U.S. Army Public Health Command

Technical Guide 179

Complying with the Safe Drinking Water Act

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USAPHC

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CHAPTER 1 INTRODUCTION

1.1 Purpose

This technical guide (TG) provides guidance on meeting the requirements pursuant to the Safe Drinking Water Act (SDWA) with amendments. Compliance with the SDWA ensures United States (U.S.) Army water systems are minimizing drinking water health risks and providing water that is protective of consumer health. Additional information provides a thorough overview of the requirements necessary for compliance with SDWA and associated regulations.

1.2 Applicability

This TG is directly applicable to CONUS Army water systems classified as Public Water Systems, (PWSs) (see Section 2.3). This TG is also applicable to outside continental U.S. (OCONUS) Army water systems required to comply with country-specific Final Governing Standards (FGS) or the Overseas Environmental Baseline Guidance Document (OEBGD) in the absence of an FGS because the OEBGD and country-specific FGSs are based on the Federal Drinking Water Regulations (e.g., the National Primary Drinking Water Regulations (NPDWR)) pursuant to SDWA.

1.3 How Preventive Medicine can use this Technical Guide

Preventive Medicine Environmental Health [PM (EH)] personnel can use this TG as a means of providing medical oversight of U.S. Army water systems in accordance with Army Regulations (AR) 40-5 and Department of the Army (DA) Pamphlet (PAM) 40-11. The SDWA defines the health-based goals that ensure safe drinking water. By understanding the requirements that PWSs must meet to ensure compliance with SDWA, PM (EH) personnel can successfully anticipate, identify, assess, and manage potential health risks associated with drinking water. Specifically, PM (EH) personnel can evaluate a water system's regulatory monitoring data to determine potential drinking water health risks—a system in full regulatory compliance is generally considered to have minimized drinking water health risks. The PM (EH) personnel can also use the data to identify increasing trends in contaminant levels and work with water system personnel to take action before contaminants potentially pose an increased health risk and the water system becomes noncompliant. With an understanding of potential health risks associated with an Army drinking water system, PM (EH) personnel can tailor the level of support (e.g., bacteriological sampling and analyses) relative to health risks associated with other environmental programs to ensure that all health risks posed by EH hazards associated with Army activities are successfully mitigated.

1.4 How Garrison Personnel can use this Technical Guide

Garrison water system stakeholders such as environmental and utilities personnel can use this TG as a means of ensuring compliance with SDWA, regardless of whether an Army water system is Government owned and Government operated (GOGO), Government owned contractor operated (GOCO), or privatized. Garrison personnel can use this TG to ensure that all required monitoring is completed at the proper frequencies and locations, and the correct information is reported to their State agency responsible for ensuring SDWA compliance.

1.5 Organization of this Technical Guide

This TG is organized around the SDWA requirements and subsequent regulations. The remaining chapters of this TG are organized as follows:

- Chapter 2 discusses the history of SDWA and the regulations developed by USEPA that water systems must meet to ensure compliance with SDWA.

- Chapters 3 and 4 introduce the NPDWR and cover each regulation associated with NPDWR.

- Chapters 5 and 6 provide general reporting, recordkeeping, and public notification requirements associated with NPDWR.

- Chapter 7 discusses the use of Point-of-Entry (POE) and Point-of-Use (POU) treatment devices for complying with some of NPDWR.

- Chapter 8 covers the SDWA requirements for development and implementation of State operator certification programs.

- Chapter 9 discusses the aesthetically-related National Secondary Drinking Water Regulations (NSDWR) which are not federally enforceable, but may be enforced by some States.

- Chapter 10 covers the SDWA source water protection programs.

- Chapter 11 summarizes the SDWA Water System Vulnerability Assessment (WSVA) and Water System Emergency Response Plan (WSERP) requirements.

- Chapter 12 discusses issues not addressed in SDWA, but important from a health risk perspective. Included are discussions on alternative health-based levels that could be considered for some regulated and unregulated contaminants in temporary water system contamination situations, and the control of cross connections.

This TG is intended to provide a thorough overview of all requirements that Army PWSs must meet to ensure compliance with SDWA. This TG is not intended to be read in its entirety. Readers may use the table of contents to quickly navigate to information specific to their current needs. Each chapter also includes links to U.S. Environmental Protection Agency's (USEPA's) quick reference guides that readers may click on to obtain more in-depth information on specific requirements and regulations.

1.6 Abbreviations and Terms

The glossary at the end of this document contains the abbreviations and definitions of key terms used in this TG.

1.7 References

Appendix B contains references used in developing this document. The USEPA documents can be found through the USEPA's groundwater and drinking water Web site, http://water.epa.gov/drink/index.cfm, and by contacting the Safe Drinking Water Hotline at 1-800-426-4791. At the beginning of each chapter or section there are links to USEPA's quick reference guides specific to the content covered. All chapter and section specific reference guides are contained in Appendix D. Additionally, at the beginning of each chapter or section are Code of Federal Regulation (CFR) citations that identify the specific NPDWR relevant to the content covered.

1.8 Additional Compliance Assistance

1.8.1 CONUS Installations

In addition to the guidance in this TG, CONUS installations can contact their State drinking water agency or Regional USEPA offices for implementation guidance that is specific to their installation.

1.8.2 OCONUS Installations

Military OCONUS installations can receive technical and compliance support from one of the following U.S. Army Public Health Command (USAPHC) Regional Offices. The contact information is provided in Table 1. Department of Defense (DOD) executive agents can also provide additional guidance on country-specific FGS. The OEBGD which is used for the development of country-specific FGS by DOD executive agents provides implementation guidance, procedures, and criteria for environmental compliance at OCONUS installations. The OEBGD and country-specific FGS are based on the SDWA and outline basic requirements for the provision of safe drinking water.

Table 1. USAPHC Regional Contact Information

Installation Location	Supporting USAPHC Regions and Contact Information
Far East countries and Hawaii	Public Health Command Region (PHCR)-Pacific Email: usarmy.zama.medcom-jpn.list.phcr-pacific-cmd@mail.mil Telephone: 011-81-46-407-8447 DSN: (315) 263-8447
Europe and Middle Eastern countries	PHCR-Europe Email: usarmy.landstuhl.medcom-phcr-e.list.usaphcre-s2-3@mail.mil Telephone: +49-6371-86-8084 DSN: (314) 486-8084

1.9 Technical Assistance

Additional assistance regarding drinking water issues may be obtained from the Drinking Water and Sanitation Program at USAPHC, For more information call (410) 436-3919 (commercial); DSN 584-3919, or email: usarmy.apg.medcom-phc.mbx.dehe-water-supply@mail.mil.

CHAPTER 2 THE SAFE DRINKING WATER ACT

2.1 References

• Current text of the SDWA available at the U.S. Government Printing Office Web site:
http://www.gpo.gov/fdsys/browse/collectionUScode.action?collectionCode=USCODE
Choose current year; expand Title 42 "Public Health and Welfare"; expand Chapter 6A "Public Health Service"; choose Subchapter XII – "Safety of Public Water Systems"

• Current text of the NPDWR available at U.S. Government Printing Office Web site:
http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR
Choose current year; expand Title 40 "Protection of Environment"; expand Chapter I "Environmental Protection Agency"; expand Subchapter D "Water Programs"; choose Part 141 "NPDWR."

2.2 The SDWA

The SDWA is the principal law governing drinking water safety in the U.S. The SDWA was originally passed by Congress in 1974 to protect public health by regulating the nation's drinking water. The SDWA authorizes the USEPA to set national health-based standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water. The USEPA, States, and water systems then work together to make sure the standards are met.

2.3 SDWA History

2.3.1 Pre-SDWA

Before 1974, the U.S. did not have enforceable national drinking water standards. Each state had its own various standards, many of which were based upon the 1914 U.S. Public Health Service (USPHS) standards. These standards governed the quality of drinking water on interstate carriers (e.g., trains) and were limited to the bacteriological quality of water until their fourth revision in 1962. The fourth revision set limits for health-related chemical and biological contaminants as well as impurities which affected the appearance, taste, and odor of drinking water. Independent studies by the USPHS in 1969 revealed that almost half of the water systems surveyed did not provide drinking water that met the USPHS standards of 1962. Because of this study and increasing public awareness of the quality of drinking water, Congress developed legislation making all public drinking water supplies subject to the authority of the newly established USEPA. This legislation was called the SDWA, Public Law (PL) 93-523, and was signed on December 16, 1974.

2.3.2 The SDWA.

The SDWA of 1974 was the legislation that gave the USEPA its authority to regulate public water supplies. The SDWA required the USEPA to publish drinking water regulations to improve drinking water quality throughout the U.S. The SDWA has been amended nine times since its initial enactment. The 1986, 1988, 1996, 2002, and 2011 amendments were the most significant amendments.

2.3.3 The SDWA Amendments of 1986

The SDWA Amendments of 1986 encompassed multiple amendments to SDWA that arose from continued public concern about then unregulated contaminants found in drinking water and contamination of ground water by industrial solvents and pesticides. Concerns included pathogens that were not regulated in the 1974 SDWA, widespread contamination of shallow ground water, lead in plumbing materials, radon, poor definitions of treatment techniques (TT) to remove contaminants, and changes in public notification needs. The SDWA Amendments of 1986, signed as PL 99-339 on June 19, 1986, addressed these concerns.

2.3.4 The SDWA Amendment of 1988

Concerns about lead leaching into drinking water from lead components and lead lined tanks in some water cooler-type drinking fountains drove the 1988 SDWA Amendment. Data submitted to Congress at that time showed about 1 million drinking fountains were in service that potentially contained lead components. In response, the 1988 SDWA amendment, termed the Lead Contamination Control Act (LCCA), was enacted on October 31, 1988 as PL 100-572. The amendment required development of a program to eliminate lead-containing drinking fountains in schools and for USEPA to provide guidance on sampling and mitigating elevated lead levels in drinking water in schools and daycare facilities.

2.3.5 The SDWA Amendments of 1996

These amendments constituted the most comprehensive changes to the SDWA. During the 1990's several studies and reports identified widespread and significant noncompliance with SDWA largely due to inadequate funding available to water systems. The SDWA's focus on treatment, lack of public involvement, and lack of focus on setting health-based standards were also contributing factors. The 1996 amendments enhanced SDWA through expansion of source water protection, and established requirements for operator certification, public awareness and involvement, and also established a funding mechanism for water systems to make improvements. The amendments were enacted on August 6, 1996 as PL 104-182.

2.3.6 The SDWA Amendment of 2002

After September 11, 2001, Congress acted to improve the ability of the U.S. to prevent, prepare for, and respond to bioterrorism and other public health emergencies. The Public Health Security and Bioterrorism Preparedness and Response Act (PL 107-188) was enacted on June 12, 2002, and amended the SDWA to require water systems to conduct vulnerability assessments and develop emergency response plans.

2.3.7 The SDWA Amendment of 2011

The 1986 SDWA amendments banned the use of lead pipe, flux, and solder, and set a limit on the amount of lead that plumbing fixtures and solder could contain (8% and 0.2%, respectively). However, subsequent research showed that plumbing fixtures containing 8% of lead can contribute significant levels of lead to the drinking water. This amendment, the Reduction of Lead in Drinking Water Act (PL 111-380), was enacted on January 4, 2011, and established a lower lead content requirement of 0.25% for plumbing fixtures and maintained the 0.2% maximum content for solder and flux.

2.4 SDWA Applicability

The SDWA applies to all PWSs. A PWS is defined as a system serving water to an area with at least 15 service connections (e.g., pipe connecting a building's plumbing system to the water system's distribution system piping) or regularly serving 25 people daily at least 60 days per year. Some PWSs may be exempt from complying with certain parts of the SDWA if they meet specific criteria as discussed in Section 3.1 of this TG.

2.5 SDWA Organization and Requirements

The SDWA is codified in Title 42, Chapter 6A, Subchapter XII, Parts A-F, Sections 300f – 300j-26 of the U.S. CFR. The SDWA is organized into six parts as shown in Table 2. The SDWA contains numerous requirements, which are not covered in this TG. The focus of this TG is on the requirements that have a direct impact on Army water system compliance. Table 2 also identifies the chapters of this TG that correspond to the applicable SDWA Part. As the Table shows, this TG primarily focuses on the requirements contained in Part B of the SDWA—PWSs—and the associated NPDWR.

Table 2. SDWA Organization

SDWA Part and Sections	Applicable TG Chapters
A – Definitions, Section 300f.	N/A
B – PWSs, Sections 300g. – 300g-9.	Chapters 3 through 7 – The NPDWR; Chapter 8 – Operator certification; and Chapter 9 – National Secondary Drinking Water Regulations
C – Protection of Underground Sources of Drinking Water, Sections 300h. – 300h-8.	Chapter 10 – Source protection requirements
D – Emergency Powers, Sections 300i. – 300i-4.	Chapter 11 – WSVA and WSERP requirements
E – General Provisions, 300j. – 300j-18.	Chapter 10 – Source protection requirements
F – Additional Requirements to Regulate Safety of Drinking Water, Sections 300j-21 – 300j-26.	Chapter 2 – SDWA Amendments of 1988 (Lead Contamination Control Act)

2.6 Drinking Water Standards and Regulations

To enable PWSs to comply with SDWA, the SDWA required the USEPA to determine what constitutes "safe" drinking water by establishing standards in Federal regulations. These standards are in the form of Maximum Contaminant Level Goals (MCLGs), Maximum Contaminant Levels (MCLs), Action Levels (ALs), Maximum Residual Disinfectant Level Goals (MRDLGs), Maximum Residual Disinfectant Levels (MRDLs), or TTs for removing the contaminants. These standards are codified in Federal level regulations. The National Interim Primary Drinking Water Regulations (NIPDWR) contained the first 23 standards set between 1974 and 1986 and prescribed how PWSs were to comply with the standards which would ensure compliance with SDWA. The SDWA Amendments of 1986 eliminated the term "Interim" from the title, and the regulations became known as the NPDWR and contain all the health-based standards with which applicable PWS must comply. The NPDWR are reflected in Title 40, CFR, Part 141. In addition, the 1986 amendments required the USEPA to establish Secondary Maximum Contaminant Levels (SMCLs) for those contaminants that affect the aesthetic quality of drinking water. These SMCLs comprised the National Secondary Drinking Water Regulations (NSDWR) and are reflected in 40 CFR 143.

2.7 SDWA Implementation

In order to effectively implement SDWA, the USEPA expected state governments and health authorities to accept most of the responsibility for administering and enforcing the drinking water regulations. Through a program of “primacy”, each state, or other designated agent, must adopt its own set of drinking water standards that are at least as

stringent as the Federal standards. There are some states that have more stringent standards. Currently (as of 2014), all states and the seven U.S. territories governed by SDWA (the District of Columbia, Puerto Rico, the Virgin Islands, American Samoa, Guam, the Commonwealth of Northern Mariana Islands, and the Republic of Palau) have primacy except Wyoming and the District of Columbia (Washington D.C.). In addition, Indian tribes are authorized under SDWA to retain primacy for their own drinking water programs, if the USEPA determines that the tribe is capable of accomplishing the required primacy tasks. Throughout the remainder of this TG, primacy agencies shall be referred to as "states."

2.8 SDWA Enforcement

States have the enforcement responsibility to ensure compliance with SDWA. If a state does not take appropriate action regarding compliance with SDWA, the USEPA can take enforcement actions against a PWS. The USEPA will first issue a violation notice to both the violator and the state, and may provide advice and technical assistance on what steps can be taken to bring the system into compliance. If the state does not act within 30 days, the USEPA can issue PWS an administrative order, with civil penalties up to $25,000/day/violation. A total penalty of $5,000 or less can be assessed without going to a district court.

2.9 SDWA Applicability to Army Installations

Congress waived Federal sovereign immunity to state and local requirements concerning SDWA. Section 1447 of SDWA states, "Each federal agency having jurisdiction over any federally owned or maintained public water system...shall be subject to, and comply with, all federal, State, and local requirements, administrative authorities, and process and sanctions respecting the provision of safe drinking water... and to the same extent as any nongovernmental entity." Therefore, U.S. Army installations are responsible for complying with all applicable federal, state, and local drinking water regulations. Typical state and local regulations include operation and maintenance (O&M) practices, design criteria, permit requirements (e.g., water withdrawal), and operator certification. In the case of installations located within an area or state without primacy, the installation must comply with Federal drinking water regulations. Army regulations (ARs 200-1 and 420-1) require OCONUS installations to comply with country-specific FGS which contain the Federal drinking water regulations and host nation regulations if they are more stringent than Federal regulations. Army regulations pertaining to the provision of drinking water apply to all Army installations. They are found in AR 200-1 (Environmental Protection and Enhancement), AR 420-1 (Facilities Management) and AR 40-5 (Preventive Medicine). These regulations refer to guidance and procedures outlined in DA PAM 40-11 (Preventive Medicine), Technical Bulletin, Medical (TB MED) 575 (Swimming Pools and Bathing Facilities), TB MED 576 (Sanitary Control and Surveillance of Water Supplies at Fixed Installations), Unified

Facilities Criteria (UFC) 3-230-03 (Water Treatment), UFC 3-230-02 (Operation & Maintenance: Water Supply Systems), UFC 3-230-01 (Water Storage, Distribution, and Transmission), and UFC 3-420-01 (Plumbing Systems).

CHAPTER 3 THE NATIONAL PRIMARY DRINKING WATER REGULATIONS

3.1 Quick References

• The Standardized Monitoring Framework: A Quick Reference Guide, EPA 816-F-04-010, March 2004.

• National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

• Variances and Exemptions: A Quick Reference Guide, EPA 816-F-04-005, September 2004.

3.2 NPDWR Applicability

As previously discussed, NPDWR contain all the health-based standards with which applicable PWS must comply. Just like SDWA, NPDWR apply to PWSs. However, if certain PWS meet specific exemption criteria, they are not required to comply with NPDWR and the corresponding Part B of SDWA. The PWS meeting all of the following criteria are exempt from complying with NPDWR:

• Contains a drinking water system consisting only of distribution and storage facilities (e.g., provides no treatment, including no re-chlorination or fluoridation, anywhere in the system).

• Obtains all of its drinking water from a regulated water supplier.

• Does not sell its drinking water.

• Does not provide water to commercial carriers conveying passengers in interstate commerce.

For example, if an installation receives its potable water from a neighboring town's water system that is required to comply with the SDWA and NPDWR, provides no extra treatment of the water, and does not charge customers for the distributed water, the installation is exempt from compliance with NPDWR (40 CFR Part 141). However, other parts of SDWA may apply if the installation's water system meets the definition of a PWS. Additionally, some state or local drinking water regulations may still apply, and Army drinking water regulations do apply.

3.3 Public Water System Classification

Public water systems are divided into two major categories: community water systems (CWSs) and noncommunity water systems (NCWSs). A CWS supplies water to year-round residents. A NCWS is used by travelers or intermittent consumers. All NCWSs are further divided into two categories: transient, noncommunity (TNC) systems and nontransient, noncommunity (NTNC) systems. An example of a TNC system is a recreational or range area water system that has its own drinking water supply. The NTNC systems include schools or work places with their own drinking water systems; they provide water for the same people throughout the year, but for less than 24 hours a day (e.g., an 8-hour work day or a 6-hour school day). An example of an NTNC water system is one that serves a small Army installation with no housing. The SDWA regulations apply to these different systems with different intensities, since consumer exposure to potential contaminants varies among the system types. The TNC systems only have to comply with those regulations that govern contaminants which may result in acute health effects (such as microbiologicals and nitrate/nitrite), rather than health effects associated with long-term exposure (such as chemical carcinogens). The NTNC systems have to comply with all regulations that apply to CWSs with the exception of radionuclides. It is important to know the classification of an installation's water system(s) to assess applicable requirements of SDWA. It is the state’s responsibility to determine water system classification. For most Army water systems that meet the definition of a PWS (see Section 2.4), the state has already determined the water system’s classification. As a rule of thumb, if the installation's water supply qualifies as a PWS and the installation has housing areas, the water supply is most likely a CWS. Figure 1 provides a flowchart to aid in understanding the determination of a water system's classification.

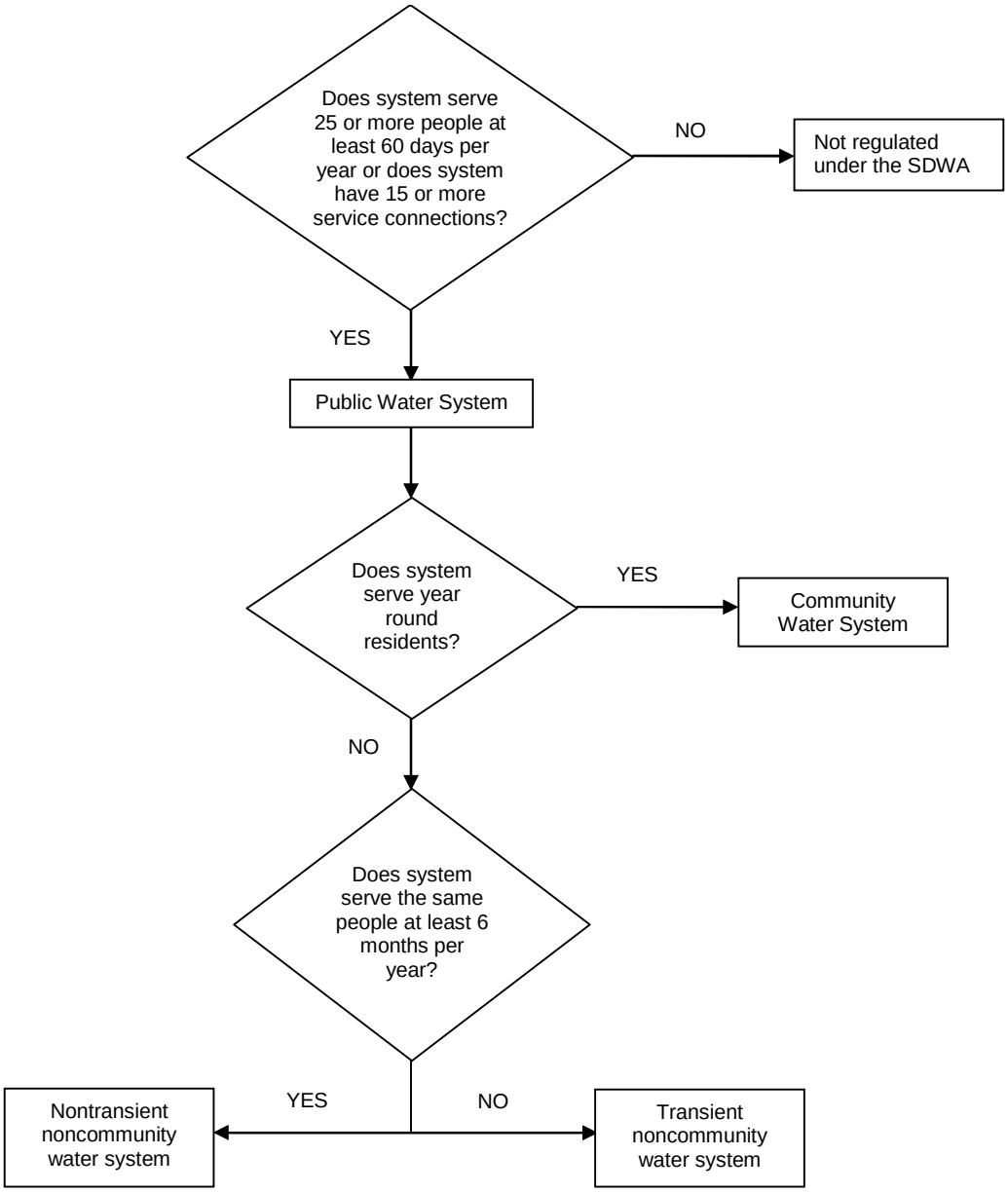

Figure 1. Water System Classification Flowchart

3.4 Public Water System Size Equals Population Served

Many of the monitoring requirements and the effective dates of standards are dependent upon the size of the water system. The term "size" refers to the number of

people served, rather than the production capacity of the water treatment facility. Populations on Army installations consist of both resident and nonresident personnel and often fluctuate due to military mission requirements. As with determining classification of water systems, states also determine the population served for SDWA compliance purposes and may not revise the population served as frequently as populations fluctuate at Army installations. Therefore, the actual population at an Army installation may be significantly different from the state's determination. If the population served is unclear, the state should be contacted to determine the applicable monitoring requirements and effective dates of standards.

3.5 Drinking Water Quality Standards

Compliance with the water quality standards of the SDWA, reflected in the NPDWR (and NSDWR, if enforced by the state), is determined in one of two ways: application of a required TT to control or remove regulated contaminants, or maintenance of water quality meeting all drinking water MCLs and ALs (or SMCLs). The MCL for a regulated contaminant is an enforceable standard (ALs are defined in Section 4.6, Lead and Copper Rule.). The USEPA establishes each MCL based upon the contaminant's MCLG— the level of a contaminant in drinking water at which no known or anticipated adverse health effects are expected to occur. The MCLGs are not enforceable but are a more desirable limit. Before establishing an MCL, the USEPA considers the best available technologies (BATs) for removing the contaminant, analytical technologies for monitoring the contaminant, and the cost associated with both. A balance must be made between the cost to the consumer and the reduction of the risk to consumer health. This cost-benefit analysis attempts to achieve a risk to human health that is no greater than one in a million (e.g., the added threat of the contaminant at that level would cause no more than one extra cancer/adverse health effect per million people, each drinking two liters of water per day during a 70-year lifetime).

3.6 The Concept of Standardized Monitoring

3.6.1 Purpose

Drinking water must be monitored to ensure that it meets all applicable MCLs. To help lessen the monitoring burden on water systems, the USEPA created a Standardized Monitoring Framework to reduce the variability and complexity of drinking water monitoring requirements for all chemical and radiological contaminants that have established MCLs. The framework synchronizes the monitoring schedules for contaminant groups associated with chronic health effects (e.g., volatile organic chemicals (VOCs), synthetic organic chemicals (SOCs), radionuclides, and inorganics) with the exception of asbestos. Nitrate and nitrite are not part of the standardized monitoring framework because they pose acute health effects.

3.6.2 The Standardized Monitoring Framework

The framework consists of a 9-year (based on a calendar year) compliance cycle which is comprised of three, 3-year compliance periods. The first 9-year compliance cycle began on January 1, 1993 and ended on December 31, 2001. The second cycle covered the period from January 1, 2002 to December 31, 2010. The third cycle, shown in Figure 2, covers the period from January 1, 2011 to December 31, 2019. The framework states the flexibility to determine the specific year within a compliance period that water systems must conduct monitoring activities. States may wish to prioritize sampling based upon system size, vulnerability, or laboratory capacity. Once a system is scheduled to sample in the first, second, or third year within a 3-year compliance period, the system must then sample in the corresponding year of subsequent compliance periods.

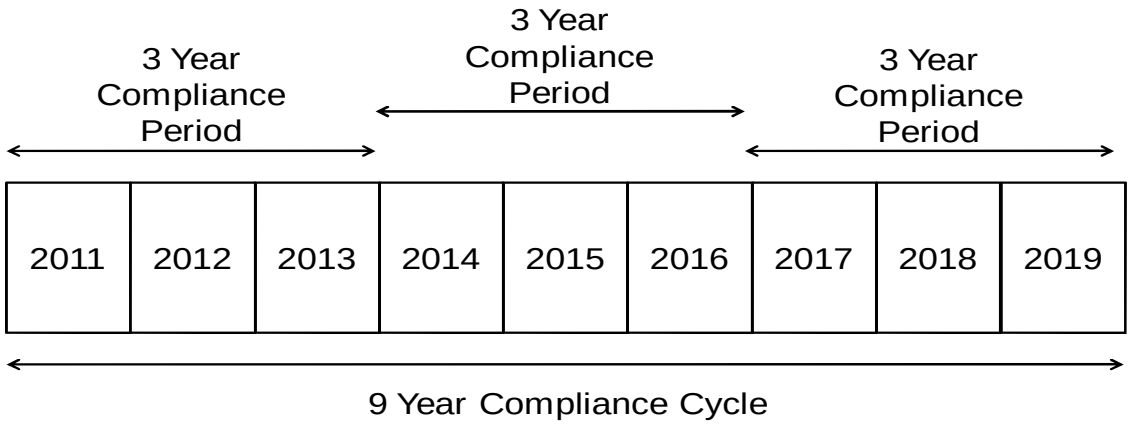

Figure 2. The Standardized Monitoring Compliance Calendar

3.6.3 Standardized Monitoring Requirements

Each newly regulated contaminant associated with a chronic health effect has initial sampling requirements that must be completed by all systems. The initial round of monitoring is required in the first full 3-year compliance period after the effective date of a regulation. For example, if a regulation is effective sometime in 2015, then initial monitoring must occur within the 2017-2019 compliance period.

Systems that complete initial monitoring may be eligible to reduce monitoring frequency to the routine sampling frequency. All systems must sample at this repeat frequency, unless they receive a waiver from the state.

Systems that detect contamination, either during initial or repeat monitoring, must sample quarterly at each sampling point detecting contamination. The concentration that constitutes "detection" is defined as the MCL for inorganics, 0.0005 milligrams per liter (mg/L) for VOCs, or at the Method Detection Limit (MDL) for SOCs. Quarterly sampling must continue until the state determines that the analytical results are "reliably and consistently" below the MCL. Ground-water systems must take a minimum of two consecutive quarterly samples before this decision can be made, and surface water systems must take four consecutive quarterly samples.

Waivers are available to all systems based upon the results of a state conducted or approved vulnerability assessment (see Section 3-7). Waivers can either reduce sampling frequencies (VOCs and inorganics) or eliminate any sampling (SOCs and asbestos). Waivers based upon vulnerability assessments are good for 3 years for SOCs, 6 years for VOCs, and 9 years for inorganics. A new vulnerability assessment must be performed in order to renew a waiver. Minimum criteria for the assessments are published in each regulation.

The Standardized Monitoring Framework allows for the grandfathering of monitoring data at the state's discretion. Data collected up to 3 years prior to the beginning of the 3-year compliance period in which initial monitoring is to begin, can be used to satisfy initial monitoring requirements. Systems grandfathering data would then monitor at the base/repeat monitoring frequencies unless issued a waiver.

3.7 Vulnerability Assessments (Not Security Related)

Monitoring for organics and inorganics under the Standardized Monitoring Framework is subject to modifications depending upon a system's vulnerability, or susceptibility, to contamination. States with primacy that have developed vulnerability assessment protocols, may allow systems to conduct the vulnerability assessments to apply for a waiver. Note that these vulnerability assessments are different from the security related water system vulnerability assessments. Waivers granted based on vulnerability assessments can eliminate initial monitoring requirements or can significantly reduce monitoring frequencies after initial monitoring is completed. The goal of the vulnerability assessment program is to reduce the overall implementation costs of the regulations. The USEPA deemed it most appropriate to allow the states to identify site-specific needs to develop their own assessment protocol based upon federal guidelines. Examples of considerations for a vulnerability assessment include previous analytical results, proximity of the system to sources of contamination, environmental persistence of the contaminant, protection of the water source, proximity to commercial or industrial use, and use profile of the contaminant within the area. If a state chooses not to develop an assessment protocol, systems cannot receive waivers and must monitor at the base frequency.

3.8 Variances and Exemptions

The SDWA permits states to grant a variance or exemption to a PWS from an MCL if the state finds that doing so will not result in an unreasonable risk to health of the consumers (see Section 12.2). A variance is issued to a system when source water conditions prohibit a system from meeting an MCL, despite the application of the most effective treatment methods available (e.g., one or more BATs must be in place). A schedule for compliance with incremental progress toward achieving the MCL is issued at the same time the variance is issued. An exemption is granted to a PWS unable to comply with an MCL or TT due to economic constraints. An exemption is granted for 1 year with the possibility for extending the reprieve for 2 additional years. Systems with 500 or less service connections may renew an exemption for one or more 2-year periods upon demonstration of pursuit of all practicable steps toward compliance. Not all regulations allow for variances and/or exemptions.

3.9 Approved Testing Methods

All regulated drinking water analyses must be conducted using USEPA approved analytical methods. Any laboratory analyzing drinking water samples for regulatory compliance must be a state certified laboratory. Approved methodologies for analyzing NPDWR contaminants are listed in CFR Part 141. Approved methodologies for analyzing NSDWR parameters are listed in CFR Part 143.

CHAPTER 4 THE NPDWR: CONTAMINANTS AND STANDARDS

4.1 Inorganic Contaminants and Standards

4.1.1 Quick Reference

• The Standardized Monitoring Framework: A Quick Reference Guide, EPA 816-F-04-010, March 2004.

4.1.2 CFR Citations

• 40 CFR 141.11 MCLs for inorganic chemicals.

• 40 CFR 141.23 Inorganic chemical sampling and analytical requirements.

• 40 CFR 141.51 MCLGs for inorganic contaminants.

• 40 CFR 141.62 MCLs for inorganic contaminants.

4.1.3 Water Systems that must Comply

All inorganic standards, with the exception of the fluoride standard, apply to CWSs and NTNCs water systems. Only CWSs must comply with the fluoride MCL. Nitrate/nitrite requirements apply to all PWSs, including TNC systems.

4.1.4 Standards

Inorganic contaminant MCLs are found in Table 3. Lead and copper are regulated under the Lead and Copper Rule, reflected in Title 40, CFR, Part 141, as Subpart I, "Control of Lead and Copper". This rule is discussed separately in Section 4.6. Some states may have more stringent MCLs. For example, California's MCL for total Chromium is 0.05 mg/L, and Delaware has established an MCL of 0.1 mg/L for nickel.

Table 3. Inorganic Contaminants

Contaminant	MCLG (mg/L)	MCL (mg/L)
Antimony	0.006	0.006
Arsenic		0.010
Asbestos (fibers > 10 micrometers)	7 million fibers per liter (MFL)	7 MFL
Barium	2	2
Beryllium	0.004	0.004
Cadmium	0.005	0.005
Chromium (total)	0.1	0.1
Cyanide (as free Cyanide)	0.2	0.2
Fluoride	4.0	4.0
Mercury (inorganic)	0.002	0.002
Nickel	N/A[1]	N/A[1]
Nitrate (measured as Nitrogen)	10	10
Nitrite (measured as Nitrogen)	1	1
Total Nitrate and Nitrite (measured as Nitrogen)	10	10
Selenium	0.05	0.05
Thallium	0.0005	0.002

[1]The MCL and MCLG for nickel were remanded on 9 February 1995; however, CWS and NTNC systems must continue to monitor levels of nickel in their drinking water.

4.1.5 Monitoring

Monitoring requirements are presented in Tables 4 – 6. Depending on the type of source water, the routine monitoring frequency for inorganics (with the exception of nitrate/nitrite and asbesots) is annually for surface water systems, and every 3 years for groundwater systems. Drinking water samples for all inorganics (with the possible exception of asbestos) must be collected at each entry point to the distribution system (EPTDS). The EPTDS is a sampling location representative of source water after treatment. There may be multiple EPTDSs for a water system (e.g., multiple wells, each with hypochlorination at the wellhead and each connected to the distribution system in different areas). Reduced monitoring programs and waivers are available at the state's discretion.

Table 4. All IOC Monitoring Requirements except Asbestos and Nitrate/Nitrite

Applicable Water Systems	No Waiver	Waiver	Increased monitoring resulting from detection **(> MCL)**	Sampling Location
Groundwater CWS & NTNC	Once every 3 years (1/monitoring period)	Once every 9 years (1/compliance cycle)	Quarterly*	EPTDS
Surface water CWS & NTNC	Annually	Once every 9 years (1/compliance cycle)	Quarterly*	

*Quarterly sampling must be conducted until the state determines the contaminant level is reliably and consistently below the MCL.
**EPTDS-entry point to the distribution system.

Table 5. Asbestos Monitoring Requirements

Applicable Water Systems	No Waiver	Waiver	Increased monitoring resulting from detection (>MCL)	Sampling Location
CWS and NTNC	Once every 9 years (1/compliance cycle)	No sampling	Quarterly until state determines the reliably and consistently below the MCL.	Distribution system tap served by asbestos-cement pipe*
				EPTDS**

*A distribution system tap sample is required for water systems determined by the state to be vulnerable to asbestos contamination within the distribution system, from a combination of asbestos-cement pipe and source water corrosivity.
**An EPTDS sample is required for water systems determined by the State to be vulnerable to asbestos contamination in the source water.

Table 6. Nitrate Monitoring Requirements

<table>
<tr><th>Applicable Water Systems</th><th>Routine monitoring</th><th>Increased monitoring resulting from detection (≥ ½ MCL)</th><th>Confirmation sampling</th><th>Sampling Location</th></tr>
<tr><td>Groundwater CWS and NTNC</td><td rowspan="3">Annually, collected during the calendar quarter that yielded the previous highest results</td><td>At least four consecutive quarters until State determines reliably and consistently < MCL</td><td rowspan="3">Required for sample result ≥ MCL</td><td rowspan="3">EPTDS</td></tr>
<tr><td>Surface water CWS and NTNC</td><td>At least four consecutive quarters until State determines reliably and consistently < ½ MCL</td></tr>
<tr><td>All TNC</td><td>Continue annually</td></tr>
<tr><td rowspan="2">All PWS - CWS, NTNC, and TNC</td><td>At State discretion if no previous result ≥ ½ MCL</td><td rowspan="2">At least four consecutive quarters until State determines reliably and consistently < MCL</td><td rowspan="2">Required for sample result ≥ MCL</td><td rowspan="2">EPTDS</td></tr>
<tr><td>Annually if any previous result ≥ ½ MCL</td></tr>
</table>

4.1.6 Compliance Determination

For systems required to monitor more frequently than annually, a system is out of compliance with the MCL if the running annual average (RAA) exceeds the MCL. For systems monitoring annually or less frequently, a system is out of compliance if any sample exceeds the MCL. For nitrate and nitrite a system is out of compliance if the average of the initial and confirmation samples exceeds the MCL.

4.1.7 BATs

Appendix C contains a list of the BATs for removal of regulated inorganics.

4.2 Volatile and Synthetic Organic Chemicals and Standards

4.2.1 Quick Reference

• The Standardized Monitoring Framework: A Quick Reference Guide, EPA 816-F-04-010, March 2004.

4.2.2 CFR Citations

• 40 CFR 141.24 Organic chemicals, sampling and analytical requirements.

• 40 CFR 141.50 MCLGs for organic contaminants.

• 40 CFR 141.61 MCLs for organic contaminants.

4.2.3 Water systems that must comply

The VOC and SOC standards apply to CWSs and NTNC water systems with the exception of acrylamide and epichlorohydrin which apply to any PWS that uses treatment chemicals which may contain these contaminants as impurities.

4.2.4 Standards

The VOCs are hydrocarbon compounds associated with fuels, solvents, hydraulic fluids, paint thinners, and dry-cleaning agents. As a group, VOCs are generally low weight molecular compounds that easily evaporate. Currently, there are 21 VOCs regulated under the NPDWR. SOCs are hydrocarbon compounds associated with pesticides and Polychlorinated Biphenyls (PCBs). As a group, SOCs are man-made molecular compounds that do not easily evaporate. Currently there are 33 SOCs regulated under the NPDWR. The VOCs and SOCs regulated under the NPDWR are referred to organic contaminants. Table 7 contains a list of the regulated organic contaminants and their MCLs.

The standard for the organic contaminants acrylamide and epichlorohydrin is a TT in lieu of an MCL. The TT was established because at the time these standards were developed there were no standardized analytical methods available to test for these contaminants. Additionally, the primary sources of these contaminants in drinking water are impurities in water treatment chemicals (principally coagulant chemicals). The TT limits the allowable levels of these contaminants in chemicals used during water treatment, storage, and distribution. These levels are:

• Acrylamide: 0.05 % acrylamide in polyacrylamide dosed at 1 mg/L.

- Epichlorohydrin: 0.01 % residual epichlorohydrin concentration dosed at 20 ppm.

Any PWS using chemicals containing these impurities must, on an annual basis, certify in writing to the State that these contaminants do not exceed the allowable levels. Certification can be accomplished using third party or manufacturer's certification.

4.2.5 Monitoring

All organic contaminants listed in Table 7 are monitored in accordance with the standardized monitoring framework (see Section 3-6). One sample must be collected at each entry point to the distribution system. Monitoring requirements for VOCs are dependent upon the type of source water and detection of a contaminant. Monitoring requirements for SOCs are dependent upon the size of a water system and detection of a contaminant. Monitoring requirements are presented in Tables 8 and 9.

Table 7. Organic Contaminant MCLGS and MCLS

Contaminant		MCLG (mg/L)	MCL (mg/L)
Volatile Organic Contaminants (VOCs)	Vinyl chloride	0	0.002
	Benzene	0	0.005
	Carbon tetrachloride	0	0.005
	1,2-Dichloroethane	0	0.005
	Trichloroethylene (TCE)	0	0.005
	Para-Dichlorobenzene	0.075	0.075
	1,1-Dichloroethylene	0.007	0.007
	1,1,1-Trichloroethane	0.20	0.2
	Cis-1,2-Dichloroethylene	0.07	0.07
	1,2-Dichloropropane	0	0.005
	Ethylbenzene	0.7	0.7
	Monochlorobenzene	0.1	0.1
	o-Dichlorobenzene	0.6	0.6
	Styrene	0.1	0.1
	Tetrachloroethylene (PCE)	0	0.005
	Toluene	1	1
	Trans-1,2-Dichloroethylene	0.1	0.1
	Xylenes (total)	10	10
	Dichloromethane	0	0.005
	1,2,4-Trichlorobenzene	0.07	0.07
	1,1,2-Trichloroethane	0.003	0.005
Synthetic Organic Contaminants (SOCs)	Acrylamide	0	TT*
	Alachlor	0	0.002
	Aldicarb**	0.001	0.003**
	Aldicarb sulfoxide**	0.001	0.004**
	Aldicarb sulfone**	0.001	0.002**
	Atrazine	0.003	0.003
	Carbofuran	0.04	0.04

Contaminant		MCLG (mg/L)	MCL (mg/L)
SOCs (cont.)	Chlordane	0	0.002
	Dibromochloropropane	0	0.0002
	2,4-D	0.07	0.07
	Epichlorohydrin	0	TT*
	Ethylene dibromide	0	0.00005
	Heptachlor	0	0.0004
	Heptachlor epoxide	0	0.0002
	Lindane	0.0002	0.0002
	Methoxychlor	0.04	0.04
	Polychlorinated biphenyls	0	0.0005
	Pentachlorophenol	0	0.001
	Toxaphene	0	0.003
	2,4,5-TP	0.05	0.05
	Benzo[a]pyrene	0	0.0002
	Dalapon	0.2	0.2
	Di(2-ethylhexyl)adipate	0.4	0.4
	Di(2-ethylhexyl)phthalate	0	0.006
	Dinoseb	0.007	0.007
	Diquat	0.02	0.02
	Endothall	0.1	0.1
	Endrin	0.002	0.002
	Glyphosate	0.7	0.7
	Hexachlorobenzene	0	0.001
	Hexachlorocyclopentadiene	0.05	0.05
	Oxamyl (Vydate)	0.2	0.2
	Picloram	0.5	0.5
	Simazine	0.004	0.004
	2,3,7,8-TCDD (Dioxin)	0	$3x10^{-8}$

*TT - Treatment technique.

**MCLs for aldicarb, aldicarb sulfoxide, and aldicarb sulfone are not effective. Monitoring is not required.

Table 8. VOC Monitoring Requirements

Applicable Water Systems	No Waiver	Waiver	Increased monitoring resulting from detection **(> 0.0005 mg/L) ***	After State determines VOC level is reliably and consistently < MCL	Sampling Location
Groundwater CWS & NTNC	Annually. After 3 years of no detections; systems may reduce to once every 3 years	Once every 6 years	At least ***two*** consecutive quarters until State determines reliably and consistently **< MCL**	Annually** Systems may apply for waiver after 3 years with no detections	EPTDS
Surface water CWS & NTNC	Annually	None if State conducts vulnerability assessment every 3 years	At least ***four*** consecutive quarters until State determines reliably and consistently **< MCL**		

* If any sample > MCL then a minimum of four consecutive quarterly samples are required, regardless of type of source water.
** Systems must continue annual monitoring frequency unless State grants a waiver.
***EPTDS -- entry point to the distribution system.

Table 9. SOC Monitoring Requirements

Applicable Water Systems	No Waiver	Waiver	Increased monitoring resulting from detection **(> MDL) *, ** **	After State determines SOC level is reliably and consistently < MCL	Sampling Location
CWS & NTNC serving ≤ 3,300 pop.	Once every 3 years (1/compliance period)	None, unless required by the State	At least ***two*** consecutive quarters for **groundwater** systems, or **four** consecutive quarters for **surface water** systems until State determines reliably and consistently **< MCL**	Annually*** Systems may apply for waiver after 3 years with no detections	EPTDS
CWS & NTNC serving > 3,300 pop.	Two quarterly samples in 1 year every 3 years (twice/ compliance period)				

* MDL - Method detection limit.
** If any sample > MCL then a minimum of four consecutive quarterly samples are required, regardless of type of source water.
*** Systems must continue annual monitoring frequency unless State grants a waiver.
****EPTDS - entry point to the distribution system

4.2.6 Compliance Determination

Compliance with an MCL, for systems that monitor more than once per year, is determined by a RAA at each sampling point. If the RAA exceeds an MCL, then the system is out of compliance. For systems that sample on an annual or less frequent basis (e.g., once per compliance period), compliance with the MCL is also determined by a RAA. When a sample results exceeds an MCL, the system is triggered into quarterly sampling and must complete at least four consecutive quarters to determine the RAA. If the RAA exceeds an MCL, then the system is out of compliance. If any sample result will cause the RAA to exceed the MCL (e.g., the sample result is four times the MCL), the system is immediately out of compliance.

4.2.7 BATs

BATs for treatment and removal of regulated organics are contained in Appendix C.

4.3 Radiological Contaminants and Standards

4.3.1 Quick Reference

- Radionuclides Rule: A Quick Reference Guide, EPA 816-F-01-003, June 2001

4.3.2 CFR Citations

- 40 CFR 141.26 Monitoring frequency and compliance requirements for radionuclides in community water system.

- 40 CFR 141.55 MCLGs for radionuclides.

- 40 CFR 141.66 MCLs for radionuclides.

4.3.3 Water Systems that Must Comply

The NPDWR radiological MCLs apply to CWSs.

4.3.4 Standards

There are some elements, natural or man-made, that are unstable and emit particles of high energy, referred to as radiation. Radiation can be harmful to people by preventing cells from functioning properly and damaging deoxyribonucleic acid (DNA). There are three basic kinds of high energy radiation: alpha, beta, and gamma (included in a broader group called photons). The USEPA developed MCLs for four groupings of radionuclides:

• One MCL is a limitation on two kinds of radium: radium-226 (Ra-226), which emits alpha radiation, and Ra-228, which emits beta radiation.

• Another MCL limits radiation from a group of 179 man-made beta and photon emitters. Only systems determined by the State to be vulnerable to contamination from this group of radionluclides must monitor for them.

• The third MCL is for "gross alpha" which includes all alpha emitters except uranium and radon.

• The fourth MCL is for uranium-234 (U-234), U-235, and U-238, which mostly emit alpha radiation.

Table 10 contains the MCLs for these radiological contaminants.

Table 10. Radiological Contaminants

Radionuclide	MCLG (mg/L)	MCL
Radium-226 and Radium-228	0	5 pCi/L*
Beta/photon emitters	0	4 mrem/year**
Gross alpha particle	0	15 pCi/L
Uranium	0	30 ug/L***

*pCi/L - picocuries per liter.
** mrem/year - millirem (a dose of energy) per year.
*** ug/L - micrograms per liter.

4.3.5 Monitoring

Monitoring frequencies for the radiological contaminants depend on initial monitoring results conducted previously. Table 11 shows the monitoring requirements for Ra-226, Ra-228; gross alpha particles, and uranium. Monitoring frequencies are based on the previous monitoring results. Applicable water systems completed the initial round of monitoring for these contaminants by 31 December 2007. Table 12 shows the monitoring requirements for beta/photon emitters. Only those CWSs determined by the state as vulnerable to beta particle and photon radioactivity or have source water contaminated by effluents from nuclear facilities must monitor those.

Table 11. RA-226, RA-228, Gross Alpha, and Uranium Monitoring Requirements

Applicable Water Systems	Routine Monitoring Requirements				Sampling Location
All CWS	Previous results < detection limit	Previous results > detection limit but < ½ MCL	Previous results > ½ MCL, but < MCL	Previous results > MCL	EPTDS
	Once every 9 years	Once every 6 years	Once every 3 years	Quarterly until four consecutive quarters are < MCL	

*EPTDS - entry point to the distribution system

Table 12. Beta/Photon Emitter Monitoring Requirements

Applicable Water Systems	Routine	Reduced	Increased monitoring resulting from MCL exceedance	Sampling Location
CWS determined to be vulnerable	Quarterly for beta emitters Annually for tritium and strontium-90	If beta emitters ≤ 50 pCi/L then conduct routine monitoring once every 3 years	Monthly until an average of 3 consecutive months < MCL; then return to routine monitoring	EPTDS
CWS with contaminated source water	Quarterly for beta emitters and iodine-131 Annually for tirium and strontium-90	If beta emitters ≤ 15 pCi/L then conduct routine monitoring every 3 years		

*EPTDS = entry point to the distribution system

4.3.6 Compliance Determination

Compliance with the Ra-226, Ra-228, gross alpha, and uranium MCLs is determined on an RAA basis. For systems monitoring quarterly, if the RAA is greater than an MCL then the system is out of compliance. For systems that sample on an annual or less frequent basis (e.g., once per compliance period), compliance with the MCL is also determined by a RAA. When a sample result exceeds an MCL, the system is triggered into quarterly sampling and must complete at least four consecutive quarters to determine the RAA. If the RAA exceeds an MCL, then the system is out of compliance. If any sample result will cause the RAA to exceed the MCL (e.g., the sample result is four times the MCL), the system is immediately out of compliance.

Systems determined to be vulnerable to beta/photon radioactivity with results > 50 pCi/L must have the water samples further analyzed for individual radionuclide concentrations that contribute beta/photon emitters. Similarly, for systems with contaminated source water with results > 15 pCi/L must analyze for individual radionuclides. Compliance with the beta/photon emitters MCL is then determined by comparing the individual radionuclide concentrations to the concentration that results in a 4 mrem exposure for that particular radionuclide. The comparison results in a fraction. If there are multiple radionuclides present, the fractions are added together. If the result is greater than 1, then the system is out of compliance.

4.3.7 BATs

Appendix C lists the BATS for removal of radiological contaminants.

4.4 Microbiological Contaminants and Standards

Microbiological contaminants are regulated under several rules:

- Total Coliform Rule (TCR).
- Revised Total Coliform Rule (RTCR).
- Surface Water Treatment Rule (SWTR).
- Interim Enhanced Surface Water Treatment Rule (IESWTR).
- Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR).
- Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).
- Filter Backwash Recycle Rule (FBRR).
- Groundwater Rule (GWR).

Because these rules regulate the acute health threat posed by pathogenic microorganisms, they apply to all PWS. However, compliance with these rules are dependent upon the type of source waters used and/or the type of treatment provided by a PWS. Table 13 shows the water systems that must comply with the microbiological contaminant rules.

Table 13. Applicability of Microbiological Contaminant Rules

Rule	Water Systems that Must Comply
TCR & RTCR	All PWSs
SWTR	PWSs using surface water or groundwater under the direct influence of surface water (GWUDI) as determined by the state
IESWTR	PWSs using surface water or GWUDI and serving ≥ 10,000 population
LT1ESWTR	PWSs using surface water or GWUDI and serving < 10,000 population
LT2ESWTR	PWSs using surface water or GWUDI
FBRR	PWSs using surface water or GWUDI and provide conventional or direct filtration and recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes.
GWR	PWSs using groundwater

4.4.1 TCR/RTCR

4.4.1.1 Quick References

- Total Coliform Rule: A Quick Reference Guide, EPA 816-F-01-035, March 2010.

- Revised Total Coliform Rule: A Quick Reference Guide, EPA 815-B-13-001, September 2013.

4.4.1.2 CFR Citations

- 40 CFR 141.21 Coliform sampling.

- 40 CFR 141.52 MCLGs for microbiological contaminants.

- 40 CFR 141.63 MCLs for microbiological contaminants.

4.4.1.3 Applicability

The TCR seeks to reduce the health risk posed by microbial pathogens by regulating total coliform bacteria (including fecal coliform and *E. coli*). These bacterial groups are potential indicators of pathogenic microorganisms. The TCR applies to all PWSs, including TNCs. The NCWSs are eligible for reduced frequency monitoring. In February 2013, the USEPA made revisions to the TCR to increase public health protection through the reduction of potential pathways of entry for fecal contamination into distribution systems. These revisions are referred to as the Revisions to the TCR (RTCR). All PWSs must comply with the RTCR no later than April 1, 2016.

4.4.1.4 Standard

Under the TCR, the MCLG for total coliform bacteria (including fecal coliform and *E. coli*) is zero. The MCL is based upon the presence/absence of total coliforms — no more than 5 percent positive samples per month for systems analyzing at least 40 samples per month, and no more than one positive sample per month for systems analyzing less than 40 samples. In addition, the MCL is violated whenever both a routine and a repeat sample are total coliform positive and at least one is also fecal coliform or *E. coli* positive.

The RTCR replaces the MCL for total coliforms with a TT requirement. The criteria for determining total coliforms compliance remains the same (e.g., no more than 5 percent positive samples per month). However, instead of an MCL violation the PWS is triggered into conducting an assessment to identify the cause of the contamination. The RTCR also established an MCL for *E. coli*. The MCL is based on routine or repeat monitoring *E. coli* positive (EC+) results in combination with routine or repeat monitoring total coliform positives, EC+, or the absence of repeat sampling results.

4.4.1.5 Monitoring

Each PWS must have a state-approved written monitoring schedule and plan, denoting the routine and repeat sampling sites. These sites should be well marked on a recent copy of the system's distribution system map. Monitoring locations should be representative of all areas of the system. Installations may choose to use the same fixed points for routine monitoring each month or may choose to rotate them in groups to ensure the most thorough surveillance of the entire distribution system. The state may review and revise the plan.

All CWSs must monitor for total coliforms monthly. The number of samples to be collected is based upon the number of people served by the system. Table 14 lists the minimum required samples for various populations. All NTNCs and TNCs using protected ground water and serving 1,000 people or less must monitor once each calendar quarter, the system provides water to the public. All NTNCs and TNCs using protected ground water and serving more than 1,000 people during any month, or using surface water or ground water under the influence of surface water must monitor at the same frequency as a like-sized CWS.

Table 14. Required Number of Total Coliform Samples

Population	#Samples	Population	#Samples	Population	# Samples
25-1000*	1+	21,501 - 25,000	25	450,001 - 600k+	210
1001 - 2500	2	25,001 - 33,000	30	600,001 - 780k	240
2501 - 3300	3	33,001 - 41,000	40	780,001 - 970k	270
3301 - 4100	4	41,001 - 50,000	50	970,001 - 1230k	300
4101 - 4900	5	50,001 - 59,000	60	1,230,001 - 1520k	330
4901 - 5800	6	59,001 - 70,000	70	1,520,001 - 1850k	360
5801 - 6700	7	70,001 - 83,000	80	1,850,001 - 2270k	390
6701 - 7600	8	83,001 - 96,000	90	2,270,001 - 3020k	420
7601 - 8500	9	96,001 - 130,000	100	3,020,001 - 3960k	450
8501 - 12,900	10	130,001 - 220,000	120	> 3,960,000	480
12,901 - 17,200	15	220,001 - 320,000	150		
17,201 - 21,500	20	320,001 - 450,000	180		

* Includes PWSs which have >15 service connections but serve <25 people.
+ State may reduce to quarterly if system is served by protected ground water and is free of sanitary defects.
k = ,000

Systems collecting multiple samples per month must collect them at regular intervals throughout the month. Systems serving less than 4,900 people, using protected ground water and collecting from different sites may collect all samples on a single day.

Repeat samples must be collected whenever a routine sample tests total coliform positive. The samples must be collected within 24 hours of notification of a positive result. Repeat samples must be taken from the same tap where the positive total coliform sample was collected, and from an upstream and downstream location, each within five (5) service connections of the original tap. The state may waive or vary either the downstream or upstream sampling requirement if conditions within the distribution system do not allow for these samples to be taken (e.g., the original tap is located on a dead end). If one or more of the repeat samples is total coliform positive, then an additional set of repeat samples must be collected in the manner specified above. Monitoring personnel must repeat the process until no samples are total coliform positive. If total coliforms continue to be detected, however, the state may waive the repeat sampling requirements. The state may waive or vary any of the specific repeat sampling requirements based upon site specific conditions of the system.

All total coliform positive (TC+) samples, both original and repeat, must be further analyzed for fecal coliforms or *E. coli*. If any TC+ sample is also fecal positive (FC+)/EC+, the state must be notified by the end of the next business day. The RTCR will no longer allow analysis for fecal coliforms because research showed that fecal

coliforms are not a good indicator group of actual fecal contamination. Only *E. coli* analysis will be allowed.

4.4.1.6 Compliance Determination

Under the TCR there are two different MCL violations—nonacute and acute MCL violations. A PWS collecting fewer than 40 samples per month is out of compliance with the nonacute MCL when there is more than one routine or repeat sample per month that is TC+. A PWS collecting at least 40 samples per month is out of compliance with the nonacute MCL when there are more than 5 percent routine or repeat samples that are TC+. All PWS are out of compliance with the acute MCL when there is an FC+/EC+ repeat sample or an FC+/EC+ original sample followed by a TC+ repeat sample. Both MCL violations must be reported to the state no later than the end of the next business day after the system learns of the violation. For a nonacute MCL violation, the public must be notified within 30 days after the system learns of the violation. For an acute MCL violation, the public must be notified within 24 hours after the system learns of the violation.

Under the RTCR, PWSs must comply with a TT and an MCL. The criteria for compliance with the TT are the same requirements for a nonacute MCL violation under the TCR – PWSs collecting fewer than 40 samples per month must not have more than one routine or repeat sample per month that is TC+; PWSs collecting at least 40 samples per month must not have more than 5 percent routine or repeat samples that are TC+. Additionally, a PWS must take every required repeat sample after any single TC+ sample. If any of these criteria are not met, then a PWS is out of compliance with the TT and is required to conduct an evaluation to identify the cause(s), termed a Level 1 assessment. The RTCR also established an *E. coli* MCL. A violation of the *E. coli* MCL occurs when there is any combination of an EC+ sample result with a routine/repeat total coliform or EC+ sample result as shown in Table 15. For an *E. coli* MCL violation a PWS is required to conduct a comprehensive evaluation to identify the cause(s), termed a Level 2 assessment, in addition to providing public notification as required with any MCL violation. A PWS must also conduct a Level 2 assessment if the PWS is required to conduct a Level 1 assessment within a 12-month period.

Table 15. *E. coli* MCL Violations

Routine Monitoring Sample Result	Repeat Monitoring Sample Result
EC+	TC+
EC+	Any missing sample
EC+	EC+
TC+	EC+
TC+	TC+ (but no EC analysis)

*EC+ - *E. coli* positive
**TC+ - Total Coliform positive

The Level 1 and Level 2 assessments are evaluations of a water system intended to identify and fix issues that could provide a pathway of entry for microbial contamination into the distribution system or indicate a failure of a barrier (e.g., treatment) that is already in place. A Level 1 assessment consists of a basic examination of the source water, treatment, distribution system and relevant operational practices. A Level 1 assessment is intended as a self-assessment conducted by the PWS in most cases. A Level 2 assessment is a more detailed examination of the water system, its operational practices and its monitoring program and results. The Level 2 assessment covers the same elements covered in a Level 1 assessment (source water, treatment, distribution, and operation practices), but in greater detail because the incidents that trigger a Level 2 assessment (e.g., *E. coli* MCL exceedance) are of a more acute nature and are more likely to result in a direct public health impact. Level 2 assessments must be conducted by a party approved by the state. Reference 12 contains more detailed information on conducting Level 1 and 2 assessments.

4.4.1.7 Invalidation of Samples

Under certain conditions, the state may invalidate coliform samples so they do not count in compliance calculations. These conditions include the following:

- The laboratory establishes that improper sample analysis caused the total coliform positive result.

- The state, on the basis of evaluating the repeat samples, determines the total coliform positive sample resulted from a domestic or other nondistribution system plumbing problem (e.g., a problem restricted to the original positive tap/sample).

- The state has substantial grounds to believe that the total coliform positive result is due to a circumstance or condition which does not reflect water quality in the distribution system. In this case, the system still collects the required repeat samples and uses them in determining compliance with the MCL for total coliforms.

4.4.1.8 Analytical Methods

The DA PAM 40-11 requires PM (EH) to verify that a PWS provides a compliance monitoring program according to the NPDWR. The PM (EH) personnel can assist a PWS by performing any compliance monitoring or by providing oversight to another laboratory conducting compliance monitoring. The PM (EH) personnel could perform the required bacteriological monitoring of the water system or provide oversight to any other entity actually performing the compliance monitoring in accordance with the TCR or RTCR. If the PM (EH) personnel perform the compliance monitoring for the TCR/RTCR, the samples may be analyzed onsite provided the onsite laboratory is state-certified to perform bacteriological analysis. There are several acceptable methods for total conform, fecal coliform, and *E. coli* analysis for compliance with the TCR and RTCR. More information on each method can be found in 40 CFR 141.21 and the Standard Methods for the Examination of Water and Wastewater.

- Total coliforms: membrane filter; multiple tube fermentation; presence-absence; Minimal Medium ONPG (MMO) - 4-methyl-umbelliferyl-t3-d-glucuronide (MUG), such as Colilert® and Colisure®.

- Fecal coliforms: EC medium. Fecal coliform analysis is not allowed for compliance monitoring under the RTCR.

- *E. coli*: EC medium + MUG; nutrient agar + MUG; MMO-MUG, such as Colilert and Colisure.

4.4.1.9 BATs

The USEPA lists the following as good management practices and techniques to maximize compliance with the TCR and RTCR in 40 CFR 141.63. Often, states require that these practices be performed to safeguard consumer health.

- Protection of wells from contamination from fecal contamination by appropriate placement and construction.

- Maintenance of a disinfectant residual throughout the distribution system.

- Proper maintenance of the distribution system including appropriate pipe replacement and repair procedures, main flushing programs, proper operation and maintenance of storage tanks and reservoirs, cross-connection control, and continual maintenance of positive water pressure in all parts of the distribution system.

• Filtration and/or disinfection of surface water as noted in 40 CFR 141, subparts H, P, T, and W, or disinfection of groundwater as described in 40 CFR 141, subpart S, using strong oxidants such as chlorine, chlorine dioxide, or ozone.

• The development and implementation of an USEPA-approved state Wellhead protection (WHP) program under Section 1428 of the SDWA.

4.4.1.10 Sanitary Surveys

Those CWSs and NCWSs which do not collect 5 or more samples per month must have a sanitary survey performed every 5 years. An NCWS using only protected and disinfected ground water, as defined by the state, can perform the repeat surveys every 10 years. These sanitary surveys must be performed by the state or another official approved by the state.

4.4.2 SWTR

4.4.2.1 Quick References

• Comprehensive Surface Water Treatment Rules Quick Reference Guide: Unfiltered Systems, EPA 816-F-04-001, August 2004.

• Comprehensive Surface Water Treatment Rules Quick Reference Guide: Systems Using Conventional or Direct Filtration, EPA 816-F-10-074, August 2010.

4.4.2.2 CFR Citations

• 40 CFR 141.70 – 141.75.

4.4.2.3 Applicability

The SWTR applies to all PWSs that use a surface water source or GWUDI. The state has the responsibility to determine whether or not ground-water systems are under the direct influence of a surface water and provide proper notification. States may require systems to conduct studies to provide information to make this determination. Systems using a source classified as a GWUDI must begin monitoring as required by the SWTR within 6 months of the notification and must be in compliance (filtering or nonfiltering) within 18 months of notification. Compliance with the rule can become complex and the text here includes only the major requirements. Appendix B lists several documents which explain in more detail the requirements of the SWTR. The USEPA's manual, Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources, March 1991, details the exact regulatory requirements (reference 14).

4.4.2.4 Standard

The SWTR was the first microbiological contaminant rule specifically applicable to PWSs using surface water or GWUDI. It was promulgated on June 29, 1989. It regulated several waterborne pathogens which may be found in surface waters — *Giardia lamblia*, *Legionella*, and enteric viruses. The rule also regulates heterotrophic bacteria, a range of bacteria that are naturally present in the environment. An MCLG of zero has been established for *Giardia*, *Legionella*, and viruses. The USEPA recommends levels of heterotrophic bacteria as close to zero as possible, but there is no formal MCLG. Since monitoring for some of these microorganisms (*Giardia*, *Legionella*, and viruses) is difficult and expensive, the rule regulates turbidity (which can interfere with disinfection, therefore reducing microbial control) and establishes TT to ensure adequate removal or inactivation of these organisms. The USEPA also recommends a turbidity as close to zero as possible, but did not establish an MCLG. Turbidity requirements vary depending upon the type of filtration process used. The TT requirements consist of installation and operation of filtration and/or disinfection treatment that provides 99.9 percent (3-log) removal and/or inactivation of *Giardia lamblia* and at least 99.99 percent (4-log) removal and/or inactivation of viruses. Treatment for these microbes provides significant protection from *Legionella* and heterotrophic bacteria, since they are less resilient organisms.

4.4.2.5 General System Requirements

Under the SWTR the USEPA established TTs rather than establish MCLs for contaminants. The SWTR also incorporated the “CT” concept – a measure of the effectiveness of disinfection treatment – used to determine compliance with the TT requirements (3-log removal and/or inactivation of *Giardia lamblia* and 4-log removal and/or inactivation of viruses). It is imperative, then, in order to protect consumer health that all regulated systems are well operated to meet the TT requirements. In order to ensure that systems are operated to the best of their ability to meet such strict treatment requirements, the SWTR requires that all regulated systems (surface water and GWUDI) are operated by a person properly certified by the state.

4.4.2.6 Nonfiltering System Requirements

Surface water and GWUDI systems that do not provide filtration of the drinking water must meet several criteria, both for source water and treated water, in order to continue to avoid filtration. This criteria is termed filtration avoidance criteria. If the requirements are not met, filtration must be installed within 18 months of failure to meet the requirements. The filtration avoidance criteria are listed in Table 16. Nonfiltering systems are required to meet the TT log-removal requirements through disinfection application alone (e.g., 3-log *Giardia lamblia* inactivation and 4-log virus inactivation). Table 17 contains the disinfectant residual monitoring requirements.

Table 16. Filtration Avoidance Criteria for Nonfiltering Systems

		Requirement	Frequency
Source Water Quality Conditions	Microbial Quality	Monitor fecal coliform or total coliform density in representative samples of source water prior to the first point of disinfectant application: Fecal coliform ≤ 20/100 mL OR - Total coliform ≤ 100/100 mL Sample results must meet this criteria in 90% of samples taken over the past 6 months.	1 to 5 samples per week depending on system size and every day the turbidity of the source water exceeds 1 nephelometric turbidity units (NTU).
	Turbidity	< 5 NTU prior to first point of disinfectant application	At least every 4 hours
Site specific criteria	Systems must:	Comply with *Giardia lamblia* and virus TTs daily (3-log and 4-log inactivation, respectively) in 11 of 12 previous months	Daily measurements before or at first customer: Temp; pH; disinfectant residual
	Systems must comply with:	-TCR/RTCR in 11 of 12 previous months (per TCR) -Stage 1 & 2 Disinfection Byproduct Rules requirements	
	Systems must have:	-EPTDS disinfectant residual at least 0.2 mg/L -Detectable disinfectant residual in the distribution system -Redundant disinfection capability or automatic shut-down when residual < 0.2 mg/L -Watershed control program -Annual on-site inspection by state or state-certified party -Not been identified as a source of a waterborne disease outbreak	

Table 17. Nonfiltering Systems Disinfection Monitoring Requirements

Location	Requirement	Frequency
EPTDS	Disinfectant residual cannot be < 0.2 mg/L for more than 4 hours.	Continuous, but state may allow systems serving ≤ 3,300 to sample from 1 to 4 times per day depending on population served.
Throughout distribution system – same locations as total coliform sample locations	Disinfectant residual must be detectable in at least 95% of monthly samples. An Heterotrophic Plate Count (HPC) of 500/mL is considered a detectable residual	Same time as total coliform samples.

4.4.2.7 Filtering System Requirements

Surface water and GWUDI systems that provide filtration must meet specific performance requirements to ensure that required log-removals are being achieved. Filtering systems will achieve a portion of the total log-removal/inactivation through the treatment process (coagulation and sedimentation, if applicable, and filtration). The remainder of the requirements must be met through the log-inactivation by disinfection. There are several types of filtration technologies available for use and each is assumed by the USEPA to have different log-removal capabilities when well operated. The exact log-removal capability and resulting log-inactivation required by disinfection are to be determined by the state for filtering systems using recommended USEPA guidance (see Table 18) or detailed proof of removal capabilities from the system. Table 18 lists the expected log-removal and the resulting recommended log-inactivation required through disinfection. The SWTR also established filtered water turbidity requirements for combined filter effluent (CFE) as shown in Table 19. The subsequent IESWTR and LT1ESWTR (discussed in Section 4.4.3) further strengthened the filtered water turbidity limits which are also shown in Table 19. Applicable PWSs must comply with the IESWTR and LT1ESWTR turbidity limits. The disinfectant residual monitoring requirements for filtering systems are the same as for nonfiltering systems (Table 17).

Table 18. Filtration Technology Log-Removal Capabilities and Disinfection Log-Inactivation Requirements

Filtration Technology	Expected Log-Removal by Filtration		Recommended Log-Inactivation by Disinfection		Total Log-Removal/Inactivation	
	Giardia lamblia	Viruses	*Giardia lamblia*	Viruses	*Giardia lamblia*	Viruses
Conventional*	2.5	2.0	0.5	2.0	3.0 (2.5+0.5)	4.0 (2.0+2.0)
Direct**	2.0	1.0	1.0	3.0	3.0	4.0
Slow sand	2.0	2.0	1.0	2.0	3.0	4.0
Diatomaceous Earth	2.0	1.0	1.0	3.0	3.0	4.0

* Conventional treatment consists of coagulation, flocculation, sedimentation, and filtration.
** Direct treatment consists of coagulation (and possibly flocculation), and filtration, excluding sedimentation.

Table 19. Filtering Systems Turbidity Monitoring Requirements

Turbidity Requirement	Frequency	STWR Limit	IESWTR/LT1ESWTR Limit (Current)
CFE 95th percentile value	At least every 4 hours. State may reduce to 1 per day (1/day) for systems serving ≤ 500 population.	≤ 0.5 NTU	≤ 0.3 NTU
CFE maximum value	At least every 4 hours. State may reduce to 1 per day for systems serving ≤ 500 population.	5 NTU	1 NTU

4.4.2.8 Disinfection Requirements

For nonfiltering and filtering systems, the adequacy of disinfection provided is determined by achievement of the required cycle threshold (CT) for given site and water quality conditions. The CT is defined as the residual concentration of the disinfectant at a sample location multiplied by the time, in minutes, that the disinfectant has been in contact with the water up to the sample location. The required CT values are detailed in 40 CFR 141, Subpart H, and the referenced USEPA guidance manual (reference 14). The CT, measured at the point of the first consumer (often the water treatment plant itself), must be measured daily during peak hourly flow rate to ensure that systems are meeting the required inactivation by disinfection. There are a number of disinfectants used to treat drinking water including chlorine, chlorine dioxide, chloramine, and ozone. The CT required to achieve a certain log-inactivation differs for each disinfectant and is a function of water temperature, pH, and the disinfectant contact chamber design. The USEPA guidance manual contains detailed information on calculating CT values on a "desktop" basis. Some states may require detailed studies of disinfectant contact chambers, referred to as "tracer studies." Tracer studies more accurately determine the true contact time of treated water prior to being distributed and may indicate greater disinfection effectiveness than that determined by a desktop approach.

4.4.2.9 Reporting Requirements

Monitoring results must be reported monthly to the state to ensure that systems are meeting the requirements under the SWTR. Detailed reporting requirements are included in 40 CFR 141, Subpart H. A summary is provided in Table 20.

Table 20. SWTR Reporting Requirements

System Type	Reporting Requirement
Filtering Systems	1. Monthly Filtration Reporting Requirements: -Report total number of CFE measurements, number and percentage of CFE measurements ≤ 95th percentile limit. -Report date and value of any CFE measurement that exceeded maximum CFE turbidity limit. States must be notified of exceedance within 24 hours. 2. Monthly Disinfection Reporting Requirements: -Lowest daily EPTDS value for each day, the date and duration when the disinfectant residual was < 0.2 mg/L, and when state was notified that ETPDS disinfectant residual was < 0.2 mg/L. -Number of disinfectant residual or HPC measurements taken in the month resulting in at least 95% of samples having a detectable residual in any 2 consecutive months.
NonFiltering Systems	1. Monthly source water quality information (microbial quality and turbidity measurements). States must be notified of turbidity exceedance within 24 hours. 2. Monthly Disinfection Reporting Requirements: -Lowest daily EPTDS value for each day, the date and duration when the disinfectant residual was < 0.2 mg/L, and when state was notified that ETPDS disinfectant residual was < 0.2 mg/L. -Number of disinfectant residual or HPC measurements taken in the month resulting in at least 95% of samples having a detectable residual in any 2 consecutive months. 3. Annually report compliance with watershed program requirements. 4. Annually report on the onsite inspection conducted by the state.

4.4.3 Interim Enhanced and Long Term 1 SWTR

4.4.3.1 Quick References.

• Comprehensive Surface Water Treatment Rules Quick Reference Guide: Systems Using Conventional or Direct Filtration, EPA 816-F-10-074, August 2010.

• Comprehensive Surface Water Treatment Rules Quick Reference Guide: Unfiltered Systems, EPA 816-F-04-001, August 2004.

4.4.3.2 CFR Citations

• 40 CFR 141.170 – 141.175 IESWTR.

• 40 CFR 141.500 – 141.571 LT1ESWTR.

4.4.3.3 Background

The USEPA developed these rules after the SWTR. They were intended to specifically address the microbial contaminant *Cryptosporidium*. These rules build upon the framework of the SWTR by strengthening some requirements of the SWTR (e.g., turbidity limits) and adding new requirements (e.g., requiring covers on any new finished water reservoir). A secondary goal of these rules was to ensure applicable systems continue to provide adequate microbial protection through effective disinfection treatment while complying with the disinfection byproduct standards (the disinfection byproduct rules are discussed in Section 4.5).

4.4.3.4 Applicability

The same PWSs that had to comply with the SWTR must also comply with the IESWTR and LT1ESWTR. The IESWTR applies to PWSs using surface water or GWUDI and serve a population of at least 10,000. The LT1ESWTR also applies to PWSs using surface water or GWUDI, but only those that serve a population less than 10,000.

4.4.3.5 Standards

The IESWTR and LT1ESWTR established an MCLG of zero for *Cryptosporidium*. A TT was established in lieu of an MCL for *Cryptosporidium*. Applicable water systems must provide a 2-log (99%) removal of *Cryptosporidium* through optimum filtration treatment for filtering water systems and improved watershed control for nonfiltering systems. These rules did not allow PWSs to comply with the 2-log removal requirement through disinfection treatment because *Cryptosporidium* is especially resistant to several disinfectants and their typical disinfectant levels used in drinking water treatment.

4.4.3.6 Requirements

To meet the 2-log *Cryptosporidium* removal standard, filtering systems must meet specific filtering requirements. The rules strengthened CFE turbidity limits previously established under the SWTR and added the requirement to continuously monitor individual filter effluent (IFE) and take certain actions if IFE turbidity limits were exceeded. When a system exceeds an IFE turbidity limit it must determine the cause(s) for the exceedance and provide a report to the state. Determining the cause of an IFE exceedance may consist of a simple filter profile, or an increasingly more complex self-assessment or comprehensive evaluation conducted by the state or a certified third party. A system is out of compliance if a CFE turbidity limits is exceeded. A system is not out of compliance if an IFE turbidity limit is exceeded; however, if a system does not conduct the certain actions required as a result of an IFE turbidity limit exceedance, then that system is out of compliance. Table 21 shows the turbidity requirements for filtering systems.

Table 21. IESWTR & LT1ESWTR Turbidity Monitoring Requirements for Filtering Systems

Turbidity Requirement	Monitoring Frequency	Action if Exceeded
CFE* monthly 95th percentile value ≤ 0.3 NTU**	At least every 4 hours. State may reduce to 1/day for systems serving ≤ 500 population.	State and public notification
CFE maximum monthly value < 1 NTU	At least every 4 hours. State may reduce to 1/day for systems serving ≤ 500 population.	State and public notification
IFE*** > 0.5 NTU in two consecutive 15-minute recordings at the end of the first 4 hours of continuous filter operation after backwash/offline. Not applicable to systems serving < 10,000 population.	Continuously, recorded every 15 minutes	Conduct filter profile within 7 days and provide report to state by the 10th of the following month
IFE > 1.0 NTU in two consecutive 15-minute recordings	Continuously, recorded every 15 minutes	Conduct filter profile within 7 days and provide report to state by the 10th of the following month
IFE > 1.0 NTU in two consecutive 15-minute recordings at the same filter for 3 months in a row	Continuously, recorded every 15 minutes	Conduct filter self-assessment within 14 days and provide report to state by the 10th of the following month
IFE > 2.0 NTU in two consecutive 15-minute recordings at the same filter for 2 months in a row	Continuously, recorded every 15 minutes	Arrange for comprehensive evaluation within 30 days and provide report to state within 90 days

*CFE – Combined Filter Effluent turbidity
** NTU – Nephelometric Turbidity Unit
***IFE – Individual Filter Effluent turbidity

The nonfiltering systems must meet the 2-log *Cryptosporidium* removal standard through a watershed control program that is adequate to limit potential contamination by *Cryptosporidium*. The nonfiltering systems must identify watershed characteristics and activities which may have an adverse effect on source water quality in relation to *Cryptosporidium* contamination, and must monitor the occurrence of activities which could potentially cause *Cryptosporidium* contamination. Annually, states must determine if a nonfiltering system's watershed control program is adequate to limit *Cryptosporidium* contamination and, therefore, comply with the 2-log removal standard.

Both filtering and nonfiltering systems must comply with additional requirements of these rules, shown in Table 22. These rules build upon the sanitary survey requirement in the TCR by requiring PWSs using surface water or GWUDI, regardless of system size, to have a sanitary survey conducted by the state or state-approved third party. The rules also require establishment of a disinfection benchmark for a PWS to evaluate the impact on the microbial contamination risk of proposed changes in disinfection practices in order to comply with the disinfection byproduct rules MCLs (discussed in Section 4.5). The PWSs must develop a disinfection profile of their system that is to be used by the state and the PWS when evaluating changes in disinfection treatment to ensure that no significant reduction in microbial protection will occur. A disinfection profile is a graphical representation of a system's level of *Giardia lamblia* and viral inactivation measured over the course of a year. A disinfection benchmark is the lowest monthly average of microbial inactivation during the disinfection profile period. Finally, systems are required to cover any new finished water reservoirs, holding tanks, or other storage facilities for finished water.

Table 22. IESWTR & LT1ESWTR Requirements for Filtering and Nonfiltering Systems

Requirement	Frequency	Compliance Date
Sanitary Surveys	-CWS – Every 3 years; or every 5 years if determined by state to provide "outstanding performance" -NCWS – Every 5 years	States must begin conducting by 16 Dec 2002
Disinfection Benchmark Development/Profiling	-Completed by 1 Apr 2001 for systems serving ≥ 10,000 -Completed by 1 Jul 2004 for systems serving 500 – 9,999 -Completed by 1 Jan 2005 for systems serving < 500 -States may waive requirement for systems with very low Total Trihalomethanes (TTHM) and five haloacetic acids (HAA5s)	
Cover New Finished Water Reservoirs	- After 16 Feb 1999 for systems serving ≥ 10,000 - After 15 Mar 2002 for systems serving < 10,000	

4.4.4 Filter Backwash Recycle Rule

4.4.4.1 Quick Reference

- Comprehensive Surface Water Treatment Rules Quick Reference Guide: Systems Using Conventional or Direct Filtration, EPA 816-F-10-074, August 2010.

4.4.4.2 CFR Citation

- 40 CFR 141.76 Recycle provisions.

4.4.4.3 Overview

The USEPA established the FBRR to reduce the risk of reintroducing microbiological contaminants associated with recycling backwash water and other recycle streams that may contain significant levels of microbial pathogens back into the drinking water treatment process. Poor recycle practices can degrade water quality, and impair treatment process performance. The FBRR seeks to reduce the opportunity for recycle practices to adversely affect treatment plant performance and potentially increase the risk of microbial contamination of finished drinking water. The FBRR applies to PWSs using surface water or GWUDI that practice conventional or direct filtration, and recycles filter backwash water, thickener supernatant, and/or liquids from dewatering processes. The FBRR requires these systems to ensure that all recycle streams are returned to a location in the treatment plant such that all processes are employed. Systems may apply to the state if they want to recycle at an alternate location.
By 8 December 2003, systems must have reported to their state specific information on its recycling practices and return location(s). States then determined if those return location(s) were acceptable or if modifications must be made. Systems must have completed any modification to comply with the FBRR by 8 June 2006.

4.4.5 Long Term 2 Enhanced SWTR

4.4.5.1 Quick Reference

- Comprehensive Surface Water Treatment Rules Quick Reference Guide: Systems Using Conventional or Direct Filtration, EPA 816-F-10-074, August 2010.

4.4.5.2. CFR Citations

- 40 CFR 141.700 – 141.723.

4.4.5.3 Background

The USEPA established the LT2ESWTR to identify PWSs that are at a higher risk from *Cryptosporidium* contamination and require those PWSs to take action to mitigate the risk. Available data on the occurrence, infectivity, and treatment of *Cryptosporidium* in drinking water indicate that existing regulations (e.g., TCR, SWTR, IESWTR, and LT1ESWTR) are sufficient to mitigate the risk of *Cryptosporidium* contamination for most PWSs. However, there are some PWSs that are at a greater vulnerability to *Cryptosporidium* contamination and must provide additional control to mitigate the risk.

4.4.5.4 Applicability

The LT2ESWTR applies to PWSs using surface water or GWUDI, regardless of system size (population served).

4.4.5.5 Standard

Under the LT2ESWTR the USEPA did not change the MCLG of zero for *Cryptosporidium* established under the IESWTR and LT1ESWTR, and continued to use a TT in lieu of an MCL to further reduce *Cryptosporidium* contamination. The USEPA took a risk-based approach in the LT2ESWTR and established a TT that requires an additional 1 – 3 logs (90-99.9%) removal/inactivation of *Cryptosporidium* depending on the levels of *Cryptosporidium* detected in PWS source waters.

4.4.5.6 Requirements

The LT2ESWTR established two main requirements to comply with the *Cryptosporidium* TT: 1) conduct source water monitoring for *Cryptosporidium*; and 2) provide additional control in the form of treatment or improved watershed control based on the results of the source water monitoring. Filtering PWSs are classified in one of four categories, or "bins", based on the source water monitoring results. Filtering PWSs must provide either no additional control of *Cryptosporidium*, or an additional 1 – 3 logs (90 – 99.9%) removal/inactivation of *Cryptosporidium*. Unfiltered PWSs must provide a minimum of 2 logs (99%) inactivation using multiple disinfectants and, based on source water monitoring results may have to provide up to 3 logs (99.9%) inactivation. Table 23 shows the TT requirements for filtered and unfiltered systems based on source water monitoring results.

Table 23. TT Requirements for Filtered and Unfiltered Systems

	Cryptosporidium Concentration (oocysts/L)	Bin Classification for Filtering PWS	Required Additional *Cryptosporidium* Control*
Filtered Systems	< 0.075	1	No additional treatment
	≥ 0.075 and < 1.0	2	1 log for conventional filtration systems 1.5 logs for direct filtration systems 1 log for slow sand (SS) or diatomaceous earth (DE) filtration systems
	≥ 1.0 and < 3.0	3	2 logs for conventional filtration systems 2.5 logs for direct filtration systems 2 logs for SS and DE filtration systems
	≥ 3.0	4	2.5 logs for conventional filtration systems 3 logs for direct filtration systems 2.5 logs for SS and DE filtration systems
Unfiltered Systems	≤ 0.01	2 logs	
	> 0.01	3 logs	

* For filtered systems using alternative filtration technologies such as cartridge or membrane filtration, the required additional *Cryptosporidium* control will be determined by the state.

Source water *Cryptosporidium* monitoring requirements are detailed in Table 24. The LT2ESWTR requires two rounds of source water monitoring be conducted 6.5 years apart in order to determine if source water quality has changed. All applicable PWSs have completed the first round of source water monitoring. The second round of monitoring must be conducted between 2015 and 2018 to determine if the quality of the source water has changed requiring additional *Cryptosporidium* control. In addition to *Cryptosporidium* monitoring, systems must also monitor for *E. coli* and, in some cases, turbidity. Small, filtered systems may conduct only *E. coli* monitoring to minimize the financial burden associated with *Cryptosporidium* monitoring, provided *E. coli* levels do not exceed certain criteria. Although data did not show a strong correlation between *E. coli* and *Cryptosporidium* levels, it is a good indicator of water sources that are not likely to contain *Cryptosporidium*.

Table 24. Source Water Monitoring Requirements

Water system	Monitoring Requirements			Round 1 Monitoring	Round 2 Monitoring
	Cryptosporidium	*E. coli*	Turbidity		
Systems serving ≥ 100,000	1/month for 2 years	1/month for 2 years	1/month for 2 years	Completed by 1 October 2008	Begin by 1 April 2015
Systems serving ≥ 50,000 and < 100,000	1/month for 2 years	1/month for 2 years	1/month for 2 years	Completed by 1 April 2009	Begin by 1 October 2015
Systems serving ≥ 10,000 and < 50,000	1/month for 2 years	1/month for 2 years	1/month for 2 years	Completed by 1 April 2010	Begin by 1 October 2016
Filtered systems serving < 10,000	If *E. coli* annual mean > 10/100 mL for lakes; or > 50/100 mL for streams then conduct Crypto monitoring: 1/month for 2 years Or 2/month for 1 year	2/week for 1 year	N/A	Completed by 1 April 2012	Begin by 1 October 2018
Unfiltered systems < 10,000	1/month for 2 years Or 2/month for 1 year	N/A	N/A	Completed by 1 April 2012	Begin by 1 October 2018

Depending on the results of the first round of source water monitoring, systems are required to provide additional *Cryptosporidium* control or none at all. Under the LT2ESWTR, USEPA developed a list of controls that are effective in reducing, removing, or inactivating *Cryptosporidium*. Table 25 shows the controls and their associated log credit. Depending on system size, any controls must be in place no later than:

- 1 April 2014 for systems ≥ 100,000.
- 1 October 2014 for systems ≥ 50,000 and < 100,000.
- 1 October 2015 for systems ≥ 10,000 and < 50,000.
- 1 October 2016 for systems < 10,000.

Table 25. Approved *Cryptosporidium* Control Methods

Cryptosporidium Control	Log credit
Watershed control program identifying and controlling contaminant sources	0.5 log
Alternative source/intake management	No presumptive credit
Presedimentation basin with coagulation	0.5 log during any month for 0.5 log or greater monthly mean turbidity reduction
Two-stage lime softening	0.5 log
Bank filtration	-0.5 log for 25-foot well setback from surface source with average turbidity < 1 NTU -1.0 log for 50-foot setback with average turbidity < 1 NTU
Optimized combined filter performance	0.5 log credit for CFE ≤ 0.15 NTU in 95% of monthly measurements
Optimized individual filter performance	0.5 log credit for IFE ≤ 0.15 NTU in 95% of monthly samples and a monthly maximum ≤ 0.3 NTU for each filter
Demonstration of treatment performance	Credit determined by state
Adding bag or cartridge filters parallel operation	Up to 2 logs
Adding bag or cartridge filters in series	Up to 2.5 logs
Membrane filtration	Credit determined by state
Second stage filtration	0.5 log
Slow sand filters	-2.5 logs as an added, secondary process -3.0 logs as a primary process
Chlorine dioxide	Credit based on CT calculations
Ozone	Credit based on CT calculations
Ultraviolet light (UV)	Credit based on CT calculations

The LT2ESWTR established additional requirements for uncovered storage facilities. Where the IESWTR and LT1ESWTR required covering of any new storage facility, the LT2ESWTR requires PWSs with any uncovered finished water storage facilities to either cover them or treat the discharge of the storage facility to achieve 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* removal/inactivation.

Any applicable PWS that proposes to make a significant change to their disinfection treatment process for compliance with the LT2ESWTR and/or the Stage 2 disinfection byproducts rule or regulation (DBPR) (discussed in Section 4.5) must develop a

disinfection profile and calculate a disinfection benchmark to ensure microbial protection is maintained. Significant changes are defined as: 1) moving the point of disinfection; 2) changing the type of disinfectant; 3) changing the disinfection process; and 4) making other modifications designated as a significant change by the state.

4.4.6 Groundwater Rule

4.4.6.1 Quick References

- Ground Water Rule Factsheet: Monitoring Requirements, EPA 816-F-08-025, June 2008.

- Ground Water Rule Triggered and Representative Monitoring: A Quick Reference Guide, EPA 815-F-08-004, March 2010.

- Ground Water Rule Compliance Monitoring Requirement: Systems Providing 4-log Treatment of Viruses with Chemical Disinfection, EPA 816-F-10-060, April 2010.

4.4.6.2 CFR Citations

- 40 CFR 141.400 – 141.405.

4.4.6.3 Background

The USEPA began developing the GWR in 1987 to address potential fecal contamination of groundwater sources. Those systems using groundwater susceptible to fecal contamination are at a greater risk of supplying water that contains harmful microbial pathogens. The GWR seeks to provide increased protection against microbial pathogens, specifically viral and bacterial pathogens. The GWR became effective for applicable water systems on 1 December 2009.

4.4.6.4 Applicability

Any PWS using groundwater as a source (not GWUDI) must comply with the GWR.

4.4.6.5 Standards

Like the surface water treatment rules the GWR established TT requirements in lieu of an MCL. The GWR is constructed around a risk-targeted rule framework – only those systems identified as susceptible to fecal contamination of the source water must comply with the TT. Sanitary surveys and source water monitoring are the mechanisms used to identify at-risk systems. At-risk systems must comply with the TT requirements through implementing one or more of the following actions (termed “corrective actions” in the GWR):

- Correct significant deficiencies identified in a sanitary survey;
- Eliminate the source of contamination;
- Provide an alternate source of water; and
- Provide treatment to achieve at least a 4-log inactivation/removal of viruses.

4.4.6.6 Requirements for Identifying At-Risk Systems

Sanitary surveys are a mechanism used by states to determine the susceptibility of a system to fecal contamination. If a significant deficiency is identified, the system is determined to be susceptible to fecal contamination and must comply with the TT requirements. Significant deficiencies are findings that have the potential for causing an introduction of contamination into the system. Examples of significant deficiencies include a well near a failing septic tank, an improperly constructed well (e.g., lack of sanitary seal or screened vent), inadequate treatment (e.g., noncontinuous disinfection), and unprotected cross connections in the distribution system. Generally, systems have 120 days to comply with the TT requirements after being notified of significant deficiencies. States must conduct recurring sanitary surveys. For CWSs, states must conduct a sanitary survey every 3 years or every 5 years if a CWS is providing 4-log virus treatment (inactivation and/or removal), or demonstrates outstanding performance based on previous sanitary surveys and regulatory compliance. For NTNC and TNC systems, states must conduct a sanitary survey every 5 years.

Triggered source water monitoring is one of two source water monitoring mechanisms used under the GWR to identify at-risk systems. A system with a distribution system TCR sample that is TC+ must conduct triggered source water monitoring to evaluate whether the total coliform presence in the distribution system is due to fecal contamination in the source water. Triggered source water monitoring involves collection of one or more samples of a fecal indicator (*E. coli*, enterococci, or coliphage). Each state has determined the fecal indicator for which systems must test. Generally, if one or more than one fecal indicator sample is positive then the system is identified as an at-risk system and has 120 days to comply with the TT requirements. Figure 3 shows the triggered source water monitoring requirements. Systems that already provide 4-log treatment of viruses (inactivation and/or removal) are not considered at-risk systems and are exempt from triggered source water monitoring.

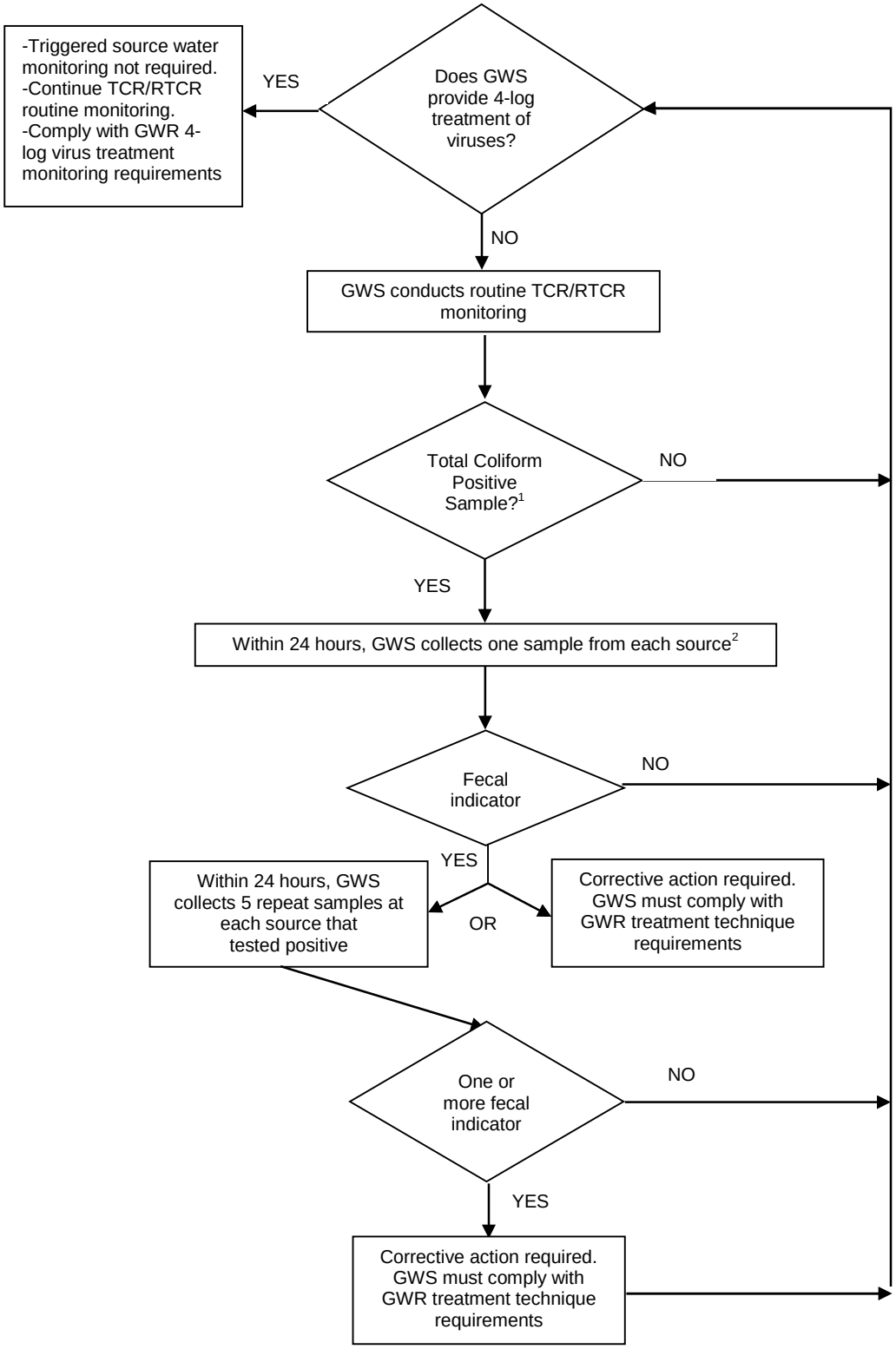

Figure 3. GWR Triggered Source Water Monitoring Requirements

Notes for Figure 3:
GWS - Groundwater systems
[1]Answer "no" if the sample is invalidated under 40 CFR 141.21(c) or the state determines that the cause of the total
coliform positive sample directly relates to the distribution system
[2]If approved by the state, systems with more than one groundwater source may monitor at representative groundwater
source(s) according to a triggered source water monitoring plan
[3]*E. coli*, enterococci, or coliphage

The GWR gave states the flexibility of requiring systems to conduct separate assessment source water monitoring as an additional mechanism to identify higher risk systems. States may review existing system information such as source water assessments, wellhead protection plans, and historical TCR monitoring data as well as conduct Hydrogeologic Sensitivity Assessments (HSAs) to target higher risk systems and require them to conduct assessment source water monitoring. The state may require a system to conduct assessment source water monitoring at any time. While assessment source water monitoring requirements may vary between states, USEPA recommends states at a minimum require collection of monthly source water fecal indicator samples (*E. coli*, enterococci, or coliphage) for 12 consecutive months. If any sample is fecal indicator positive then the system is identified as an at-risk system and has 120 days to comply with the TT requirements. Systems that already provide 4-log treatment of viruses (inactivation and/or removal) are not considered at-risk systems and are exempt from assessment source water monitoring.

4.4.6.7 TT Requirements

Systems identified as susceptible to fecal contamination (e.g., at-risk systems) as a result of a state-conducted sanitary survey or source water monitoring must comply with the GWR TT requirements by completing at least one of four corrective actions: correct sanitary survey significant deficiencies; eliminate the source of contamination; provide an alternate water source; or provide 4-log virus treatment (inactivation and/or removal).

When states identify significant deficiencies in a sanitary survey, systems must correct them within 120 days. Examples of corrected significant deficiencies include repairs to wellhead sanitary seals and vents, and control of cross connections. Systems are in compliance with the TT requirements when all significant deficiencies are corrected.

Systems may pursue elimination of the contamination source as a corrective action regardless of the mechanism used to identify the system as being at-risk (e.g., findings of significant deficiencies or positive fecal indicator source water samples). Examples of contamination source elimination include removal of point sources (e.g., removal of

septic tanks), relocation of piping, redirection of drainage or run-off, installation or repair of wellhead fencing or housing.
Systems may choose to provide an alternative source of water such as a new well or a connection to a PWS.

System may choose to provide 4-log treatment of viruses using inactivation (disinfection), removal (filtration), or a state-approved combination of inactivation and removal. Systems choosing this corrective action must conduct routine monitoring to ensure the effectiveness and reliability of the treatment process. Table 26 shows the routine monitoring requirements.

Table 26. Routine Monitoring Requirements for Demonstrating 4-Log Virus Treatment

Treatment Technology and System Size	Monitoring Requirements
PWS serving > 3,300 using a chemical disinfectant	Continuous monitoring and maintenance of state-determined disinfectant residual concentration
PWS serving ≤ 3,300 using a chemical disinfectant	-Daily monitoring and maintenance of state-determined disinfectant residual concentration -Monitor disinfectant residual every 15 minutes if residual falls below state-determined concentration.
PWS using membrane filtration	Comply with state-specified operating criteria and demonstrate membrane integrity
PWS using alternative treatment technologies	Comply with state-specified operating criteria

4.4.6.8 GWR Violations and Public Notification Requirements

In general a system is out of compliance with the GWR and must provide public notification if the system fails to conduct source water monitoring or fails to implement corrective actions (e.g., TT requirements). Additionally, there are some special public notification requirements. Table 27 identifies GWR violations and public notification requirements.

Table 27. GWR Violations and Public Notification Requirements

Rule Violation	Public Notification Deadline
System fails to take corrective action following: -State direction to take corrective action; -Receipt of laboratory results of fecal indicator positive sample from triggered source water monitoring; or -Receipt of state notice of significant deficiency	30 days (Tier 2 public notification)
System fails to comply with state-approved schedule and plan to correct significant deficiency and/or eliminate fecal contamination	
System fails to maintain 4-log treatment of viruses for longer than 4 hours	
System fails to conduct triggered or assessment source water monitoring	1 year (Tier 3 public notification)
System fails to conduct monitoring to demonstrate compliance with 4-log TT requirements	
Triggered source water monitoring sample or assessment source water monitoring sample is fecal indicator positive	24 hours (Tier 1 public notification)
Special Public Notification Requirements	
CWS with an uncorrected significant deficiency or a source water fecal indicator positive sample must provide annual notice as part of the Consumer Confidence Report (CCR) until significant deficiency corrected or fecal contamination addressed.	
NCWS with an uncorrected significant deficiency or a source water fecal indicator positive sample must provide annual notice in a manner approved by the state (e.g., direct distribution or conspicuous posting) until significant deficiency corrected or fecal contamination addressed.	

4.5 Disinfectants and Disinfection Byproduct Regulations

The effectiveness of disinfection to minimize the acute microbial pathogen health risk has long been recognized. However, as early as the 1970s researchers identified chemicals known as disinfection byproducts (DBPs) formed from chlorination of naturally occurring organic matter that posed long-term health risks. While it is important to minimize these long-term health risks, water systems must ensure that disinfection efficacy is never compromised. Thus, water systems must strike a balance between these seemingly competing health risks. The disinfectants and DBP regulations developed by the USEPA are intended to strike that balance – minimizing

both the long-term health risks posed by DBPs while continuing to minimize the acute microbial pathogen health risks. Since 1979, USEPA published three regulations addressing DBPs and disinfectants: the 1979 Total Trihalomethanes (TTHM) rule; the 1998 Stage 1 Disinfectants and DBPR (Stage 1 DBPR); and the 2006 Stage 2 DBPR.

4.5.1 The 1979 Total Trihalomethane Rule

In 1979 USEPA published the regulation that set an MCL for TTHMs at 0.10 mg/L (100 parts per billion (ppb)). TTHMs are a class of DBPs that are formed when chlorine reacts with naturally occurring organic matter in the water. Four trihalomethane chemicals (THMs) make up the TTHM class of DBPs – chloroform, bromodichloromethane, dibromochloromethane, and bromoform). The 0.10 mg/L TTHM MCL applied to water systems serving 10,000 or more. Compliance with the MCL was calculated as a RAA based on four samples collected each quarter throughout the distribution system. The RAA was calculated each quarter from the current and three previous quarterly averages of the four distribution system samples. A water system was out of compliance with the TTHM MCL if the RAA exceeded the MCL. This rule was succeeded by the Stage 1 DBPR.

4.5.2 Stage 1 Disinfectants and Disinfection Byproduct Rule

4.5.2.1 Quick Reference

• Comprehensive Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2): Quick Reference Guide, EPA 816-F-10-080, August 2010.

4.5.2.2 CFR Citations

• 40 CFR 141.64 MCLs for disinfection byproducts.

• 40 CFR 141.65 MRDLs for disinfectant levels.

• 40 CFR 141.130 – 141.135.

4.5.2.3 Overview

The USEPA published the Stage 1 DBPR in 1998. This rule strengthened the 1979 TTHM rule by lowering the TTHM MCL to 0.080 mg/L (80 ppb) as an RAA and expanding the applicability of the TTHM MCL to all CWS and NTNC that add a chemical disinfectant such as chlorine, chlorine dioxide, chloramines, or ozone. The Stage 1 DBPR also established an MCL for another group of DBPs – five haloacetic acids (HAA5s). The HAA5 MCL was 0.060 mg/L (60 ppb) as a RAA. In addition to regulating DBPs, the Stage 1 DBPR established limits (termed Maximum Residual Disinfectant

Levels – MRDLs) on certain disinfectants which was intended to minimize potential negative health effects from elevated dosages of a disinfectant. Lastly, the Stage 1 DBPR established a TT requirement for the removal of naturally occurring organic matter - a precursor to the formation of DBPs – which will reduce levels of DBPs in drinking water. The TT requires a minimum amount of organic matter removal, measured as Total Organic Carbon (TOC), depending on the amount of TOC in the source water and the source water alkalinity. The TT requirements are applicable to water systems using conventional treatment (e.g., coagulation, flocculation, sedimentation, and filtration). Table 28 summarizes the rule requirements. Although the 2006 Stage 2 DBPR (discussed in Section 4.5.3) succeeded the Stage 1 DBPR, the Stage 2 DBPR only revised the TTHM and HAA5 compliance requirements. Applicable water systems must continue to comply indefinitely with the majority of requirements in the Stage 1 DBPR. In particular, water systems must continue to comply with the disinfectant MRDLs, the TT requirements for removing organic matter (DBP precursors), the bromate and chlorite MCLs, and their associated monitoring and reporting requirements.

Table 28. Stage 1 DBPR Requirements

Regulated DBPs			MCL (mg/L)
Total Trihalomethanes (TTHM)			0.080
Five Haloacetic Acids (HAA5)			0.060
Bromate (systems that use ozone)			0.010
Chlorite (systems that use chlorine dioxide)			1.0
Regulated Disinfectants			MRDL (mg/L)
Chlorine			4.0 as Cl_2
Chloramines			4.0 as Cl_2
Chlorine dioxide			0.8
TT Requirements for Conventional Treatment Systems			
Source Water TOC (mg/L)	Source Water Alkalinity, mg/L as $CaCO_3$		
	0-60	>60-120	>120
>2.0 to 4.0	35%	25%	15%
>4.0 to 8.0	45%	35%	25%
>8.0	50%	40%	30%

* TT - treatment technique

4.5.2.4 Compliance requirements for Disinfectants

All CWS and NTNC that add a chemical disinfectant (either for disinfection or oxidation purposes) must continue to comply with the disinfectant MRDLs and associated monitoring, reporting, and public notification requirements. If a TNC uses chlorine dioxide, it must comply with the chlorine dioxide disinfectant MRDL because excessive

levels of chlorine dioxide can cause acute, or immediate, health effects. Tables 29 and 30 summarize the compliance requirements for disinfectants. With chlorine dioxide there are two types of MRDL exceedances: acute and nonacute.

Table 29. Stage 1 DBPR Compliance Requirements for Chlorine and Chloramines

Disinfectant	MRDL (mg/L)	Routine Monitoring	Compliance Determination	Reporting requirements	Public Notification
Chlorine and Chloramines	4.0 as an RAA of monthly averages calculated quarterly.	Same time and location as monthly bacteriological samples collected in accordance with the TCR/RTCR (see Section 4.4.1). Reduced monitoring is not allowed.	At the end of each quarter, average the monthly averages for the last 12 months and compare to MRDL. If RAA > 4.0 mg/L then system is in violation.	Quarterly report the following: 1. Number of samples taken each month over the quarter; 2. The monthly average of all samples taken in each month for the last 12 months; 3. The average of the monthly averages for the last 12 months; and 4. Whether the MRDL was exceeded.	Within 30 days following MRDL exceedance (Tier 2)

Table 30. Stage 1 DBPR Compliance Requirements For Chlorine Dioxide

Disinfectant	MRDL (mg/L)	Routine Monitoring	Increased Monitoring	Compliance Determination	Reporting requirements	Public Notification
Chlorine Dioxide	0.8	One sample/day at EPTDS	3 samples the day after a daily sample exceeds the MRDL collected in the distribution system as close to the first customer as possible with at least 6 hours between samples. Systems operating a booster chlorination station after the first customer must take 3 samples: 1. As close as possible to the first customer; 2. At a location representing average residence time; and 3. At a location representing maximum residence time.	<u>Acute violation</u> A system exceeds the MRDL at the EPTDS and either: 1. Any distribution system sample exceeds the MRDL; or 2. System fails to take any distribution system samples.	Quarterly report the following: 1. Date, results, and locations of all samples taken last quarter. 2. Whether the MRDL was violated 3. Whether the MRDL was an acute or nonacute violation	Within 24 hours (Tier 1) for an acute MRDL violation
				<u>Nonacute violation</u> A system exceeds the MRDL in 2 consecutive daily samples at the EPTDS OR A system exceeds the MRDL at the EPTDS and fails to take the routine EPTDS sample the next day		Within 30 days (Tier 2) for a nonacute MRDL violation

4.5.2.5 Complying with the TT Requirement

The Stage 1 DBPR requires the use of a TT to reduce DBP precursors (naturally occurring organic matter) which is intended to minimize the formation of DBPs. This TT is called “enhanced coagulation”. Enhanced coagulation requires a specific percentage of DBP precursors – measured as TOC – be removed during treatment. This TT requirement applies only to CWS and NTNC using surface water or groundwater under the direct influence of surface water (GWUDI) that use conventional filtration treatment (use of coagulation, flocculation, sedimentation, and filtration treatment processes). Systems must remove a specified percentage of TOC, or meet one of six alternative compliance criteria, or meet a combination of TOC removal and alternative compliance criteria on a monthly basis.

Monthly monitoring is required for compliance. Every month systems must monitor both the source and treated water for TOC levels. Monthly source water TOC samples are collected prior to any chemical treatment and monthly treated water TOC samples are collected after filtration. Source and treated TOC samples must be collected at the same time (referred to as “paired samples”). Source water alkalinity samples must also be collected at the same time TOC samples are collected. Systems choosing to comply with the TT by meeting one of six alternative compliance criteria may also be required to monitor source and treated waters monthly for ultraviolet light (UV) absorbance and dissolved organic carbon (DOC) to determine a Specific Ultraviolet Light Absorbance (SUVA) value. The SUVA value is a surrogate measure of the predominant type of organic matter in the water (e.g., the humic content of organic matter) and gives an indication as to how well the organic matter will be removed through conventional treatment. Lower SUVA values mean the organic matter is not easily removed through conventional treatment.

To comply with the TT systems must remove a certain percentage of TOC based on source water TOC and alkalinity levels as shown in Table 28. Systems also have the flexibility to comply with one of six alternative compliance criteria as shown in Table 31. Some systems are not able to comply with either TOC percentage removal requirements or the alternative compliance criteria. Those systems must apply to the state for approval of feasible TOC removal percentages. Compliance is determined on a quarterly basis using the monthly monitoring data collected. Each month systems calculate a ratio of percent TOC removed divided by percent TOC required to be removed. A ratio greater than 1.00 indicates the system removed the percentage TOC required if not more. Systems meeting any alternative compliance criteria for a month use a ratio of 1.00. The monthly ratios are then used to calculate an RAA each quarter. If the quarterly RAA is < 1.00 then a system is in violation of the TT requirement and must provide public notification.

Table 31. TT Alternative Compliance Criteria

Source water TOC RAA < 2.0 mg/L
Treated water TOC RAA < 2.0 mg/L
RAA of source water TOC < 4.0 mg/L, and RAA source water alkalinity > 60 mg/L, and either: -TTHM RAA ≤ 0.040 mg/L and HAA5 RAA ≤ 0.030 mg/L; or -System installed treatment technology to limit TTHM and HAA5 to these levels
TTHM RAA ≤ 0.040 mg/L and HAA5 RAA ≤ 0.030 mg/L and system uses only chlorine as a disinfectant
Source water Specific UV Absorbance (SUVA) prior to treatment ≤ 2.0 L/mg-m
Treated water SUVA ≤ 2.0 L/mg-m

*TT - trteatment technique
**RAA - running annual average

Systems are required to report routine monitoring results within 10 days of the end of each quarter. At a minimum systems must report the number, location, date, and results of all TOC samples collected, the percent removal achieved, the alternative criteria met (if used), the calculations to determine compliance, and whether the system is in compliance. Systems that are out of compliance with the TT must notify the state within 24 hours and must provide public notification within 30 days (Tier 2 public notification).

4.5.2.6 Complying with requirements for Bromate and Chlorite

All CWS and NTNC that use ozone must comply with the bromate MCL and associated monitoring, reporting, and public notification requirements. Any CWS or NTNC using chlorine dioxide must comply with the chlorite MCL and associated requirements. Table 32 summarizes the requirements for these DBPs.

Table 32. Stage 1 DBPR Chlorite and Bromate Compliance Requirements

DBP	Routine Monitoring	Increased Monitoring	Reduced Monitoring	Compliance Determination	Reporting requirements	Public Notification
Chlorite	Daily at EPTD	3 samples in the distribution system the day after a daily sample exceeds the MCL	N/A	N/A	Quarterly report the following: 1. Number of EPTDS samples taken each month over the quarter; 2. Location, date, and result of all samples taken during the quarter; 3. Monthly average for each distribution sample set; and 4. Whether the MCL was exceeded, in which month(s), and how many times each month	Within 30 days following MCL exceedance (Tier 2)
	Monthly at 3 locations in the distribution system	N/A	Quarterly at 3 distribution system sites if after 1 year: 1. no single sample exceeded chlorite MCL; and 2. No daily EPTDS sample exceeded	MCL exceeded if monthly calculation of the average of a 3-sample set (or more sets if conducting increased monitoring) > 1.0 mg/L		
Bromate	Monthly at EPTD	N/A	Quarterly if system chooses to monitor **bromide** monthly and maintains a bromide RAA < 0.05 mg/L	MCL exceeded if RAA of the last 12 monthly samples computed quarterly > 0.010 mg/L OR Any one sample result causes RAA to exceed 0.010 mg/L.	Quarterly report the following: 1. Number of samples taken during quarter; 2. Location, date, and result of each sample; 3. Average of the monthly averaged of all samples during previous 12 months; 4. Whether the MCL was exceeded.	Within 30 days following MCL exceedance (Tier 2)

4.5.3 The Stage 2 Disinfectants and Disinfection Byproducts Rule

4.5.3.1 Quick Reference

• Comprehensive Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2): Quick Reference Guide, EPA 816-F-10-080, August 2010.

4.5.3.2 CFR Citations

• 40 CFR 141.600 – 141.605 Initial distribution system evaluations.

• 40 CFR 141.620 – 141.629 Stage 2 disinfection byproducts requirements.

4.5.3.3 Overview

The Stage 2 DBPR continues to increase protection against potential adverse health risks from DBPs. The USEPA recognized that compliance with the Stage 1 DBPR, determined as a distribution system-wide RAA, could still result in some persons being exposed to elevated levels of DBPs in parts of a distribution system (locations in a distribution system with elevated DBP levels would be averaged out with other locations that had lower levels of DBPs when calculating a distribution system-wide RAA). The overall intent of the Stage 2 DBPR is to identify those systems that experience elevated DBPs in parts of a distribution system and take action to reduce DBP levels across an entire distribution system. The Stage 2 DBPR applies to all CWS and NTNC that add a disinfectant other than UV. The rule also applies to consecutive systems. A consecutive system is a PWS that receives some or all of its drinking water from another water system (a wholesale system) and is regulated by the state. The Army has numerous drinking water systems that receive some or all their water from another system; however, most of these systems are not regulated by their respective states. Therefore, those systems are not considered consecutive systems as defined in the NPDWR. There are three major provisions of the Stage 2 DBPR: 1) an Initial Distribution System Evaluation (IDSE); 2) revised TTHM and HAA5 MCLs; and 3) an Operational Evaluation Level (OEL) requirement.

4.5.3.4 Initial Distribution System Evaluation Requirement

The IDSE is the mechanism that identified areas in distribution systems that experience elevated DBPs and, subsequently identified the Stage 2 DBPR compliance monitoring locations for TTHMs and HAA5s. Through identification of distribution areas with elevated DBPs and subsequent compliance monitoring locations, the IDSE resulted in systems ensuring DBP MCLs are met across an entire distribution system. The IDSE generally consisted of 1 year of TTHM and HAA5 monitoring with an option for systems to perform a site-specific study based on existing DBP data and distribution system

models. All applicable systems have completed the IDSE requirement by 1 July 2010 and have determined their Stage 2 DBPR compliance monitoring locations.

4.5.3.5 TTHM and HAA5 MCL Compliance

The Stage 2 DBPR revised the TTHM and HAA5 MCLs. Rather than tightening the MCLs, the Stage 2 DBPR retains the 0.080 mg/L (80 ppb) TTHM and 0.060 mg/L (60 ppb) HAA5 Stage 1 DBPR MCLs and changed the method for determining compliance. Instead of using a distribution system-wide RAA to determine compliance with the DBP MCLs, the Stage 2 DBPR uses a LRAA to determine compliance in which an RAA is developed for each Stage 2 DBPR TTHM and HAA5 monitoring location in a distribution system. The LRAA compliance method ensures more consistent, equitable protection across a distribution system. Monitoring requirements are based on source water type and a system's population served. Table 33 shows the routine monitoring requirements. Increased monitoring is required only for systems that conduct annual routine monitoring. Systems can reduce monitoring if the LRAA at each distribution system sampling location is ≤ 0.040 mg/L (40 ppb) for TTHMs and ≤ 0.030 mg/L (30 ppb) for HAA5s based on at least 1 year of routine monitoring. Reduced monitoring may include a reduced frequency and/or a reduced number of distribution system sample locations. Table 34 shows the reduced monitoring requirements and includes criteria for returning to routine monitoring. Compliance is determined based on the LRAA. For systems monitoring annually, if an annual samples exceeds the TTHM or HAA5 MCL, the system is triggered into increased, quarterly monitoring until an LRAA can be calculated (the system is not immediately out of compliance). If an LRAA at any sampling locations is greater than the TTHM or HAA5 MCL then the system is in violation.

Table 33. Routine TTHM and HAA5 Monitoring Requirements

Source Water	System Size (population)	Routine Monitoring Frequency	Total Locations per Monitoring Period[1]	Distribution System Monitoring Location		
				Highest TTHM locations determined by IDSE[2]	Highest HAA5 locations determined by IDSE	Existing Stage 1 DBPR monitoring locations
Surface water and GWUDI	<500	Annually	2	1	1	-
	500-3,300	Quarterly	2	1	1	-
	3,301-9,999		2	1	1	-
	10,000-49,999		4	2	1	1
	50,000-249,999		8	3	3	2
	250,000-999,999		12	5	4	3
	1,000,000-4,999,999		16	6	6	4
	≥5,000,000		20	8	7	5
Groundwater	<500	Annually	2	1	1	-
	500-9,999		2	1	1	-
	10,000-99,999	Quarterly	4	2	1	1
	100,000-499,999		6	3	2	1
	≥500,000		8	3	3	2

[1]All systems must monitor during month of highest DBP concentrations.
[2]Systems on quarterly monitoring must take dual sample sets (e.g., a TTHM and HAA5 sample) every 90 days at each monitoring location, except for surface water and GWUDI systems serving 500-3,300. Systems on annual monitoring and systems using surface water or GWUDI and serving 500-3,300 are required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentrations, respectively. Only one location with a dual sample set per monitoring period is needed if highest TTHM and HAA5 concentrations occur at the same location, and month, if monitored annually.

Table 34. Reduced TTHM and HAA5 Monitoring Requirements[1]

Source Water	System Size (population)	Reduced Monitoring Frequency	Distribution System Monitoring Locations per Monitoring Period
Surface water and GWUDI	<500	Not allowed	N/A
	500-3,300	Annually	1 TTHM and 1 HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement; 1 dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	3,301-9,999	Annually	2 dual sample sets; one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement.
	10,000-49,999	Quarterly	2 dual sample sets at the locations with the highest TTHM and highest HAA5 LRAAs.
	50,000-249,999		4 dual sample sets at the locations with the two highest TTHM and two highest HAA5 LRAAs.
	250,000-999,999		6 dual sample sets at the locations with the three highest TTHM and three highest HAA5 LRAAs.
	1,000,000-4,999,999		8 dual sample sets at the locations with the four highest TTHM and four highest HAA5 LRAAs.
	≥5,000,000		10 dual sample sets at the locations with the five highest TTHM and five highest HAA5 LRAAs.
Groundwater	<500	Triennially	1 TTHM and 1 HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement; 1 dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	500-9,999	Annually	
	10,000-99,999	Annually	2 dual sample sets; one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement.
	100,000-499,999	Quarterly	2 dual sample sets at the locations with the highest TTHM and highest HAA5 LRAAs.
	≥500,000		4 dual sample sets at the locations with the two highest TTHM and two highest HAA5 LRAAs.

[1] Systems can reduce monitoring if the LRAA at each distribution system sampling location is ≤ 0.040 mg/L (40 ppb) for TTHMs and ≤ 0.030
mg/L (30 ppb) for HAA5s based on at least 1 year of routine monitoring

4.5.3.6 OEL Requirement

Systems in full compliance with the Stage 2 DBPR LRAAs may still experience elevated individual TTHM or HAA5 measurements at various monitoring locations. These significant excursions that would generally go unnoticed if a system maintains compliance with the LRAAs may still pose a potential health threat. For that reason, the Stage 2 DBPR established OELs that address these significant DBP excursions. Only systems that conduct quarterly TTHM and HAA5 monitoring must comply with the OEL requirement. Systems monitoring annually are not subject to the OEL requirement. If a system exceeds an OEL it is triggered into conducting an operational evaluation to determine the reason or cause of the significant excursion and identify actions to minimize future excursions. The OELs for TTHMs and HAA5s are the same as the respective MCLs – e.g., 0.080 mg/L for TTHMs and 0.060 mg/L for HAA5s. The OEL is determined for each monitoring location quarterly as the sum of the two previous quarters' TTHM result at a location plus twice the current quarter's TTHM result divided by 4 (the same process is used for HAA5s).

$$OEL = (Q1 + Q2 + 2Q3)/4$$

Where: Q1 = Quarter before previous quarter measurement
Q2 = Previous quarter measurement
Q3 = Current quarter measurement

If the OEL exceeds 0.080 mg/L TTHMs or 0.060 mg/L HAA5s at any sampling location then the system must conduct an operational evaluation and submit a written report to the state. An operational evaluation includes an examination of a system's treatment and distribution operational practices, including changes in source water quality, storage tank operations, and excess storage capacity that may contribute to high TTHMs and HAA5s. If a system knows the cause of the high DBP levels then it may apply to the state to conduct a limited operational evaluation.

4.5.3.7 Reporting and Public Notification Requirements

Table 35 contains the reporting and public notification requirements associated with the Stage 2 DBPR.

Table 35. Stage 2 DBPR Reporting and Public Notification Requirements

Stage 2 DBPR Requirement	Reporting	Public Notification
LRAA	Within 10 days of the end of any quarter in which monitoring is required systems must report: -Number of samples taken -Date and result of each sample -LRAA for each monitoring location -Whether the MCL was violated	Within 30 days for an MCL exceedance (Tier 2) Within 1 year for failure to monitor or report results (Tier 3)
OEL	Within 10 days of the end of any quarter in which monitoring is required systems must report any OEL that was exceeded and the location, date, and calculated TTHM and HAA5 levels. Systems that exceed the OEL must conduct an operational and submit a report to the state within 90 days.	Within 1 year for failure to submit an operational evaluation report to the state within 90 days (Tier 3)

4.6 The Lead and Copper Rule

4.6.1 Quick Reference

- Lead and Copper Rule: A Quick Reference Guide, EPA 816-F-08-018, June 2008.

4.6.2. CFR Citations

- 40 CFR 141.80 – 141.91 Control of lead and copper.

4.6.3 Applicability

The Lead and Copper Rule (LCR) applies to CWS and NTNC.

4.6.4 Standard

The LCR was finalized on 7 June 1991 with revisions issued in 1991, 1992, 1994, and 2000. The LCR established standards for lead and copper in drinking water. The majority of lead and copper concentrations in water received by the consumer is a result of leaching of the metals from water service lines and internal plumbing materials rather than contamination of source water. Corrosive waters, as defined by various corrosivity indicators (e.g., the Langelier Saturation Index (LSI)), enhance the leachability of lead and copper. As a result, the rule regulates the levels of lead and copper found at the consumer's water tap. The rule requires monitoring of tap water lead and copper levels

(from sink taps, not drinking fountains) and distributed water quality characteristics. The LCR was designed to be most protective of the health of children and developing infants in response to lead's detrimental effects to mental development.

The MCLG for lead is zero and for copper is 1.3 mg/L. The ALs rather than MCLs have been established for regulating lead and copper in drinking water: 0.015 mg/L (15 ppb) for lead and 1.3 mg/L (1,300 ppb) for copper to be met at the 90th percentile of the 1 liter first draw tap water samples. In other words, lead and copper concentrations must not exceed their respective ALs in at least 90% of the taps sampled. First draw samples are collected by catching the first water that comes from the tap after water has sat unused for at least 6 hours and not allowing for any flushing or wasting of water. Exceeding the AL requires a system to take actions to correct the lead and copper leaching problem within the system and to educate and protect the consumer from exposure to lead from drinking water.

4.6.5 System Sizes

The LCR divides water systems into three size categories: large, medium, and small. Large systems are those serving more than 50,000; medium systems serve 3,301 – 50,000; and small systems serve 3,300 or less. Monitoring requirements and required actions that must be taken for systems that exceed the ALs are dependent on system size.

4.6.6 Monitoring Requirements

The LCR requires systems to monitor lead and copper content at taps within homes and workplaces in the distribution system. The LCR sampling locations were previously identified when systems first began monitoring according to the LCR in 1992. The locations were chosen according to specific criteria in the LCR intended to target buildings at the greatest risk of leaching lead defined as Tier 1 (greatest risk of lead leaching), Tier 2, and Tier 3 (less risk of lead leaching). Systems were required to choose as many Tier 1 locations as possible to meet their required number of sampling locations. Tier 2 and Tier 3 locations were used to complete the required number of sampling locations.

Monitoring requirements are contained in Table 37. The LCR established routine and reduced monitoring requirements. Since the LCR was finalized in 1991, most Army water systems have met the criteria to conduct monitoring at the reduced frequencies and locations. Applicable systems, regardless of size, must conduct lead and copper monitoring. All large systems are required to conduct monitoring for various water quality parameters (WQPs) to ensure water corrosivity is minimized and the risk of lead leaching is reduced. The WQPs consist of pH, alkalinity, calcium, conductivity, orthophosphate (if phosphate-based treatment chemical used), silica (if silica-based

treatment chemical used), and temperature. Small and medium size systems must monitor for WQPs if a lead or copper AL is exceeded. Reduced monitoring is allowed for lead, copper, and WQPs under the LCR provided systems meet certain criteria as shown in Table 36. A system that exceeds an AL must return to routine monitoring frequencies and locations.

Table 36. LCR Monitoring Requirements

System Size Category	System Size	Number of Lead/Copper Sample Locations		Number of WQP[1] Sample Locations	
		Routine Monitoring	Reduced Monitoring	Routine Monitoring	Reduced Monitoring
Large	> 100,000	100	50	25	10
	50,001-100K	60	30	10	7
Medium	10,001-50K	60	30	10	7
	3,301-10K	40	20	3	3
Small	501-3,300	20	10	2	2
	101-500	10	5	1	1
	≤100	5	5	1	1
Criteria for Reduced Lead/Copper Monitoring at Reduced Number of Sample Locations					
Annually	1. System serves ≤ 50,000 and does not exceed either AL for 2 consecutive 6-month monitoring periods; or				
	2. System meets optimal WQPs as specified by state for 2 consecutive 6-month monitoring periods.				
Triennially	1. System serves ≤ 50,000 and does not exceed either AL for 3 consecutive annual monitoring periods (3 years); or				
	2. System meets optimal WQPs as specified by state for 3 consecutive annual monitoring periods (3 years); or				
	3. System has 90th percentile lead levels ≤ 0.005 mg/L and 90th percentile copper levels ≤ 0.65 mg/L for 2 consecutive 6-month monitoring periods.				

[1]WQP – Water Quality Parameter

4.6.7 AL Exceedance

Systems must determine compliance with the ALs. The procedure for determining compliance is done by listing the lead and copper sampling results separately from lowest to highest, assigning each sample result a number from 1 to n (n = total number of sample results), multiplying the total number of sample results by 0.9 to identify the sample result at the 90th percentile, and comparing that result to the lead or copper AL. If the 90th percentile value exceeds the AL then the system is triggered into conducting additional actions. Table 37 shows actions systems must take if an AL is exceeded.

Table 37. Required Actions Resulting from LCR AL Exceedance

Action Level Exceedance	Required Action
Lead or Copper AL	Begin monitoring for lead, copper, and WQPs at standard monitoring locations (increased number of locations) and frequency (every 6 months).
	Collect a source water lead or copper sample to determine contribution from source. Results may require treatment to reduce levels in source waters.
	Implement corrosion control treatment (if not already in place).
	Begin lead service line replacement (if corrosion control treatment is already in place).
Lead AL	Provide public education in addition to above actions.
	Offer to sample the tap water of any customer who requests it. The system is not required to pay for collecting or analyzing the sample, nor is the system required to collect or analyze the sample itself.

4.6.8 Public Education Requirements

Systems that exceed the lead AL must provide public education to inform consumers about lead health effects, sources, and actions they can take to reduce exposure. Public education is not required if the copper AL is exceeded. The public education requirements consist of providing information to consumers, and facilities and organizations that regularly serve pregnant women and children such as schools, child development centers, pediatrician's offices, and family planning clinics. Systems are required to contact the local health agency (e.g., county health department) via phone or in-person to request their assistance in distributing public education materials. Table 38 summarizes the public education requirements.

Table 38. LCR Public Education Requirements

Applicable System	Public Education Requirement
All systems	Develop written public education materials that must contain mandatory health effects language, sources of lead in drinking water, and actions consumers can take to reduce exposure to lead in drinking water.
	Deliver public education materials within 60 days after the end of the monitoring period in which the lead AL exceedance occurred.
	Deliver public education materials to all consumers served by the system
	Deliver public education materials to facilities and organizations visited regularly by pregnant women and children
	Contact the local health department via phone or in-person to notify of the lead AL exceedance and request assistance in communicating public education information
Small systems (<3,300)	Conduct one outreach activity such as a Public Service Announcement (PSA), mass email, paid advertisement, or public meeting
Medium and Large systems (≥3,301)	Conduct three outreach activities
	Submit a press release to newspaper, television, and radio stations
Large systems (>100,000)	Post public education materials on publically accessible website

4.6.9 Reporting Requirements

The LCR includes several reporting requirements. Of particular significance is the requirement to report the lead results to consumers at a location where that particular lead sample was collected. Of additional significance is the requirement to notify the state if a system is considering or planning to use a new source of water or implement a long-term treatment change that may impact lead or copper corrosion in the distribution system. Table 39 summarizes the reporting requirements.

Table 39. LCR Reporting Requirements

1. Within 30 day of obtaining results, provide notice of lead results for individual taps to consumers at the specific sampling site from which the sample was taken. Results may be provided by mail or posting.
2. Within 3 months of the end of the monitoring period, provide the state a copy of the notice of lead results provided to consumers along with a certification that all consumers were notified.
3. Within 10 days of the end of a monitoring period, provide all lead and copper sample results to the state, along with the 90th percentile calculation, and WQP results (if providing optimal corrosion control)
4. As early as possible, notify the state prior to the addition of a new source or any long-term change in water treatment.
5. If required (e.g., lead or copper AL exceedance), within 10 days of the end of the monitoring period, provide source water monitoring results.

4.7 The Unregulated Contaminant Monitoring Rule

4.7.1 Quick Reference

• The Third Unregulated Contaminant Monitoring Rule (UCMR 3), EPA 815-F-12-002, May 2012.

4.7.2 CFR Citation

• 40 CFR 141.40 Monitoring requirements for unregulated contaminants.

4.7.3 Background

The 1996 SDWA Amendments required the USEPA to establish a program to monitor unregulated contaminants and publish a list of up to 30 contaminants to be monitored every 5 years. The USEPA subsequently established the Unregulated Contaminant Monitoring Rule (UCMR) that defines a program for monitoring unregulated contaminants. The UCMR provides scientifically valid data on the occurrence of contaminants in drinking water which is used in the regulatory determination for contaminants. Because the 1996 SDWA Amendments require monitoring every 5 years, monitoring requirements of the UCMR are finalized about every 5 years. The first round of UCMR monitoring requirements (UCMR 1) were finalized in 2001. The second round of UCMR monitoring requirements (UCMR 2) were finalized in 2007, and the third round of UCMR monitoring requirements (UCMR 3) were finalized in 2012.

4.7.4 Applicability

The UCMR applies to all PWS – CWS, NTNC, and TNC. All CWS and NTNC serving more than 10,000 must comply with the UCMR. All CWS and NTNC serving less than 10,000 are not required to comply with the UCMR. Rather the USEPA will identify a representative portion of these smaller systems for compliance with the UCMR. Similarly, only those TNC identified or chosen by the USEPA must comply with the UCMR.

4.7.5 Monitoring

The first and second rounds of UCMR monitoring have been completed. Currently, applicable water systems must conduct the monitoring associated with the third round of UCMR monitoring requirements between 2013 and 2015. The third round of monitoring consists of a total of 30 contaminants divided into three lists. Affected systems must monitor for listed contaminants during a 12-month period between 2013 and 2015. Table 40 shows which systems that must monitor for specific unregulated contaminants.

Table 40. UCMR 3 List of Contaminants

Affected Systems	Unregulated Contaminant	
-CWS and NTNC > 10,000; and -800 CWS and NTNC ≤ 10,000 chosen by USEPA	1,2,3-trichloropropane	Bromomethane (methyl bromide)
	Chloromethane (methyl chloride)	Bromochloromethane (Halon 1011)
	Chlorodifluoromethane (HCFC-22)	1,3-butadiene
	1,1-dichloroethane	1,4-dioxane
	Vanadium	Molybdenum
	Cobalt	Strontium
	Chromium	Chromium-6
	Chlorate	Perfluorooctanesulfonic acid (PFOS)
	Perfluorooctanoic acid (PFOA)	Perfuorobutanesulfonic acid (PFBS)
	Perfluorohexanesulfonic acid (PFHxS)	Perfuoroheptanoic acid (PFHpA)
	Perfluorononanoic acid (PFNA)	
-CWS and NTNC > 100,000 and -320 CWS and NTNC > 10,000 to ≤ 100,000 chosen by USEPA and -480 CWS and NTNC ≤ 10,000 chosen by USEPA	17-β-estradiol	Estriol
	Estrone	4-androstene-3,17-dione
	17-α-ethynylestradiol	Equilin
	Testosterone	
-800 PWS ≤ 1,000 chosen by USEPA	Enteroviruses	noroviruses

4.8 Future Regulations

There are a few drinking water regulations which are expected to be proposed in the near future.

4.8.1 Perchlorate Regulation

4.8.1.1 In February 2011, the USEPA decided to regulate perchlorate under the SDWA. Based on available health effects studies and occurrence data in public water supplies, USEPA determined that regulating perchlorate will result in a meaningful health risk reduction for between 5.2 and 16.6 million people who may be served drinking water containing perchlorate. As of 2014, the USEPA has not yet proposed a

perchlorate MCL. It is assumed monitoring and compliance with the perchlorate MCL will be similar to current inorganic contaminant requirements.

4.8.1.2 All Army-owned CWS and NTNC should already have perchlorate occurrence data available. A 2009 DOD policy Memorandum required DOD-owned water systems that sample for inorganic analytes to add perchlorate for at least two sampling events. The DOD policy established a perchlorate level of 15 ppb (ug/L) for taking action. The 15 ppb level is based on USEPA's lifetime Health Advisory (HA) for perchlorate. The 15 ppb lifetime HA is the concentration of perchlorate in drinking water that is not expected to cause any adverse noncarcinogenic effects for a lifetime of exposure. Army systems that detect perchlorate above 15 ppb must conduct quarterly perchlorate sampling and develop an action plan to reduce drinking water perchlorate exposure.

4.8.2 Carcinogenic VOC Contaminant Grouping

In 2011, the USEPA decided to group together several contaminants in an effort to more effectively regulate certain contaminants. The USEPA believes that if groups of contaminants pose similar health risks, can be measured by the same analytical methods, can be treated using the same technology or TT, and are likely to occur together, then regulating as a group may result in an overall reduced exposure. The USEPA is considering grouping 16 VOCs that are known or suspected to cause cancer. Eight of the 16 VOCs are currently regulated and eight are unregulated. Table 41 lists the 16 VOCs. It is assumed that a single MCL will be proposed and compliance will be based on a summation of individual VOCs. As of 2014, the USEPA has not yet proposed regulation for the VOC contaminant group.

Table 41. Grouped Carcinogenic VOCs

Currently regulated VOCs	Unregulated VOCs
Benzene	Aniline
Carbon tetrachloride	Benzyl chloride
1,2-dichloroethane	1,3-butadiene
1,2-dichloropropane	1,1-dichloroethane
Dichloromethane	Nitrobenzene
Tetrachloroethylen	Oxirane methyl
Trichloroethylene	1,2,3-trichloropropane
Vinyl chloride	urethane

4.8.3 Long-Term Revisions to the Lead and Copper Rule

The USEPA is considering substantive changes to the LCR based on research conducted since the LCR was finalized. As of 2014, the USEPA has not yet proposed any long-term revisions to the LCR. Potential revisions include:

- Revisions to sample site collection criteria and sampling procedures for lead and copper tap monitoring;
- Corrosion control treatment and water quality parameter monitoring requirements;
- Lead service line replacement requirements;
- Addressing school and day care facilities;
- Including consecutive system requirements; and
- Addressing potentially outdated requirements, rule relevancy and simplicity for systems.

CHAPTER 5 THE NPDWR: RECORDKEEPING AND REPORTING

5.1 Recordkeeping Requirements

5.1.1 Quick Reference

• Record Keeping Rules: A Quick Reference Guide, EPA 816-F-06-033, September 2006.

5.1.2 CFR Citation

• 40 CFR 141.33 Record maintenance.

5.1.3 Requirements

The SDWA requires water systems to maintain records of water quality analyses and actions taken pertaining to the drinking water system. Such records should be physically kept at an installation, usually by a DPW POC (e.g., environmental office or the water system's contracting officers representative). Additionally, the installation's PM (EH) office should maintain copies of water system records. Table 42 summarizes the recordkeeping schedule mandated by the SDWA. The records must include the date, place, and time of sampling, the name of the person taking the sample, the type of sample (routine, confirmatory, or special), the date of analysis, the laboratory name and identification number, names of analysts, analytical methodology, and the results.

Table 42. Recordkeeping Requirements

Contaminant Group	Years to Keep Records
Microbiological	5
Chemical	10
Records of actions to correct violations	3
Sanitary survey reports	10
Records of variances/exemptions	5*
Lead and Copper Rule monitoring results	12

*5 years after expiration date of variance/exemption

5.1.4 Value of Well-Kept Records

Well-kept records are useful to identify causes of noncompliance, to monitor the progress of a system during new treatment initiatives, to monitor the changes in source water quality, and to ensure the continuing adequacy of a treatment system. Records

are necessary for the application of waivers and for compliance. Records may also be a very important part of litigation matters.

5.2 Reporting Requirements

- 40 CFR 141.31 Reporting requirements.

All regulatory monitoring results must be reported to the state. The specific information to be reported and the time in which it must be reported to the state are dependent upon the contaminant group or rule as identified in Chapter 4. Typically, the system must report the monitoring results within the first 10 days of the month in which the analytical results are received or within 10 days following the end of a monitoring period, whichever is earlier. If an MCL is exceeded or if a monitoring requirement is missed, the state must be notified within 48 hours. Special reporting requirements with often shorter suspense's exist for the microbiological-related rules (e.g., TCR and LT2ESWTR), and the LCR.

CHAPTER 6 THE NPDWR: PUBLIC NOTIFICATION AND CONSUMER CONFIDENCE REPORTS

6.1 Public Notification Requirements

6.1.1 Quick Reference

• The Public Notification Rule: A Quick Reference Guide, EPA 816-F-09-010, August 2009.

6.1.2 CFR Citations

• 40 CFR 141.201 – 141.211 Subpart Q - Public notification of drinking water violations.

• Appendix A to Subpart Q of 40 CFR 141 – NPDWR violations and situations requiring public notice.

• Appendix B to Subpart Q of 40 CFR 141 – Standard health effects language for public notification.

• Appendix C to Subpart Q of 40 CFR 141 – List of acronyms used in public notification regulation.

6.1.3 Purpose

The purpose of public notification is not only for compliance, but is to protect the health of the consumer. This is the heart of the SDWA since that is the mission of the legislation — to ensure the safety of the consumer. Sometimes, the drinking water produced does not meet the criteria to be considered safe, as determined by the regulations of the SDWA. In these cases, the consumer must be notified of the concern and what she can do to protect herself. The USEPA has established the public notification criteria for all SDWA violations.

6.1.4 Types of Violations

The public notification requirements are divided into three categories, or Tiers, based on the type SDWA violation. Those violations that have the potential to result in acute or serious adverse health effects as a result of short-term exposure are Tier 1 violations. Examples of Tier 1 violations include exceedances of the *E. coli* MCL under the RTCR, exceedance of the nitrate or nitrite MCL, and exceedance of the chlorine dioxide MRDL. Violations that have the potential to pose serious adverse health effects as a result of

long term exposure are Tier 2 violations. Examples of Tier 2 violations include exceedances of the MCLs for most inorganic and organic chemicals, and failure to maintain 4-log treatment for viruses under the GWR. Those violations that are not directly related to adverse health consequences are Tier 3 violations. Examples of Tier 3 violations include failure to monitor at the required frequency or location, and failure to comply with established testing procedures. The complete list of specific violations and their associated public notification Tier can be found in 40 CFR 141, Appendix A to Subpart Q.

6.1.5 General Content, Timing, and Distribution of Public Notice

The USEPA requires certain information to be included in all public notices, such as mandatory health effects language, a water system point of contact regarding the issue, and what the system is doing to correct the problem. The delivery methods used and the deadlines for notification are also governed. Table 43 provides the deadlines, delivery methods, and general content of public notifications.

Table 43. Public Notification Requirements

Tier Violation	Deadline for Notice	Repeat Notice Frequency	Delivery Methods to Use
1	24 hours	As directed by the state	1) Broadcast media (radio; TV), posting, or hand delivery 2) Additional methods as directed by the state
2	30 days	Every 3 months	CWS: 1) Mail or hand delivery 2) Additional methods as necessary to reach all consumers
			NCWS: 1) Posting, mail, or hand delivery 2) Additional methods as necessary to reach all consumers
3	1 year	Annually	CWS: 1) Mail or hand delivery. May be included in annual Consumer Confidence Report (CCR) 2) Additional methods as necessary to reach all consumers
			NCWS: 1) Posting, mail, or hand delivery 2) Additional methods as necessary to reach all consumers
General Content of Public Notice			
1. Description of the violation, including the contaminants of concern and their detected levels.			
2. When the violation occurred.			
3. Inclusion of mandatory health effects language provided in Appendix B to 40 CFR 141 Subpart Q			
4. The population at risk, including subpopulations that may be particularly susceptible.			
5. Whether alternate water supplies should be used.			
6. Actions consumers should take, including when they should seek medical help, if known.			
7. What the system is doing to correct the violation.			
8. When the system expects to return to compliance.			
9. Contact information for a water system point of contact.			
10. A statement encouraging distribution of the notice to others.			

6.2 Consumer Confidence Reports

6.2.1 Quick Reference.

• Consumer Confidence Report Rule: A Quick Reference Guide, EPA 816-F-09-009, August 2009.

6.2.2 CFR Citations.

• 40 CFR 141.151 – 141.155 Subpart O - Consumer confidence reports.

• Appendix A to Subpart O of 40 CFR 141 – Regulated contaminants.

6.2.3 Purpose and Applicability.

The Consumer Confidence Report (CCR) requirements were established by the USEPA in 1998. The CCR was an effort by USEPA to address public awareness and involvement identified in the 1996 SDWA Amendments. The CCR requirements apply to all CWS. The CCR is a brief water quality report provided annually to consumers. The CCR summarizes information already collected to comply with regulations. Many water systems refer to their CCR as an annual water quality report.

6.2.4 Timing, Content, and Delivery of Consumer Confidence Reports.

The annual CCR must be provided to consumers of a CWS by July 1 of each year. The reports are based on calendar year data. A CWS providing water to a consecutive water system must provide the consecutive system with monitoring data and other information by April 1 of each year to allow the consecutive system to prepare a CCR before the July 1 deadline. Each CCR must contain information on eight categories. Table 44 shows the eight categories that must be addressed. Every CWS must make a good faith effort to provide CCRs to all consumers served by the system. The CCR delivery requirements are varied to allow systems flexibility is reaching all consumers. In addition to typical mail and hand delivery, CCRs may be delivered via posting on the internet, publishing in a newspaper, posting in public places, and delivering to community organizations.

Table 44. Consumer Confidence Report Content

1. Information about the water system – points of contact, public participation opportunities
2. Source(s) of water
3. Definitions and explanation of acronyms (e.g., MCL, MCLG, MRDL)
4. Reported levels of detected contaminants
5. Information on monitoring for *Cryptosporidium*, radon, and other specific contaminants (e.g., lead) or unregulated contaminants (as applicable)
6. Compliance with drinking water regulations
7. Explanation of variances and exemptions (as applicable)
8. Inclusion of required, specific educational information

CHAPTER 7 POINT-OF-ENTRY AND POINT-OF-USE TREATMENT

7.1 Definitions

Point-of-entry (POE) and point-of-use (POU) treatment devices provide additional or alternative treatment of distributed drinking water at the point of the consumer. The POE devices treat the drinking water at the water's entry point to a building to provide water that meets MCLs or ALs throughout the building. Maintenance of POE-devices is often the responsibility of the supplier of water. The POU devices are tap or location specific treatment devices. They can only provide water that meets standards at one tap, leaving water untreated elsewhere in a building.

7.2 Using Point-Of-Entry Treatment

- 40 CFR 141.100 Subpart J - Criteria and procedures for public water systems using point-of-entry devices.

The USEPA recognizes that full-scale treatment upgrades/changes are not always the most economical way to provide drinking water in compliance with the NPDWR. In order to provide safe drinking water to all consumers, the NPDWR allows use of POE devices to comply with MCLs or ALs if the POE devices meet certain criteria. The devices must be maintained and operated by the supplier of public water. The PWS must develop and obtain state approval for a monitoring plan prior to using the POE for compliance. The POE device used must provide health protection equivalent to central water treatment, where "equivalent" is defined as providing water that would meet all NPDWR and is as acceptable to the consumer as centrally treated drinking water. The state must require adequate certification of performance, field testing, and, if not included in the certification process, a rigorous engineering design review of the POE device. The POE device cannot jeopardize the microbiological quality of the drinking water, and its design must consider the tendency for heterotrophic bacteria to increase in water treated with activated carbon. Most importantly, all consumers must be protected if POE devices are to be used for compliance. In this case, every building connected to the systems (or every building which exceeds an MCL or AL) must have a POE device installed, maintained, and sufficiently monitored. The use requirements for POE treatment devices are contained in 40 CFR. 141, Subpart J.

7.3 Using Point-Of-Use Treatment

Building upon the POE requirements in 40 CFR 141, Subpart J, the 1996 SDWA Amendments explicitly allowed small PWS serving ≤ 10,000 to install POU (and POE) treatment devices to achieve compliance with some of the MCLs established in the NPDWR. Larger PWS (serving > 10,000) may not use POU devices as a compliance

technology; however, POU devices may be used as a temporary measure to avoid unreasonable risks to health. The 1996 SDWA Amendments added four key provisions for use of POU treatment devices by small systems:

- The POU devices may not be used to achieve compliance with an MCL or TT for a microbiological contaminant or an indicator of a microbiological contaminant;

- The POU and POE devices must be owned, controlled, and maintained by the small PWS to ensure proper operation and maintenance;

- The POU and POE devices must have mechanical warnings to automatically notify customers of operational problems; and

- If the American National Standards Institute (ANSI) has issued product standards for a specific type of POU or POE device, then only those units that have been independently certified according to these standards may be used as a compliance technology.

Small systems that choose POU devices to comply with an MCL should consult with the state to determine how many taps within a residence or facility should be protected. At a minimum, all taps primarily used for consumption (e.g., kitchen, breakroom sinks) should be protected. Although not explicitly prohibited in the SDWA, the USEPA indicates that POU devices should not be used to comply with most VOC MCLs because they do not provide adequate protection against routes of exposure other than ingestion, such as inhalation exposure, at unprotected taps. A PWS may not use bottled water to achieve compliance with an MCL. Bottled water may be used; however, as a temporary measure to avoid unreasonable risks to health.

CHAPTER 8 OPERATOR CERTIFICATION

8.1 Operator Certification Requirements

The SDWA Amendments of 1996 required the USEPA to establish guidelines specifying minimum standards for certification and recertification of operators of CWS and NTNC. The USEPA published the guidelines in the Federal Register on 5 February 1999. States must adopt and implement an operator certification program that meets these guidelines. The purpose of these guidelines was to provide a mechanism to ensure adequate public health protection of drinking water supplies. By requiring states to adopt and implement an operator certification program meeting these guidelines, systems will be operated by trained and certified personnel with knowledge and understanding of the public health reasons for drinking water standards. The guidelines contain nine baseline standards, shown in Table 45, that all state operator certification programs must meet. States must annually submit documentation to USEPA verifying ongoing operator certification implementation. State regulations will contain their specific operator certification requirements. All CONUS Army CWS and NTNC should be staffed by licensed, certified operators in the state where the Installation is located.

Table 45. Standards of a State Operator Certification Program

1. Authorization. States must have SDWA Primacy
2. Classification of systems, facilities, and operators. States must: a) Classify all CWS and NTNC based on indicators of potential health risk; b) Require water systems to be directly under the responsible charge of a certified operator; and c) Require a designated certified operator be available for each shift.
3. Define operator qualifications: a) Take and pass an exam; b) Hold a high school diploma or General Equivalency Diploma (GED); and c) Have defined minimum on-the-job experience for the appropriate system classification.
4. Ability to enforce compliance.
5. Establish requirements for certification renewal to include: a) training requirement for renewal b) specified period of renewal not to exceed 3 years
6. Identify adequate resources to implement the operator certification program
7. Establish a process for recertification of operator with expired certifications exceeding 2 years
8. Involve stakeholders in routine reviews of the operator certification program
9. Conduct periodic reviews of the their operator certification program

CHAPTER 9 NATIONAL SECONDARY DRINKING WATER REGULATIONS

9.1 Standards

- 40 CFR 143.1 – 143.4 National secondary drinking water regulations.

The NSDWR are standards for substances that impact the aesthetic quality of drinking water (taste, odor, appearance, cosmetic effects on plumbing fixtures and clothes). The NSDWR established Secondary Maximum Contaminant Levels (SMCLs) for 15 contaminants. The SMCLs are not health-based standards like the MCLs established in the NPDWR. The NSDWR are reflected in 40 CFR 143. Table 46 contains a list of the NSDWR parameters and their SMCLs.

Table 46. NSDWR Contaminants

Parameter	SMCL (mg/L)
Aluminium	0.05 – 0.2
Chloride	250
Color	15 color units
Corrosivity	Noncorrosive
Fluoride	2.0
Foaming agents	0.5
Iron	0.3
Manganese	0.05
Odor	3 threshold odor
pH	6.5-8.5
Silver	0.1
Sulfate	250
Total dissolved solids	500
Zinc	5

9.2 Applicability

The NSDWR are not federally enforceable. They are suggested guidelines for producing water acceptable to consumers. Some states enforce the NSDWR in the consumer's best interest. Installations must be aware of state-established standards and monitoring regulations for these parameters.

CHAPTER 10 SOURCE WATER PROTECTION

10.1 General

The SDWA contains provisions to protect sources of drinking water from contamination, both groundwater and surface water sources. These provisions are not part of the NPDWR. The SDWA and SDWA Amendments of 1986 contain provisions for three ground-water protection programs. The SDWA Amendments of 1996 established the source water assessment program that covers both surface and groundwater sources of drinking water.

10.2 Protection of Groundwater Sources

10.2.1 Sole Source Aquifer Demonstration (SSAD) Program – 40 CFR 149

The 1986 SDWA Amendments established the SSAD program to ensure that critical aquifer protection areas (CAPAs) are not adversely impacted by federal, state or local activities. A CAPA is either all or part of a major recharge area of a sole or principal drinking water source aquifer. The program requires the development of a comprehensive management plan which identifies potential sources of ground-water degradation, impact of land use, and proposed actions to prevent adverse impacts.

10.2.2 The WHP Program – PL 99-399, Section 205

The SDWA Amendments of 1986 established the WHP program to protect the recharge area of public water supply wells from all sources of contamination. States were given the responsibility of developing their own WHP programs. A WHP program requires systems using ground water to delineate the drinking water well's or well field's Wellhead Protection Area (WHPA). The WHPA is the surface and subsurface area surrounding the water well or well field, through which contaminants are reasonably likely to move toward and reach the water well or well field. The program also regulates all activities within this WHPA.

10.2.3 Underground Injection Control (UIC) Program – 40 CFR 144-148

The SDWA established the UIC program to protect ground water from materials disposed of through underground injection wells. Each state is responsible for developing and implementing its own UIC program. Basically, the program prohibits and penalizes all underground injections unless authorized by a permit. Permitted underground injection operations must be monitored to determine the effects, if any, on nearby ground water.

10.2.4 Compliance with Groundwater Protection Programs

Army installations using a ground-water source should contact the state to determine specific WHP program or SSAD program requirements. Some installations may not have ground-water systems, but may be located within another system's WHPA or CAPA and must comply with the regulations on activities within that area. Army installations involved in underground injection operations of any type of material should contact the state to ensure compliance with applicable UIC regulations.

10.3 The Source Water Assessment Program

10.3.1 The 1996 SDWA Amendments established the Source Water Assessment Program (SWAP) which includes measures to identify and protect both surface and groundwater sources of drinking water. States were required to comply with the components of the SWAP. The SWAP did not apply to individual water systems. To comply with the SWAP, states had to develop their own SWAP with approval from USEPA. A state SWAP must contain four components:

- Delineation of a source water protection area - the portion of a watershed (for surface water sources) or area surrounding a well (for groundwater sources) that may contribute pollution to the water supply;

- Inventory of significant potential sources of contamination in the source water protection area;

- Analysis of the water supply's susceptibility to contamination from identified sources; and

- Distribution of the source water assessment results to the public.

States performed the source water assessments for all PWSs in their jurisdiction. In most cases a single source water assessment covered sources of drinking water for more than one PWS. The USEPA has approved all states' submittals. While not required under the SDWA, states may have implemented additional regulatory requirements for PWS based on their source water assessments.

10.3.2 Army installations should review their state's source water assessment that covers their source of drinking water. Contact the state to obtain a copy of the source water assessment. A source water assessment will provide valuable information on potential sources of contamination and can be a useful tool in contingency planning in the event of contamination of the water supply.

CHAPTER 11 WATER SYSTEM VULNERABILITY ASSESSMENTS AND EMERGENCY RESPONSE PLANNING

11.1 General

As a result of the terrorist attacks on 11 September 2001, PL 107-188, the Public Health Security and Bioterrorism Prevention and Response Act was enacted on 12 June 2002. The PL 107-188 amended the SDWA requiring water systems to conduct a WSVA and develop or revise their WSERP. Specifically, these requirements applied to CWS serving at least 3,300 persons. Because these requirements were not included in the NPDWR, there were several Army water systems that had to comply even though they were exempt from the NPDWR.

11.2 The SDWA WSVA and WSERP Requirements

The SDWA required CWS ≥ 3,300 to conduct a WSVA and update or develop their WSERP. These were one-time requirements. The SDWA defined a WSVA as a mechanism for evaluating a water system's susceptibility to adversarial actions and provides a prioritized approach for reducing or mitigating the risks associated with those identified adverse actions. A WSVA must include "a review of pipes and constructed conveyances; physical barriers; water collection, pretreatment, treatment, storage and distribution facilities; electronic, computer or other automated systems which are utilized by the public water systems; the use, storage or handling of various chemicals; and the operation and maintenance of such system". Additionally, WSERPs must include "plans, procedures and identification of equipment that can be implemented or utilized in the event of a terrorist or other intentional attack" as well as "actions, procedures and identification of equipment which can obviate or significantly lessen the impact of terrorist attacks or other intentional actions." The systems were required to certify to USEPA that a WSVA was conducted and submit a copy of the WSVA to USEPA by the following deadlines:

- 31 March 2003 for CWS ≥ 100,000.
- 31 December 2003 for CWS ≥ 50,000 – 99,999.
- 30 June 2004 for CWS ≥ 3,300 – 49,999.

Systems were also required to certify to USEPA no later than 6 months after completion of the WSVA they had developed or updated their WSERP.

11.3 DOD and Army WSVA and WSERP Policies

In a July 2003 policy memorandum, the DOD significantly expanded the SDWA WSVA and WSERP requirements to apply to all DOD PWS, stateside and overseas. Pursuant to the DOD policy, the Army identified timelines for meeting the WSVA and WSERP requirements in an October 2003 policy memorandum. By 1 July 2010, all affected Army water systems were to have met the one-time WSVA and WSERP requirements under the Army policy. Because of the concern that these were not recurring requirements, the Army developed a subsequent policy memorandum in June 2008 that linked the WSVA and WSERP requirements to existing Antiterrorism/Force Protection (AT/FP) DOD and Army recurring vulnerability assessment requirements. The DOD Instruction 2000.16, 6055.17, and Army Regulation 525-13 require annual internal vulnerability assessments and triennial higher headquarter external evaluations of critical nodes. The June 2008 Army policy memorandum identified drinking water as a critical node and directed the inclusion of WSVA and WSERP requirements into existing recurring vulnerability assessment requirements.

CHAPTER 12 BEYOND THE SDWA

12.1 Health Advisories

There are currently 89 contaminants or groups of contaminants with MCLGs and MCLs, ALs or TTs. Consumers served by a PWS are protected from these contaminants. However, there are a number of other contaminants for which regulated health limits do not exist at all. Consumers can be protected from many of these other contaminants through conscientious use of USEPA HAs. The HAs are developed through risk assessments based upon scientific studies of health effects. Risk is dependent upon both concentration and exposure period. The HAs present limits for contaminants in drinking water based upon various exposure durations. There are several HAs for contaminants which are now regulated. These can be consulted in the event of a contamination episode to determine the risk when exposure will be for a short duration (less than the life-time consumption upon which most MCLs are developed). Common exposure durations for HAs are 1-day, 10-day, longer-term, and lifetime. A longer-term duration can be anywhere from a few months up to 7 years and is specifically defined for each HA. One-day and 10-day HA limits are based upon a 10-kilogram (kg) child's consumption. Longer-term HA limits are often given for both 10-kg child and 70-kg adult consumption scenarios. The HAs also provide technical guidance on health effects, analytical methodologies, and treatment technologies. Current HAs can be obtained through the USEPA website: http://water.epa.gov/drink/standards/hascience.cfm, or by contacting the USAPHC at DSN 584-3919, or commercial (410) 671-3919.

12.2 Unreasonable Risk to Health

The USEPA has released guidance for states to use when determining what constitutes an unreasonable risk to health (URTH) in issuing variances and exemptions. This same guidance can also be used to determine acceptable exposure levels in situations of temporary contamination of drinking water supplies. Guidance in Developing Health Criteria for Determining Unreasonable Risk to Health is a draft document available from USEPA that gives guidance in determining URTHs for various regulated contaminants. The URTH guidance establishes Upper Bound Levels (UBLs) for contaminants, which present an unreasonable risk to consumer health when exceeded. The health criteria for determining a URTH are based upon an evaluation of the toxicity exhibited by individual contaminants. Consideration is given to both carcinogenic and noncarcinogenic health effects. The UBL is established based upon MCLGs, MCLs, longer term HAs for a child, cancer classifications, the 10-4 cancer risk level, and safety factors of 1-10 for possible carcinogens. Since risk assessments are time dependent, the USEPA recommends a maximum of 7 years for exposure to a UBL, based upon noncarcinogenic effects. Table 47 summarizes published URTH levels.

Table 47. EPA Guidance - URTH Levels

Contaminant	MCLG (mg/L)	MCL (mg/L)	URTH Level (mg/L)
Asbestos (fibers > 10 micrometers)	7 MillionMFL	7 MFL	7 MFL
Cadmium	0.005	0.005	0.005
Copper	1.3	1.3	1.3
Fluoride	4.0	4.0	5
Mercury (inorganic)	0.002	0.002	0.01
Nitrate	10	10	10 (child); 20 (adult)
Nitrite	1	1	1 (child)
Total Nitrate and Nitrite	10	10	10 (child)
Selenium	0.05	0.05	0.1
Total Coliforms	0	5%/1%	5%/1%
Vinyl chloride	0	0.002	0.002
Benzene	0	0.005	0.01
Carbon tetrachloride	0	0.005	0.03
1,2-Dichloroethane	0	0.005	0.04
Trichloroethylene (TCE)	0	0.005	0.3
Para-Dichlorobenzene	0.075	0.075	0.75
1,1-Dichloroethylene	0.007	0.007	0.07
1,1,1-Trichloroethane	0.20	0.2	1
Cis-1,2-Dichloroethylene	0.07	0.07	0.4
1,2-Dichloropropane	0	0.005	0.06
Ethylbenzene	0.7	0.7	1
Monochlorobenzene	0.1	0.1	2
o-Dichlorobenzene	0.6	0.6	9
Tetrachloroethylene (PCE)	0	0.005	0.07
Trans-1,2-Dichloroethylene	0.1	0.1	2
Xylenes (total)	10	10	40
Acrylamide	0	TT*	0.001
Alachlor	0	0.002	0.04
Atrazine	0.003	0.003	0.03
Carbofuran	0.04	0.04	0.05
Chlordane	0	0.002	0.003
Dibromochloropropane	0	0.0002	0.003
2,4-D	0.07	0.07	0.1
Epichlorohydrin	0	TT*	0.07
Ethylene dibromide	0	0.00005	0.00005
Heptachlor	0	0.0004	0.0008
Heptachlor epoxide	0	0.0002	0.0004
Lindane	0.0002	0.0002	0.002
Methoxychlor	0.04	0.04	0.5
Polychlorinated biphenyls	0	0.0005	0.005
Toxaphene	0	0.003	0.003
2,4,5-TP	0.05	0.05	0.07

* TT – Treatment Technique

12.3 Alternate Water Supplies for an MCL Exceedance

In the past, the Army has supplied alternate water in situations when the regular water supply exceeds an MCL (onpost and offpost, if the Army was considered to have a possible role in or was responsible for the contamination). The USAPHC developed recommended guidance for determining use of alternate water supplies when a water system exceeds an MCL. The recommendations are as follows: The Army should promote consumer health in contaminated drinking water situations. Alternative drinking water response action criteria should be the USEPA MCLs or similarly conservative health-based criteria in the absence of MCLs where the duration of the exposure period cannot be sufficiently defined. In cases where the exposure period can be defined/controlled, more relaxed action criteria based on an USEPA URTH approach can be used. In OCONUS environments, the foregoing response action criteria or ones consistent with host nation requirements should be followed, whichever are more stringent. Alternative water supplies should be implemented in accordance with applicable regulations. Economic and risk communication aspects should be considered in alternative water supply decision-making, provided the risk to consumer health is not increased. Specified Army authorities must approve any response to contamination of drinking water supplies caused by Army activities. It should be noted that alternative water supplies may constitute an interim measure (e.g., bottled water or installation of POU devices) or a more permanent measure, such as connecting to a neighboring PWS. Provision of any interim alternative water supply measures shall cease once the original water supply has been restored to an acceptable use condition or when a permanent approved water supply is provided.

12.4 Cross-Connection Control

Cross connections, which are actual or potential connections between a potable and nonpotable water supply, constitute a serious public health hazard. Within distribution systems there exist points called cross connections where nonpotable water can be connected to potable sources. These cross connections can provide a pathway for backflow of nonpotable water into potable sources. Backflow can occur either because of reduced pressure in the distribution system (termed backsiphonage) or the presence of increased pressure from a nonpotable source (termed backpressure). Backsiphonage may be caused by a variety of circumstances, such as main breaks, flushing, pump failure, or emergency firefighting water drawdown. Backpressure may occur when heating/cooling, waste disposal, or industrial manufacturing systems are connected to potable supplies and the pressure in the external system exceeds the pressure in the distribution system. Both situations act to change the direction of water, which normally flows from the distribution system to the customer, so that nonpotable and potentially contaminated water from industrial, commercial, or residential sites flows back into the distribution system through a cross connection. During incidents of backflow, these chemical and biological contaminants have caused illness and deaths,

with contamination affecting a number of service connections. The number of incidents actually reported is believed to be a small percentage of the total number of backflow incidents in the United States. Presently, neither the SDWA nor the NPDWR require states or PWSs to develop, implement, or maintain cross-connection control programs. The USEPA does not have a regulation mandating a cross-connection control program; however, it does indirectly recognize the importance of cross-connection controls. Cross-connection control is identified in the NPDWR (40 CFR 141.63(e)(3)) as part of a BAT for achieving compliance with the MCL for total coliforms (in accordance with the TCR) and the MCL for *E. coli* (in accordance with the RTCR). Although cross-connection control programs are not required under the SDWA or the NPDWR, Army Regulation 420-1 and local requirements (e.g., municipal ordinances) establish the authority for a cross-connection control plan at all Army installations through the adoption of modern plumbing codes such as the Uniform Plumbing Code™.

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APPENDIX B BEST AVAILABLE TECHNOLOGIES

Inorganics		**Organics Continued**	
Antimony	2,7	Ethylbenzene	4,12
Arsenic	2,5,6,7	Ethylene dibromide (EDB)	4,12
Asbestos	2,3,8	Glyphosate	10
Barium	5,6,7,9	Heptachlor epoxide	4
Beryllium	2,5,6,7	Heptachlor	4
Cadmium	2,5,6,7	Hexachlorobenzene	4
Chromium	2,5,6[2],7	Hexachlorocyclo-pentadiene	4,12
Copper	2,5,6,7,8	Lindane	4
Cyanide	5,7,10	Methoxychlor	4
Fluoride	1,7	Monochlorobenzene	4,12
Lead	2,5,6,7,8	o-Dichlorobenzene	4,12
Mercury	2[1],4,6[1],7[1]	Oxamyl (Vydate)	4
Nickel	5,6,7	para-Dichlorobenzene	4,12
Nitrate	5,7,9,13	PCBs	4
Nitrite	5,7	Pentachlorophenol	4,12
Selenium	1,2[3],5[4],6,7,9[3]	Picloram	4
Thallium	5,7	Simazine	4
		Styrene	4,12
Organics		1,1,1-Trichloroethane	4,12
Alachlor	4	1,1,2-Trichloroetbane	4,12
Atrazine	4	1,2,4-Trichlorobenzene	4,12
Benzene	4,12	2,3,7,8-TCDD (Dioxin)	4
Benzo(a)pyrene	4	2,4,5-TP (Silvex)	4
Carbofuran	4	Tetrachloroethylene	4,12
Carbon tetrachloride	4,12	Toluene	4
Chlordane	4	Toxaphene	4,12
cis-1,2-Dichloro-ethylene	4,12	trans-1,2-Dichloro-ethylene	4,12
Dalapon	4	Trichloroethylene	4,12
1,1-Dichloroethylene	4,12	Vinyl chloride	12
1,2-Dichloroethane	4,12	Xylenes (total)	4,12
1,2-Dichloropropane	4,12		
2,4-D	4	**Radiologicals**	
Di(2-ethythexyl)adipate	4,12	Gross alpha	7
Di(2-ethylhexyl)phthalate	4	Gross beta	5,7
Dibromochloro-propane (DBCP)	4,12	Radium 226	5,6,7
Dichloromethane	12	Radium 228	5,6,7
Dinoseb	4	Radon	12

Diquat	4	Uranium	5,7,6,2
Endotall	4		
Endrin	4		

1 Activated Alumina
2 Coagulation/Filtration
3 Direct/Diatomaceous Filtration
4 Granular Activated Carbon
5 Ion Exchance
6 Lime Softening
7 Reverse Osmosis
8 Corrosion Control
9 Electrodialysis
10 Oxidation (chlorine or ozone)
11 Ultraviolet Light
12 Packed Tower Aeration

[1] BAT for influent Hg Concentration < 10 ug/L. [2] BAT for Chromium III only. [3] BAT for Selenium IV only. [4] BAT for Selenium VI only.

APPENDIX C CHAPTER-SPECIFIC QUICK REFERENCES

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The Standardized Monitoring Framework: A Quick Reference Guide

Overview of the Framework

Title*	The Standardized Monitoring Framework (SMF), promulgated in the Phase II Rule on January 30, 1991 (56 FR 3526).
Purpose	To standardize, simplify, and consolidate monitoring requirements across contaminant groups. The SMF increases public health protection by simplifying monitoring plans and synchronizing monitoring schedules leading to increased compliance with monitoring requirements.
General Description	The SMF reduces the variability within monitoring requirements for chemical and radiological contaminants across system sizes and types.

*This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Additional Requirements

The SMF outlined on these pages summarizes existing systems' ongoing federal monitoring requirements only. Primacy agencies have the flexibility to issue waivers, with EPA approval, which take into account regional and state specific characteristics and concerns. To determine exact monitoring requirements, the SMF must be used in conjunction with any EPA approved waiver and additional requirements as determined by the primacy agency.

New water systems may have different and additional requirements as determined by the primacy agency.

SMF Benefits

Implementation of the SMF results in . . .

- Increased public health protection through monitoring consistency.
- A reduction in the complexity of water quality monitoring from a technical and managerial perspective for both primacy agencies and water systems.
- Equalizing of resource expenditures for monitoring and vulnerability assessments.
- Increased water system compliance with monitoring requirements.

Regulated Contaminants

Inorganic Contaminants (IOCs)	Fifteen (15) (Nitrate, Nitrite, total Nitrate/ Nitrite, and Asbestos are exceptions to SMF)
Synthetic Organic Contaminants (SOCs) & Volatile Organic Contaminants (VOCs)	Fifty-One (51)
Radionuclides	Four (4)

Utilities Covered

All PWSs	**Nitrate** **Nitrite**
CWSs	**IOCs** **SOCS** **VOCs** **Radionuclides**
NTNCWSs	**IOCs** **SOCS** **VOCs**

For additional information:

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at http://water.epa.gov/drink or contact your primacy agency's drinking water representatives.

See 40 CFR 141.23 regarding IOCs; 40 CFR 141.24 regarding VOCs and SOCs; and 40 CFR 141.26 regarding Radionuclides.

Office of Water (4606M) EPA 816-F-04-010 http://water.epa.gov/drink March 2004

STANDARDIZED MONITORING FRAMEWORK

		Second Cycle									Third Cycle								
		1st Period			2nd Period			3rd Period			1st Period			2nd Period			3rd Period		
Inorganic Contaminants (IOCs)[1]		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	Groundwater (Below Trigger Level)																		
	Waiver[2]					*									*				
	No Waiver		*			*			*			*			*			*	
	Surface Water (Below Trigger Level)																		
	Waiver[2]					*									*				
	No Waiver	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Groundwater and Surface Water (Above Trigger Level)[3]																		
	Reliably and Consistently ≤ MCL for Groundwater Systems		*			*			*			*			*			*	
	Reliably and Consistently ≤ MCL for Surface Water Systems	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	> MCL or Not Reliably and Consistently ≤ MCL	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
Synthetic Organic Contaminatns (SOCs)		02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
	Population >3,300 (Below Trigger Level)																		
	Waiver		X			X			X			X			X			X	
	< Detect and No Waiver		**			**			**			**			**			**	
	Population <3,300 (Below Trigger Level)																		
	Waiver		X			X			X			X			X			X	
	< Detect and No Waiver		*			*			*			*			*			*	
	Above Trigger Level																		
	Reliably and Consistently ≤ MCL[4]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	≥ Detect or Not Reliably and Consistently ≤ MCL	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
Volatile Organic Contaminants (VOCs)		02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
	Groundwater (Below Trigger Level)																		
	< Detect, Vulnerability Assessment, and Waiver[5]					*									*				
	No Waiver[6]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Surface Water (Below Trigger Level)																		
	< Detect, Vulnerability Assessment, and Waiver[7]		X			X			X			X			X			X	
	No Waiver[8]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Above Trigger Level																		
	Reliably and Consistently < MCL[4]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	≥ Detect or Not Reliably and Consistently ≤ MCL	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****

STANDARDIZED MONITORING FRAMEWORK

		Second Cycle									Third Cycle								
		1st Period			2nd Period			3rd Period			1st Period			2nd Period			3rd Period		
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Nitrate	**CWSs & NTNCWSs**																		
	≥ 1/2 MCL	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
	Groundwater Reliably and Consistently < MCL[9]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Surface Water with 4 Quarters of Results < 1/2 MCL[9]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	TNCWSs																		
	Standard Monitoring	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Nitrite		02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
	< 1/2 MCL	#									#								
	Reliably and Consistently < MCL[9]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	≥ 1/2 MCL or not Reliably and Consistently < MCL	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
Radio-nuclides		02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
	< Detection Level	!		****				*									*		
	≥ Detection Level but ≤ 1/2 MCL			****				*						*					
	> 1/2 MCL but ≤ MCL			****				*			*			*			*		
	> MCL			****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
Asbestos		02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
	Waiver		X			X			X			X			X			X	
	No Waiver, Reliably and Consistently ≤ MCL, or vulnerable to asbestos contamination[10]	*									*								
	> MCL	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****

Legend

* = 1 sample at each entry point to distribution system (EPTDS).

** = 2 quarterly samples at each EPTDS. Samples must be taken during 1 calendar year during each 3-year compliance period.

**** = 4 quarterly samples at each EPTDS within time frame designated by the primacy agency.

X = No sampling required unless required by the primacy agency.

= Systems must monitor at a frequency specified by the primacy agency.

! = When allowed by the primacy agency, data collected between June 2000 and December 6, 2003 may be grandfathered to satisfy the initial monitoring requirements due in 2004 for gross alpha, radium 226/228, and uranium.

[1]Until January 22, 2006 the maximum contaminant level (MCL) for arsenic is 50 µg/L; on January 23, 2006 the MCL for arsenic becomes 10 µg/L.

[2]Based on 3 rounds of monitoring at each EPTDS with all analytical results below the MCL. Waivers are not permitted under the current arsenic requirements, however systems are eligible for arsenic waivers after January 23, 2006.

[3]A system with a sampling point result above the MCL must collect quarterly samples, at that sampling point, until the system is determined by the primacy agency to be reliably and consistently below the MCL.

[4]Samples must be taken during the quarter which previously resulted in the highest analytical result. Systems can apply for a waiver after 3 consecutive annual sampling results are below the detection limit.

[5]Groundwater systems must update their vulnerability assessments during the time the waiver is effective. Primacy agencies must re-confirm that the system is non-vulnerable within 3 years of the initial determination or the system must return to annual sampling.

[6]If all monitoring results during initial quarterly monitoring are less than the detection limit, the system can take annual samples. If after a minimum of 3 years of annual sampling with all analytical results less than the detectection limit, the primacy agency can allow a system to take 1 sample during each compliance period. Systems are also eligible for a waiver.

[7]Primacy agencies must determine that a surface water system is non-vulnerable based on a vulnerability assessment during each compliance period or the system must return to annual sampling.

[8]If all monitoring results during initial quarterly monitoring are less than the detection limit, the system can take annual samples. Systems are also eligible for a waiver.

[9]Samples must be taken during the quarter which previously resulted in the highest analytical result.

[10]Systems are required to monitor for asbestos during the first 3-year compliance period of each 9-year compliance cycle. A system vulnerable to asbestos contamination due solely to corrosion of asbestos-cement pipe must take 1 sample at a tap served by that pipe. A system vulnerable to asbestos contamination at the source must sample at each EPTDS.

National Primary Drinking Water Regulations

Contaminant		MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
OC	Acrylamide	TT[4]	Nervous system or blood problems; increased risk of cancer	Added to water during sewage/ wastewater treatment	zero
OC	Alachlor	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	zero
R	Alpha/photon emitters	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation	zero
IOC	Antimony	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	0.006
IOC	Arsenic	0.010	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards; runoff from glass & electronics production wastes	0
IOC	Asbestos (fibers >10 micrometers)	7 million fibers per Liter (MFL)	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	7 MFL
OC	Atrazine	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	0.003
IOC	Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	2
OC	Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	zero
OC	Benzo(a)pyrene (PAHs)	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	zero
IOC	Beryllium	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	0.004
R	Beta photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation	zero
DBP	Bromate	0.010	Increased risk of cancer	Byproduct of drinking water disinfection	zero
IOC	Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	0.005
OC	Carbofuran	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	0.04
OC	Carbon tetrachloride	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	zero
D	Chloramines (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort; anemia	Water additive used to control microbes	MRDLG=4[1]
OC	Chlordane	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	zero
D	Chlorine (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort	Water additive used to control microbes	MRDLG=4[1]
D	Chlorine dioxide (as ClO_2)	MRDL=0.8[1]	Anemia; infants, young children, and fetuses of pregnant women: nervous system effects	Water additive used to control microbes	MRDLG=0.8[1]
DBP	Chlorite	1.0	Anemia; infants, young children, and fetuses of pregnant women: nervous system effects	Byproduct of drinking water disinfection	0.8
OC	Chlorobenzene	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	0.1
IOC	Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	0.1
IOC	Copper	TT[5]; Action Level = 1.3	Short-term exposure: Gastrointestinal distress. Long-term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits	1.3
M	*Cryptosporidium*	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero

LEGEND

D Disinfectant | DBP Disinfection Byproduct | IOC Inorganic Chemical | M Microorganism | OC Organic Chemical | R Radionuclides

Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
IOC Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories	0.2
OC 2,4-D	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	0.07
OC Dalapon	0.2	Minor kidney changes	Runoff from herbicide used on rights of way	0.2
OC 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	zero
OC o-Dichlorobenzene	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	0.6
OC p-Dichlorobenzene	0.075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories	0.075
OC 1,2-Dichloroethane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC 1,1-Dichloroethylene	0.007	Liver problems	Discharge from industrial chemical factories	0.007
OC cis-1,2-Dichloroethylene	0.07	Liver problems	Discharge from industrial chemical factories	0.07
OC trans-1,2-Dichloroethylene	0.1	Liver problems	Discharge from industrial chemical factories	0.1
OC Dichloromethane	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories	zero
OC 1,2-Dichloropropane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC Di(2-ethylhexyl) adipate	0.4	Weight loss, liver problems, or possible reproductive difficulties	Discharge from chemical factories	0.4
OC Di(2-ethylhexyl) phthalate	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	zero
OC Dinoseb	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	0.007
OC 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	zero
OC Diquat	0.02	Cataracts	Runoff from herbicide use	0.02
OC Endothall	0.1	Stomach and intestinal problems	Runoff from herbicide use	0.1
OC Endrin	0.002	Liver problems	Residue of banned insecticide	0.002
OC Epichlorohydrin	TT[4]	Increased cancer risk; stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals	zero
OC Ethylbenzene	0.7	Liver or kidney problems	Discharge from petroleum refineries	0.7
OC Ethylene dibromide	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	zero
M Fecal coliform and *E. coli*	MCL[6]	Fecal coliforms and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes may cause short term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, and people with severely compromised immune systems.	Human and animal fecal waste	zero[6]
IOC Fluoride	4.0	Bone disease (pain and tenderness of the bones); children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	4.0
M *Giardia lamblia*	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC Glyphosate	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	0.7
DBP Haloacetic acids (HAA5)	0.060	Increased risk of cancer	Byproduct of drinking water disinfection	n/a[9]
OC Heptachlor	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	zero
OC Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	zero
M Heterotrophic plate count (HPC)	TT[7]	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.	HPC measures a range of bacteria that are naturally present in the environment	n/a

LEGEND

D Disinfectant
IOC Inorganic Chemical
OC Organic Chemical
DBP Disinfection Byproduct
M Microorganism
R Radionuclides

Contaminant		MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
OC	Hexachlorobenzene	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	zero
OC	Hexachlorocyclopentadiene	0.05	Kidney or stomach problems	Discharge from chemical factories	0.05
IOC	Lead	TT5; Action Level=0.015	Infants and children: Delays in physical or 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	zero
M	*Legionella*	TT7	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems	zero
OC	Lindane	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens	0.0002
IOC	Mercury (inorganic)	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands	0.002
OC	Methoxychlor	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	0.04
IOC	Nitrate (measured as Nitrogen)	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL 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	10
IOC	Nitrite (measured as Nitrogen)	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL 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	1
OC	Oxamyl (Vydate)	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	0.2
OC	Pentachlorophenol	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood-preserving factories	zero
OC	Picloram	0.5	Liver problems	Herbicide runoff	0.5
OC	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	zero
R	Radium 226 and Radium 228 (combined)	5 pCi/L	Increased risk of cancer	Erosion of natural deposits	zero
IOC	Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines	0.05
OC	Simazine	0.004	Problems with blood	Herbicide runoff	0.004
OC	Styrene	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	0.1
OC	Tetrachloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	zero
IOC	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	0.0005
OC	Toluene	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	1
M	Total Coliforms	5.0 percent[8]	Coliforms are bacteria that indicate that other, potentially harmful bacteria may be present. See fecal coliforms and *E. coli*	Naturally present in the environment	zero
DBP	Total Trihalomethanes (TTHMs)	0.080	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	n/a[9]
OC	Toxaphene	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	zero
OC	2,4,5-TP (Silvex)	0.05	Liver problems	Residue of banned herbicide	0.05
OC	1,2,4-Trichlorobenzene	0.07	Changes in adrenal glands	Discharge from textile finishing factories	0.07
OC	1,1,1-Trichloroethane	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	0.2
OC	1,1,2-Trichloroethane	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	0.003
OC	Trichloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	zero

LEGEND

D Disinfectant
DBP Disinfection Byproduct
IOC Inorganic Chemical
M Microorganism
OC Organic Chemical
R Radionuclides

Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
M Turbidity	TT[7]	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 short term symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff	n/a
R Uranium	30µg/L	Increased risk of cancer, kidney toxicity	Erosion of natural deposits	zero
OC Vinyl chloride	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories	zero
M Viruses (enteric)	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	10

LEGEND

D Disinfectant
DBP Disinfection Byproduct
IOC Inorganic Chemical
M Microorganism
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NOTES

1 Definitions

- Maximum Contaminant Level Goal (MCLG)—The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
- Maximum Contaminant Level (MCL)—The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
- Maximum Residual Disinfectant Level Goal (MRDLG)—The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- Maximum Residual Disinfectant Level (MRDL)—The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- Treatment Technique (TT)—A required process intended to reduce the level of a contaminant in drinking water.

2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

3 Health effects are from long-term exposure unless specified as short-term exposure.

4 Each water system must certify annually, in writing, to the state (using third-party or manufacturers certification) that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05 percent dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01 percent dosed at 20 mg/L (or equivalent).

5 Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10 percent of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

6 A routine sample that is fecal coliform-positive or *E. coli*-positive triggers repeat samples--if any repeat sample is total coliform-positive, the system has an acute MCL violation. A routine sample that is total coliform-positive and fecal coliform-negative or *E. coli*-negative triggers repeat samples--if any repeat sample is fecal coliform-positive or *E. coli*-positive, the system has an acute MCL violation. See also Total Coliforms.

7 EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- *Cryptosporidium*: 99 percent removal for systems that filter. Unfiltered systems are required to include Cryptosporidium in their existing watershed control provisions.
- Giardia lamblia: 99.9 percent removal/inactivation
- Viruses: 99.99 percent removal/inactivation
- *Legionella*: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated according to the treatment techniques in the surface water treatment rule, *Legionella* will also be controlled.
- Turbidity: For systems that use conventional or direct filtration, at no time can turbidity (cloudiness of water) go higher than 1 nephelolometric turbidity unit (NTU), and samples for turbidity must be less than or equal to 0.3 NTU in at least 95 percent of the samples in any month. Systems that use filtration other than conventional or direct filtration must follow state limits, which must include turbidity at no time exceeding 5 NTU.
- HPC: No more than 500 bacterial colonies per milliliter
- Long Term 1 Enhanced Surface Water Treatment; Surface water systems or ground water systems under the direct influence of surface water serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- Long Term 2 Enhanced Surface Water Treatment; This rule applies to all surface water systems or ground water systems under the direct influence of surface water. The rule targets additional *Cryptosporidium* treatment requirements for higher risk systems and includes provisions to reduce risks from uncovered finished water storages facilities and to ensure that the systems maintain microbial protection as they take steps to reduce the formation of disinfection byproducts. (Monitoring start dates are staggered by system size. The largest systems (serving at least 100,000 people) will begin monitoring in October 2006 and the smallest systems (serving fewer than 10,000 people) will not begin monitoring until October 2008. After completing monitoring and determining their treatment bin, systems generally have three years to comply with any additional treatment requirements.)
- Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

8 No more than 5.0 percent samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli*. If two consecutive TC-positive samples, and one is also positive for *E. coli* or fecal coliforms, system has an acute MCL violation.

9 Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)
- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

National Secondary Drinking Water Regulation

National Secondary Drinking Water Regulations are non-enforceable guidelines regarding contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, some states may choose to adopt them as enforceable standards.

Contaminant	Secondary Maximum Contaminant Level
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

For More Information

EPA's Safe Drinking Water Web site:
http://www.epa.gov/safewater/

EPA's Safe Drinking Water Hotline:
(800) 426-4791

To order additional posters or other ground water and drinking water publications, please contact the National Service Center for Environmental Publications at :
(800) 490-9198, or
email: nscep@bps-lmit.com.

United States Environmental Protection Agency

EPA 816-F-09-004
May 2009

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Variances and Exemptions: A Quick Reference Guide

Overview of the Rule

*Title**	*Variances and Exemptions Rule, 63 FR 43834-43851, August 14, 1998*	
	General and Small System Variances	*Exemptions*
Purpose	Variances allow eligible systems to provide drinking water that does not comply with a National Primary Drinking Water Regulation (NPDWR) on the condition that the system installs a certain technology and the quality of the drinking water is still protective of public health.	Exemptions allow eligible systems additional time to build capacity in order to achieve and maintain regulatory compliance with newly promulgated NPDWRs, while continuing to provide acceptable levels of public health protection.
General	There are two types of variances: 1. General variances are intended for systems that are not able to comply with a NPDWR due to their source water quality. 2. Small system variances are intended for systems serving 3,300 persons or fewer that cannot afford to comply with a NPDWR (but may be allowed for systems serving up to 10,000 persons).	Exemptions do not release a water system from complying with NPDWRs; rather, they allow water systems additional time to comply with NPDWRs.
Compliance Date	*General variances* require compliance as expeditiously as practicable and in accordance with a compliance schedule determined by the State. *Small system variances* require compliance within 3 years (with a possible 2-year extension period).	Systems must achieve compliance as expeditiously as practicable and in accordance with the schedule determined by the State. In addition: • Initial exemptions cannot exceed 3 years. • Systems serving < 3,301 persons may be eligible for one or more additional 2-year extension periods (not to exceed 6 years).
Contaminants Excluded	• *General variances* may generally not be granted for the maximum contaminant level (MCL) for total coliforms or any of the treatment technique (TT) requirements of Subpart H of 40 CFR 141. Exemptions from the MCL for total coliforms may generally not be granted. • *Small system variances* may not be granted for NPDWRs promulgated prior to1986 or MCLs, indicators, and TTs for microbial contaminants.	• Exemptions from the MCL for total coliforms may generally not be granted.

*This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Utilities Covered

All public water systems	Exclusions: • Systems that have received a small system variance are not eligible for an exemption. • Small system variances may not be granted for NPDWRs that do not list a small system variance technology (SSVT). • Systems that have received an exemption are generally not eligible for a variance.

Definitions

State	For purposes of this document, “State” is used to refer to the primacy agency.
Best Available Technology (BAT)	The BAT, TT, or other means identified by EPA for use in complying with a NPDWR.
Small System Variance Technology (SSVT)	A treatment technology identified by EPA specifically for use by a small public water system that will achieve the maximum reduction or inactivation efficiency that is affordable considering the size of the system and the quality of its source water, while adequately protecting public health.
Small System Compliance Technology (SSCT)	A treatment technology that is affordable by small systems and allows systems to achieve compliance with the requirements of a NPDWR.

For additional information:

• Call the Safe Drinking Water Hotline at 1-800-426-4791.

• Visit the EPA Web site at http://water.epa.gov/drink.

• Contact your State’s drinking water representatives.

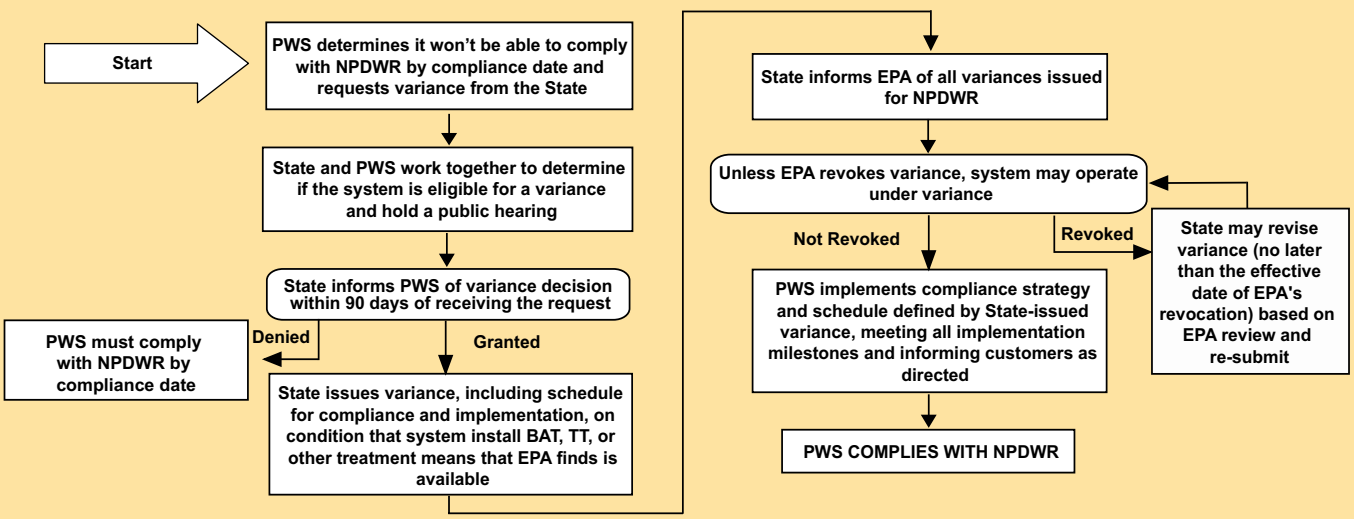
Rule-Related Activities and Responsibilities

	Systems	*States*
General and Small System Variances	• May apply for, if eligible and unable to meet the NPDWR. • Work with the State to hold a public hearing on the proposed variance. • Meet all compliance criteria, including schedule set by the State, once the variance is approved. • Must provide public notice within 1 year after the system begins operating under the variance.	• Review the system's application to determine whether the system meets all eligibility criteria. • Before issuing a variance, determine a schedule for compliance and implementation. • Work with the system to hold a public hearing on the variance and notify EPA of all variances.
Additional Activities for Small System Variances	• May apply for only if EPA has identified an SSVT for the rule. • Work with the State to provide notice of the proposed variance to all persons served by the system.	• Determine whether the system is financially and technically able to install and operate an EPA-approved SSVT. • Work with the system to provide notice of the proposed variance to all persons served by the system and EPA. • Review all small system variances every 5 years.
Exemptions	• May apply for, if eligible and unable to meet the NPDWR. • Work with the State to hold a public hearing on the proposed exemption. • Upon approval, must meet all compliance criteria and comply with the NPDWR within 3 years. (Note: systems serving <3,301 persons may be eligible for an extension). • Systems must provide public notice within 1 year after the system begins operating under the exemption.	• Review the system's application to determine whether the system meets all eligibility criteria. • Before issuing an exemption, determine a schedule for compliance and implementation. • Work with the system to hold a public hearing on the exemption and notify EPA of all exemptions.

General Variances

Eligibility Requirements	
No Alternative Water Source	Using raw water sources that are reasonably available, the system is unable to meet MCLs (SDWA §1415(a)(1)(A) and 40 CFR 142.40(a)(1)).
Does Not Pose an URTH	The State must determine that the granting of the variance will not pose an unreasonable risk to health (URTH) (SDWA §1415(a)(1)(A) and 40 CFR 142.40(a)(2)).
Compliance Requirements	
Compliance Date	Systems must comply with the NPDWR as soon as practicable and in accordance with a compliance schedule determined by the State (SDWA §1415(a)(1)(A) and 40 CFR 142.41(c)(4)).
Technology Improvements	The system must install and operate the BAT, TT, or other means found available by EPA as expeditiously as possible (SDWA §1415(a)(1)(A) and 40 CFR 142.42(c)).
Public Hearing	Before a variance may take effect, the State must provide notice and opportunity for a public hearing on the variance and schedule (SDWA §1415(a)(1)(A) and 40 CFR 142.44).
Public Notification	Systems must provide public notice within 1 year after the system begins operating under a variance and repeat the notice annually for the duration of the variance (40 CFR 141.204(b)(1)).

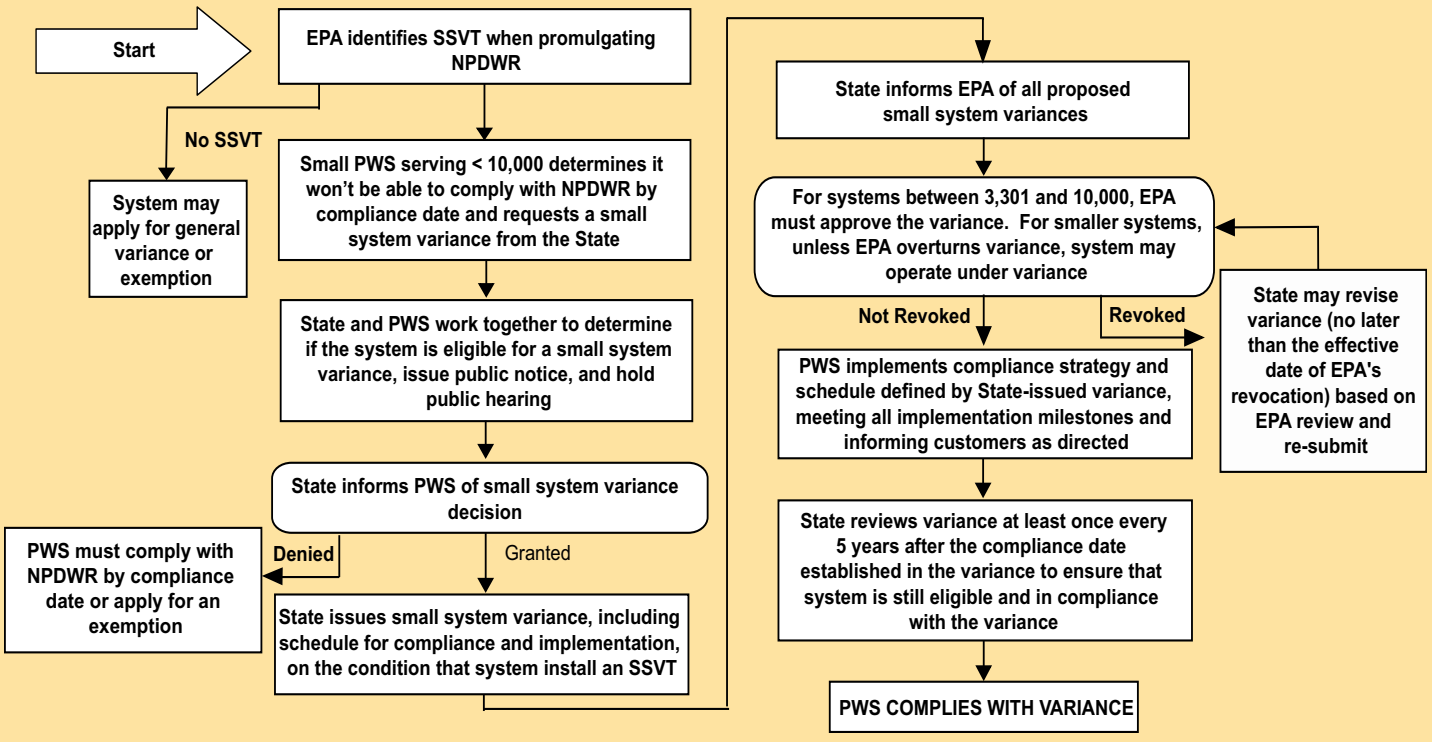
Example Application Process: General Variances



Small System Variances

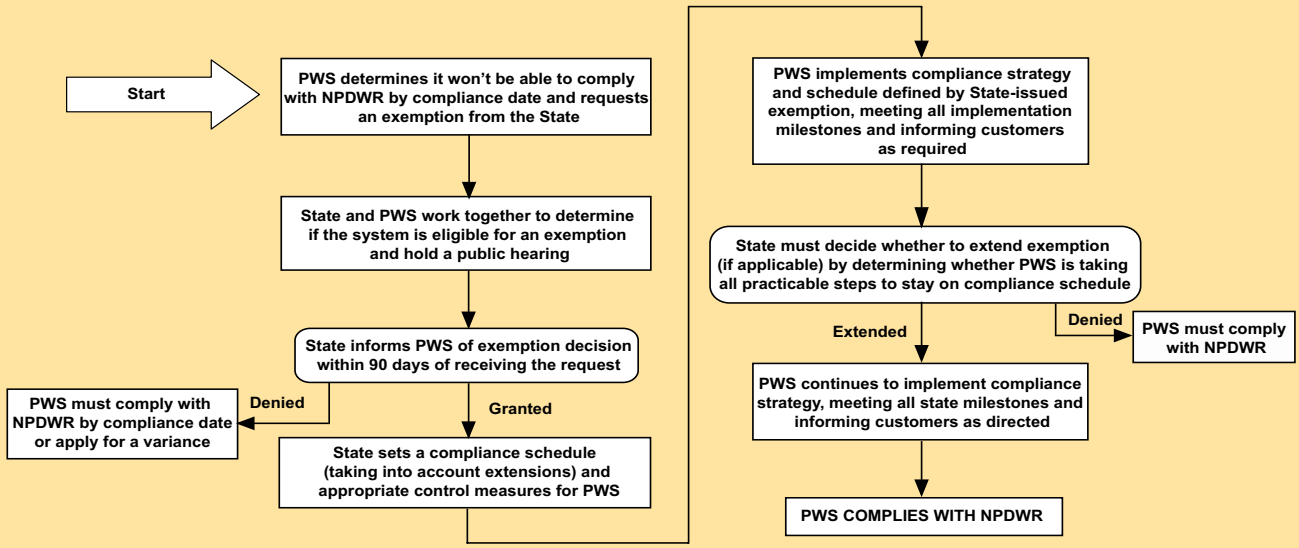
Eligibility Requirements	
System Size	Generally available for systems serving < 3,301 persons and, with the approval of EPA, systems serving >3,300 persons but <10,000 persons (SDWA §1415(e)(1)(A)&(B) and 40 CFR 142.303(a)&(b)).
SSVT	Systems must install, operate, and maintain in accordance with guidance or regulations issued by the EPA Administrator, a TT or other means that EPA has identified as a variance technology that is applicable to the size and source water quality conditions of the system (SDWA §1415(e)(2)(A)&(B) and 40 CFR 142.307(b)).
Affordability	In accordance with the affordability criteria established by the State, the system cannot afford to comply with the NPDWR for which a small system variance is sought, including compliance through (SDWA §1415(e)(3) and 40 CFR 142.306(b)(2)): • Treatment • Alternate source of water supply • Restructuring or consolidation changes • Financial assistance
Ensure Adequate Protection of Human Health	The terms of the small system variance must ensure adequate protection of human health given source water quality, removal efficiencies, and the expected useful life of the SSVT (SDWA §1415(e)(3)(B) and 40 CFR 142.306(b)(5)).
Compliance Requirements	
Compliance Date	Systems must comply with the terms of the small system variance within 3 years, unless the State allows up to an additional 2 years to make capital improvements. The State must review each variance at least once every 5 years to determine whether the system remains eligible (SDWA §1415(e)(4)&(5) and 40 CFR 142.307(c)(4)&(d)).
Technology Improvements	Systems must install an SSVT no later than 3 years (with a possible 2-year extension period) after the issuance of the variance and must be financially and technically capable of installing, operating, and maintaining the SSVT (40 CFR 142.306(b)(3)&(4)).
Public Hearing	Before a small system variance may take effect, the State must work with the system to provide public notice to everyone served by the system. Public notice must be issued 15 days before the proposed effective date and 30 days prior to a public meeting (40 CFR 142.308(a)).
Public Notification	Systems must provide public notice within 1 year after the system begins operating under a variance and repeat the notice annually for the duration of the small system variance (40 CFR 141.204(b)(1)).

Example Application Process: Small System Variances



Exemptions	
Eligibility Requirements	
No Alternative Water Source	The system is unable to comply with the NPDWR due to compelling factors (which may include economic factors) or to implement measures to develop an alternative source of water supply to achieve compliance (SDWA §1416(a)(1) and 40 CFR 142.50(a)(1)).
Does Not Pose An URTH	The State must make a determination that the exemption will not pose an URTH and may require interim compliance measures (SDWA §1416(a)(3) and 40 CFR 142.50(a)(3)).
System Operation	Systems must have begun operation prior to the effective date of the NPDWR, however, this requirement may be waived if the system does not have an alternative source of water supply (SDWA §1416(a)(2) and 40 CFR 142.50(a)(2)).
Management or Restructuring Changes	The system cannot reasonably make management or restructuring changes that would result in compliance or improved quality of the drinking water (SDWA §1416(a)(4) and 40 CFR 142.50(a)(4)).
Unable to Achieve Compliance	No exemption shall be granted unless (SDWA §1416(b)(2)(B) and 40 CFR 142.50(b)(1),(2)&(3)): • Capital improvements are unable to be completed before the NPDWR effective date -or- • A system that needs financial assistance has entered into an agreement to obtain that assistance -or- • The system has entered into an enforceable agreement to become part of a regional public water system; and the system is taking all appropriate steps to meet the standard.
Compliance Requirements	
Duration	Systems must achieve compliance with the MCL as expeditiously as practicable and in accordance with a compliance schedule determined by the State, but no longer than 3 years from the date of issuance (SDWA §1416(b)(2)(A) and 40 CFR 142.56). Systems serving <3,301 persons may be eligible for an additional one or more 2-year periods, but the total duration of the exemption extensions may not exceed 6 years (SDWA §1416(b)(2)(C) and 40 CFR 142.56).
Public Hearing	Before an exemption can take effect, the State must provide notice and opportunity for a public hearing on the exemption schedule (SDWA §1416(b)(1)(B) and 40 CFR 142.54(a)).
Public Notification	Systems must provide public notice within 1 year after the system begins operating under an exemption and must repeat the notice annually for the duration of the exemption (40 CFR 141.204(b)(1)).

Example Application Process: Exemptions



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Radionuclides Rule: A Quick Reference Guide

Overview of the Rule

Title*	Radionuclides Rule 66 FR 76708 December 7, 2000 Vol. 65, No. 236
Purpose	Reducing the exposure to radionuclides in drinking water will reduce the risk of cancer. This rule will also improve public health protection by reducing exposure to all radionuclides.
General Description	The rule retains the existing MCLs for combined radium-226 and radium-228, gross alpha particle radioactivity, and beta particle and photon activity. The rule regulates uranium for the first time.
Utilities Covered	Community water systems, all size categories.

*This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Public Health Benefits

Implementation of the Radionuclides Rule will result in . . .	Reduced uranium exposure for 620,000 persons, protection from toxic kidney effects of uranium, and a reduced risk of cancer.
Estimated impacts of the Radionuclides Rule include . . .	Annual compliance costs of $81 million. Only 795 systems will have to install treatment.

Regulated Contaminants

Regulated Radionuclide	MCL	MCLG
Beta/photon emitters**	4mrem/yr	0
Gross alpha particle	15 pCi/L	0
Combined radium-226/228	5 pCi/L	0
Uranium	30µg/L	0

**A total of 168 individual beta particle and photon emitters may be used to calculate compliance with the MCL.

Critical Deadlines & Requirements

For Drinking Water Systems	
June 2000 - December 8, 2003	When allowed by the State, data collected between these dates may be eligible for use as grandfathered data (excluding beta particle and photon emitters).
December 8, 2003	Systems begin initial monitoring under State-specified monitoring plan unless the State permits use of grandfathered data.
December 31, 2007	All systems must complete initial monitoring.
For States	
December 2000 - December 2003	States work with systems to establish monitoring schedules.
December 8, 2000	States should begin to update vulnerability assessments for beta photon and particle emitters and notify systems of monitoring requirements.
Spring 2001	EPA meets and works with States to explain new rules and requirements and to initiate adoption and implementation activities.
December 8, 2002	State submits primacy revision application to EPA. (EPA approves within 90 days.)

Monitoring Requirements

Gross Alpha, Combined Radium-226/228, and Uranium (1)	Beta Particle and Photon Radioactivity (1)
Initial Monitoring	
Four consecutive quarters of monitoring.	No monitoring required for most CWSs. Vulnerable CWSs (2) must sample for: • Gross beta: quarterly samples. • Tritium and Strontium-90: annual samples.
Reduced Monitoring	
If the average of the initial monitoring results for each contaminant is below the detection limit: One sample every 9 years. If the average of the initial monitoring results for each contaminant is greater than or equal to the detection limit, but less than or equal to one-half the MCL: One sample every 6 years. If the average of the initial monitoring results for each contaminant is greater than one-half the MCL, but less than or equal to the MCL: One sample every 3 years.	If the running annual average of the gross beta particle activity minus the naturally occurring potassium-40 activity is less than or equal to 50 pCi/L: One sample every 3 years.
Increased Monitoring	
A system with an entry point result above the MCL must return to quarterly sampling until 4 consecutive quarterly samples are below the MCL.	If gross beta particle activity minus the naturally occurring potassium-40 activity exceeds 50 pCi/L, the system must: • Speciate as required by the State. • Sample at the initial monitoring frequency.

(1) All samples must be collected at each entry point to the distribution system.
(2) The rule also contains requirements for CWSs using waters contaminated by effluents from nuclear facilities.

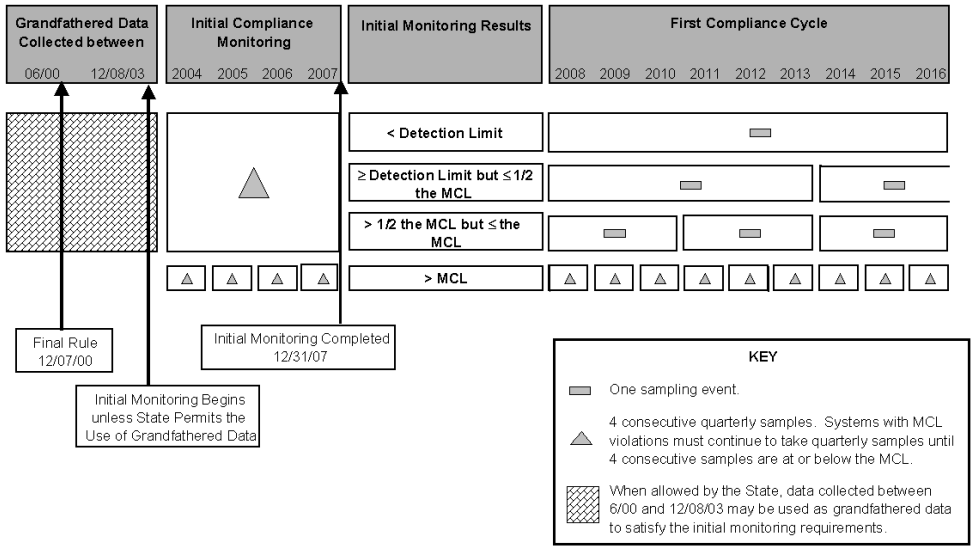
Grandfathering of Data

When allowed by the State, data collected between June, 2000 and December 8, 2003 may be used to satisfy the inital monitoring requirements if samples have been collected from:

- Each entry point to the distribution system (EPTDS).
- The distribution system, provided the system has a single EPTDS.
- The distribution system, provided the State makes a written justification explaining why the sample is representative of all EPTDS.

Applicability of the Standardized Monitoring Framework to Radionuclides

(Excluding the Beta Particle and Photon Emitters)



For additional information on the Radionuclides Rule

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA Web site at http://water.epa.gov/drink.

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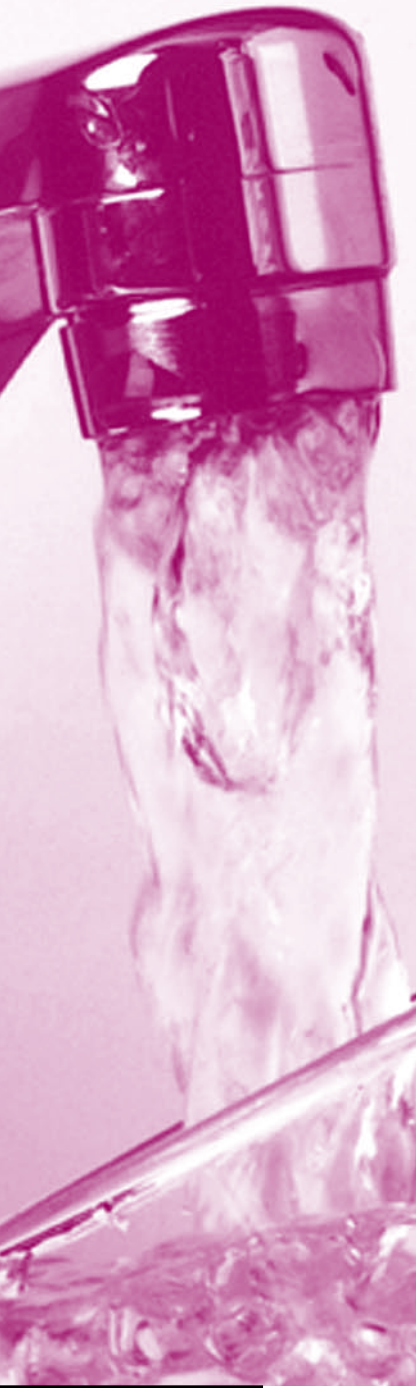
Total Coliform Rule: A Quick Reference Guide



Overview of the Rule

Title[1]	**Total Coliform Rule (TCR) 54 FR 27544-27568, June 29, 1989, Vol. 54, No. 124**[2]
Purpose	**Improve public health protection by reducing fecal pathogens to minimal levels through control of total coliform bacteria, including fecal coliforms and *Escherichia coli* (*E. coli*).**
General Description	**Establishes a maximum contaminant level (MCL) based on the presence or absence of total coliforms, modifies monitoring requirements including testing for fecal coliforms or *E. coli*, requires use of a sample siting plan, and also requires sanitary surveys for systems collecting fewer than five samples per month.**
Utilities Covered	**The TCR applies to all public water systems.**

Public Health Benefits

Implementation of the TCR has resulted in . . .	► **Reduction in risk of illness from disease causing organisms associated with sewage or animal wastes. Disease symptoms may include diarrhea, cramps, nausea, and possibly jaundice, and associated headaches and fatigue.**

What are the Major Provisions?

ROUTINE Sampling Requirements

- **Total coliform samples must be collected at sites which are representative of water quality throughout the distribution system according to a written sample siting plan subject to state review and revision**
- **Samples must be collected at regular time intervals throughout the month except groundwater systems serving 4,900 persons or fewer may collect them on the same day.**
- **Monthly sampling requirements are based on population served (see table on next page for the minimum sampling frequency).**
- **A reduced monitoring frequency may be available for systems serving 1,000 persons or fewer and using only ground water if a sanitary survey within the past 5 years shows the system is free of sanitary defects (the frequency may be no less than 1 sample/quarter for community and 1 sample/year for non-community systems).**
- **Each total coliform-positive routine sample must be tested for the presence of fecal coliforms or *E. coli.***
- **If any routine sample is total coliform-positive, repeat samples are required.**

REPEAT Sampling Requirements

- **Within 24 hours of learning of a total coliform-positive ROUTINE sample result, at least 3 REPEAT samples must be collected and analyzed for total coliforms:**
  - **One REPEAT sample must be collected from the same tap as the original sample.**
  - **One REPEAT sample must be collected within five service connections upstream.**
  - **One REPEAT sample must be collected within five service connections downstream.**
  - **Systems that collect 1 ROUTINE sample per month or fewer must collect a 4th REPEAT sample.**
- **If any REPEAT sample is total coliform-positive:**
  - **The system must analyze that total coliform-positive culture for fecal coliforms or *E.coli.***
  - **The system must collect another set of REPEAT samples, as before, unless the MCL has been violated and the system has notified the state.**

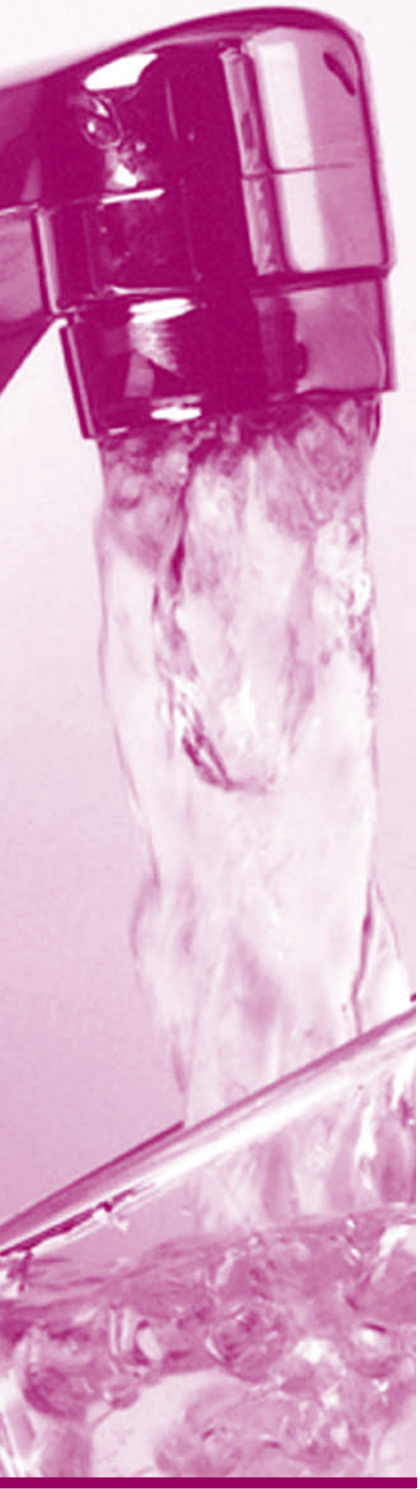
Additional ROUTINE Sample Requirements

- **A positive ROUTINE or REPEAT total coliform result requires a minimum of five ROUTINE samples be collected the following month the system provides water to the public unless waived by the state.**

[1] This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

[2] The June 1989 Rule was revised as follows: Corrections and Technical Amendments, 6/19/90 and Partial Stay of Certain Provisions (Variance Criteria) 56 FR1556-1557, Vol 56, No 10.

Note: The TCR is currently undergoing the 6 year review process and may be subject to change.



Public Water System ROUTINE Monitoring Frequencies

Population	Minimum Samples/ Month	Population	Minimum Samples/ Month	Population	Minimum Samples/ Month
25-1,000*	1	21,501-25,000	25	450,001-600,000	210
1,001-2,500	2	25,001-33,000	30	600,001-780,000	240
2,501-3,300	3	33,001-41,000	40	780,001-970,000	270
3,301-4,100	4	41,001-50,000	50	970,001-1,230,000	300
4,101-4,900	5	50,001-59,000	60	1,230,001-1,520,000	330
4,901-5,800	6	59,001-70,000	70	1,520,001-1,850,000	360
5,801-6,700	7	70,001-83,000	80	1,850,001-2,270,000	390
6,701-7,600	8	83,001-96,000	90	2,270,001-3,020,000	420
7,601-8,500	9	96,001-130,000	100	3,020,001-3,960,000	450
8,501-12,900	10	130,001-220,000	120	≥ 3,960,001	480
12,901-17,200	15	220,001-320,000	150		
17,201-21,500	20	320,001-450,000	180		

*Includes PWSs which have at least 15 service connections, but serve <25 people.

What are the Other Provisions?

Systems collecting fewer than 5 ROUTINE samples per month . . .	Must have a sanitary survey every 5 years (or every 10 years if it is a non-community water system using protected and disinfected ground water).**
Systems using surface water or ground water under the direct influence of surface water (GWUDI) and meeting filtration avoidance criteria . . .	Must collect and have analyzed one coliform sample each day the turbidity of the source water exceeds 1 NTU. This sample must be collected from a tap near the first service connection.

** As per the IESWTR, states must conduct sanitary surveys for community surface water and GWUDI systems in this category every 3 years (unless reduced by the state based on outstanding performance).

How is Compliance Determined?

- Compliance is based on the presence or absence of total coliforms.
- Compliance is determined each calendar month the system serves water to the public (or each calendar month that sampling occurs for systems on reduced monitoring).
- The results of ROUTINE and REPEAT samples are used to calculate compliance.

A Monthly MCL Violation is Triggered if:

A system collecting fewer than 40 samples per month . . .	Has greater than 1 ROUTINE/REPEAT sample per month which is total coliform-positive.
A system collecting at least 40 samples per month . . .	Has greater than 5.0 percent of the ROUTINE/REPEAT samples in a month total coliform-positive.

An Acute MCL Violation is Triggered if:

Any public water system . . .	Has any fecal coliform- or *E. coli*-positive REPEAT sample or has a fecal coliform- or *E. coli*-positive ROUTINE sample followed by a total coliform-positive REPEAT sample.

What are the Public Notification and Reporting Requirements?

For a Monthly MCL Violation	► The violation must be reported to the state no later than the end of the next business day after the system learns of the violation. ► The public must be notified within 30 days after the system learns of the violation.
For an Acute MCL Violation	► The violation must be reported to the state no later than the end of the next business day after the system learns of the violation. ► The public must be notified within 24 hours after the system learns of the violation.
Systems with ROUTINE or REPEAT samples that are fecal coliform- or *E. coli*-positive . . .	Must notify the state by the end of the day they are notified of the result or by the end of the next business day if the state office is already closed.

For additional information on the TCR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at http://water.epa.gov/drink; or contact your state drinking water representative.

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Revised Total Coliform Rule: A Quick Reference Guide

Overview of the Rule

Title*	Revised Total Coliform Rule (RTCR) 78 FR 10269, February 13, 2013, Vol. 78, No. 30
Purpose	Increase public health protection through the reduction of potential pathways of entry for fecal contamination into distribution systems.
General Description	The RTCR establishes a maximum contaminant level (MCL) for *E. coli* and uses *E. coli* and total coliforms to initiate a "find and fix" approach to address fecal contamination that could enter into the distribution system. It requires public water systems (PWSs) to perform assessments to identify sanitary defects and subsequently take action to correct them.
Utilities Covered	The RTCR applies to all PWSs.

***** This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Public Health Benefits

Implementation of the RTCR will result in:

- A decrease in the pathways by which fecal contamination can enter the drinking water distribution system.
- Reduction in fecal contamination *should* reduce the potential risk from all waterborne pathogens including bacteria, viruses, parasitic protozoa, and their associated illnesses.

Critical Deadlines and Requirements

For Public Water Systems

Before April 1, 2016	► PWSs must develop a written sample siting plan that identifies the system's sample collection schedule and all sample sites, including sites for routine and repeat monitoring. ► PWSs monitoring quarterly or annually must also identify additional routine monitoring sites in their sample siting plans. ► Sample siting plans are subject to state review and revision.
Beginning April 1, 2016	PWSs must comply with the RTCR requirements unless the state selects an earlier implementation date.

For State Drinking Water Agencies

By February 13, 2015	State submits final primacy program revision package to the EPA Region, including: ► Adopted State Regulations. ► Regulation Crosswalk. ► 40 CFR 142.10 Primacy Update Checklist. ► 40 CFR 142.14 and 142.15 Reporting and Recordkeeping. ► 40 CFR 142.16 Special Primacy Requirements. ► Attorney General's Enforceability Certification. NOTE: EPA regulations allow states until February 13, 2015, for this submittal. An extension of up to 2 years may be requested by the state.
Before February 13, 2015	State must submit a primacy program revision extension request if it does not plan to submit the final primacy program revision package by February 13, 2015. The state extension request is submitted to the EPA Region including all of the information required in 40 CFR 142.12(b): ► A schedule (not to exceed 2 years) for the submission of the final primacy program revision package. ► Justification that meets the federal requirements for an extension request. ► Confirmation that the state is implementing the RTCR within its scope of its current authorities and capabilities. ► An approved workload agreement with the EPA Region.
No later than February 13, 2017	For states with an approved extension, submit complete and final program revision package by the agreed upon extension date.

What are the Major Provisions?

Routine Sampling Requirements

- Total coliform samples must be collected by PWSs at sites which are representative of water quality throughout the distribution system according to a written sample siting plan subject to state review and revision.
- For PWSs collecting more than one sample per month, collect total coliform samples at regular intervals throughout the month, except that ground water systems serving 4,900 or fewer people may collect all required samples on a single day if the samples are taken from different sites.

Routine Sampling Requirements (cont.)

- Each total coliform-positive (TC+) routine sample must be tested for the presence of *E. coli*.
- If any TC+ sample is also *E. coli*-positive (EC+), then the EC+ sample result must be reported to the state by the end of the day that the PWS is notified.

- If any routine sample is TC+, repeat samples are required.
  - PWSs on quarterly or annual monitoring must take a minimum of three additional routine samples (known as additional routine monitoring) the month following a TC+ routine or repeat sample.

- Reduced monitoring may be available for PWSs using only ground water and serving 1,000 or fewer persons that meet certain additional PWS criteria.

Repeat Sampling Requirements

Within 24 hours of learning of a TC+ routine sample result, at least 3 repeat samples must be collected and analyzed for total coliform:	► One repeat sample must be collected from the same tap as the original sample. ► One repeat sample must be collected from within five service connections upstream. ► One repeat sample must be collected from within five service connections downstream.
	► The PWS may propose alternative repeat monitoring locations that are expected to better represent pathways of contamination into the distribution system.
If one or more repeat sample is TC+:	► The TC+ sample must be analyzed for the presence of *E. coli.* ► If any repeat TC+ sample is also EC+, then the EC+ sample result must be reported to the state by the end of the day that the PWS is notified. ► The PWS must collect another set of repeat samples, unless an assessment has been triggered and the PWS has notified the state.

Assessments and Corrective Action

The RTCR requires PWSs that have an indication of coliform contamination (e.g., as a result of TC+ samples, *E. coli* MCL violations, performance failure) to assess the problem and take corrective action. There are two levels of assessments (i.e., Level 1 and Level 2) based on the severity or frequency of the problem.

Purpose of Level 1 and Level 2 Assessments	To find sanitary defects at the PWS including: ► Sanitary defects that could provide a pathway of entry for microbial contamination, or ► Sanitary defects that indicate failure (existing or potential) of protective barriers against microbial contamination. *Guidance on how to conduct Level 1 and Level 2 Assessments and how to correct sanitary defects found during the Assessments can be found at:* http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/regulation_revisions.cfm.
Deadline for Completing Corrective Actions	When sanitary defects are identified during a Level 1 or Level 2 Assessment, they should be corrected as soon as possible to protect public health. The PWS must complete corrective actions by one of the following timeframes: ► No later than the time the assessment form is submitted to the state, which must be within 30 days of triggering the assessment, or ► Within state-approved timeframe which was proposed in the assessment form.

Level 1 Assessments

Conducting Level 1 Assessments	► Performed by the PWS owner or operator each time a Level 1 Assessment is triggered.
	► Upon trigger of a Level 1 Assessment, the Level 1 Assessment form must be submitted within 30 days to the state.
Level 1 Assessment Triggers	Level 1 Assessment is triggered if any one of the following occurs: ► A PWS collecting fewer than 40 samples per month has 2 or more TC+ routine/repeat samples in the same month. ► A PWS collecting at least 40 samples per month has greater than 5.0 percent of the routine/repeat samples in the same month that are TC+. ► A PWS fails to take every required repeat sample after any single TC+ sample.

Level 2 Assessments

Conducting Level 2 Assessments	► Performed by the state or state-approved entity each time a Level 2 Assessment is triggered. ► The PWS is responsible for ensuring that the Level 2 Assessment is conducted regardless of the entity conducting the Level 2 Assessment.
	► Upon trigger of a Level 2 Assessment, the Level 2 Assessment form must be submitted within 30 days to the state.
Level 2 Assessment Triggers	Level 2 Assessment is triggered if any one of the following occurs: ► A PWS incurs an *E. coli* MCL violation. ► A PWS has a second Level 1 Assessment within a rolling 12-month period. ► A PWS on state-approved annual monitoring has a Level 1 Assessment trigger in 2 consecutive years.

For additional information on the RTCR:

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA website at http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/regulation_revisions.cfm; or contact your state drinking water representative.

Seasonal System Provisions

The RTCR defines seasonal systems and specifies additional requirements for these types of PWSs:

- A seasonal system is defined as a non-community water system that is not operated as a PWS on a year-round basis and starts up and shuts down at the beginning and end of each operating season.

Start-up Procedures for Seasonal Systems	At the beginning of each operating period, before serving water to the public, seasonal water systems must: ► Conduct state-approved start-up procedures. ► Certify completion of state-approved start-up procedures. ► An exemption from conducting state-approved start-up procedures may be available for seasonal systems that maintain pressure throughout the distribution system during non-operating periods.
	Examples of state-approved start-up procedures, which need to be completed prior to serving water to the public, may include one or more of the following: ► Disinfection. ► Distribution system flushing. ► Sampling for total coliform and *E. coli*. ► Site visit by state. ► Verification that any current or historical sanitary defects have been corrected.
Routine Monitoring for Seasonal Systems	► The baseline monitoring frequency for seasonal systems is monthly. ► A reduced monitoring frequency may be available for seasonal systems that use ground water only and serve fewer than 1,000 persons.

Other Provisions for the State Drinking Water Agency

Special Monitoring Evaluation	The state must perform a special monitoring evaluation at all ground water systems serving 1,000 or fewer persons during each sanitary survey to review the status of the PWS and to determine whether the sample sites and monitoring schedule need to be modified.

Major Violations

***E. coli* MCL Violation**

A PWS will receive an *E. coli* MCL violation when there is any combination of an EC+ sample result with a routine/repeat TC+ or EC+ sample result:

***E. coli* MCL Violation Occurs with the Following Sample Result Combination**	
Routine	**Repeat**
EC+	**TC+**
EC+	**Any missing sample**
EC+	**EC+**
TC+	**EC+**
TC+	**TC+ (but no *E. coli* analysis)**

Treatment Technique Violation

A PWS will receive a Treatment Technique violation when any of the following occur:

- Failure to conduct a Level 1 or Level 2 Assessment within 30 days of a trigger.
- Failure to correct all sanitary defects from a Level 1 or Level 2 Assessment within 30 days of a trigger or in accordance with the state-approved timeframe.
- Failure of a seasonal system to complete state-approved start-up procedures prior to serving water to the public.

Key Points for Public Water Systems to Remember

Find and correct sanitary defects as soon as you become aware of them.

- This can help reduce *E. coli* MCL violations, which trigger a Level 2 Assessment.
- This can help reduce TC+ sample results, which may trigger a Level 1 Assessment.

Make sure to collect all routine and repeat samples as required.

- Timely and correct monitoring can help reduce triggering a Level 1 or Level 2 Assessment because:
  - Failure to conduct repeat monitoring triggers a Level 1 Assessment.
  - A Level 1 Assessment triggered twice within a certain timeframe triggers a Level 2 Assessment.

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Comprehensive Surface Water Treatment Rules Quick Reference Guide: Unfiltered Systems

Overview of the Rules

Title*	**Surface Water Treatment Rule** (SWTR) - 40 CFR 141.70-141.75 **Interim Enhanced Surface Water Treatment Rule** (IESWTR) - 40 CFR 141.170-141.175 **Long Term 1 Enhanced Surface Water Treatment Rule** (LT1ESWTR) - 40 CFR 141.500-141.571 **Long Term 2 Enhanced Surface Water Treatment Rule** (LT2ESWTR) - 40 CFR 141.700-141.722
Purpose	Improve public health protection through the control of microbial contaminants, particularly viruses, *Giardia lambia*, and *Cryptosporidium*.
General Description	The Surface Water Treatment Rules: ▶ Applies to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as "Subpart H systems." ▶ Requires all Subpart H systems to disinfect. ▶ Requires Subpart H systems to filter unless specific filter avoidance criteria are met. ▶ Requires unfiltered systems to perform surface water monitoring and meet site specific conditions for controls of microbials.

*This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Overview of Requirements

The purpose of this table is to show how the requirements for the IESWTR, LT1ESWTR and LT2ESWTR build on the existing requirements established in the original SWTR.

APPLICABILITY: PWSs that use surface water or GWUDI (Subpart H systems) that do not provide filtration.		**Final Rule Dates**			
		SWTR 1989	**IESWTR 1998**	**LT1ESWTR 2002**	**LT2ESWTR 2006**
Population Served	≥ 10,000	✔	✔		✔
	< 10,000	✔	For sanitary survey provisions only	✔	✔
Regulated Pathogens	99.99% (4-log) removal/inactivation of viruses	✔	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR
	99.9% (3-log) removal/inactivation of *Giardia lamblia*	✔	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR
	99% (2-log) removal of *Cryptosporidium* (through watershed control)		✔	✔	Regulated under IESWTR and LT1ESWTR
	99% (2-log) inactivation of *Cryptosporidium* for systems reporting ≤ 0.01 oocysts/L; 99.9% (3-log) inactivation of *Cryptosporidium* for systems reporting > 0.01 oocysts/L.				✔
Treatment Requirements	Entrance to distribution system (≥ 0.2 mg/L)	✔	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR
	Detectable in the distribution system	✔	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR
	Must use a minimum of two disinfectants to meet the *Cryptosporidium, Giardia lamblia*, and virus inactivation requirements.				✔
Source Water Monitoring Requirements	Monitoring of *Cryptosporidium* to calculate arithmetic mean of sample concentrations and determine additional treatment requirements				✔
Unfiltered System Requirements	Avoidance Criteria	✔	✔	✔	Regulated under SWTR, IESWTR and LT1ESWTR
Disinfection Profiling and Benchmarking	Systems must profile inactivation levels and generate benchmark, if required		✔	✔	✔
Sanitary Surveys (state requirement)	CWS**: Every 3 years NCWS**: Every 5 years		✔	Regulated under IESWTR	Regulated under IESWTR
Finished Reservoirs/ Water Storage Facilities	All new facilities constructed must be covered		✔	✔	Regulated under IESWTR and LT1ESWTR
	Uncovered finished water facilities must be covered or discharge treated				✔
Operated by Qualified Personnel as Specified by State		✔	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR

**Community water system (CWS), Noncommunity water system (NCWS)

Filtration Avoidance Criteria

Since December 30, 1991, systems must meet source water quality and site specific conditions to remain unfiltered. If any of the following criteria to avoid filtration are not met, systems must install filtration treatment within 18 months of the failure. The following table outlines the avoidance criteria established by the SWTR and later enhanced by the IESWTR and LT1ESWTR.

Filtration Avoidance Criteria			
		Requirement	**Frequency**
Source Water Quality Conditions	**Microbial Quality**	Monitor fecal coliform or total coliform density in representative samples of source water immediately prior to the first point of disinfection application: ► **Fecal coliform density** concentrations must be ≤ 20/100 mL; OR ► **Total coliform density** concentrations must be ≤ 100/100 mL. Sample results must satisfy the criteria listed above in at least 90% of the measurements from previous 6 months.	► 1 to 5 samples per week depending on system size, AND ► Every day the turbitidy of the source water exceeds 1 NTU
	Turbidity	Prior to the first point of disinfection application, turbidity levels cannot exceed 5 NTU.	Performed on representative grab samples of source water every 4 hours (or more frequently)
Site Specific Conditions	**Systems must:**	Calculate total inactivation ratio daily and provide 3-log *Giardia lamblia* and 4-log virus inactivation daily (except any one day each month) in 11 of 12 previous months (on an ongoing basis).	Take daily measurements before or at the first customer at each residual disinfectant concentration sampling point: ► Temperature ► pH (if chlorine used) ► Disinfectant contact time (at peak hourly flow) ► Residual disinfectant concentration measurements (at peak hourly flow)
	System must comply with:	► MCL for total coliforms in 11 of 12 previous months (as per Total Coliform Rule) ► Stage 1 Disinfectants and Disinfection Byproducts Rule requirements.	
	Systems must have:	► Adequate entry point residual disinfectant concentration (see disinfection requirements). ► Detectable residual disinfectant concentration in the distribution system (see disinfection requirements). ► Redundant disinfection components or automatic shut-off whenever residual disinfectant concentration < 0.2 mg/L. ► A watershed control program minimizing potential for contamination by *Giardia lamblia* cysts and viruses in source water; IESWTR and LT1ESWTR update this requirement by adding *Cryptosporidium* control measures. ► An annual on-site inspection by state or approved third party with reported findings. ► Not been identified as a source of a waterborne disease outbreak.	

Disinfection

Disinfection must be sufficient to ensure that the total treatment process of the system achieves at least:

► 99.9% (3-log) inactivation and/or removal of *Giardia lamblia*.

► 99.99% (4-log) inactivation and/or removal of viruses.

Subpart H systems using chlorine dioxide, ozone, or ultraviolet (UV) disinfection must achieve additional *Cryptosporidium* log credit by using the Microbial Toolbox option under the LT2ESWTR. Systems must also comply with the maximum residual disinfectant level (MRDL) and maximum contaminant levels (MCL) requirements specified in the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) and the Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR).

Residual Disinfectant Monitoring and Reporting Requirements			
Location	**Concentration**	**Monitoring Frequency**	**Reporting** (Reports due 10th of the following month)
Entry to distribution system.	Residual disinfectant concentration cannot be < 0.2 mg/L for more than 4 hours.	Continuous, but states may allow systems serving 3,300 or fewer persons to take grab samples from 1 to 4 times per day, depending on system size.	Lowest daily value for each day, the date and duration when residual disinfectant was < 0.2 mg/L, and when state was notified of events where residual disinfectant was < 0.2 mg/L.
Distribution system - same location as total coliform sample location(s).	Residual disinfectant concentration cannot be undetectable in greater than 5% of samples in a month, for any 2 consecutive months. Heterotrophic plate count (HPC) ≤ 500/mL is deemed to have detectable residual disinfectant.	Same time as total coliform samples.	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5% of the measurements as being undetectable in any 2 consecutive months.

LT2ESWTR Source Water Monitoring and Treatment Requirements

Each PWS must determine the arithmetic mean of all *Cryptosporidium* samples collected during monitoring.

A combined distribution system (CDS) is an interconnected distribution system consisting of the distribution systems of the wholesale system and of the consecutive systems that receive finished water from that wholesale system. Under the LT2ESWTR, wholesale systems in a CDS must comply with the LT2ESWTR based on the population of the largest system in their CDS.

EPA has established four schedule categories based on system size to simplify the discussion of the LT2ESWTR monitoring requirements. Schedule 1 applies to systems that serve 100,000 or more people or in a CDS that largest system serves 100,000 people. Schedule 2 applies to systems that serve 50,000 to 99,999 people or in a CDS that largest system serves 50,000 to 99,999 people. Schedule 3 applies to systems that serve 10,000 and 49,999 people or in a CDS that largest system serves 10,000 and 49,999 people. Schedule 4 applies to systems that serve less than 10,000 people.

Source water monitoring requirements are as follows:

- Schedule 1-3 systems must sample for *Cryptosporidium* at least monthly for 2 years.
- Schedule 4 systems must sample for *Cryptosporidium* at a frequency of either (a) at least 2 times per month for 1 year or (b) 1 time per month for 2 years.
- All systems must begin a second round of monitoring no later than 6 years after determining initial *Cryptosporidium* level.

Treatment Requirements

If Arithmetic Mean Cryptosporidium Level is:	System Must Provide Treatment to:*	Disinfectant System Must Use:
≤ 0.01 oocysts/L	2-log *Cryptosporidium* inactivation	► At least 2 disinfectants to provide 4-log virus, 3-log *Giardia lambia* and 2- or 3-log *Cryptosporidium* inactivation. ► Each disinfectant must achieve by itself the total inactivation required for one of these target pathogens
> 0.01 oocysts/L or if PWS chooses not to monitor for *Cryptosporidium*	3-log *Cryptosporidium* inactivation	

* Inactivation credit for treatment with chlorine dioxide, ozone or UV light.

Microbial Toolbox: Inactivation Options, Credits and Criteria

The Microbial Toolbox provides a list of the tools that systems can use, and receive treatment credits for, in order to meet additional treatment requirements of LT2ESWTR. The toolbox provides systems with the flexibility to use any combination of applicable treatment options as long as the systems are in compliance with design, operational, and performance criteria which are not detailed in this document. Unfiltered systems must use one of the following inactivation/disinfection tools to receive the corresponding credits:

- Chlorine dioxide: log credit received is based on measured CT in relation to the CT table.
- Ozone: log credit received is based on measured CT in relation to the CT table.
- UV: log credit received is based on validated UV dose in relation to the UV dose table; reactor validation testing is required to establish UV dose and associated operating conditions.

System Reporting Requirements

System Reporting Requirements

Report to State:	What to Report:
Within 10 days after the end of the month:	► Source water quality information (microbial quality and turbidity measurements). ► In addition to the disinfection information above, systems must report the daily residual disinfectant concentration(s) and disinfectant contact time(s) used for calculating the CT value(s).
Within 10 days after the end of the first month following the month when the source water monitoring sample(s) were collected:	► Results from the required source water monitoring.
By October 10 each year:	► Report compliance with all watershed control program requirements. ► Submit report on the on-site inspection, unless that state conducted the inspection, in which case the state must provide the system with a copy of the report.
Within 24 hours:	► Turbidity exceedances of 5 NTU and waterborne disease outbreaks.
ASAP but no later than the end of the next business day:	► Instance where the residual disinfectant level entering the distribution system was < 0.2mg/L.
Based on system's LT2ESWTR schedule*:	► Sampling schedules and monitoring results for source water monitoring ► Certain data elements of *Cryptosporidium, E. coli* and turbidity analyses.

*See each of the four LT2ESWTR by schedule QRGs available online at http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/compliance.cfm for additional details.

Disinfection Profiling and Benchmarking Requirements

A **disinfection profile** is the graphical representation of a system's microbial inactivation over 12 consecutive months.

A **disinfection benchmark** is the lowest monthly average microbial inactivation value. The disinfection benchmark is used as a baseline of inactivation when considering changes in the disinfection process.

Disinfection Profiling and Benchmarking Requirements

The purpose of disinfection profiling and benchmarking is to allow systems and states to assess whether a change in disinfection practices reduces microbial protection. Systems must develop a disinfection profile that reflects *Giardia lamblia* and viruses inactivation, calculate a benchmark (lowest monthly inactivation) based on the profile, and consult with the state prior to making a significant change to disinfection practices.

Requirement	IESWTR	LT1ESWTR	LT2ESWTR
Affected Systems:	Community water systems (CWS), nontransient noncommunity water systems (NTNCWS), and transient noncommunity water systems (TNCWS) serving ≥10,000.	CWS and NTNCWS serving <10,000 only.	Any CWS, NTNCWS, or TNCWS that proposes to make a significant change in disinfection practice*.
Begin Profiling By:	April 1, 2000	▶ July 1, 2003, for systems serving 500-9,999 people. ▶ January 1, 2004, for systems serving < 500 people.	▶ Upon completion of initial round of source water monitoring, AND ▶ 12 consecutive months prior to making the proposed change.
Frequency & Duration:	**Daily** monitoring for 12 consecutive calendar months to determine the total logs of *Giardia lamblia* inactivation (and viruses, if necessary) for each day in operation.	**Weekly** inactivation of *Giardia lamblia* (and viruses, if necessary), on the same calendar day each week over 12 consecutive months.	At least **weekly** inactivation of *Giardia lamblia* and viruses, for at least 1 year. May use data collected for profile under IESWTR and LT1SWTR.
States May Waive Disinfection Profiling Requirements If:	TTHM annual average <0.064 mg/L and HAA5 annual average <0.048 mg/L: ▶ Collected during the same period. ▶ Annual average is arithmetic average of the quarterly averages of 4 consecutive quarters of monitoring. ▶ At least 25% of samples at the maximum residence time in the distribution system. ▶ Remaining 75% of samples at representative locations in the distribution system.	One TTHM sample <0.064 mg/L and one HAA5 sample <0.048 mg/L: ▶ Collected during the month of warmest water temperature; AND ▶ At the maximum residence time in the distribution system. Samples must have been collected after January 1, 1998.	▶ The system has an existing disinfection profile for both *Giardia lamblia* and viruses, and has neither made a change in disinfection practices nor changed sources since the profile was developed; OR, ▶ The system has at least 1 year of existing data that can be used to complete a disinfection profile, and has neither made a significant change to its treatment practice nor changed sources since the data were collected.
Disinfection Benchmark Must be Calculated If:	▶ Systems required to develop a disinfection profile and are considering making a significant changes in disinfection practice*. ▶ Systems must consult the state prior to making any modifications to disinfection practices.	Same as IESWTR, and systems must obtain state approval prior to making any modifications to disinfection practices.	Complete a disinfection profile and benchmark for viruses and *Giardia lamblia*.

*A significant change in disinfection practice is defined as (1) change in the point of disinfection, (2) change to the type of disinfectant, (3) change to the disinfection process, or (4) any other modification designated by the state.

Comprehensive Surface Water Treatment Rules Quick Reference Guide: Systems Using Conventional or Direct Filtration

Overview of the Rules

Title*	**Surface Water Treatment Rule** (SWTR) - 40 CFR 141.70-141.75 **Interim Enhanced Surface Water Treatment Rule** (IESWTR) - 40 CFR 141.170-141.175 **Filter Backwash Recycling Rule** (FBRR) 40 CFR 141.76 **Long Term 1 Enhanced Surface Water Treatment Rule** (LT1ESWTR) - 40 CFR 141.500-141.571 **Long Term 2 Enhanced Surface Water Treatment Rule** (LT2ESWTR) - 40 CFR 141.700-141.722
Purpose	Improve public health protection through the control of microbial contaminants, particularly viruses, *Giardia lamblia*, and *Cryptosporidium*.
General Description	The Surface Water Treatment Rules: ▶ Applies to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as "Subpart H systems." ▶ Requires all Subpart H systems to disinfect. ▶ Requires Subpart H systems to filter unless specific filter avoidance criteria are met. ▶ Applies a treatment technique requirement for control of microbials.

*This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Overview of Requirements

The purpose of this table is to show how the requirements for the IESWTR, FBRR, LT1ESWTR and LT2ESWTR build on the existing requirements established in the original SWTR.

APPLICABILITY: PWSs that use surface water or GWUDI (Subpart H systems) that practice conventional or direct filtration.		**Final Rule Dates**				
		SWTR 1989	**IESWTR 1998**	**LT1ESWTR 2002**	**LT2ESWTR 2006**	**FBRR 2001**
Population Served	≥ 10,000	✔	✔		✔	✔
	< 10,000	✔	For sanitary survey provisions only	✔	✔	✔
Regulated Pathogens	99.99% (4-log) removal/ inactivation of viruses	✔	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR
	99.9% (3-log) removal/ inactivation of *Giardia lamblia*	✔	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR
	99% (2-log) removal of *Cryptosporidium*		✔	✔	Additional treatment may be required	Regulated under IESWTR and LT1ESWTR
Residual Disinfection Requirements	Entrance to distribution system (≥ 0.2 mg/L)	✔	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR	
	Detectable in the distribution system	✔	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR	
Source Water Monitoring Requirements and Bin Classification	Monitoring to calculate *Cryptosporidium* and determine appropriate bin classification for each plant required to monitor				✔	
Turbidity Performance Standards	Combined Filter Effluent	✔	✔	✔	Regulated under SWTR, IESWTR and LT1ESWTR	
	Individual Filter Effluent		✔	✔	Regulated under IESWTR and LT1ESWTR	
Disinfection Profiling and Benchmarking	Systems must profile inactivation levels and generate benchmark, if required		✔	✔	✔	
Sanitary Surveys (state requirement)	CWS**: Every 3 years NCWS**: Every 5 years		✔	Regulated under IESWTR	Regulated under IESWTR	
Finished Reservoirs/ Water Storage Facilities	All new facilities constructed must be covered		✔	✔	Regulated under LT1ESWTR	
	Uncovered facilities must be covered or discharge treated				✔	
Operated by Qualified Personnel as Specified by State		✔	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR

** Community water system (CWS), Noncommunity water system (NCWS)

Turbidity

Compliance with turbidity provisions is measured at the Combined Filter Effluent (CFE) and Individual Filter Effluent (IFE). The **CFE** turbidity results may mask the performance of an individual filter since the individual filter may have a turbidity spike of a short duration not detected by 4 hours CFE readings. **IFE** performance is measured in systems using conventional or direct filtration. The performance of each individual filter is critical to controlling pathogen breakthrough.

The IESWTR and LT1ESWTR created more stringent CFE turbidity standards and established a new IFE turbidity monitoring requirement to address *Cryptosporidium*. These new turbidity standards assure conventional and direct filtration systems will be able to provide 2-log *Cryptosporidium* removal. Subpart H systems using the Treatment Performance Toolbox option under the LT2ESWTR must meet the more stringent CFE and IFE turbidity monitoring levels in order to receive additional *Cryptosporidium* log credit.

Turbidity: Monitoring and Reporting Requirements

Turbidity Type and Reporting Requirements *(Reports due by the 10th day of the following month the system serves water to the public.)*	**Monitoring/ Recording Frequency**	**SWTR As of June 29, 1993**	**IESWTR ≥ 10,000 people As of January 1, 2002**	**LT1ESWTR < 10,000 people As of January 1, 2005**
CFE 95% Value Report total number of CFE measurements and number and percentage of CFE measurements ≤ 95th percentile limit	At least every 4 hours*	≤ 0.5 NTU	≤ 0.3 NTU	≤ 0.3 NTU
CFE Maximum Value Report date and time of any CFE measurement that exceeds CFE maximum limit	At least every 4 hours*	5 NTU Contact state within 24 hours	1 NTU Contact state within 24 hours	1 NTU Contact state within 24 hours
IFE Monitoring Report IFE monitoring conducted and any follow-up actions	Monitor continuously every 15 minutes	None	Monitor-exceedances require follow-up action. Systems with 2 or fewer filters may monitor CFE continuously in lieu of IFE.	

*Monitoring frequency may be reduced by the state to once per day for systems serving fewer than 500 people.

IFE Turbidity: Follow-Up and Reporting Requirements

Condition	**IESWTR (≥ 10,000)**			**LT1ESWTR (<10,000)****		
	Action	**Report**	**By**	**Action**	**Report**	**By**
2 consecutive recordings > 0.5 NTU taken 15 minutes apart at end of first 4 hours of continuous filter operation after backwash/offline:	Produce filter profile within 7 days (if unknown cause).	▶ Filter # ▶ Turbidity value ▶ Date ▶ Cause (if known) or report profile was produced	10th of the following month			
2 consecutive recordings > 1.0 NTU taken 15 minutes apart:	Produce filter profile within 7 days (if unknown cause).	▶ Filter # ▶ Turbidity value ▶ Date ▶ Cause (if known) or report profile was produced	10th of the following month		▶ Filter # ▶ Turbidity value ▶ Date ▶ Cause (if known)	10th of the following month
2 consecutive recordings > 1.0 NTU taken 15 minutes apart at the same filter for **3 months in a row**:	Conduct filter self-assessment within 14 days.	▶ Filter # ▶ Turbidity value ▶ Date ▶ Report filter self-assessment produced	10th of the following month	Conduct a filter self-assessment within 14 days Systems with 2 filters that monitor CFE in lieu of IFE must do both filters.	Date filter assessment triggered & completed	10th of the following month (or within 14 days of filter self-assessment being triggered if triggered in last 4 days of the month).
2 consecutive recordings > 2.0 NTU taken 15 minutes apart at the same filter for 2 months in a row:	Arrange for Comprehensive Performance Evaluation (CPE) within 30 days & submit report within 90 days.	▶ Filter # ▶ Turbidity value ▶ Date	10th of the following month	Arrange for CPE within 60 days & submit CPE report within 120 days.	Date CPE triggered	10th of the following month
		Submit CPE report	90 days after exceedance		Submit CPE report	120 days after exceedance

** Systems serving fewer than 10,000 people had to begin complying with these requirements beginning January 1, 2005.

Filter Backwash Recycling Rule

The FBRR applies to Subpart H systems that practice conventional or direct filtration, and recycle spent filter backwash, thickener suernatant, or liquids from dewatering processes. The FBRR requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state. The FBRR was developed to improve public health protection by assessing and changing, where needed, recycle practices for improved contaminant control, particularly microbial contaminants. Systems were required to submit recycle notification to the state by December 8, 2003. By June 8, 2004, systems were required to return recycle flows through the processes of a system's existing conventional or direct filtration system or an alternate recycle location approved by the state and collect recycle flow information and retain on file. Any system making capital improvements to modify the recycle return location was given until June 8, 2006, to complete the improvements. All new systems must abide by these requirements.

Disinfection

Disinfection must be sufficient to ensure that the total treatment process (disinfection plus filtration) of the system achieves at least:

- 99.9% (3-log) inactivation and/or removal of *Giardia lamblia*.
- 99.99% (4-log) inactivation and/or removal of viruses.

Subpart H systems using chlorine dioxide, ozone, or ultraviolet (UV) disinfection may achieve additional *Cryptosporidium* log credit by using the Inactivation Toolbox option under the LT2ESWTR. Systems must also comply with the maximum residual disinfectant level (MRDL) and maximum contaminant level (MCL) requirements specified in the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) and Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR).

Residual Disinfectant Monitoring and Reporting Requirements

Location	Concentration	Monitoring Frequency	Reporting (Reports due 10th of the following month)
Entry to distribution system.	Residual disinfectant concentration cannot be < 0.2 mg/L for more than 4 hours.	Continuous, but states may allow systems serving ≤ 3,300 to take grab samples from 1 to 4 times per day, depending on system size.	Lowest daily value for each day, the date and duration when residual disinfectant was < 0.2 mg/L, and when state was notified of events where residual disinfectant was < 0.2 mg/L.
Distribution system - same location as total coliform sample location(s).	Residual disinfectant concentration cannot be undetectable in greater than 5% of samples in a month, for any 2 consecutive months. Heterotrophic plate count (HPC) ≤ 500/mL is deemed to have detectable residual disinfectant.	Same time as total coliform samples.	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5% of the measurements as being undetectable in any 2 consecutive months.

LT2ESWTR Source Water Monitoring and Bin Classification

Bin concentration is calculated by averaging individual sample results from 1 or more years of monitoring (specific procedures vary by frequency and duration of monitoring).

A combined distribution system (CDS) is an interconnected distribution system consisting of the distribution systems of the wholesale system and of the consecutive systems that receive finished water from that wholesale system. Under the LT2ESWTR, wholesale systems in a CDS must comply with the LT2ESWTR based on the population of the largest system in their CDS.

EPA has established four schedule categories based on system size to simplify the discussion of the LT2ESWTR monitoring requirements. Schedule 1 applies to systems that serve 100,000 or more people or in a CDS that largest system serves 100,000 people. Schedule 2 applies to systems that serve 50,000 to 99,999 people or in a CDS that largest system serves 50,000 to 99,999 people. Schedule 3 applies to systems that serve 10,000 and 49,999 people or in a CDS that largest system serves 10,000 and 49,999 people. Schedule 4 applies to systems that serve less than 10,000 people.

Source water monitoring requirements are as follows:

- Large systems (≥ 10,000 people served) must sample for *Cryptosporidium*, *E.coli* and turbidity at least monthly for 2 years.
- Small systems (< 10,000 people served) must initially sample for *E.coli* at least once every 2 weeks for 1 year. *Cryptosporidium* monitoring is only required if *E. coli* levels are above certain levels based on the water source type.
- All systems must begin a second round of monitoring 6 years after initial bin classification.

Bin Classification and Additional Treatment Requirements

Bin	Cryptosporidium Bin Concentration	Additional Treatment Requirements*	
		Conventional Filtration	Direct Filtration
Bin 1	Less than .075 oocysts/ L **	No additional treatment	No additional treatment
Bin 2	.075 oocysts/L or higher, but less than 1.0 oocysts/L	1-log treatment***	1.5-log treatment***
Bin 3	1.0 oocysts or higher, but less than 3.0 oocysts/L	2-log treatment***	2.5-log treatment***
Bin 4	3.0 oocysts or higher	2.5 log treatment***	3-log treatment***

* Requirements in addition to those met in full compliance with SWTR, IESWTR, and LT1ESWTR
** Or Subpart H systems not required to monitor for *Cryptosporidium*
*** Removal or inactivation

Microbial Toolbox: Inactivation Options, Credits and Criteria

The Microbial Toolbox provides a list of the tools that systems can use, and receive treatment credits for, in order to meet additional treatment requirements of LT2ESWTR. The toolbox provides systems with the flexibility to use any combination of applicable treatment options as long as the systems are in compliance with design, operational, and performance criteria which are not detailed in this document. The toolbox options and credits available for Subpart H systems are divided into five categories:

- Source protection and management: watershed control program (0.5-log), alternative source/intake management (no prescribed credit).
- Prefiltration: presedimentation basin with coagulation (0.5-log), two-stage lime softening (0.5-log), bank filtration (0.5- or 1-log).
- Treatment performance: combined filter performance (0.5-log), individual filter performance (0.5-log), demonstration of performance (log credit variable).
- Additional filtration: bag and cartridge filters individual (up to 2-log), bag and cartridge filters in series (up to 2.5-log), membrane filtration (log credit variable), second stage filtration (0.5-log), slow sand filters (2.5- to 3-log).
- Inactivation: chlorine dioxide (log credit variable), ozone (log credit variable), UV (log credit variable).

Disinfection Profiling and Benchmarking Requirements

A **disinfection profile** is the graphical representation of a system's microbial inactivation over 12 consecutive months.

A **disinfection benchmark** is the lowest monthly average microbial inactivation value. The disinfection benchmark is used as a baseline of inactivation when considering changes in the disinfection process.

Disinfection Profiling and Benchmarking Requirements

The purpose of disinfection profiling and benchmarking is to allow systems and states to assess whether a change in disinfection practices reduces microbial protection. Systems must develop a disinfection profile that reflects *Giardia lamblia* and viruses inactivation, calculate a benchmark (lowest monthly inactivation) based on the profile, and consult with the state prior to making a significant change to disinfection practices.

Requirement	IESWTR	LT1ESWTR	LT2ESWTR
Affected Systems:	Community water systems (CWS), nontransient noncommunity water systems (NTNCWS), and transient noncommunity water systems (TNCWS) ≥ 10,000.	CWS and NTNCWS <10,000 only.	Any CWS, NTNCWS or TNCWS that proposes to make a significant change in disinfection practice*.
Begin Profiling By:	April 1, 2000	▶ July 1, 2003, for systems serving 500-9,999 people. ▶ January 1, 2004, for systems serving < 500 people.	▶ Upon completion of initial round of source water monitoring, AND ▶ 12 consecutive months prior to making the proposed change.
Frequency & Duration:	**Daily** monitoring for 12 consecutive calendar months to determine the total logs of *Giardia lamblia* inactivation (and viruses, if necessary) for each day in operation.	**Weekly** inactivation of *Giardia lamblia* (and viruses, if necessary), on the same calendar day each week over 12 consecutive months.	At least **weekly** inactivation of *Giardia lamblia* and viruses, for at least 1 year. May use data collected for profile under IESWTR or LT1ESWTR.
States May Waive Disinfection Profiling Requirements If:	TTHM annual average < 0.064 mg/L and HAA5 annual average < 0.048 mg/L: ▶ Collected during the same period. ▶ Annual average is arithmetic average of the quarterly averages of 4 consecutive quarters of monitoring. ▶ At least 25% of samples at the maximum residence time in the distribution system. ▶ Remaining 75% of samples at representative locations in the distribution system.	One TTHM sample < 0.064 mg/L and one HAA5 sample < 0.048 mg/L: ▶ Collected during the month of warmest water temperature; AND ▶ At the maximum residence time in the distribution system. Samples must have been collected after January 1, 1998.	▶ The system has an existing disinfection profile for both *Giardia lamblia* and viruses, and has neither made a significant change to its treatment practices nor changed sources since the profile was developed; OR, ▶ The system has at least 1 year of existing data that can be used to complete a disinfection profile, and has neither made a significant change to its treatment practice nor changed sources since the data were collected.
Disinfection Benchmark Must be Calculated If:	▶ Systems required to develop a disinfection profile and are considering making a significant changes in disinfection practice*. ▶ Systems must consult the state prior to making any modifications to disinfection practices.	Same as IESWTR, and systems must obtain state approval prior to making any modifications to disinfection practices.	Complete disinfection profile and benchmark for viruses and *Giardia lamblia*.

*A significant change in disinfection practice is defined as (1) change in the point of disinfection, (2) change to the type of disinfectant, (3) change to the disinfection process, or (4) any other modification designated by the state.

Ground Water Rule Factsheet: Monitoring Requirements

WHAT IS THE GROUND WATER RULE?

The U.S. Environmental Protection Agency (EPA) published the Ground Water Rule (GWR) on November 8, 2006. One goal of the GWR is to provide increased protection against microbial pathogens, specifically bacterial and viral pathogens, in public water systems (PWSs) that use ground water. Instead of requiring disinfection for all ground water sources, the GWR establishes a risk-targeted approach to identifying ground water sources that are susceptible to fecal contamination. The GWR requires systems with ground water sources at risk of microbial contamination to take corrective action to protect consumers from harmful bacteria and viruses. Monitoring is a key element of this risk-targeted approach.

There are two types of monitoring required by the GWR:

- **Source Water Monitoring**: *Triggered* source water monitoring is used to determine if fecal contamination is present in the ground water source. Triggered source water monitoring is required for any GWS that has a positive total coliform result under the Total Coliform Rule (TCR) routine sampling and does not provide and monitor for 4-log treatment of viruses. Alternatively, states may require GWSs with sources that seem susceptible to fecal contamination to conduct *assessment* source water monitoring.

- **Compliance Monitoring**: Systems that notify the state that they provide and monitor for 4-log treatment of viruses are required to conduct compliance monitoring.

WHAT ARE THE SOURCE WATER MONITORING REQUIREMENTS?

Some ground water systems (GWSs) will be required to conduct triggered source water monitoring or assessment source water monitoring of a fecal indicator (e.g., *E. coli*, enterococci, or coliphage) to detect microbial contamination in the source.

Triggered Source Water Monitoring

Within 24 hours of being notified of a positive total coliform result under routine TCR monitoring, a GWS must collect at least one ground water source sample from each source in use when the positive total coliform result under the TCR was collected. These samples are **triggered source water samples**.

If a triggered source water sample is positive for a fecal indicator, the state will require the system to take corrective action or take five **additional samples** from the same source within 24 hours of notification of the fecal indicator-positive result and analyze the additional samples for a fecal indicator. If any one of the five additional samples is fecal indicator-positive, the system must take corrective action.

Triggered Source Water Monitoring Exceptions

A state may waive the triggered source water monitoring requirement if the state determines and documents, in writing, that the total coliform-positive routine sample is the result of a documented distribution system deficiency.

In addition, states may develop criteria for distribution system conditions that cause total coliform-positive samples. A GWS can document to the state that it met the state criteria within 30 days of the total coliform-positive sample and be exempt from collecting the triggered source water sample(s).

Representative Source Water Monitoring

With state approval, GWSs with more than one ground water source may fulfill the triggered source water monitoring requirements by taking a ground water sample at a representative source. The state may require the system to submit a triggered source water monitoring plan that identifies the sources that are representative of its TCR sampling sites.

GWSs providing at least 99.99 percent (4-log) treatment of viruses (using inactivation, removal, or a state-approved combination of inactivation and removal) of all of their ground water can notify the state of this treatment and would not be required to conduct triggered source water monitoring. Those systems are, however, required to conduct compliance monitoring to show they are providing consistent and sufficient treatment. Compliance monitoring requirements depend on the system's size and the type of treatment it is using. Compliance monitoring requirements are discussed below.

Small Systems

GWSs serving fewer than 1,000 people that have a total coliform-positive result under the TCR may use the triggered source water monitoring sample collected from the ground water source to meet both the triggered source water monitoring requirement of the GWR as well as part of the repeat sampling requirement of the TCR (if the state approves the use of *E. coli* as a fecal indicator for source water monitoring).

Consecutive Systems

A consecutive system with a positive routine total coliform result under the TCR must notify its wholesale system(s) within 24 hours of being notified of the positive sample.

Wholesale Systems

A wholesale system that receives notice from a consecutive system of a positive total coliform result under routine monitoring of the TCR must collect a triggered source water sample from its ground water source(s) and analyze the source water sample(s) for a fecal indicator within 24 hours of being notified by the consecutive system. If the triggered source water sample is positive for the fecal indicator, the wholesale system must notify all consecutive systems served by that source within 24 hours of the positive sample result. The wholesale system and any consecutive systems served by the fecal indicator-positive source must all notify their consumers within 24 hours of learning of the result. If the state does not require corrective action for this fecal indicator-positive sample, the wholesale system must collect five additional source water samples from the same source within 24 hours of receiving notification of the fecal indicator-positive sample.

Invalidation of Source Water Monitoring Samples

If the state provides written documentation that a fecal indicator-positive sample does not reflect source water quality, or if a GWS provides the state with written notice from the laboratory that improper analysis of a sample occurred, the state may invalidate the fecal indicator-positive sample. Within 24 hours of receiving the state sample invalidation notification, a GWS is required to take another sample and have it analyzed for the same fecal indicator.

Assessment Source Water Monitoring

States may require GWSs with sources that seem susceptible to fecal contamination to conduct assessment source water monitoring. States may require assessment source water monitoring at any time, on a case-by-case basis. Based on the results of the assessment source water monitoring, systems may have to take corrective action.

Assessment source water monitoring requirements are in addition to triggered source water monitoring requirements. A system may, however, use a triggered source water sample to meet part of the assessment source water monitoring requirement.

Analytical Methods	
Fecal Indicator	**Method Name**
E. coli	9223 B EPA Method 1604 9221 F 9222 G
Enterococci	9230B 9230C EPA Method 1600
Coliphage	EPA Method 1601 EPA Method 1602

New Sources and Systems

GWSs that begin service from a new source after November 30, 2009, may be required by their state to conduct assessment source water monitoring. The state may require the system to begin assessment source water monitoring before the new source provides water to the public.

Other Source Water Monitoring Details

Sampling Locations for All Source Water Monitoring

Triggered, additional, and assessment source water monitoring samples must be collected prior to treatment or at a state-approved location.

Sample Volume

All source water samples must be at least 100 mL for all fecal indicator analytical methods.

WHAT ARE THE COMPLIANCE MONITORING REQUIREMENTS?

Compliance monitoring requirements apply to systems that provide 4-log treatment of viruses and are not subject to triggered source water monitoring requirements. These systems must:

- Notify the state that they provide 4-log treatment of viruses.
- Conduct compliance monitoring rather than triggered source water monitoring.
  - Systems with existing ground water sources must notify the state in writing by December 1, 2009, that they provide at least 4-log treatment of viruses for the sources.
  - Systems with ground water sources placed into service after November 30, 2009, must notify the state in writing that they provide at least 4-log treatment of viruses of those sources and begin compliance monitoring within 30 days of placing the source in service or conduct triggered source water monitoring.

Compliance Monitoring

Compliance monitoring ensures that systems already providing 99.99 percent (4-log) inactivation, removal, or a state-approved combination of inactivation and removal of viruses are achieving this level of treatment.

After November 30, 2009, GWSs that begin providing at least 4-log treatment of viruses must notify the state and conduct compliance monitoring to avoid being required to conduct triggered source water monitoring. Systems that provide 4-log treatment should check with their state regulators to see if they need to satisfy any additional state compliance monitoring requirements (e.g. Stage 1 Disinfectants and Disinfection Byproducts Rule (DBPR)) beyond the requirements listed below.

System Type	Monitor For	Frequency	Sample Location
Disinfecting GWSs serving ≤ 3,300	Residual disinfectant concentration (must meet state minimum)	Daily or continuous[1,2]	State-approved location(s)
Disinfecting GWSs serving > 3,300		Continuous only[1,3]	
GWSs using membrane filtration	Membrane filtration process effectiveness	Consult state for specific information	
GWSs using state-approved alternative treatment	Alternative treatment effectiveness		

1. Provisions available for equipment failure.
2. If any daily grab sample is less than the minimum disinfectant residual concentration, the system must take follow-up samples every 4 hours until the residual meets or exceeds the minimum.
3. System must record the lowest residual disinfectant concentration each day water from the ground water source is served to the public.

WHAT ARE THE COMPLIANCE DEADLINES ASSOCIATED WITH GWR MONITORING?

Individual states may have earlier compliance requirement dates.

Requirements	Deadline:
Source Water Monitoring	
❁ Triggered	Beginning December 1, 2009
❁ Additional	
❁ Assessment	
Notification of 4-log treatment of viruses (for existing ground water source(s))	By December 1, 2009
Compliance Monitoring (for systems with 4-log treatment of viruses)	Beginning December 1, 2009

WHAT ARE THE MONITORING VIOLATIONS ASSOCIATED WITH THE GWR?

If a system is in violation of a GWR monitoring requirement, the system must report the problem to the state and notify the public. Systems are required to send a copy of the public notification (PN) to the state within 10 days of the notification. Note that when a system has a ground water source with a fecal indicator-positive sample, it is a *situation* and not a violation.

Situation or Violation	Report to State	Notify Public	Tier	PN Method
Source water monitoring sample is fecal indicator-positive for *E. coli*, enterococci, or coliphage and not invalidated by the state	Within 24 hours	Within 24 hours	1	TV, hand-delivery, public postings, or other state-approved method (consult your state)
Failure to conduct required source water monitoring (triggered, additional, or assessment)	Consult your State	Within 12 months	3	Consumer Confidence Report (CCR)[1] (consult your state for other specific PN requirements)
Failure to conduct required compliance monitoring	Consult your State	Within 12 months	3	CCR[1] (consult your state for other specific PN requirements)
1. The CCR may be used by CWSs to make this notification if it meets the requirement to notify the public within 12 months. Non-community water systems must use an alternate form of Tier 3 notice approved by their state.				

Community GWSs must also report any fecal indicator-positive samples in their CCR that addresses the year in which the samples were collected.

ADDITIONAL GUIDANCE MATERIALS

The following guidance materials for states and PWSs have been released or will be released in 2008:

Ground Water Rule: A Quick Reference Guide – This guide provides a description of the GWR and includes critical deadlines and requirements. www.epa.gov/ogwdw/disinfection/gwr/compliancehelp.html.

Ground Water Rule Factsheets – Including factsheets on GWR general requirements, monitoring requirements, and Public Notice, Consumer Confidence Reports, and Special Notices.

Ground Water Sanitary Survey Guidance Manual. November 2007. EPA 815-D-07-006 – This guidance provides states, tribes, and other primacy agencies with a brief review of the sanitary survey regulatory provisions, give examples of what may constitute a significant deficiency, and provide a checklist of elements that should be evaluated during the course of a sanitary survey inspection. www.epa.gov/ogwdw/disinfection/gwr/compliancehelp.html.

Source Water Assessment Guidance Manual. September 2007. EPA 815-R-07-023 – This guidance provides states, tribes, and other primacy agencies with a brief review of hydrogeologic sensitivity assessments, an overview of the characteristics of a sensitive aquifer, information about how source water assessments may be used, and information about how to determine if a sensitive aquifer has a hydrogeologic barrier. www.epa.gov/ogwdw/disinfection/gwr/compliancehelp.html.

Ground Water Rule Source Water Monitoring Methods Guidance Manual. July 2007. EPA 815-R-07-019 – This guidance provides GWSs, states, tribes, and other primacy agencies with a brief review of the source water monitoring provisions. Primacy agencies may select fecal indicators (e.g., *E. coli*, enterococci, coliphage) that systems would be required to test for in the ground water source sample. The source water monitoring guidance manual provides criteria to assist primacy agencies in their determination of which fecal indicator(s) may be most appropriate. www.epa.gov/ogwdw/disinfection/gwr/compliancehelp.html.

Corrective Action Guidance Manual (under development) – This guidance will provide states, tribes, other primacy agencies and GWSs with an overview of the treatment technique requirements of the GWR. The guidance manual will provide assistance with determining the information that should be included in a system's corrective action plan.

Consecutive System Guide for the Ground Water Rule. July 2007. EPA 815-R-07-020 – This guidance describes the regulatory requirements of the GWR that apply to wholesale GWSs and the consecutive systems that receive and distribute that ground water supply. www.epa.gov/ogwdw/disinfection/gwr/compliancehelp.html.

Complying with the Ground Water Rule: Small Entity Compliance Guide: One of the Simple Tools for Effective Performance (STEP) Guide Series. July 2007. EPA 815-R-07-018 – This document is intended to be an official compliance guide to the GWR for small PWSs, as required by the Small Business Regulatory Enforcement Fairness Act of 1996. This guide contains a general introduction and background for the GWR, describes the specific requirements of the GWR and provides information on how to comply with those requirements. www.epa.gov/ogwdw/disinfection/gwr/compliancehelp.html.

For additional information, please contact the Safe Drinking Water Hotline at 1-800-426-4791, or visit www.epa.gov/safewater/disinfection/gwr.

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Agency

Ground Water Rule Triggered and Representative Monitoring: A Quick Reference Guide

Overview of the Rule

Title*	Ground Water Rule (GWR) 71 FR 65574, November 8, 2006, Vol. 71, No. 216 Correction 71 FR 67427, November 21, 2006, Vol. 71, No. 224
Purpose	Reduce the risk of illness caused by microbial contamination in public ground water systems (GWSs).
General Description	The GWR establishes a risk-targeted approach to identify GWSs susceptible to fecal contamination and requires corrective action to correct significant deficiencies and source water fecal contamination in all public GWSs.
Utilities Covered	The GWR applies to all public water systems (PWSs) that use ground water, including consecutive systems, except that it does not apply to PWSs that combine all of their ground water with surface water or with ground water under the direct influence of surface water prior to treatment.

*This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Purpose of Triggered Source Water Monitoring

- The purpose of triggered source water monitoring is to evaluate whether the presence of total coliform in the distribution system is due to fecal contamination in the ground water source.
- This type of source water monitoring is triggered by routine total coliform monitoring required by the Total Coliform Rule (TCR) (40 CFR 141.21).
  - Since TCR monitoring is conducted regularly, triggered source water monitoring can occur at any time and thus provides an ongoing evaluation of ground water sources.

Triggered Source Water Monitoring Requirements

Systems Required to Conduct Triggered Source Water Monitoring

GWSs are subject to triggered source water monitoring if they:

- Do not provide, and conduct compliance monitoring for, at least 4-log treatment of viruses (through inactivation and/or removal).
  - This includes systems that decide to discontinue 4-log treatment.
- Do not purchase 100% of their water (and therefore have a source at which to sample).

Situations Leading to Triggered Source Water Monitoring

GWSs must conduct triggered source water monitoring when:

- The system is notified of a total coliform-positive routine sample collected in compliance with the TCR unless:
  - The total coliform sample is invalidated by the State.
  - The State allows an exception to the GWR triggered source water monitoring requirements.

OR

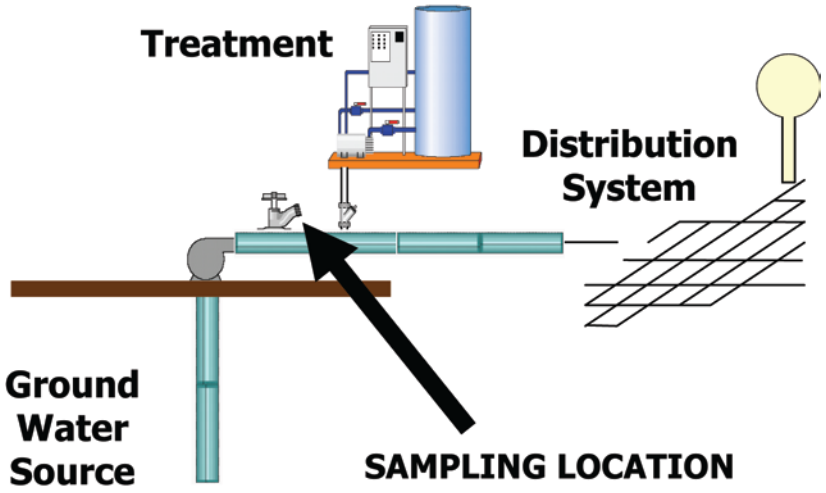
- The system is a wholesale system and is notified by one of its consecutive systems that the consecutive system had a total coliform-positive sample during TCR monitoring.

Collecting and Analyzing Triggered Source Water Monitoring Samples

When triggered source water monitoring is required, GWSs must:

- Collect at least one ground water source sample from each source in use at the time the total coliform-positive sample was collected.
  - Samples must be collected within 24 hours of being notified of the total coliform-positive sample (unless the 24-hour limit is extended by the State).
  - Sample must be taken before treatment or at a State-approved location after treatment (see the diagram on the next page).
- Ensure all samples are analyzed for the presence of a fecal indicator (e.g., *E. coli*, enterococci, or coliphage) using an approved GWR method.
- If a fecal indicator-positive source sample is invalidated by the State, the GWS must collect another source water sample within 24 hours of being notified by the State of the sample invalidation and analyze for the same fecal indicator using an approved method. See the "Analytical Methods Approved for the Ground Water Rule" at http://water.epa.gov/scitech/drinkingwater/labcert/analyticalmethods.cfm.

- The diagram below represents an appropriate sampling location for triggered source water monitoring. GWSs should have a sample tap at each source that enables triggered source water monitoring.



Additional Sampling

- If the initial triggered source water sample is fecal indicator-positive, and the State does not require corrective action in response, GWSs must conduct additional source water monitoring.
  - GWSs must collect five additional source water samples (from the source(s) that contained the original fecal indicator-positive samples) within 24 hours of being notified of the fecal indicator-positive sample.
  - The additional samples must be tested for a fecal indicator using an approved GWR method.
- If any one of the five additional samples is fecal indicator-positive, the system must take corrective action.
- If any additional sample is found to be fecal indicator-positive but is subsequently invalidated by the State, the GWS must resample for the same fecal indicator within 24 hours of being notified of the invalidation.

Note: If the GWS is a wholesale system, it must notify all consecutive systems served by a source of any fecal indicator-positive samples from that source within 24 hours of being notified of the sample result.

Sampling at Representative Sources and Triggered Source Water Monitoring Plans

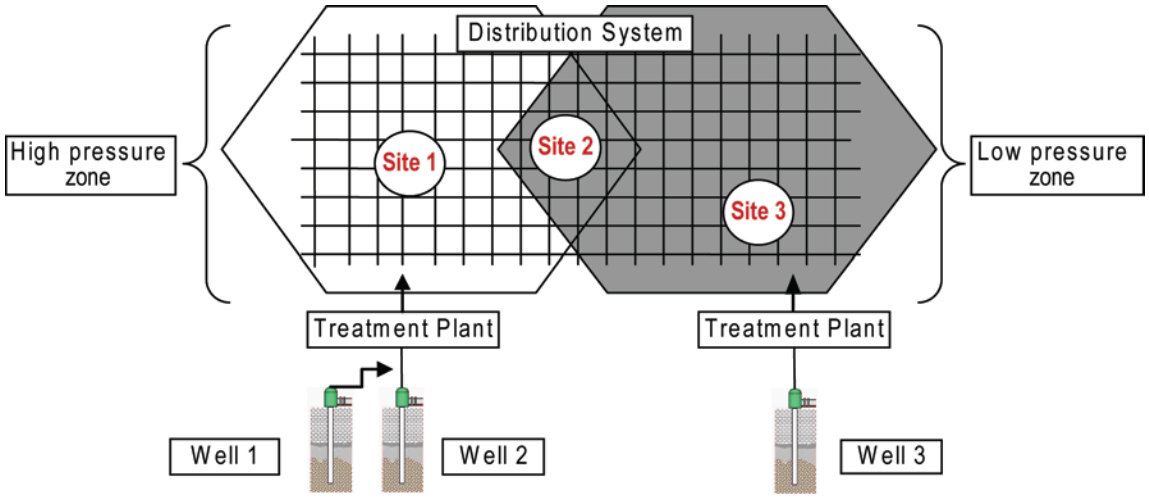
Representative Source Sampling

- If a GWS has multiple sources, the State may allow the GWS to conduct representative source sampling.
- Representative source water sampling allows systems to collect samples from the sources that represent (serve) the TCR monitoring site rather than from all sources. These representative ground water sources must be approved by the State.
- Systems must still:
  - Sample within 24 hours of total coliform-positive sample.
  - Analyze using an approved GWR method.

Triggered Source Water Monitoring Plan

- If the State allows representative site sampling, the State may require the GWS to submit a triggered source water monitoring plan for approval before the GWS starts conducting representative source sampling.
  - A triggered source water monitoring plan may include:
    - A map of the water system (including location of ground water sources, location of pressure zones, and location of storage facilities),
    - A written explanation of how the GWS knows which source feeds which section of the distribution system, and
    - Seasonal or intermittent ground water sources and when they are used.
  - Regardless of whether or not the State requires a plan to be submitted, all representative source sampling locations must be approved by the State.

- The diagram below provides an example of a system schematic that could be used to determine representative sources and develop a triggered source water monitoring plan, based on where in the distribution system the total coliform-positive sample is found. If approved by the State, the system could sample sources 1 and 2 after a total coliform-positive at Site 1 since Site 1 is in the zone served by those sources. A total coliform-positive at Site 2 would require source sampling from all sources since this area is served by all sources.



Variations in Requirements Based on System Size

GWSs Serving Fewer than 1,000 Persons

- GWSs that serve fewer than 1,000 persons may be able to meet TCR repeat monitoring requirements and GWR triggered source water monitoring requirements together if the State allows:
  - Repeat TCR monitoring at the source
    AND
  - *E. coli* to be used as a fecal indicator under the GWR.
- If the State allows this situation, then the GWS can use a TCR repeat sample collected at the source to meet the triggered source water monitoring requirement of the GWR. The fourth TCR repeat sample is collected at the source. Upstream and downstream samples and a sample at the TCR site are still needed to meet TCR requirements.
- Labs must use an approved GWR method to test for *E. coli.*

Note: If the TCR repeat sample collected at the source is TCR-positive but *E. coli* is not found, the GWR does not require further action but the system is in violation of the TCR MCL.

Consecutive Systems and Wholesale Systems

Consecutive Systems	► Consecutive systems that purchase 100% of their water (and therefore do not have a source from which to sample) must: ■ Notify their wholesale system within 24 hours of receiving notice of a total coliform-positive sample taken under the TCR. ■ Upon hearing from the wholesale system of a fecal indicator-positive source water sample (either initial triggered samples or additional samples), notify the public within 24 hours. ► Consecutive systems that purchase only some of their water must: ■ Notify their wholesale system within 24 hours of receiving notice of a total coliform-positive sample taken under the TCR. ■ Collect GWR triggered source water monitoring samples and additional samples as required. ■ Upon receipt of notification from the laboratory about a fecal indicator-positive source water sample at the system's source(s) take corrective action, if required, and notify the public within 24 hours. ■ Upon receipt of notification from the wholesale system of a fecal indicator-positive sample (either initial triggered samples or additional samples) at the wholesale system's source(s), notify the public within 24 hours.
Wholesale Systems	► Wholesale systems that are notified by a consecutive system of a total coliform-positive sample must: ■ Within 24 hours of being notified, collect at least one ground water source sample from each source in use (unless representative sampling is allowed) when the total coliform-positive sample was collected. ■ Notify the public and ALL consecutive systems served by the source within 24 hours of learning that a source water sample is fecal-indicator positive.

Invalidation of Fecal Indicator-Positive Samples

- The State can invalidate a fecal indicator-positive triggered source water sample if:
  - The system provides the State with written notice from the laboratory that improper sample analysis occurred or
  - The State determines there is substantial evidence that the sample does not reflect source water quality.
    - The State must document in writing there is substantial evidence that the fecal indicator-positive ground water source sample is not related to source water quality.
- If any sample is found to be fecal indicator-positive and is subsequently invalidated by the State, the GWS must resample for the same indicator within 24 hours of being notified of the invalidation.

Exceptions to the Triggered Source Water Monitoring Requirements

Extension of the 24-hour collection limit

- The State may extend the 24-hour limit for collecting source water samples on a case-by-case basis if the State determines the system cannot collect the ground water source water sample within 24 hours due to circumstances beyond its control.
- In the case of an extension, the State must specify how much time the system has to collect the sample.

Total Coliform-Positive Sample Is The Result of Distribution System Conditions

- A GWS is not required to conduct triggered source water monitoring under one of the following circumstances:
  - The State determines and documents in writing that the total coliform-positive TCR sample is caused by a distribution system deficiency.
  - The GWS determines the total coliform-positive TCR sample was collected at a location that meets State criteria for distribution conditions that will cause total coliform-positive samples and notifies the State within 30 days.

Notification Requirements

If a GWS receives notice of a fecal indicator-positive source water sample collected under the GWR, the system must:	► Consult with the State within 24 hours. ► Notify the public within 24 hours. ■ Tier 1 Public Notification. ► If the system is a community GWS, they must provide Special Notice of the fecal indicator-positive sample in their CCR.
If a GWS fails to conduct required triggered or additional monitoring, the system must:	► Notify the public within 12 months. ■ Tier 3 Public Notification. ► Community GWSs may be able to use their CCR.
Wholesale and consecutive systems are subject to:	► The same notification requirements outlined above, in addition to the requirements to notify the wholesale or consecutive systems.

Critical Deadlines for Triggered Source Water Monitoring for Drinking Water Systems

November 30, 2009	New ground water sources put in place after this date must conduct triggered source water monitoring if the GWS does not provide 4-log virus treatment and conduct compliance monitoring and the GWS is notified that a sample collected for the TCR is total coliform-positive.
December 1, 2009	GWSs must conduct triggered source water monitoring if the GWS does not provide 4-log virus treatment and conduct compliance monitoring and the GWS is notified that a sample collected for the TCR is total coliform-positive.

United States Environmental Protection Agency

Ground Water Rule Compliance Monitoring Requirements

Systems Providing 4-log Treatment of Viruses with Chemical Disinfection

MONITORING REQUIREMENTS

System Size	Monitor What, Where & When		Public Notification
>3,300 People	1. **Notify your state** that you provide 4-log treatment of viruses and wish to conduct compliance monitoring. 2. **Contact your state** to determine the minimum disinfectant residual concentration and record here: _____ 3. Monitor disinfectant residual concentration **continuously** at or before the first customer. 4. Record the lowest disinfectant residual concentration each day that water from the ground water source is served to the public.	**If continuous monitoring equipment fails:** 1. You must conduct grab sampling **every 4 hours** until the continuous monitoring equipment is returned to service. 2. You must resume continuous disinfectant residual monitoring within 14 days.	1. Failure to monitor is a monitoring violation and you must notify the public with a **Tier 3 Public Notice (PN).**[1] 2. Failure to meet the minimum disinfectant residual concentration for more than 4 hours (i.e., 2 samples 4 hours apart) is a treatment technique violation and you must notify the public with a **Tier 2 PN.**[2]
≤3,300 People	1. **Notify your state** that you provide 4-log treatment of viruses and wish to conduct compliance monitoring. 2. **Contact your state** to determine the minimum disinfectant residual concentration and record here: _____ 3. Monitor disinfectant residual concentration at or before the first customer. 4. Take grab samples on a daily basis during peak flow (or at another time specified by the state). 5. If you choose to monitor **continuously** you must meet all the monitoring requirements for systems serving >3,300 people.	**If any daily grab sample is less than the minimum disinfectant residual concentration:** 1. You must take samples **every 4 hours** until the residual meets or exceeds the minimum disinfectant residual concentration.	1. Failure to monitor is a monitoring violation and you must notify the public with a **Tier 3 PN.**[1] 2. Failure to meet the minimum disinfectant residual concentration for more than 4 hours (i.e., 2 samples 4 hours apart) is a treatment technique violation and you must notify the public with a **Tier 2 PN.**[2]

CORRECTIVE ACTION

If the state identifies a significant deficiency at your system, take corrective action.

- A significant deficiency may be identified during a sanitary survey or at any other time.
- You are required to provide the state with information requested to complete a sanitary survey.

Within 30 days of notification:

- You must **consult with your state** to determine a corrective action unless the state specifies a corrective action.

Within 120 days of notification:

- You must complete corrective action; or,
- You must be in compliance with state-approved corrective action plan and schedule.

If you fail to take corrective action, you will incur a treatment technique violation and must notify the public with a **Tier 2 PN.**[3]

- *Community water systems*: If you have not corrected the significant deficiency before the end of the calendar year, you must notify the public with a **Special Notice in your next CCR** and repeat annually until the significant deficiency has been addressed.
- *Noncommunity water systems*: If you have not corrected the significant deficiency within 12 months, you must notify the public with a **Special Notice** and repeat annually until the significant deficiency has been addressed.

Footnote 1: For this violation you must **notify the state** within 48 hours of the violation and provide a **Tier 3 PN** to the public within 1 year (potentially in CCR).

Footnote 2: For this violation you must **notify the state** as soon as possible but no later than the end of the next business day of the violation and provide a **Tier 2 PN** to the public within 30 days.

Footnote 3: For this violation you must **notify the state** within 48 hours of the violation and provide a **Tier 2 PN** to the public within 30 days.

The term "state" is used to refer to all types of primacy agencies including states, U.S. territories, Indian tribes, and EPA.

If your system decides to discontinue 4-log treatment of viruses, you must get state approval and meet triggered source water monitoring requirements. *These requirements are covered in a separate placard*.

State/Primacy Agency Contact (name and phone number):_____ **Office of Water (4606M)** **EPA 816-F-10-060** **www.epa.gov/safewater** **April 2010**

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Comprehensive Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2): Quick Reference Guide

Overview of the Rules

Titles*	► Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) 63 FR 69390, December 16, 1998, Vol. 63, No. 241 ► Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) 71 FR 388, January 4, 2006, Vol. 71, No. 2
Purpose	Improve public health protection by reducing exposure to disinfection byproducts. Some disinfectants and disinfection byproducts (DBPs) have been shown to cause cancer and reproductive effects in lab animals and suggested bladder cancer and reproductive effects in humans.
General Description	The DBPRs require public water systems (PWSs) to: ► Comply with established maximum contaminant levels (MCLs) and operational evaluation levels (OELs) for DBPs, and maximum residual disinfection levels (MRDLs) for disinfectant residuals. ► Conduct an initial evaluation of their distribution system. In addition, PWSs using conventional filtration are required to remove specific percentages of organic material that may react to form DBPs through the implementation of a treatment technique.
Utilities Covered	The DBPRs apply to all sizes of community water systems (CWSs) and nontransient noncommunity water systems (NTNCWSs) that add a disinfectant other than ultraviolet (UV) light or deliver disinfected water, and transient noncommunity water systems (TNCWSs) that add chlorine dioxide.

*This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Overview of Requirements

This table shows how the requirements for the Stage 2 DBPR build on the existing requirements established in the Stage 1 DBPR. For more information on changes in monitoring requirements, see Table 1.

		Stage 1 DBPR	Stage 2 DBPR	For More Info:
Coverage	All CWSs and NTNCWSs that add disinfectant other than UV light and TNCWSs that treat with chlorine dioxide.	✓	✓	
	Consecutive systems that deliver water treated with a disinfectant other than UV light.		✓	
TTHM & HAA5 MCL Compliance	MCL compliance is calculated using the running annual average (RAA) of all samples from all monitoring locations across the system.	✓		See Table 3 and Table 4.
	MCL compliance is calculated using the locational RAA (LRAA) for each monitoring location in the distribution system.		✓	
Regulated Contaminants & Disinfectants	*Contaminants*			See Table 2.
	Total Trihalomethanes (TTHM)	✓	✓	
	5 Haloacetic Acids (HAA5)	✓	✓	
	Bromate	✓	Regulated under Stage 1 DBPR[1]	
	Chlorite	✓	Regulated under Stage 1 DBPR	
	Disinfectants			
	Chlorine/chloramines	✓	Regulated under Stage 1 DBPR	
	Chlorine dioxide	✓	Regulated under Stage 1 DBPR	
Operational Evaluation	If an operational evaluation level (OEL) is exceeded, systems must evaluate practices and identify DBP mitigation actions.		✓	See Table 5.

1. A new analytical method for bromate was approved with the Stage 2 DBPR.

Table 1. Changes in Monitoring Requirements

			Stage 1 DBPR	Stage 2 DBPR
TTHM/ HAA5 Routine Monitoring	Number of Samples		Based on source water type, population, and number of treatment plants or wells.	Based on source water type and population.
	Sample Locations		At location of maximum residence time.[1]	Based on Initial Distribution System Evaluation (IDSE) requirements.[2]
	Compliance Calculation		RAA must not exceed the MCL for TTHM or HAA5.	LRAA must not exceed the MCL for TTHM or HAA5.
Reduced Monitoring	Eligibility	TTHM/HAA5	All systems need TTHM RAA ≤ 0.040 mg/L and HAA5 ≤ 0.030 mg/L. Subpart H systems also need source water TOC RAA at location prior to treatment ≤ 4.0 mg/L .[3, 4] The Stage 2 DBPR left eligibility unchanged but specifies that Subpart H systems must take source water TOC samples every 30 days. Subpart H systems on reduced monitoring must take source water TOC samples every 90 days to qualify for reduced monitoring.	
		Bromate[5]	Source water bromide RAA < 0.05 mg/L. With the Stage 2 DBPR specified entry point to distribution system bromate RAA ≤ 0.0025 mg/L.	

[1]Subpart H systems serving ≥ 10,000 must have at least 25 percent of samples at the location of maximum residence time; the remaining samples must be representative of average residence time.

[2]All systems are required to satisfy their IDSE requirement by July 10, 2010.

[3]Subpart H systems are water systems that use surface water or ground water under the direct influence of surface water (GWUDI).

[4]Ground water systems serving < 10,000 must meet these RAA for 2 years; can also qualify for reduced monitoring if the TTHM RAA is ≤ 0.020 mg/L and a HAA5 RAA ≤ 0.015 mg/L for 1 year.

[5]A new analytical method for bromate was established with the Stage 2 DBPR.

Table 2. Regulated Contaminants and Disinfectants

	Stage 1 DBPR		Stage 2 DBPR	
Regulated Contaminants	MCL (mg/L)	MCLG (mg/L)	MCL (mg/L)	MCLG (mg/L)
TTHM	0.080		Unchanged[2]	
Chloroform		-		0.07
Bromodichloromethane		Zero		Unchanged[2]
Dibromochloromethane		0.06		Unchanged[2]
Bromoform		Zero		Unchanged[2]
HAA5	0.060		Unchanged[2]	
Monochloroacetic acid		-		0.07
Dichloroacetic acid		Zero		Unchanged[2]
Trichloroacetic acid		0.3		0.2
Bromoacetic acid		-		-
Dibromoacetic acid		-		-
Bromate (plants that use ozone)[1]	0.010	Zero	Unchanged[2]	Unchanged[2]
Chlorite (plants that use chlorine dioxide)	1.0	0.8	Unchanged[2]	Unchanged[2]
Regulated Disinfectants	**MRDL[3] (mg/L)**	**MRDLG[3] (mg/L)**	**MRDL (mg/L)**	**MRDLG (mg/L)**
Chlorine	4.0 as Cl_2	4	Unchanged[2]	Unchanged[2]
Chloramines	4.0 as Cl_2	4	Unchanged[2]	Unchanged[2]
Chlorine dioxide	0.8	0.8	Unchanged[2]	Unchanged[2]

[1]A new analytical method for bromate was established with the Stage 2 DBPR.

[2]Stage 2 DBPR did not revise the MCL or MRDL for this contaminant/disinfectant.

[3]Stage 1 DBPR included MRDLs and MRDLGs for disinfectants, which are similar to MCLs and MCLGs.

Table 3. Compliance Determination

	Stage 1 DBPR	Stage 2 DBPR
TTHM/HAA5	RAA	LRAA
Bromate[1]	RAA	Unchanged[2]
Chlorite	Daily/follow-up monitoring	Unchanged[2]
Chorine dioxide	Daily/follow-up monitoring	Unchanged[2]
Chlorine/chloramines	RAA	Unchanged[2]
DBP precursors (TOC sample set)*	Monthly for TOC and alkalinity	Every 30 days for TOC and alkalinity

[1]A new analytical method for bromate was established with the Stage 2 DBPR.

[2]Stage 2 DBPR did not change the compliance requirements for this contaminant/disinfectant.

*TOC sample set is comprised of source water alkalinity, source water TOC, and treated TOC.

Table 4. Compliance with MCLs and MRDLs (Routine Monitoring)

Contaminant/ Disinfectant	Coverage		Stage 1 DBPR		Stage 2 DBPR	
	Source Water	Population	Monitoring Frequency	Total Distribution System Monitoring Locations	Monitoring Frequency[1]	Total Distribution System Monitoring Locations
TTHM/HAA5	Subpart H	< 500	Per year[2]	1 per treatment plant	Per year[2]	2
		500 - 3,300	Per quarter	1 per treatment plant	Per quarter	2
		3,301 - 9,999				
		10,000 - 49,000		4 per treatment plant		4
		50,000 - 249,999				8
		250,000 - 999,999				12
		1,000,000 - 4,999,999				16
		≥ 5,000,000				20
	Ground water	< 500	Per year[2]	1 per treatment plant	Per year[2]	2
		500 - 9,999				
		10,000 - 99,999	Per quarter		Per quarter	4
		100,000 - 499,999				6
		≥ 500,000				8
Bromate[3]	Systems that use ozone as a disinfectant		Monthly	1 at entry point to distribution system	Unchanged[4]	
Chlorite	Systems that use chlorine dioxide as a disinfectant		**Daily** (at entrance to distribution system); **monthly** (in distribution system)	1 at entry point to distribution system; 3 in distribution system	Unchanged[4]	
Chlorine dixoide	Systems that use chlorine dioxide as a disinfectant		Daily	1 at entry point to distribution system	Unchanged[4]	
Chorine/ Chloramines	All systems		Same location and frequency as Total Coliform Rule (TCR) sampling		Unchanged[4]	
DBP precursors (TOC sample set)*	Systems that use conventional filtration		Monthly	1 per source water source	Unchanged[4]	

[1]All systems must monitor during the month of highest DBP concentrations. Systems on quarterly monitoring, except Subpart H systems serving 500 - 3,300, must take dual sample sets every 90 days at each monitoring location. Systems on annual monitoring and Subpart H systems serving 500 - 3,300 are required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentrations, respectively. If monitoring annually, only one location with a dual sample set per monitoring period is needed if the highest TTHM and HAA5 concentrations occur at the same location and in the same month.

[2]Ground water systems serving < 10,000 and Subpart H systems serving < 500 must increase monitoring to quarterly if an MCL is exceeded.

[3]A new analytical method for bromate was established with the Stage 2 DBPR.

[4]Stage 2 DBPR did not revise the monitoring frequency or location requirements for this contaminant/disinfectant.

*TOC sample set is comprised of source water alkalinity, source water TOC, and treated TOC.

Table 5. Operational Evaluation Levels (OELs)

Applies to:	All systems subject to Stage 2 DBPR monitoring requirements that conduct compliance monitoring and collect samples quarterly.
Purpose of establishing OELs:	To reduce peaks in DBP levels and exposure to high DBP levels.
OEL calculations:	► Calculated for both TTHMs and HAA5s at each monitoring location using Stage 2 DBPR compliance monitoring results. ► OEL is determined by the sum of the two previous quarter's TTHM or HAA5 result plus twice the current quarter's TTHM or HAA5 result at that location, divided by four. ► OEL = (Q1 + Q2 + 2Q3) / 4
OELs are exceeded:	During any quarter in which the OEL is greater than the TTHM or HAA5 MCL.
If an OEL is exceeded, a system must:	► Conduct an operational evaluation. ► Submit a written report of the evaluation to the state no later than 90 days after being notified of the analytical results that caused the exceedance(s). ► Keep a copy of the operational evaluation report and make it publically available upon request.
The operational evaluation must include:	► An examination of the treatment and distribution systems' operational practices that may contribute to TTHM and HAA5 formation. ► Steps to minimize future exceedances.
OEL requirements take effect:	When the system begins compliance monitoring for the Stage 2 DBPR.

Table 6. Standard Monitoring Compliance Dates

If You are a System Serving:	Schedule[1]	Begin LRAA TTHM & HAA5 Monitoring By:
At least 100,000 people or part of a combined distribution system (CDS) serving at least 100,000 people.	1	April 1, 2012
50,000 to 99,999 people or part of a CDS serving 50,000 to 99,999 people.	2	October 1, 2012
10,000 to 49,999 people or part of a CDS serving 10,000 to 49,999 people.	3	October 1, 2013
Less than 10,000 people or part of a CDS serving less than 10,000 people.	4	October 1, 2013[2]

[1]Your schedule is determined by the largest system in your CDS.

[2]Systems not conducting *Cryptosporidium* monitoring under Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) must begin LRAA TTHM/HAA5 monitoring by this date. Systems conducting *Cryptosporidium* monitoring under LT2ESWTR must begin LRAA TTHM/HAA5 monitoring by October 1, 2014.

Table 7. TOC Removal

Subpart H systems that use conventional filtration treatment are required to remove specific percentages of organic materials, measured as total organic carbon (TOC), that may react with disinfectants to form DBPs. Removal must be achieved through a treatment technique (enhanced coagulation or enhanced softening) unless a system meets alternative criteria. Systems practicing softening must meet TOC removal requirements for source water alkalinity greater than 120 mg/L $CaC0_3$.

Source Water TOC (mg/L)	Source Water Alkalinity, mg/L as $CaCO_3$		
	0 - 60	> 60 to 120	> 120
> 2.0 to 4.0	35.0%	25.0%	15.0%
> 4.0 to 8.0	45.0%	35.0%	25.0%
> 8.0	50.0%	40.0%	30.0%

For additional information on the DBPRs:

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at http://water.epa.gov/drink; or contact your state drinking water representative.

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Lead and Copper Rule: A Quick Reference Guide

Overview of the Rule

Title[1]	Lead and Copper Rule (LCR)[2], 56 FR 26460 - 26564, June 7, 1991
Purpose	Protect public health by minimizing lead (Pb) and copper (Cu) levels in drinking water, primarily by reducing water corrosivity. Pb and Cu enter drinking water mainly from corrosion of Pb and Cu containing plumbing materials.
General Description	Establishes action level (AL) of 0.015 mg/L for Pb and 1.3 mg/L for Cu based on 90th percentile level of tap water samples. An AL exceedance is not a violation but can trigger other requirements that include water quality parameter (WQP) monitoring, corrosion control treatment (CCT), source water monitoring/treatment, public education, and lead service line replacement (LSLR).
Utilities Covered	All community water systems (CWSs) and non-transient non-community water systems (NTNCWSs) are subject to the LCR requirements.

Public Health Benefits

Implementation of the LCR has resulted in	► Reduction in risk of exposure to Pb that can cause damage to brain, red blood cells, and kidneys, especially for young children and pregnant women. ► Reduction in risk of exposure to Cu that can cause stomach and intestinal distress, liver or kidney damage, and complications of Wilson's disease in genetically predisposed people.

Major Monitoring Provisions

Lead and Copper Tap

Applicability	► All CWSs and NTNCWSs.
Standard	► CWSs and NTNCWSs must collect first-draw samples at taps in homes/buildings that are at high risk of Pb/Cu contamination as identified in 40 CFR 141.86(a). ► Number of samples is based on system size (see Table 1). ► Systems must conduct monitoring every 6 months unless they qualify for reduced monitoring.
Reduced	► See Table 1 for sample number and Table 2 for criteria.

Water Quality Parameter (WQP)

Applicability	► Systems serving > 50,000 people. ► Systems serving ≤ 50,000 during monitoring periods in which either AL is exceeded.
Standard	► WQP samples at taps are collected every 6 months. ► WQPs at entry points to distribution system (EPTDS) are collected every 6 months prior to CCT installation, then every 2 weeks.
Reduced	► See Table 1 for sample number and page 2 for criteria. Does not apply to EPTDS WQP monitoring.

Table 1: Lead and Copper Tap and WQP Tap Monitoring

Size Category	System Size	Number of Pb/Cu Tap Sample Sites[3]		Number of WQP Tap Sample Sites[4]	
		Standard	Reduced	Standard	Reduced
Large	> 100K	100	50	25	10
	50,001 - 100K	60	30	10	7
Medium	10,001 - 50K	60	30	10	7
	3,301 - 10K	40	20	3	3
Small	501 - 3,300	20	10	2	2
	101 - 500	10	5	1	1
	≤ 100	5	5	1	1

[3] With written State approval, PWSs can collect < 5 samples if all taps used for human consumption are sampled.
[4] Two WQP tap samples are collected at each sampling site.

Table 2: Criteria for Reduced Pb/Cu Tap Monitoring

Annual	1. PWS serves ≤ 50,000 people and is ≤ both ALs for 2 consecutive 6-month monitoring periods; or 2. Any PWS that meets optimal WQPs (OWQPs) and is ≤ Pb AL for 2 consecutive 6-month monitoring periods.
Triennial	1. PWS serves ≤ 50,000 people and is ≤ both ALs for 3 consecutive years of monitoring; or 2. Any PWS that meets OWQP specifications and is ≤ Pb AL for 3 consecutive years of monitoring; or 3. Any PWS with 90th percentile Pb and Cu levels ≤ 0.005 mg/L and ≤ 0.65 mg/L, respectively, for 2 consecutive 6-month monitoring periods (i.e., accelerated reduced Pb/Cu tap monitoring).
Every 9 years	PWS serves ≤ 3,300 people and meets monitoring waiver criteria found at 40 CFR 141.86(g).

Lead Consumer Notice

Within 30 days of learning the results, all systems must provide individual Pb tap results to people who receive water from sites that were sampled, *regardless of whether the results exceed the Pb AL*, as required by 40 CFR 141.85(d).

Consumer Confidence Report (CCR)

All CWSs, irrespective of their lead levels, must provide an educational statement about lead in drinking water in their CCRs as required by 40 CFR 141.154. Must be in 2008 CCR (due July 1, 2009) if EPA is Primacy Agency, State adopts the rule by reference automatically, or adopts during 2008. Otherwise, this statement is required in the 2009 CCR (due July 1, 2010).

[1] This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

[2] The June 1991 LCR was revised with the following Technical Amendments: 56 FR 32112, July 15, 1991; 57 FR 28785, June 29, 1992; 59 FR 33860, June 30, 1994.

It was subsequently revised by: the LCR Minor Revisions, 65 FR 1950, January 12, 2000; and the LCR Short-Term Revisions, 72 FR 57782, October 10, 2007.

Treatment Technique and Sampling Requirements if the AL is Exceeded[5]

[5] Based on 90th percentile level. Multiply number of valid samples by 0.9 (e.g., 10 samples x 0.9 = 9; thus, use 9th highest Pb and Cu test result to compare to AL). For 5 samples, average 4th and 5th highest results. For < 5 samples, use highest result.

Water Quality Parameter (WQP)

Applicability	Refer to page 1.
Parameters	► pH, alkalinity, calcium *(initial only, unless calcium carbonate stabilization is used)*, conductivity *(initial monitoring only)*, orthophosphate *(if inhibitor is phosphate-based)*; silica *(if inhibitor is silicate-based)*, and temperature *(initial monitoring only)*.
Frequency	► Systems installing CCT, must conduct follow-up monitoring for 2 consecutive 6-month periods. ► WQP tap monitoring is conducted every 6 months, EPTDS monitoring increases to every 2 weeks. ► After follow-up monitoring, State sets OWQP specifications that define optimal CCT.
Reduced Tap Monitoring	► Collect reduced number of sampling sites (see Table 1) if meet OWQPs for 2 consecutive 6-month periods. ► Collect reduced number of sampling sites at reduced frequency if meet OWQPs for: – 6 consecutive 6-month monitoring periods can monitor annually; – 3 consecutive years of annual monitoring can monitor triennially.

Public Education (PE)

Applicability	► Systems that exceed the Pb AL (*not required if only the Cu AL is exceeded*).
Purpose	► Educates consumers about lead health effects, sources, and steps to minimize exposure.
Delivery Method	► CWSs: deliver materials to bill-paying customers and post lead information on water bills, work in concert with local health agencies to reach at-risk populations (children, pregnant woman), deliver to other organizations serving "at-risk" populations, provide press releases, include new outreach activities from list in 40 CFR 141.85(a)(2)(vi), and post to Web site (CWSs serving > 100,000 only). ► NTNCWSs: posting and distribution to all consumers (can be electronic with State permission). Can apply to CWSs such as hospitals and prisons where population cannot make improvements.
Timing	► Within 60 days *after end of monitoring period* in which Pb AL was exceeded if not already delivering PE.[6] ► Repeat annually except: water bill inserts - quarterly; press releases - 2x/year, and Web posting - continuous. ► Can discontinue whenever ≤ Pb AL but must recommence if subsequently exceed Pb AL.

[6] State may allow extension in some situations. Also, State may require approval of message content prior to delivery.

Source Water Monitoring and Source Water Treatment (SOWT)

Applicability	► Systems that exceed Pb or Cu AL.
Purpose	► Determine contribution from source water to total tap water Pb and Cu levels and need for SOWT.
Timing	► One set of samples at each EPTDS is due within 6 months of first AL exceedance. ► System has 24 months to install any required SOWT. ► State sets maximum permissible levels (MPLs) for Pb and Cu in source water based on initial and follow-up source water monitoring.
Standard	► Ground water PWSs monitor once during 3-year compliance periods; surface water PWSs monitor annually.
Reduced	► Monitor every 9 years if MPLs are not exceeded during 3 consecutive compliance periods for ground water PWSs or 3 consecutive years for surface water PWSs.

Corrosion Control Treatment (CCT)

Applicability	► All large systems except those meeting requirements of 40 CFR 141.81(b)(2) or (b)(3). ► Medium and small systems that exceed either AL; may stop CCT steps if ≤ both ALs for 2 consecutive 6-month periods but must recommence CCT if subsequently exceed either AL.
Study	► All large systems except as noted above. ► If State requires study for small or medium systems, it must be completed within 18 months.
Treatment	► Once State determines type of CCT to be installed, PWS has 24 months to install. ► Systems installing CCT must conduct 2 consecutive 6 months of follow-up tap and WQP monitoring.
OWQPs	► After follow-up Pb/Cu tap and WQP monitoring, State sets OWQPs. *Refer to WQP section above.*

Lead Service Line Replacement (LSLR)

Applicability	► Systems that continue to exceed the Pb AL after installing CCT and/or SOWT. ► Can discontinue LSLR whenever ≤ Pb AL in tap samples for 2 consecutive 6-month monitoring periods; must recommence if subsequently exceed.
Monitoring	► Optional: Sample from LSL to determine if line must be replaced. If all samples are ≤ 0.015 mg/L, line is considered "replaced through testing"; must reconsider these lines if Pb AL is subsequently exceeded. ► Required: Sample from any LSLs not completely replaced to determine impact on Pb levels.
Replacement	► Must replace at least 7% of LSLs annually; State can require accelerated schedule. ► If only portion of LSL is replaced, PWS must: – Notify customers at least 45 days prior to replacement about potential for increased Pb levels. – Collect samples within 72 hours of replacement and provide results within 3 days of receipt.

For additional information on the LCR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA Web site at http://water.epa.gov/drink; or contact your State drinking water representative.

United States Environmental Protection Agency

The Third Unregulated Contaminant Monitoring Rule (UCMR 3)

Searching for Emerging Contaminants in Drinking Water

What is the Unregulated Contaminant Monitoring Rule?

The 1996 amendments to the Safe Drinking Water Act (SDWA) require that once every five years, the U.S. Environmental Protection Agency (EPA) issue a new list of no more than 30 unregulated contaminants to be monitored by public water systems (PWSs). The Unregulated Contaminant Monitoring Rule (UCMR) provides EPA and other interested parties with scientifically valid data on the occurrence of contaminants in drinking water. These data serve as a primary source of occurrence and exposure information that the agency uses to develop regulatory decisions.

The final rule "Revisions to the Unregulated Contaminant Monitoring Rule (UCMR 3) for Public Water Systems" was published in the *Federal Register* on May 2, 2012 (77 FR 26072). UCMR 3 monitoring will take place from 2013-2015, and includes monitoring for 28 chemicals and two viruses.

What contaminants are systems looking for as part of UCMR 3?

Under UCMR 3, public water systems or EPA will conduct sampling and analysis for Assessment Monitoring (List 1), Screening Survey (List 2), and Pre-Screen Testing (List 3) contaminants, as follows:

UCMR 3 Contaminant List			
Assessment Monitoring (List 1 Contaminants)			
1,2,3-trichloropropane	bromomethane (methyl bromide)	chloromethane (methyl chloride)	bromochloromethane (Halon 1011)
chlorodifluoromethane (HCFC-22)	1,3-butadiene	1,1-dichloroethane	1,4-dioxane
vanadium	molybdenum	cobalt	strontium
chromium[1]	chromium-6[2]	chlorate	perfluorooctanesulfonic acid (PFOS)
perfluorooctanoic acid (PFOA)	perfluorobutanesulfonic acid (PFBS)	perfluorohexanesulfonic acid (PFHxS)	perfluoroheptanoic acid (PFHpA)
perfluorononanoic acid (PFNA)			
Screening Survey (List 2 Contaminants)			
17-β-estradiol	estriol	estrone	4-androstene-3,17-dione
17-α-ethynylestradiol	equilin	testosterone	
Pre-Screen Testing[3] (List 3 Contaminants)			
enteroviruses	noroviruses		

1. Monitoring for total chromium, in conjunction with UCMR 3 Assessment Monitoring, is required under the authority provided in Section 1445 (a)(1)(A) of SDWA.
2. Chromium-6 will be measured as soluble chromate (ion).
3. Monitoring for microbial indicators, in conjunction with Pre-Screen Testing, will be conducted, including: total coliforms, *E.coli*, bacteriophage, *Enterococci* and aerobic spores. EPA will pay for all sampling and analysis costs for the small systems selected for this monitoring.

Which water systems will participate in UCMR 3?

The UCMR program divides contaminants into three types of monitoring. UCMR 3 includes monitoring under each of the three lists:

- **Assessment Monitoring (List 1):** All PWSs serving more than 10,000 people (i.e., large systems) and 800 representative PWSs serving 10,000 or fewer people (i.e., small systems) will monitor for 21 chemicals during a 12-month period from 2013-2015.
- **Screening Survey (List 2):** All PWSs serving more than 100,000 people, a representative sample of 320 large PWSs serving 10,001 to 100,000 people, and a representative sample of 480 small PWSs serving 10,000 or fewer people will monitor for seven chemicals during a 12-month period from 2013-2015.

- **Pre-Screen Testing (List 3):** A representative selection of 800 undisinfected ground water PWSs serving 1,000 or fewer people will participate in monitoring for two viruses (i.e., enterovirus and norovirus) and related pathogen indicators (i.e., total coliforms, *E. coli*, bacteriophage, *Enterococci*, and aerobic spores) during a 12-month period from 2013-2015. The virus monitoring will take place in sensitive hydrogeological areas (e.g., karst or fractured bedrock).

Approximately, 6,000 PWSs are participating in UCMR 3. All laboratories conducting analyses for UCMR 3 List 1 and List 2 contaminants must receive EPA approval to perform those analyses (see "UCMR 3 Laboratory Approval Requirements and Information Document" for details of the EPA laboratory approval program). Pre-Screen Testing (List 3) analyses for viruses and indicators are organized and paid for by EPA through direct contracts with laboratories.

Where will samples be collected?

UCMR 3 samples are to be collected at entry points to the distribution system for all contaminants. Assessment Monitoring systems must also sample for chromium, chromium-6, cobalt, molybdenum, strontium, vanadium, and chlorate in the distribution system.

What does UCMR 3 participation involve? What does it cost?

Participating systems collect drinking water samples and have them tested for UCMR contaminants. Large PWSs (systems serving more than 10,000 people) pay for their own testing costs ($50-$470 per sample, per testing method, on average). EPA pays for the testing costs of small PWSs (systems serving 10,000 or fewer people) and manages the small system monitoring.

How did EPA select the UCMR 3 contaminants?

EPA used a stepwise prioritization process to identify potential UCMR 3 contaminants. An agency and state working group first reviewed the third Contaminant Candidate List (CCL 3), as well as the contaminants considered in the development of CCL 3. The final CCL 3 is comprised of contaminants that were selected through a data-driven process that considered adverse health effects (potency and severity) and occurrence (prevalence and magnitude). EPA used CCL 3, along with additional sources of information about other emerging contaminants of potential concern, to establish an initial list of potential UCMR 3 contaminants. This list was further pared down by eliminating contaminants with methods that would not be ready for UCMR 3 monitoring and contaminants included in UCMR 1 or UCMR 2 monitoring. EPA published this proposed list of 30 contaminants in the Federal Register on March 3, 2011. After receiving and considering public comments on the proposed list, EPA added chromium-6 and total chromium to UCMR 3, and removed *sec*-butylbenzene and *n*-propylbenzene, both non-carcinogenic VOCs.

What does this information mean to me?

Contaminant monitoring is part of a larger process that EPA, states, tribes, water systems, and other partners use to protect drinking water. Health information is necessary to know whether these contaminants pose a health risk, but it is often incomplete for unregulated contaminants. Some contaminants maybe harmful at low levels; others may be harmful only at much higher levels. UCMR examines what is in the drinking water, but additional health information is needed to know whether these contaminants pose a health risk.

What are the environmental and public health benefits?

UCMR 3 benefits the environment and public health as follows: EPA and other interested parties will have scientifically valid data on the occurrence of targeted contaminants in drinking water; EPA can assess the number of people potentially being exposed; and EPA can provide an estimate of the levels of that exposure. This data set is one of the primary sources of occurrence and exposure information the agency uses to develop regulatory decisions for contaminants of concern.

Where can consumers find UCMR results?

If a PWS monitoring for UCMR 3 finds contaminants in its drinking water, it provides the information to its customers in an annual water quality report (called a Consumer Confidence Report). This includes both regulated and unregulated contaminants. Most systems mail these reports directly to customers, and many reports are available from EPA's website. EPA also makes the results available online via its National Drinking Water Contaminant Occurrence Database, http://water.epa.gov/scitech/datait/databases/drink/ncod/databases-index.cfm. These results will be posted on an ongoing basis after they have been reviewed for quality.

How can I learn more?

For general information on UCMR 3, go to: http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/ucmr3/ or contact the Safe Drinking Water Hotline at (800) 426-4791, or at: http://water.epa.gov/drink/contact.cfm.

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Record Keeping Rules: A Quick Reference Guide

Introduction

Purpose	This Guide will help you better understand: ◆ What records you are required to keep. ◆ The types of system information and additional records you should keep. ◆ How long this information should be retained to maintain a comprehensive history of your public water system (PWS). ◆ The benefits of record keeping. ◆ How to keep your records secure.
Target Audience	This guide is intended for owners and operators of all PWSs serving **fewer** than 10,000 persons.

Benefits of Record Keeping

Record keeping has many benefits and can help you improve the operation and management of your system. Some benefits of recordkeeping are:

- Records are a simple, easy, and cost-effective management tool.
- Complete, well-organized records can help ensure proper system operation and maintenance of facilities and equipment, helping facilities run more efficiently.
- Accurate records can help to educate new staff, guide all staff in recognizing and diagnosing problems, and provide possible solutions.
- Records can help resolve customer complaints.
- Records document changes that occur in water use, water quality, and water availability.
- Records can help facilitate communication with customers, regulators, and decision makers.
- Financial records can help determine if revenues are covering costs, help plan for the future, and assist in compiling information for required reports.

General Record Keeping Requirements[1]

All PWSs Must Keep Records of	*Frequency*
◆ Actions taken by your system to correct violations of primary drinking water regulations (40 Code of Federal Regulations [CFR] 141.33). ◆ Public notices that your system issues (40 CFR 141.33).	At least 3 years
◆ Microbiological and turbidity analyses (40 CFR 141.33).[2] You may maintain actual laboratory results or a summary of these results. (See 40 CFR 141.33 for specific requirements.) Groundwater systems may not be required to keep turbidity records. ◆ Variances or exemptions (40 CFR 141.33).	At least 5 years
◆ Chemical analyses (e.g., disinfectant residuals; disinfection byproducts; nitrate/nitrite; radionuclides; inorganic, volatile organic, and synthetic organic compounds)[2] (40 CFR 141.33). You may maintain actual laboratory results or a summary of these results. (See 40 CFR 141.33 for specific requirements.) ◆ Sanitary surveys and written reports and summaries of sanitary surveys (40 CFR 141.33).	At least 10 years

[1] States may adopt more stringent record keeping requirements. Check with your state to determine if your system is subject to additional state requirements.
[2] These requirements may not apply if your system purchases its drinking water and provides no additional treatment. Contact your state for more information.

In addition to the requirements listed on the previous page, some Rules have more extensive record keeping requirements. These requirements and the systems to which they apply are listed below.

Additional Rule Specific Record Keeping Requirements

Rule	*If You Are*	*You Must Keep*	*Frequency*
Public Notification Rule	A PWS	Any public notification issued (40 CFR 141.33(e))	At least 3 years
Consumer Confidence Rule	A community water system (CWS)	Consumer Confidence Reports (40 CFR 141.155(h))	At least 3 years
Lead and Copper Rule	A CWS or nontransient noncommunity water system (NTNCWS) that has had a lead action level exceedance (ALE)	Records of Public Education for a lead ALE (40 CFR 141.91)	At least 12 years
	A CWS or NTNCWS	Records of all lead and copper results, including water quality parameters, source water sampling results, corrosion control recommendations and studies, public education materials, state determinations, schedules, letters, and evaluations (40 CFR 141.91)	At least 12 years
Phase II/V Rules	No additional rule specific record keeping requirements.		
Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR)	A CWS or NTNCWS that adds a disinfectant during any part of the treatment process or a TNCWS using chlorine dioxide	Stage 1 DBPR monitoring plans (40 CFR 141.33(f))	At least 10 years
Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR)	A CWS or NTNCWS that adds and/or delivers water treated with a primary or residual disinfectant other than ultraviolet light	Stage 2 DBPR (Subpart V) monitoring plans and analytical results (40 CFR 141.629(b))	At least 10 years
Surface Water Treatment Rule	No additional rule specific record keeping requirements.		
Interim Enhanced Surface Water Treatment Rule	This rule is not covered by this Quick Reference Guide because it applies to systems serving greater than 10,000 persons.		
Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR)	A PWS using surface water or groundwater under the direct influence of surface water (GWUDI) sources	Results from disinfection profiling and benchmarking (including raw data and analysis), if you were required to develop a disinfection profile and benchmark (40 CFR 141.571)	Indefinitely
	A PWS using surface water or GWUDI sources and using conventional or direct filtration	Individual filter monitoring results (40 CFR 141.571)	At least 3 years

In addition to the requirements listed on the first page, some Rules have more extensive record keeping requirements. These requirements and the systems to which they apply are listed below.

Additional Rule Specific Record Keeping Requirements (continued)

Rule	*If You Are*	*You Must Keep*	*Frequency*
Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)	A subpart H PWS supplied by surface water or GWUDI sources	Results from initial source water monitoring and the second round of source water monitoring **OR** Notification to the state that you will not conduct source water monitoring under the LT2ESWTR because your system meets the criteria under 40 CFR 141.701(d)	At least 3 years after bin classification for filtered systems and after determination of mean *Crypto* level for unfiltered systems **OR** At least 3 years
		Results of treatment monitoring associated with microbial toolbox options and uncovered finished water reservoirs required under the LT2ESWTR, if applicable (40 CFR 141.722)	At least 3 years
Filter Backwash Recycling Rule	A PWS that recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes	A copy of the recycle notification and information submitted to the state (40 CFR 141.76(d))	Indefinitely
		A list of all recycle flows and the frequency with which they are returned (40 CFR 141.76(d))	Indefinitely
		Average and maximum backwash flow rate through the filters (40 CFR 141.76(d))	Indefinitely
		Average and maximum duration of the filter backwash process in minutes (40 CFR 141.76(d))	Indefinitely
		A typical filter run length and a written summary of how filter run length is determined (40 CFR 141.76(d))	Indefinitely
		The type of treatment provided for recycle flow (40 CFR 141.76(d))	Indefinitely
		If applicable, data on the physical dimensions of the treatment and/or equalization units, typical and maximum hydraulic loading rates, type of treatment chemicals used and average dose and frequency of use, and the frequency at which solids are removed (40 CFR 141.76(d))	Indefinitely

What Additional Records Should My System Keep on File?

Records you may want to keep include:

- Information on system infrastructure (e.g., up-to-date as built engineering drawings, maps of valve and hydrant locations, pipe sizes and locations, permits, etc.).
- Equipment purchase and repair records.
- Operations and routine maintenance log sheets.
- Locations and dates of leak repairs.
- Records related to water treatment, including filter backwash logs, turbidity readings that are taken in addition to those required by regulation, coagulation records, and corrosivity control records.
- Records of chemical purchases.
- Records on source production, including static and pumping water levels, flow, and water use.
- Records of customer complaints, reason for the complaints, findings, and resolution.
- Public meeting and board meeting minutes.
- Records of operator certifications.
- Correspondence with regulators.
- Meter reading reports.
- Financial information, including budgets and customer billing records.

Contact your state primacy agency for additional information on other records your system should keep on file.

Issues to Consider About the Generation and Storage of Records

Records Security	◆ Limit access to sensitive information to authorized individuals, but make it available to employees who may need it. ◆ Keep hard copy sensitive information locked and ensure that only authorized personnel have access. ◆ Install and maintain firewalls on network computers, or ensure that computers with sensitive information are not connected to a network or the internet. ◆ Install and regularly run virus scans on networks and individual computers. ◆ Use passwords to control access to data. ◆ Install and maintain a back-up power supply so that information may be accessed during a power failure. ◆ Maintain a back-up of sensitive electronic information in the event of an emergency. Also keep copies of sensitive hard copy information. Store both electronic and hard copy duplicates in a secure off-site location.
Record Retention and Destruction Processes	◆ Develop a hard copy or electronic filing system to ensure efficient access to data. ◆ Ensure that there is a satisfactory way to destroy electronic and hard copy files that contain sensitive information (e.g., shred paper copies, erase old hard drives, and destroy other electronic media).

For additional information:
Call the Safe Drinking Water Hotline at 1-800-426-4791, visit the EPA Web site at www.epa.gov/safewater/, or contact your state drinking water representative.

Office of Water September 2006 EPA 816-F-06-033

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United States Environmental Protection Agency

The Public Notification Rule: A Quick Reference Guide

Overview of the Rule

Title	Public Notification (PN) Rule, 65 FR 25982, May 4, 2000.
Purpose	To notify the public of drinking water violations or situations that may pose a risk to public health.
General Description	The PN Rule requires all public water systems (PWSs) to notify their consumers any time a PWS violates a national primary drinking water regulation or has a situation posing a risk to public health. Notices must be provided to persons served (not just billing customers).
Utilities Covered	All PWSs.
Timing and Distribution	Notices must be sent within 24 hours, 30 days, or one year depending on the tier to which the violation is assigned. The clock for notification starts when the PWS learns of the violation.

Tier 1 (Immediate Notice, Within 24 Hours)

Tier 1 PN is required to be issued as soon as practical but no later than 24 hours after the PWS learns of the violation or situation including:

- Distribution system sample violation when fecal coliform or *E. coli* are present; failure to test for fecal coliform or *E. coli* after initial total coliform distribution system sample tests positive.
- Nitrate, nitrite, or total nitrate and nitrite maximum contaminant level (MCL) violation; failure to take confirmation sample.
- Special notice for noncommunity water systems (NCWSs) with nitrate exceedances between 10 mg/L and 20 mg/L, where system is allowed to exceed 10 mg/L by primacy agency.
- Chlorine dioxide maximum residual disinfectant level (MRDL) violation when one or more of the samples taken in the distribution system exceeds the MRDL on the day after a chlorine dioxide measurement taken at the entrance to the distribution system exceeds the MRDL, or when required samples are not taken in the distribution system.
- Exceedance of maximum allowable turbidity level, if elevated to a Tier 1 notice by primacy agency.
- Waterborne disease outbreak or other waterborne emergency.
- Detection of *E. coli*, enterococci, or coliphage in a ground water source sample.
- Other violations or situations determined by the primacy agency.

Tier 2 (Notice as Soon as Practical, Within 30 Days)

Tier 2 PN is required to be issued as soon as practical or within 30 days. Repeat notice every 3 months until violation or situation is resolved.

- All MCL, MRDL, and treatment technique violations, except where Tier 1 notice is required.
- Monitoring violations, if elevated to Tier 2 notice by primacy agency.
- Failure to comply with variance and exemption conditions.
- For ground water systems providing 4-log treatment and conducting Ground Water Rule (GWR) compliance monitoring, failure to maintain required treatment for more than 4 hours.
- Failure to take any required corrective action or be in compliance with a corrective action plan for a fecal indicator-positive ground water source sample.
- Failure to take any required corrective action or be in compliance with a corrective action plan for a significant deficiency under the GWR.
- Special public notice for repeated failure to conduct monitoring for *Cryptosporidium.*

Turbidity consultation is required when a PWS has a treatment technique violation resulting from a single exceedance of the maximum allowable turbidity limit or an MCL violation resulting from an exceedance of the 2-day turbidity limit. The PWS must consult their primacy agency within 24 hours. Primacy agencies will then determine whether a Tier 1 PN is necessary. If consultation does not occur within 24 hours, violations are automatically elevated to require Tier 1 PN.

Tier 3 (Annual Notice)

Tier 3 PN is required to be issued within 12 months and repeated annually for unresolved violations.

- All monitoring or testing procedure violations, unless primacy agency elevates to Tier 2, including failure to conduct benchmarking and profiling (surface water systems) and failure to develop a monitoring plan (disinfecting systems).
- Operating under a variance and exemption.
- Special public notice for availability of unregulated contaminant monitoring results.
- Special public notice for fluoride secondary maximum contaminant level (SMCL) exceedance.

For additional information on the PN Rule

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA Web site at www.epa.gov/safewater/pn.html; or contact your state or local primacy agency's drinking water representative. Log onto the PNiWriter Web site to use EPA's templates at www.PNiWriter.com.

Ten Required Elements of a Public Notice

Unless otherwise specified in the regulations,* each notice must contain:

1. Description of the violation or situation, including the contaminant(s) of concern, and (as applicable) the contaminant level(s).
2. When the violation or situation occurred (i.e., date the sample was collected or was supposed to be collected).
3. Any potential adverse health effects from drinking the water and standard language regarding the violation or situation. (For MCL, MRDL, treatment technique violations, or violations of the conditions of a variance or exemption, use health effects language from Appendix B of the PN Rule. For monitoring and testing procedure violations, use the standard monitoring language below.)
4. The population at risk, including subpopulations that may be particularly vulnerable if exposed to the contaminant in their drinking water.
5. Whether alternate water supplies should be used.
6. Actions consumers should take, including when they should seek medical help, if known.
7. What the PWS is doing to correct the violation or situation.
8. When the PWS expects to return to compliance or resolve the situation.
9. The name, business address, and phone number or those of a designee of the PWS as a source of additional information concerning the notice.
10. A statement (see standard distribution language below) encouraging notice recipients to distribute the notice to others, where applicable.

** These elements do not apply to notices for fluoride SMCL exceedances, availability of unregulated contaminant monitoring data, and operation under a variance or exemption. Content requirements for these notices are specified in the PN Rule.*

Standard Language:
Standard Monitoring Language: We are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During [period] we [did not monitor or test/did not complete all monitoring or testing] for [contaminant(s)], and therefore cannot be sure of the quality of the drinking water during that time.

Standard Distribution Language: Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

Multilingual Requirements

- Where the PWS serves a large proportion of non-English speakers, the PWS must provide information in the appropriate language(s) on the importance of the notice or on how to get assistance or a translated copy.

Presentation and Distribution

- The Tier 1 PN must be issued via radio, TV, hand delivery, posting, or other method specified by the primacy agency to reach all persons served. PWSs must also initiate consultation with the primacy agency within 24 hours. Primacy agency may establish additional requirements during consultation.
- The Tier 2 and Tier 3 PNs must be issued by Community Water Systems (CWSs) via mail or direct delivery and by NCWSs via posting, direct delivery, or mail. Primacy agencies may permit alternate methods. All PWSs must use additional delivery methods reasonably calculated to reach other consumers not notified by the first method.*
- Notices for individual violations can be combined into an annual notice (including the Consumer Confidence Report [CCR], if PN requirements can still be met).
- Each PN:
  - Must be displayed in a conspicuous way.
  - Must not include overly technical language or very small print.
  - Must not be formatted in a way that defeats the purpose of the notice.
  - Must not include language that nullifies the purpose of the notice.
- If the notice is posted, it must remain in place for as long as the violation or situation persists, but in no case for less than seven days, even if the violation or situation is resolved.

*PWSs should check with their primacy agency to determine the most appropriate delivery methods.

Notices to New Customers

- All new billing units and customers must be notified of ongoing violations or situations requiring PN.

Reporting and Recordkeeping

- PWSs have 10 days to send a certification of compliance and a copy of the completed notice to the primacy agency.
- PWS and primacy agency must keep notices on file for 3 years.

The Required Elements of a Public Notice

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

Tests Showed Presence of Coliform Bacteria

2. When the violation occurred →

The Jonesville Water System routinely monitors for coliform bacteria. During the month of July, 7 percent of our samples tested positive. The standard is that no more than 5 percent of samples may test positive.

← 1. Description of the violation

6. Actions consumers should take →

What should I do?

- **You do not need to boil your water or take other corrective actions.** However, if you have specific health concerns, consult your doctor.
- You do not need to use an alternate (e.g., bottled) water supply.
- People with severely compromised immune systems, infants, pregnant women, and some elderly may be at increased risk. These people should seek advice about drinking water from their health care providers. General guidelines on ways to lessen the risk of infection by microbes are available from EPA's Safe Drinking Water Hotline at 1-800-426-4791.

← 5. Should alternate water supplies be used

← 4. The population at risk

What does this mean?

3. Potential adverse health effects →

This is not an emergency. If it had been, you would have been notified immediately. Coliform bacteria are generally not harmful themselves. *Coliforms are bacteria which are naturally present in the environment and are used as an indicator that other, potentially-harmful, bacteria may be present. Coliforms were found in more samples than allowed and this was a warning of potential problems.*

Usually, coliforms are a sign that there could be a problem with the system's treatment or distribution system (pipes). Whenever we detect coliform bacteria in any sample, we do follow-up testing to see if other bacteria of greater concern, such as fecal coliform or *E. coli*, are present. We did not find any of these bacteria in our subsequent testing.

7. What is being done to correct the violation or situation →

What was done?

We took additional samples for coliform bacteria which all came back negative. As an added precaution, we chlorinated and flushed the pipes in the distribution system to make sure bacteria were eliminated. This situation is now resolved.

← 8. When the system expects to return to compliance

For more information, or to learn more about protecting your drinking water please contact John Jones at (502) 555-1212.

← 9. Phone number for more information

10. Required distribution language →

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This is being sent by the Jonesville Water System.

State Water System ID#1234567. Date Distributed: 8/8/09

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Consumer Confidence Report Rule: A Quick Reference Guide

Overview of the Rule

Title	Consumer Confidence Report (CCR) Rule, 63 FR 44511, August 19, 1998, Vol. 63, No. 160
Purpose	Improve public health protection by providing educational material to allow consumers to make educated decisions regarding any potential health risks pertaining to the quality, treatment, and management of their drinking water supply.
General Description	The CCR Rule requires all community water systems to prepare and distribute a brief annual water quality report summarizing information regarding source water, detected contaminants, compliance, and educational information.
Utilities Covered	Community water systems (CWSs), all size categories.

Public Health Related Benefits

Implementation of the CCR Rule will result in . . .	► Increased consumer knowledge of drinking water sources, quality, susceptibility to contamination, treatment, and drinking water supply management. ► Increased awareness of consumers to potential health risks so they may make informed decisions to reduce those risks, including taking steps toward protecting their water supply. ► Increased dialogue between drinking water utilities and consumers to increase understanding of the value of drinking water and water supply services and to facilitate consumer participation in decisions that affect public health.

Annual Requirements

CWSs must prepare and distribute a CCR to all billing units or service connections.	► *April 1* - Deadline for CWS that sells water to another CWS to deliver the information necessary for the buyer CWS to prepare their CCR (requirement outlined in 40 CFR 141.152). ► *July 1* - Deadline for annual distribution of CCR to customers and state or local primary agency for report covering January 1 - December 31 of previous calendar year. ► *October 1* - (or 90 days after distribution of CCR to customers, whichever is first) Deadline for annual submission of proof of distribution to state or local primacy agency. ► A CWS serving 100,000 or more persons must also post its current year's report on a publicly accessible site on the Internet. Many systems choose to post their reports at the following EPA Web site http://yosemite.epa.gov/ogwdw/ccr.nsf/america. ► All CWSs must make copies of the report available on request.

Multilingual Requirements

- ► CWSs that have a large proportion of non-English speaking residents must include information in the appropriate language(s) expressing the importance of the CCR, or a phone number or address where residents may contact the CWS to obtain a translated copy of the CCR or assistance in the appropriate language.
- ► The state or EPA will make the determination of which CWSs need to include this information.

Small Water System Flexibility

- ► With the permission of the governor of a state (or designee), or where the tribe has primacy, in lieu of mailing, systems serving fewer than 10,000 persons may publish their CCR in a local newspaper.*
- ► With the permission of the governor of a state (or designee), or where the tribe has primacy, in lieu of a mailing and/or publication, systems serving 500 or fewer persons may provide a notice stating the CCR is available upon request.*

*Questions regarding whether the necessary permission has been granted should be addressed to the appropriate state or primacy agency.

Eight Content Requirements of a CCR

- ***Item 1*: Water System Information** – Name/phone number of a contact person; information on public participation opportunities.
- ***Item 2*: Source(s) of Water**.
- ***Item 3*: Definitions** – Maximum Contaminant Level (MCL); MCL Goal (MCLG); Treatment Technique (TT); Action Level (AL); Maximum Residual Disinfectant Level (MRDL); MRDL Goal (MRDLG).
- ***Item 4*: Detected Contaminants** – A table summarizing reported concentrations and relevant MCLs and MCLGs or MRDLs and MRDLGs; known source of detected contaminants; health effects language.
- ***Item 5*: Information on Monitoring for *Cryptosporidium*, Radon, and Other Contaminants** (if detected).
- ***Item 6*: Compliance with Other Drinking Water Regulations** (any violations and Ground Water Rule [GWR] special notices).
- ***Item 7*: Variances and Exemptions** (if applicable).
- ***Item 8*: Required Educational Information** – Explanation of contaminants in drinking water and bottled water; information to vulnerable populations about *Cryptosporidium*; statements on nitrate, arsenic, and lead.

Optional Information

CWSs are not limited to providing only the required information in their CCR. CWSs may want to include:

- An explanation (or include a diagram of) the CWSs treatment processes.
- Source water protection efforts and/or water conservation tips.
- Costs of making the water safe to drink.
- A statement from the mayor or general manager.
- **Information to educate customers about**: Taste and odor issues, affiliations with programs such as the Partnership for Safe Water, opportunities for public participation, etc.

Communication Tips

- Provide a consistent message. Be as simple, truthful, and straightforward as possible. Avoid acronyms, initials, and jargon.
- Provide links to useful information resources.
- Limit wordiness – write short sentences and keep your paragraphs short.
- Assume that consumers will only read the top half of the notice or what can be read in 10 seconds.
- Display important elements in bold and/or large type in the top half of the notice.
- Do not make your text size too small.
- Give a draft of your CCR to relatives or friends who are not drinking water experts and ask them if it makes sense. Ask customers for their comments when you publish the CCR.
- Use graphics, photographs, maps, and drawings to illustrate your message. Do not distract from your main message with graphics and/or pictures that do not complement your message.
- Consider printing the CCR on recycled paper and taking other steps to make the CCR "environmentally friendly." If you hope to get your customers involved in protecting or conserving water, set a good example for them to follow.
- Use the CCR as an opportunity to tell your customers about all of the things that you are doing well.

Reporting and Recordkeeping

- CWSs must:
  - Mail or directly deliver a copy of the CCR to each of their customers by July 1 annually.
  - Make a good faith effort to get CCRs to non-bill-paying consumers, using means recommended by the state.
  - Send a copy to the director of the state drinking water program and any other state agency that the state drinking water program director identifies when you mail it to customers.
  - Submit to the state a certification, within 3 months of mailing, that the CWS distributed the CCR, and that its information is correct and consistent with the compliance monitoring data previously submitted to the state.
  - Post their CCRs on the Internet (if the CWSs serve 100,000 or more people).
- CWSs may also want to send copies to state and local health departments, as well as local TV and radio stations and newspapers.

For additional information on the CCR Rule

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA Web site at www.epa.gov/safewater/ccr1.html; or contact your state or local primacy agency's drinking water representative. Log onto the CCRiWriter Web site to use EPA's template at www.CCRiWriter.com.

GLOSSARY

Section I
Abbreviations

AL
Action Level

ANSI
American National Standards Institute

AR
Army Regulation

AT/FP
Antiterrorism/Force Protection

BAT
Best Available Technology

CAPA
Critical Aquifer Protection Area

CCR
Consumer confidence report

CFE
combined filter effluent

CFR
Code of Federal Regulations

CONUS
Continental United States

CT
Disinfectant Concentration X Time

CWS
Community Water System

DA
Department of the Army

DBP
Disinfectant By-Product

DBPR
Disinfection byproducts rule or regulations

DDBP
Disinfectants and Disinfection By-Products

DE
diatomaceous earth

DNA
deoxyribonucleic acid

DOC
dissolved organic carbon

DOD
Department of Defense

DPW
Department of Public Works

DWPL
Drinking Water Priority List

EC+
E. coli positive

EH
Environmental Health

EPTDS
Entry Point to the Distribution System

ERP
Emergency Response Plan

FBRR
Filter Backwash Recycle Rule

FGS
Final governing Standards

FP (AT/FP)
Antiterrorism/Force Protection

FR
Federal Register

GED
General Equivalency Diploma

GOCO
Government contractor Government operated

GOGO
Government owned and Government operated

GW
Ground Water

GWR
Ground-Water Rule

GWUDI
Ground Water Under Direct Influence (of surface water)

HA
Health Advisory

HAAs
Haloacetic acids

HAA5s
Group of five haloacetic acids

HPC
Heterotrophic Plate Count

HSA
Hydrogeologic Sensitivity Assessment

IESWTR
Interim Enhanced Surface Water Treatment Rule

IFE
individual filter effluent

IOC
Inorganic Chemical

kg
kilogram

LCCA
Lead Contamination Control Act

LRAA
Locational Running Annual Average

LSI
Langelier Saturation Index

LT1ESWTR
Long Term 1 Enhanced Surface Water Treatment Rule

LT2ESWTR
Long Term 2 Enhanced Surface Water Treatment Rule

MCL
Maximum Contaminant Level

MCLG
Maximum Contaminant Level Goal

MDL
Method Detection Limit

MFL
Million fibers per liter

mg/L
milligrams per liter

MMO
Minimal Medium ONPG

MREM/year
millirem (a dose of energy)

MRDL
Maximum Residual Disinfectant Level

MRDLG
Maximum Residual Disinfectant Level Goal

MUG
4-methyl-umbelliferyl-t3-d-glucuronide

NCWS
Noncommunity Water System

NIPDWR
National Interim Primary Drinking Water Regulations

NPDWR
National Primary Drinking Water Regulations

NSDWR
National Secondary Drinking Water Regulations

NTNC
Nontransient Noncommunity (water system)

NTU
Nephelometric Turbidity Unit

O&M
Operation and Maintenance

OCONUS
Outside CONUS

OEBGD
Overseas Environmental Baseline Guidance Document

OELs
operational evaluation levels

ONPG
ortho-nitrophenyl-d-galactopyranoside

PCBs
Polychlorinated Biphenyls

pCi/L
picocuries per liter

PHS
Public Health Service

PL
Public Law

POE
Point-of-Entry

POU
Point-of-Use

ppb
parts per billion

PSA
Public Service Announcement

psi
pounds per square inch

PM
Preventive Medicine

PWS
Public Water System

RAA
Running Annual Average

RTCR
Revised Total Coliform Rule

SDWA
Safe Drinking Water Act

SMCL
Secondary Maximum Contaminant Level

SOC
Synthetic Organic Chemical

SOFA
Status of Forces Agreement

SS
slow sand

SSAD
Sole Source Aquifer Demonstration

SW
Surface Water

SWAP
Source Water Assessment Program

SWTR
Surface Water Treatment Rule

TB MED
Technical Bulletin, Medical

TC
Total Coliform Positive

TCR
Total Coliform Rule

TG
Technical guide

THMs
trihalomethane chemicals

TNC
Transient Noncommunity (water system)

TOC
Total Organic Carbon

TT
treatment technique

TTHM
Total Trihalomethane

UBL
Upper Bound Level

UCMR
Unregulated Contaminant Monitoring Rule

UFC
Unified Facilities Criteria

UIC
Underground Injection Control

ug/L
micrograms per liter

ug/dL
micrograms per deciliter

URTH
Unreasonable Risk to Health

U.S.
United States

USEPA
U.S. Environmental Protection Agency

USPHS
United States Public Health Service

UV
Ultraviolet Light

VOC
Volatile Organic Chemical

WHP
Wellhead protection

WHPA
Wellhead Protection Area

WHPP
Wellhead Protection Plan

WSERP
Water System Emergency Response Plan

WSVA
Water System Vulnerability Assessment

Section II
Definitions

Action Level (AL). The concentration of lead or copper in tap water samples which triggers the treatment requirements outlined in the Lead and Copper Rule.

Best Available Technology (BAT). The best means available for treating water in order to meet an MCL or AL. BATs are determined by the EPA after examination of efficacy under field conditions and economic feasibility. Sometimes different BATs are chosen for various system sizes due to varied economic capabilities.

Community Water System (CWS). A public water system which serves year-round residents.

Compliance cycle. The 9-year calendar cycle consisting of three 3-year compliance periods during which public water systems must monitor.

Compliance period. The 3-year calendar period (based upon the calendar year) upon which public water systems' monitoring frequencies are set.

Contaminant. Any physical, chemical, biological, or radiological substance or matter in water at a level which may cause adverse effects (health or aesthetic).

CT or CT calculation. The product of "residual disinfectant concentration" (C) in mg/L determined before or at the first customer, and the corresponding "disinfectant contact time" (T) in minutes.

Disinfectant. Any oxidant, including, but not limited to, chlorine, chlorine dioxide, chloramine and ozone added to water in any part of the treatment or distribution process that is intended to kill or inactivate pathogenic microorganisms.

Entry point to the distribution system (EPTDS). A regulatory monitoring location which is representative of a source after treatment. Generally, the EPTDS is the “finished” water tap at a water treatment plant.

First draw sample. A 1-liter sample of tap water, collected for monitoring under the Lead and Copper Rule, that has been standing still in plumbing pipes for at least 6 hours and is collected without flushing the tap.

Ground Water Under the Direct Influence (of surface water) (GWUDI). Any water beneath the surface of the ground with: (1) a significant occurrence of insects or other microorganisms, algae, or large-diameter pathogens such as *Giardia lamblia*, or (2) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions.

Locational Running Annual Average (LRAA). The average of sample analytical results for samples taken at a particular monitoring location during the previous four calendar quarters.

Maximum Contaminant Level (MCL). The maximum permissible level of a contaminant in drinking water provided to the public. The MCLs are enforceable levels to protect the health of consumers.

Maximum Contaminant Level Goal (MCLG). The maximum level of a contaminant in drinking water at which no known or anticipated health effects would occur, and which allows for an adequate margin of safety. The MCLGs are not Federally enforceable; however, providers of drinking water should strive to meet these established goals.

Method Detection Limit (MDL). The contaminant concentration that when processed through the complete analytical method, produces a signal with a 99% probability that is different from the blank.

Maximum Residual Disinfectant Level (MRDL). The level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap without an unacceptable possibility of adverse health effects.

Maximum Residual Disinfectant Level Goal (MRDLG). The maximum level of a disinfectant added for water treatment at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety. MRDLGs are nonenforceable health goals and do not reflect the benefit of the addition of a disinfectant for control of waterborne microbial contaminants.

NonTransient Noncommunity Water System (NTNC). A public water system which serves the same people daily, but for less than 24 hours a day, or which serves the same people (not year round residents) for at least 6 months of the year.

Point-of-Entry (POE) treatment device. A treatment device applied to the drinking water entering a house or building for the purpose of reducing contaminants in the drinking water distributed throughout the house or building.

Point-of-Use (POU) treatment device. A treatment device applied to a single tap for the purpose of reducing contaminants in drinking water at that one tap.

Primacy. Administration and enforcement responsibility for drinking water regulations given to governing entities by the USEPA.

Public Water System (PWS). A system which supplies drinking water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 25 people daily at least 60 days out of the year.

Running Annual Average (RAA). The 12-month average concentration of a chemical in samples collected more frequently than annually, where new sampling results replace the oldest results to maintain a constant 12-month average.

Sanitary Survey. An onsite review of the water source, facilities, equipment, operation and maintenance of a public water system for the purpose of evaluating the adequacy of such source, facilities, equipment, operation and maintenance for producing and distributing safe drinking water.

Secondary Maximum Contaminant Level (SMCL). Recommended limits (not federally enforceable) for contaminants in drinking water which affect its aesthetic quality (color, taste, odor, staining).

State. Reference to the regulatory authority for drinking water.

Supplier of water. Any person who owns or operates a public water system.

Surface water. All water which is open to the atmosphere and subject to surface water run-off.

Transient Noncommunity Water System (TNC). A public water system which serves different people daily for at least 60 days out of the year.

Waterborne disease outbreak. The significant occurrence of acute infectious illness, epidemiologically associated with the ingestion of water from a public water system which is deficient in treatment, as determined by the appropriate local or State agency.