- recognizing the need for planning to address the critical problems posed by **non-point source** pollution

Changes in 1987 phased out the construction grants program and replaced it with the State Water Pollution Control Revolving Fund, more commonly known as the Clean Water State Revolving Fund (CWSRF). This new funding strategy addressed water quality needs by building on partnerships between EPA and states.

The CWA contains several rules and regulations for wastewater treatment plants:

- **National Pollutant Discharge Elimination System** (NPDES) permit program including the Pretreatment Streamlining Rule
- The Biosolids Rule for sludge
- Total Maximum Daily Load (TMDL) and Impaired Waters Rules
- Water quality-based control standards

Publicly owned treatment works (POTW) and other centralized wastewater treatment systems are not intended to handle industrial waste. They are intended to treat conventional household waste and biodegradable commercial/industrial waste. Generally, primary treatment consists of removing solids (cans, paper, plastic, and other items) from wastewater coming into the system, and secondary treatment entails removing organic components from wastewater before returning the cleaned water back into the environment. To ensure that the receiving waters are adequately protected, the National Pollutant Discharge Elimination System (NPDES) requires all entities that discharge into waters to obtain permits, including wastewater treatment systems. Those contaminants specifically required to be removed from POTW effluent are listed in Appendix D.

In the past, many industries treated sewer systems as a convenient receptacle for waste of all sorts. Because of this, industrial and non-biodegradable waste could enter the collection system. This practice led to the formation of toxic gases, explosions, interference or disruption of the processes used by wastewater treatment systems, or pass-throughs (when a constituent is not removed by primary or secondary treatment and passes through the treatment system, which can cause the POTW to violate its NPDES permit). The Pretreatment Rule (1978) requires industrial and commercial point sources to reduce or eliminate these wastes before discharging their wastewater to any collection system. There are 129 different priority pollutants listed in the Pretreatment Rule.

Because much water contamination comes from non-point sources, such as agriculture, forestry, development activities and road runoff, the EPA has authorized states to develop **water quality-based control standards.** The standards designate for what purpose a body of water is to be used (drinking water, recreation, or fish and wildlife habitat) and the amount of a pollutant that can be assimilated by the water body without impairing its designated use (plus a margin of safety). If no applicable water quality standards exist, the state establishes **total maximum daily load** (TMDL) criteria for a given contaminant.

40 Code of Federal Regulations 503 contains the Biosolids Rule. Biosolids are treated wastewater sludges that are recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth. The Part 503 rule governing the use and disposal of biosolids contains numerical limits for metals in biosolids, pathogen-reduction standards, site restriction,

Everybody is downstream from somebody else. Know where your effluent (waste) goes!

crop-harvesting restrictions and monitoring, recordkeeping and reporting requirements for land-applied biosolids, as well as similar requirements for biosolids that are surface-disposed or incinerated. Standards have been proposed to include requirements in the Part 503 Rule that limit the concentration of dioxin and dioxin-like compounds in biosolids to ensure safe land application. About 50 percent of all biosolids are recycled to land, and all 50 states use land application of biosolids.

State or Tribal Regulations

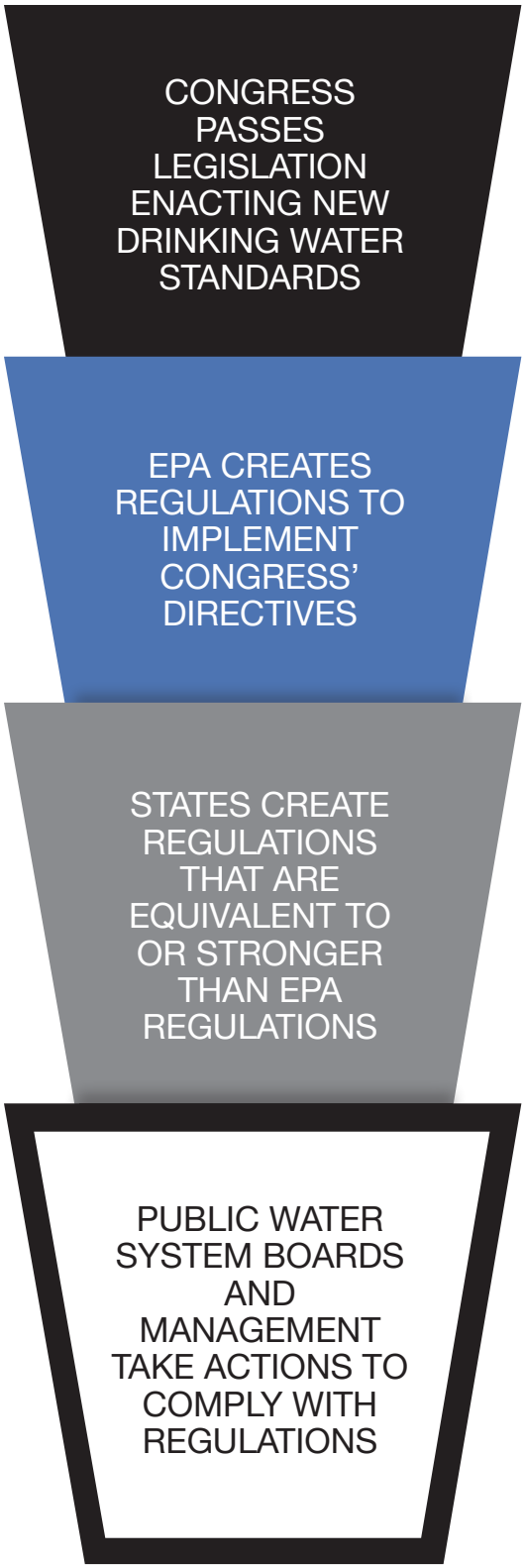
Individual states and tribes are allowed to impose their own regulations on water treatment and wastewater treatment. These regulations must satisfy federal regulations at a minimum but may be even more stringent. State and tribal regulatory information is available on the EPA's website at *www.epa.gov/lawsregs/states/index.html* and *http://water.epa.gov/aboutow/ogwdw/tribal.cfm.* Consult your state regulators to determine if there are other regulations with which you are required to comply. For specific state or tribal requirements, applications, permits, and forms, contact your state, tribal or federal **primacy agency**.

THE TOP TEN PIECES OF ADVICE FOR BOARD MEMBERS FROM PAT KLINE, WHO AUTHORED AND COMPILED MANY PARTS OF THIS GUIDE

1. Bring snacks to meetings. Food always makes a meeting more bearable (and gets people to come).
2. Befriend regulators. They are not the enemy but are there to assist you in providing for and protecting the public's health.
3. Understand how to compromise effectively.
4. Know the rules under which your board operates, and follow them.
5. Understand your treatment system from start to finish.
6. Show up to every meeting, and contribute regularly.
7. Treat all customers, co-workers, contractors, and employees with respect and dignity.
8. Laboratory analyses, budget line items, the size of your system and what it does—all are described in numbers, and all of the numbers have meaning. Know what the numbers mean.
9. Don't be afraid to ask questions.
10. "Be the change you want to see in the world." (quote by Mahatma Gandhi)

Appendix B

Regulatory Process



Graphic courtesy of Environmental Finance Center, Boise State University. Taken from Drinking Water System Management Handbook: Administration of a Drinking Water System Through Technical, Managerial and Financial Planning, February 2002, page 3.

Appendix C

Maximum Contaminant Levels (MCL) and Secondary Standards for Drinking Water

This information was taken from the website of the U.S. Environmental Protect Agency—*National Primary Drinking Water Regulations* at *http://water.epa.gov/drink/contaminants/index.cfm#List* (as of Oct. 18, 2010). This information is subject to change as new regulations are passed. Be sure to consult with your regulatory agency for the latest information.

C1 Regulated Microorganisms in Drinking Water

CONTAMINANT	MCL OR TT (MG/L)	POTENTIAL HEALTH EFFECT FROM LONG-TERM EXPOSURE	SOURCE OF CONTAMINANT
Cryptosporidium	TT	Gastrointestinal illness (diarrhea, vomiting, cramps)	Human/animal fecal matter.
Giardia lamblia	TT	Gastrointestinal illness (diarrhea, vomiting, cramps)	Human/animal fecal matter.
Legionella	TT	Legionnaires' Disease (a type of pneumonia)	Found naturally in water.
Enteric viruses	TT	Gastrointestinal illness (diarrhea, vomiting, cramps)	Human/animal fecal matter
Heterotrophic plate count	TT	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is assumed to be.	Found naturally in the environment.
Total coliforms	95% removal	The presence of total coliforms is used to indicate whether other potentially harmful bacteria may be present.	Most found naturally in water, but fecal coliforms and *E. coli* only come from human and animal fecal waste.
Turbidity	TT	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff.

C2 Regulated Disinfection Byproducts in Drinking Water

CONTAMINANT	MCL OR TT (MG/L)	POTENTIAL HEALTH EFFECT FROM LONG-TERM EXPOSURE	SOURCE OF CONTAMINANT
Bromate	0.010	Increased risk of cancer.	Byproduct of disinfection.
Chlorite	1.0	Anemia; nervous system effects in infants/children	Byproduct of disinfection.
Haloacetic acids (HAA5)	0.060	Increased risk of cancer.	Byproduct of disinfection.
Total trihalomethanes (TTHM)	0.080	Liver, kidney or central nervous system problems; increased risk of cancer.	Byproduct of disinfection.

C3 Regulated Disinfection Chemicals in Drinking Water

CONTAMINANT	MCL OR TT (MG/L)	POTENTIAL HEALTH EFFECT FROM LONG-TERM EXPOSURE	SOURCE OF CONTAMINANT
Chloramines (as Cl_2)	4.0	Eye/nose irritation; stomach discomfort, anemia	Disinfection chemical.
Chlorine (as Cl_2)	4.0	Eye/nose irritation; stomach discomfort, anemia.	Disinfection chemical.
Chlorine dioxide (as ClO_2)	0.8	Anemia; nervous system effects in infants/children.	Disinfection chemical.

C4 Regulated Radionuclides in Drinking Water

CONTAMINANT	MCL OR TT (MG/L)	POTENTIAL HEALTH EFFECT FROM LONG-TERM EXPOSURE	SOURCE OF CONTAMINANT
Alpha particles	15 picoCuries per Liter (pCi/L)	Increased risk of cancer.	Erosion of natural deposits.
Beta particles and photon emitters	4 millirems per year	Increased risk of cancer.	Decay of natural and man-made deposits of radioactive minerals.
Radium 226/228	5 pCi/L	Increased risk of cancer.	Erosion of natural deposits.
Uranium	30 µg/L	Increased risk of cancer, kidney toxicity.	Erosion of natural deposits.

C5 Regulated Inorganic Chemicals in Drinking Water

CONTAMINANT	MCL OR TT (MG/L)	POTENTIAL HEALTH EFFECT FROM LONG-TERM EXPOSURE	SOURCE OF CONTAMINANT
Antimony	0.006	Increase in blood cholesterol; decrease in blood sugar.	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder
Arsenic	0.010	Non-cancer effects: thickening and discoloration of the skin, stomach pain, nausea, vomiting; diarrhea; numbness in hands and feet; partial paralysis; and blindness. Increased risk of cancer of the bladder, lungs, skin, kidney, nasal passages, liver, and prostate.	Erosion of natural deposits; runoff from orchards, runoff from glass & electronics production wastes
Asbestos (>10 µm)	7 million fibers/ Liter	Increased risk of developing benign intestinal polyps.	Decay of asbestos cement in water mains; erosion of natural deposits
Barium	2	Increase in blood pressure.	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits.
Beryllium	0.004	Intestinal lesions.	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries.
Cadmium	0.005	Kidney damage.	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints.
Chromium (total)	0.1	Allergic dermatitis.	Discharge from steel and pulp mills; erosion of natural deposits.
Copper	TT; Action Level=1.3	Short-term exposure: gastrointestinal distress. Long-term exposure: liver or kidney damage; people with Wilson's Disease should consult their doctor if the amount of copper in their water exceeds the action level.	Corrosion of household plumbing systems; erosion of natural deposits.
Cyanide (as free Cn)	0.2	Nerve damage or thyroid problems.	Discharge from steel or metal factories; discharge from plastic and fertilizer factories.

C5 Regulated Inorganic Chemicals in Drinking Water

CONTAMINANT	MCL OR TT (MG/L)	POTENTIAL HEALTH EFFECT FROM LONG-TERM EXPOSURE	SOURCE OF CONTAMINANT
Fluoride	4.0	Bone disease (pain and tenderness of the bones); children may get mottled teeth.	Water additive; erosion of natural deposits; discharge from fertilizer and aluminum factories.
Lead	TT; Action Level=0.015	Infants and children: delays in physical or mental development; children could show slight deficits in attention span and learning abilities. Adults: kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits.
Mercury	0.002	Kidney damage.	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands.
Nitrate (as N)	10	Infants below the age of 6 months could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits.
Nitrite (as N)	1	Infants below the age of 6 months could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits.
Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems.	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines.
Thallium	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems.	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories.

C6 Regulated Organic Chemicals in Drinking Water

CONTAMINANT	MCL OR TT (MG/L)	POTENTIAL HEALTH EFFECT FROM LONG-TERM EXPOSURE	SOURCE OF CONTAMINANT
Acrylamide	TT	Nervous system or blood problems; increased risk of cancer.	Added to water during sewage/ wastewater treatment.
Alachlor	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer.	Runoff from herbicide used on row crops.
Atrazine	0.003	Cardiovascular system or reproductive problems.	Runoff from herbicide used on row crops.
Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer.	Discharge from factories; leaching from gas storage tanks and landfills.
Benzo(a)pyrene (PAHs)	0.0002	Reproductive difficulties; increased risk of cancer.	Leaching from linings of water storage tanks and distribution lines.
Carbofuran	0.04	Problems with blood, nervous system, or reproductive system.	Leaching of soil fumigant used on rice and alfalfa.
Carbon tetrachloride	0.005	Liver problems; increased risk of cancer.	Discharge from chemical plants and other industrial activities.
Chlordane	0.002	Liver or nervous system problems; increased risk of cancer.	Residue of banned termiticide.
Chlorobenzene	0.1	Liver or kidney problems.	Discharge from chemical and agricultural chemical factories.
2,4-D	0.07	Kidney, liver, or adrenal gland problems.	Runoff from herbicide used on row crops.
Dalapon	0.2	Minor kidney changes.	Runoff from herbicide used on rights of way.
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards.
o-Dichlorobenzene	0.6	Liver, kidney, or circulatory system problems.	Discharge from industrial chemical factories.
p-Dichlorobenzene	0.075	Anemia; liver, kidney or spleen damage; changes in blood.	Discharge from industrial chemical factories.
1,2-Dichloroethane	0.005	Increased risk of cancer.	Discharge from industrial chemical factories.

C6 Regulated Organic Chemicals in Drinking Water

CONTAMINANT	MCL OR TT (MG/L)	POTENTIAL HEALTH EFFECT FROM LONG-TERM EXPOSURE	SOURCE OF CONTAMINANT
1,1-Dichloroethylene	0.007	Liver problems.	Discharge from industrial chemical factories.
cis-1,2-Dichloroethylene	0.07	Liver problems.	Discharge from industrial chemical factories.
trans-1,2-Dichloroethylene	0.01	Liver problems.	Discharge from industrial chemical factories.
Dichloromethane	0.005	Liver problems; increased risk of cancer.	Discharge from drug and chemical factories.
1,2-Dichloropropane	0.005	Increased risk of cancer.	Discharge from industrial chemical factories.
Di(2-ethylhexyl) adipate	0.4	Weight loss, liver problems, or possible reproductive difficulties.	Discharge from chemical factories.
Di(2-ethylhexyl) phthalate	0.006	Reproductive difficulties; liver problems; increased risk of cancer.	Discharge from rubber and chemical factories.
Dinoseb	0.007	Reproductive difficulties.	Runoff from herbicide used on soybeans and vegetables.
Dioxin (2,3,7,8-TCDD)	0.00000003	Reproductive difficulties; increased risk of cancer.	Emissions from waste incineration and other combustion; discharge from chemical factories.
Diquat	0.02	Cataracts.	Runoff from herbicide use.
Endothall	0.1	Stomach and intestinal problems.	Runoff from herbicide use.
Endrin	0.002	Liver problems.	Residue of banned insecticide.
Epichlorohydrin	TT	Increased cancer risk, and over a long period of time, stomach problems.	Discharge from industrial chemical factories; an impurity of some water treatment chemicals.
Ethylbenzene	0.7	Liver or kidney problems.	Discharge from petroleum refineries.
Ethylene dibromide	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer.	Discharge from petroleum refineries.
Glyphosate	0.7	Kidney problems; reproductive difficulties.	Runoff from herbicide use.
Heptachlor	0.0004	Liver damage; increased risk of cancer.	Residue of banned termiticide.
Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer.	Breakdown of heptachlor.

C6 Regulated Organic Chemicals in Drinking Water

CONTAMINANT	MCL OR TT (MG/L)	POTENTIAL HEALTH EFFECT FROM LONG-TERM EXPOSURE	SOURCE OF CONTAMINANT
Hexachlorobenzene	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer.	Discharge from metal refineries and agricultural chemical factories.
Hexachlorocyclo-pentadiene	0.05	Kidney or stomach problems.	Discharge from chemical factories.
Lindane	0.0002	Liver or kidney problems.	Runoff/leaching from insecticide used on cattle, lumber, gardens.
Methoxychlor	0.04	Reproductive difficulties.	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock.
Oxamyl (Vidate)	0.2	Slight nervous system effects.	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes.
Polychlorinated biphenyls (PCBs)	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer.	Runoff from landfills; discharge of waste chemicals.
Pentachlorophenol	0.001	Liver or kidney problems; increased cancer risk.	Discharge from wood-preserving factories.
Picloram	0.5	Liver problems.	Herbicide runoff.
Simazine	0.004	Problems with blood.	Herbicide runoff.
Styrene	0.1	Liver, kidney, or circulatory system problems.	Discharge from rubber and plastic factories; leaching from landfills.
Tetrachloroethylene	0.005	Liver problems; increased risk of cancer.	Discharge from factories and dry cleaners.
Tolulene	1	Nervous system, kidney, or liver problems.	Discharge from petroleum factories.
Toxaphene	0.003	Kidney, liver, or thyroid problems; increased risk of cancer.	Runoff/leaching from insecticide used on cotton and cattle.
2,4,5-TP (Silvex)	0.05	Liver problems.	Residue of banned herbicide.
1,2,4-Trichlorobenzene	0.07	Changes in adrenal glands.	Discharge from textile finishing factories.

C6 Regulated Organic Chemicals in Drinking Water

CONTAMINANT	MCL OR TT (MG/L)	POTENTIAL HEALTH EFFECT FROM LONG-TERM EXPOSURE	SOURCE OF CONTAMINANT
1,1,1-Trichloroethane	0.2	Liver, nervous system or circulatory problems.	Discharge from metal degreasing sites and other factories.
1,1,2-Trichloroethane	0.005	Liver, kidney, or immune system problems.	Discharge from industrial chemical factories.
Trichloroethylene	0.005	Liver problems; increased risk of cancer.	Discharge from metal degreasing sites and other factories.
Vinyl chloride	0.002	Increased risk of cancer.	Leaching from PVC pipes; discharge from plastic factories.
Xylenes (total)	10	Nervous system damage.	Discharge from petroleum factories and chemical factories.