United States
Environmental Protection
Agency

Surface Water Treatment Rules

What Do They Mean to You?

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Table of Contents

Acronyms and Glossary

Acronyms

CDS	Combined Distribution System
CFE	Combined Filter Effluent
CPE	Comprehensive Performance Evaluation
CWS	Community Water System
DBP	Disinfection Byproducts
DBPR	Disinfectants and Disinfection Byproducts Rule
EPA	United States Environmental Protection Agency
FBRR	Filter Backwash Recycling Rule
GAC	Granular Activated Carbon
GWUDI	Ground Water Under the Direct Influence of Surface Water
HAA5	Haloacetic acids (Monochloroacetic, Dichloroacetic, Trichloroacetic, Monobromoacetic and Dibromoacetic Acids)
HPC	Heterotrophic Bacteria Plate
IDSE	Initial Distribution System Evaluation
IESWTR	Interim Enhanced Surface Water Treatment Rule
IFE	Individual Filter Effluent
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
M–DBP	Microbial/Disinfection Byproducts
MRDL	Maximum Residual Disinfectant Level
MRDLG	Maximum Residual Disinfectant Level Goal
NCWS	Non-Community Water System
NSCEP	National Service for Environmental Publications
NTIS	National Technical Information Service
NTU	Nephelometric Turbidity Unit
PWS	Public Water System
O&M	Operation and Maintenance
SDWA	Safe Drinking Water Act
SUVA	Specific Ultraviolet Absorption
SWTR	Surface Water Treatment Rule
SWTRs	Suite of Surface Water Treatment Rules
TOC	Total Organic Carbon
TTHM	Total Trihalomethanes

Glossary

Combined distribution system — the interconnected distribution system consisting of the distribution systems of wholesale systems and of the consecutive systems that receive finished water.

Comprehensive performance evaluation (CPE) — thorough review and analysis of a treatment plant's performance-based capabilities and associated administrative, operation and maintenance practices. It is conducted to identify factors that may be adversely impacting a plant's capability to achieve compliance and emphasizes approaches that can be implemented without significant capital improvements. For purpose of compliance with subparts P and T of 40 CFR 141, the comprehensive performance evaluation must consist of at least the following components: assessment of plant performance; evaluation of major unit processes; identification and prioritization of performance limiting factors; assessment of the applicability of comprehensive technical assistance; and preparation of a CPE report.

Disinfection profile — a summary of *Giardia lamblia* inactivation through the treatment plant.

Dual sample set — a set of two samples collected at the same time and same location, with one sample analyzed for TTHM and the other sample analyzed for HAA5. Dual sample sets are collected for the purposes of conducting an IDSE under subpart U of 40 CFR 141 and determining compliance with the TTHM and HAA5 MCLs under subpart V of 40 CFR 141.

Enhanced coagulation — the addition of sufficient coagulant for improved removal of disinfection byproduct precursors by conventional filtration treatment.

Enhanced softening — the improved removal of disinfection byproduct precursors by precipitative softening.

Filter profile — graphical representation of individual filter performance, based on continuous turbidity measurements or total particle counts versus time for an entire filter run, from startup to backwash inclusively, that includes an assessment of filter performance while another filter is being backwashed.

Locational running annual average (LRAA) — the average of analytical results for samples taken at a particular monitoring location during the previous four calendar quarters.

Log Inactivation — logarithm of (N_0/N_t), where N_0 is the number of *Cryptosporidium* oocysts in a system's untreated source water and N_t is the number of *Cryptosporidium* oocysts in system's finished water after treatment.

Maximum contaminant level (MCL) — the maximum permissible level of a contaminant in water which is delivered to any user of a public water system.

Maximum contaminant level goal (MCLG) — the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety. Maximum contaminant level goals are non-enforceable health goals.

Maximum residual disinfectant level (MRDL) — a 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. For chlorine and chloramines, a PWS is in compliance with the MRDL when the running annual average of monthly averages of samples taken in the distribution system, computed quarterly, is less than or equal to the MRDL. For chlorine dioxide, a PWS is in compliance with the MRDL when daily samples are taken at the entrance to the distribution system and no two consecutive daily samples exceed the MRDL.

MRDLs are enforceable in the same manner as maximum contaminant levels under Section 1412 of the Safe Drinking Water Act. There is convincing evidence that addition of a disinfectant is necessary for control of waterborne microbial contaminants. Notwithstanding the MRDLs listed in §141.65, operators may increase residual disinfectant levels of chlorine or chloramines (but not chlorine dioxide) in the distribution system to a level and for a time necessary to protect public health to address specific microbiological contamination problems caused by circumstances such as distribution line breaks, storm runoff events, source water contamination, or cross-connections.

Maximum residual disinfectant level goal (MRDLG) — the maximum level of a disinfectant added for water treatment at which no known or anticipated adverse effect pm 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 the chemical for control of waterborne microbial contaminants.

Running annual average (RAA) — the average of all sample analytical results taken during the previous four calendar quarters.

Specific Ultraviolet Absorption (SUVA) — Specific Ultraviolet Absorption at 254 nanometers (nm), an indicator of the humic content of water. It is a calculated parameter obtained by dividing a sample's ultraviolet absorption at a wavelength of 254 nm (UV_{254}) (in m -1) by its concentration of dissolved organic carbon (DOC) (in mg/L).

Subpart H systems — public water systems using surface water or ground water under the direct influence of surface water as a source that are subject to the requirements of subpart H of 40 CFR 141.

Total Organic Carbon (TOC) — total organic carbon in mg/L measured using heat, oxygen, ultraviolet irradiation, chemical oxidants, or combinations of these oxidants that convert organic carbon to carbon dioxide, rounded to two significant figures.

Uncovered finished water storage facility — tank, reservoir, or other facility used to store water that will undergo no further treatment to reduce microbial pathogens except residual disinfection and is directly open to the atmosphere.

1. Introduction

Purpose of the Guide

The purpose of this guide is to describe how the Suite of Surface Water Treatment Rules (SWTRs) apply to different types of public water systems (PWSs) based on the type of filtration used and the population of the PWS (or combine distribution system (CDS) population). The SWTRs covered by this guide include:

- Surface Water Treatment Rule (SWTR) – June 1989
- Interim Enhanced Surface Water Treatment Rule (IESWTR) – December 1998
- Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) – January 2002
- Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) – January 2006
- Filter Backwash Recycling Rule (FBRR) – June 2001

The SWTRs are developed with the Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rules (DBPRs). These series of rules are known as the Microbial/Disinfection Byproduct (M-DBP) Rules cluster and are intended to reduce microbial contaminants in the water and, at the same time, minimize the risks posed by disinfectants and disinfection byproducts (DBPs). The DBPRs set enforceable limits for disinfectants and DBPs, create monitoring requirements, and specify reporting procedures (including specific monitoring requirements for consecutive systems).

This guide presents an overview of the SWTRs requirements as well as attachments that provide a detailed description of the rule requirements for water systems according to system size and filtration status. System operators and other readers should look at the short overview sections at the beginning of the guide and then turn to the specific attachments that apply to their water system. A companion guide to this document – *Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?* – addresses the DBPR required disinfectants and DBP monitoring.

The U.S. Environmental Protection Agency's (EPA's) website provides links to the original rule language as well as the most recent guidance documents and other information for the SWTRs and Stage 1 and Stage 2 DBPRs (https://www.epa.gov/dwreginfo/drinking-water-regulations).

Background

The 1974 Safe Drinking Water Act (SDWA) authorized EPA to regulate drinking water. Although the SDWA was amended slightly in 1977, 1979, and 1980, significant changes occurred when the SDWA was reauthorized in 1986 and then again in 1996. To safeguard public health, the 1986 Amendments required EPA to set health goals, or maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs) for 83 contaminants. EPA was also required to establish regulations, require disinfection of all PWSs, specify filtration requirements for nearly all water systems that draw their water from surface sources, and develop additional programs to protect ground water sources.

In 1990, EPA's Science Advisory Board, an independent panel of experts established by Congress, cited drinking water contamination as one of the most important environmental risks and indicated that disease-causing microbial contaminants (*i.e.*, bacteria, protozoa, and viruses) are the greatest remaining health-risk challenge for drinking water suppliers. The 1989 SWTR required most surface water and ground water under the direct influence of surface water (GWUDI) systems (also known as Subpart H systems) to remove microbial contaminants physically through filtration. The 1989 SWTR set MCLGs for

Legionella, *Giardia lamblia*, and viruses at zero since any exposure to these contaminants presents some level of health risk. Specifically, the 1989 SWTR requires that a Subpart H system have sufficient treatment to reduce the source water concentration of *Giardia lamblia* and viruses by at least 99.9 percent (3-log) and 99.99 percent (4-log), respectively. A detectable disinfectant residual must be maintained throughout the entire distribution system. The 1989 SWTR does not specifically control for *Cryptosporidium*.

The 1989 SWTR uses turbidity to measure the performance of filtration systems. In order to reduce the public health risk associated with *Cryptosporidium* in finished water, the IESWTR requires improved filtration performance by lowering the turbidity standard at Subpart H systems that serve 10,000 or more people. The LT1ESWTR extends this requirement to systems serving fewer than 10,000 persons. The LT2ESWTR requires additional treatment for *Cryptosporidium* at those surface water or GWUDI systems with significant levels of *Cryptosporidium* in their source waters. Finally, the FBRR is intended to reduce pathogen concentrations in the finished water by properly managing the backwash water and waste streams at water treatment plants.

2. Applicability and LT2ESWTR Schedules

The SWTRs apply to PWSs that use surface water or GWUDI as a source (also known as Subpart H systems). The 1989 SWTR applies to all Subpart H systems. The IESWTR generally only applies to Subpart H systems serving 10,000 or more persons, although the requirement for states to conduct sanitary surveys applies to all Subpart H systems. The LT1ESWTR extends the IESWTR's requirements to Subpart H systems that serve fewer than 10,000 persons. The LT2ESWTR applies to all Subpart H systems, and wholesale PWSs must comply with the rule based on the population of the largest PWS in their CDS. A CDS is an interconnected distribution system consisting of the distribution systems of wholesale systems and of the consecutive systems that receive finished water. The CDS applies when a consecutive system receives some or all of its finished water from a wholesale system.

If you have a Subpart H source and are this kind of system:	You are on LT2ESWTR Schedule:
System serving 100,000 or more people OR a wholesale system in a CDS that contains a system serving >100,000	1
System serving 50,000 to 99,999 people OR a wholesale system in a CDS that contains a system serving 50,000 to 99,999	2
System serving 10,000 to 49,999 people OR a wholesale system in a CDS that contains a system serving 10,000 to 49,999	3
System serving fewer than 10,000 and not a wholesale system in a CDS that contains a system serving at least 10,000	4

For more information about critical deadlines related to LT2ESWTR schedules refer to the LT2 Quick Reference Guides by Schedule available at: https://www.epa.gov/dwreginfo/drinking-water-rule-quick-reference-guides. The state has discretion with respect to new systems and sources that were put into use after the initial monitoring began. New Subpart H systems and Subpart H systems that develop a new source must conduct source water monitoring of the new sources unless the PWS provides 5.5-log of treatment for *Cryptosporidium* (filtered systems) or 3.0-log treatment (unfiltered systems) using options

from the LT2ESWTR Microbial Toolbox. New Subpart H systems and Subpart H systems with new sources must contact the state regarding their requirements and schedule for source water monitoring.

EPA has developed compliance requirements for different filtration types (i.e., standards for PWSs that use conventional filtration are different than standards for PWSs using slow sand filtration or for systems that are unfiltered). IESWTR and LT1ESWTR compliance dates depended on the size of the population served by the PWS.

3. Summary of Regulatory Requirements

Disinfection profiling and benchmarking

A disinfection benchmark is an indicator of disinfection effectiveness based on the lowest monthly average inactivation of *Giardia lamblia* and viruses. The disinfection profiling and benchmarking requirement in LT2ESWTR requires a Subpart H system that intends to make a significant change to its disinfection practice to evaluate its disinfection practice and work with the state to assure there are no unintended reductions in microbial protection when the system changes how it disinfects its water. The process consists of the following three steps:

1. Determining if a PWS must develop a disinfection profile.
2. Developing the disinfection profile.
3. Calculating the disinfection benchmark and consulting with the state.

Some PWSs have already prepared a disinfection profile to comply with the requirements of the IESWTR or LT1ESWTR. Under these rules, if a PWS had an annual average level of total trihalomethanes (TTHM) greater than 0.064 mg/L or of haloacetic acids (HAA5) greater than 0.048 mg/L, the system was required to develop a disinfection profile. Of these systems, those that served 10,000 or more persons had to complete their disinfection profile by April 2001; those serving 10,000 and fewer persons had to complete their disinfection profile by the end of 2004. Systems can use disinfection profiles developed under IESWTR or LT1ESWTR to satisfy the LT2ESWTR requirement as long as the system has not significantly changed its treatment or its source(s) and the disinfection profile was for *Giardia lamblia* and viruses.

The disinfection profile is developed by compiling *Giardia lamblia* and virus log inactivation values computed over a period of at least 12 months. For PWSs that were required to comply with the disinfection profiling requirements of the IESWTR, disinfection profile log inactivation values were calculated using **daily** measurements of operational data collected during peak-hour flows. All other PWSs developing a disinfection profile are required to calculate their disinfection profile log inactivation values using **weekly** measurements of operational data collected during peak-hour flows. If a PWS is using profiling and benchmarking information originally gathered for IESWTR or LT1ESWTR compliance and that PWS did not calculate a benchmark for viruses, the PWS must use the same monitoring data on which the *Giardia lamblia* disinfection profile is based to develop the disinfection profile for viruses.

PWSs that were required to prepare a disinfection profile under the IESWTR or LT1ESWTR must keep their disinfection profiles on file to be reviewed during their sanitary surveys.

A PWS that decides to make a significant modification to its disinfection practice (e.g., changing the disinfectants used in the treatment plant, moving the point of disinfection, changing the disinfection process) may calculate a disinfection benchmark and consult with the state prior to implementing such a

change. The state consultation process helps assure that the PWS will meet all of the standards for *Giardia lamblia*, viruses, DBPs, and *Cryptosporidium*.

The benchmark is determined by calculating the average inactivation value for each of 12 consecutive months. The lowest monthly average inactivation value becomes the disinfection benchmark. If a PWS is using monitoring data from more than one year, it repeats the calculation for each year for which data are available. The benchmark then becomes the average of the lowest monthly average values for each year.

EPA developed a guidance manual that provides guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Technical Guidance Manual*, EPA 815-R-20-003, June 2020). This document is available on EPA's website at: https://www.epa.gov/dwreginfo/guidance-manuals-surface-water-treatment-rules.

Cryptosporidium

EPA set a MCLG of zero for the protozoan *Cryptosporidium*. It also established a requirement for 2-log (99 percent) removal of *Cryptosporidium* for systems that must currently filter under the 1989 SWTR. Systems that use conventional or direct filtration meet this requirement if they are in compliance with the strengthened turbidity performance standards for combined filter effluent (CFE) set in the IESWTR and LT1ESWTR. Systems that use slow sand or diatomaceous earth filtration meet the 2-log removal requirement if they are in compliance with the existing turbidity performance standards under the 1989 SWTR.

In the LT2ESWTR, EPA required all Subpart H filtered systems, including wholesale systems, to characterize their source water and determine what, if any, additional treatment is necessary to reduce *Cryptosporidium*. Subpart H unfiltered systems are required to determine what additional treatment must be provided to reduce *Cryptosporidium.* Systems must conduct source water monitoring to determine an average *Cryptosporidium* concentration. Based on that average, filtered systems will be classified into one of four possible risk categories (bins). Depending on the bin in which they are placed, the systems may or may not be required to provide additional treatment to remove or inactivate *Cryptosporidium*. Filtered systems on Schedule 4[1] can sample for *E. coli* instead of sampling for *Cryptosporidium* during source water monitoring. If the *E. coli* sampling results exceed a trigger, depending on type of source water, the system would then need to conduct *Cryptosporidium* sampling.

These new provisions, along with the new turbidity requirements, will better protect consumers from *Cryptosporidium* and other pathogens.

Turbidity and disinfection requirements

The SWTRs establish requirements for the control of turbidity and require disinfection of Subpart H systems. Subpart H systems are required to meet specific removal and/or inactivation criteria. To meet these requirements Subpart H systems must measure the finished water turbidity as well as the disinfection residual entering the distribution system and must maintain a detectable disinfectant residual in the distribution system. The turbidity limits and monitoring requirements depend on whether or not the Subpart H system is filtered and the type of filtration process that is utilized.

[1] See Section 2 of this document for more information about Schedules.

Combined filter effluent monitoring requirements

Pathogens in source water can travel through the treatment plant processes and eventually reach customers, creating a health risk. *Cryptosporidium* is of particular concern because it is resistant to commonly used disinfectants, such as chlorine. The IESWTR and LT1ESWTR established CFE turbidity requirements to accomplish a 2-log removal of *Cryptosporidium*. CFE is generated when the effluent water from individual filters in operation is combined into one stream.

Individual filter effluent monitoring requirements

Filtration is one of the most critical treatment processes for particle and pathogen removal. Subpart H systems using conventional or direct filtration must also conduct continuous monitoring of the turbidity in the effluent from individual filters to provide information about each filter's performance. This requirement allows systems to identify filters whose poor performance might be masked by lower turbidity CFE. Individual filter performance problems, indicated by an exceedance of certain turbidity limits for specified time periods, trigger follow-up actions.

Recycling of filter backwash requirements

EPA established filter backwash requirements for Subpart H systems that meet the following criteria:

- The system treats water by conventional or direct filtration processes; and
- The system recycles one or more of the following: spent filter backwash water, thickener supernatant or liquids from dewatering processes.

These systems were required to notify the state about their recycling practices by December 8, 2003. They are also required to return spent filter backwash, thickener supernatant, or liquids from dewatering processes through all the processes of a system's existing conventional or direct filtration system (if the system recycles). Systems can receive state approval to recycle at an alternate location. Systems must collect and retain recycling information.

Uncovered finished water storage facilities

Subpart H systems are prohibited from building any new uncovered finished water storage facilities (reservoir, holding tank, or other storage facility). Subpart H systems that have existing uncovered finished water storage facilities must notify the state of any uncovered finished water storage facilities and must either:

- Cover any uncovered finished water storage facility; or
- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation and/or removal using a state-approved protocol.

These provisions will help limit re-contamination of treated water.

Sanitary surveys

Conducting sanitary surveys on a routine basis is an important element of preventing contamination of drinking water supplies. EPA recognizes the importance of sound sanitary surveys in helping water systems protect public health. Sanitary surveys are an opportunity to work and communicate with water systems in a preventative mode. These surveys are structured to determine whether a system's source, facilities, equipment, operation and maintenance (O&M), and management are effective in producing safe drinking water. Sanitary surveys also evaluate a system's compliance with federal drinking water regulations, as well as state regulations and operational requirements. EPA requires that a sanitary survey address each of the following eight elements: source; treatment; distribution system; finished water storage; pumps, pump facilities, and controls; monitoring and reporting and data verification; system management and operation; and operator compliance with state requirements.

States must conduct sanitary surveys for all Subpart H systems every 3 years for community water systems (CWSs) and every 5 years for non-community water systems (NCWSs). For CWSs determined by the state in previous sanitary surveys to have "outstanding performance," successive sanitary surveys may be conducted at up to 5-year intervals. Conducting sanitary surveys on a regular basis is an effective way to identify potential problems and possible reasons for trends in finished water quality and demand that may need to be addressed.

Unfiltered Subpart H systems

In order to protect public health, unfiltered Subpart H systems are required to meet stringent source water quality requirements. EPA requires unfiltered Subpart H systems to meet the 1989 SWTR source water and site-specific requirements in order to remain unfiltered. In addition, unfiltered systems must include *Cryptosporidium* in their watershed control programs and must meet all applicable DBPR MCLs and maximum residual disinfectant levels (MRDLs) to remain unfiltered. Like filtered systems, they are subject to disinfection profiling and benchmarking and sanitary survey requirements.

In the LT2ESWTR, EPA requires all unfiltered Subpart H systems, including wholesale systems, to characterize their source water and determine what additional treatment is necessary to reduce *Cryptosporidium*. Systems must conduct source water monitoring to determine a mean *Cryptosporidium* concentration. Unfiltered Subpart H systems are required to provide two forms of disinfection. They must meet the combined *Cryptosporidium* inactivation requirements of the LT2ESWTR and *Giardia lamblia* and virus inactivation requirements of the 1989 SWTR using a minimum of two disinfectants, and each of the two disinfectants must separately achieve the total inactivation required for *Cryptosporidium*, *Giardia lamblia*, or viruses.

PWS recordkeeping and reporting requirements

Subpart H filtered systems must submit CFE monitoring and compliance data and report that they have conducted individual filter turbidity monitoring, if required, to states within 10 days after the end of each month the system serves water to the public. Additionally, Subpart H systems using conventional or direct filtration must report to the state if certain individual filter monitoring trigger levels are exceeded. In this case, systems must report turbidity measurements and report that filter profiles, filter self-assessments, or Comprehensive Performance Evaluation (CPE) reports have been produced or conducted when instances of poor filter performance occur or persist based on monitoring of individual filter performance. Systems must maintain the results of individual filter monitoring for at least three years.

Subpart H unfiltered systems must submit source water quality conditions (e.g. fecal and/or total coliform samples and turbidity) compliance data and monitoring to states within 10 days after the end of each month the system serves water to the public.

In addition, Subpart H systems (filtered and unfiltered) must report disinfection residual levels to the state within 10 days after the end of each month the system serves water to the public.

4. Additional Information

A series of guidance manuals have been developed to support the SWTRs. They are available on EPA's website and may be available free of charge through the National Service Center for Environmental Publications, or may be purchased through National Technical Information Service (NTIS). The manuals can help water system operators, state agencies, and EPA implement drinking water regulations consistently and effectively.

You may access electronic versions of available guidance documents online at EPA's website via https://www.epa.gov/dwreginfo/drinking-water-regulations.

You also may order copies of these guidance manuals by calling:

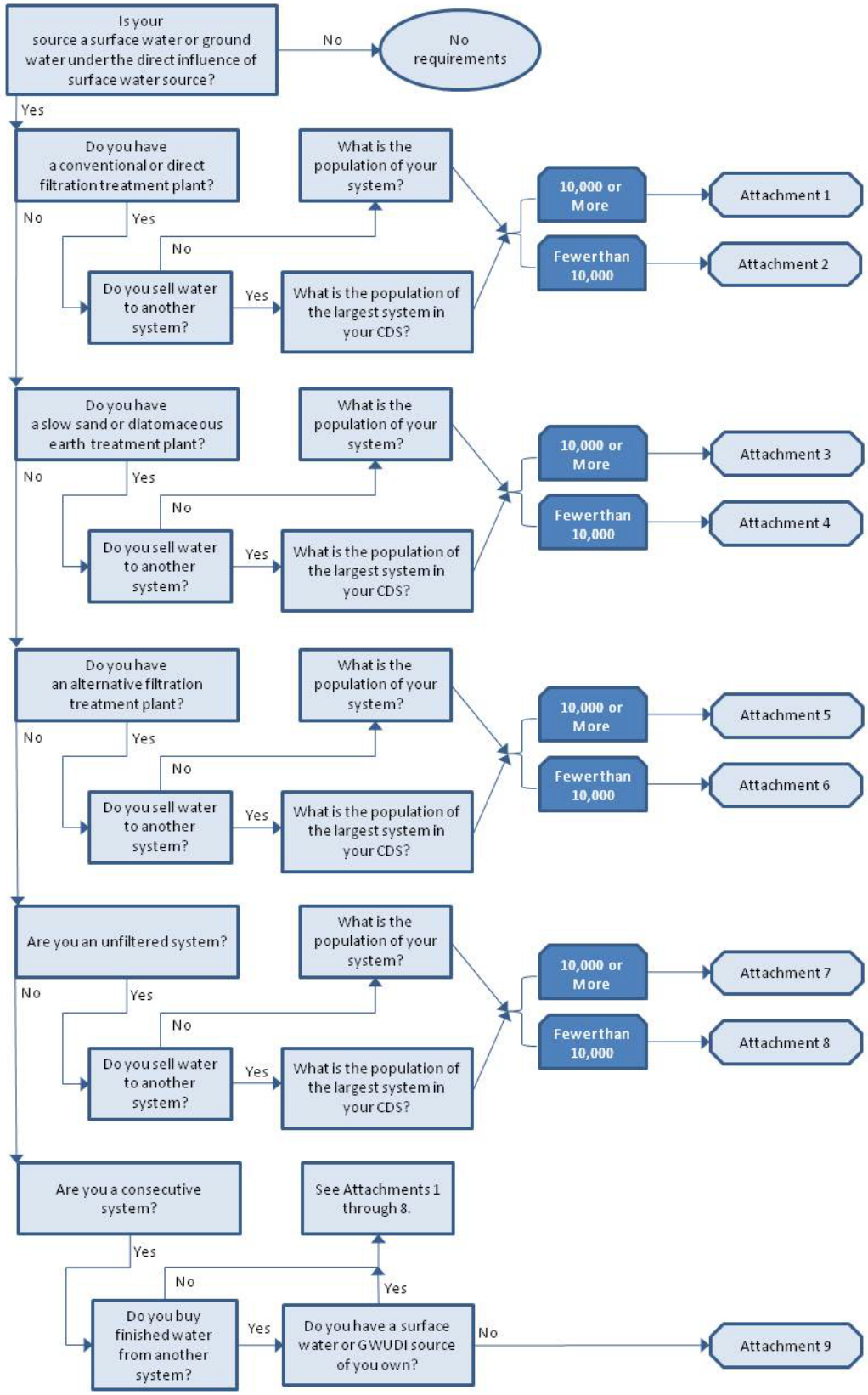
- National Service Center for Environmental Publications (NSCEP) – 1.800.490.9198
- National Technical Information Service (NTIS) – 1.800.553.6847

5. Detailed Regulatory Requirements

EPA has developed compliance requirements for different filtration types (i.e., standards for systems that use conventional filtration are different than standards for systems using slow sand filtration or for systems that are unfiltered). IESWTR and LT1ESWTR compliance dates depended on the size of the population served by the system. LT2ESWTR compliance dates depend on the size of the population served by the Subpart H system or, if the Subpart H system sells water, the population of the largest system in the CDS. The flowchart on page 9 will assist you in determining which attachment best applies to your system.

This section is organized so that specific categories of systems can turn directly to their specific requirements. The categories of systems are:

Figure 1. Organization of Attachments



Attachment 1: I operate a Subpart H water system that: uses conventional or direct filtration and is on LT2ESWTR Schedule 1, 2, or 3[2]

BACKGROUND

The purpose of the Suite of Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses
- *Giardia lamblia*
- *Cryptosporidium*

The SWTRs apply 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." Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also, the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

This attachment applies to systems that use surface water or GWUDI, use conventional or direct filtration, and:

1) **serve 10,000 or more persons and do not sell water; or**
2) **sell water, and the largest system in their CDS serves 10,000 or more persons.**

REQUIREMENTS

REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA LAMBLIA*, AND *CRYPTOSPORIDIUM*

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
Giardia lamblia	Zero	99.9% (3-log)
Cryptosporidium	Zero	99% (2-log)

[2] See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia lamblia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in Disinfectants and Disinfection Byproducts Rules (DBPRs). EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?*, EPA 815-R-20-005, June 2020] which addresses those rules requirements. This document is available on EPA's website at https://www.epa.gov/dwreginfo/stage-1-and-stage-2-disinfectants-and-disinfection-byproducts-rules.

TURBIDITY

Turbidity is measured in two ways: combined filter effluent (CFE) and individual filter effluent (IFE). CFE is generated when the effluent water from individual filters is combined into one stream. The CFE turbidity results may mask the poor performance of an individual filter. The performance of each individual filter is critical to controlling pathogen breakthrough. Due to this, IFE performance is also measured in systems using conventional or direct filtration.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity for conventional and direct filtration systems:

- Must be less than or equal to 0.3 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and

- Can at no time exceed 1 NTU.

If you serve 500 or fewer persons, the frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

IFE must be monitored continuously using an approved method and systems must calibrate turbidimeters using the procedure specified by the manufacturer. You must record the results of IFE turbidity monitoring every 15 minutes. If the individual filter is not providing water which contributes to the CFE, (i.e., it is not operating, is filtering to waste, or recycled) you do not need to record or monitor the turbidity for that specific filter.

If there is a failure in continuous IFE turbidity monitoring equipment, you must conduct grab sampling every 4 hours in lieu of continuous monitoring but must return to 15 minute monitoring no more than 5 working days following the failure of the equipment.

Additionally, you must report IFE turbidity measurements to the state if the measurements demonstrate one of the following:

- **Any individual filter has a measured effluent turbidity greater than 0.5 NTU in two consecutive measurements taken 15 minutes apart at the end of the first 4 hours of continuous filter operation after the filter has been backwashed or otherwise taken offline**. If you directly serve 10,000 or more persons, you must report the filter number, the turbidity, and the date(s) on which the exceedance occurred. In addition, you must either produce a filter profile for the filter within 7 days of the exceedance (if you are not able to identify an obvious reason for the abnormal filter performance) and report that the profile has been produced or report the obvious reason for the exceedance. **(THIS ONLY APPLIES TO YOU IF YOU DIRECTLY SERVE 10,000 OR MORE PERSONS.)**

- **Any individual filter has a measured turbidity level greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart**. You must report the filter number, the turbidity measurement, the date(s) on which the exceedance occurred, and the obvious reason for the exceedance. If you directly serve 10,000 or more persons, you must produce a filter profile within 7 days of the exceedance (if you are not able to identify an obvious reason for the abnormal filter performance) and report that the profile has been produced. **(IF YOU DIRECTLY SERVE FEWER THAN 10,000 PERSONS YOU ARE NOT REQUIRED TO COMPLETE A FILTER PROFILE, EVEN IF YOU ARE NOT ABLE TO IDENTIFY AN OBVIOUS REASON FOR THE ABNORMAL FILTER PERFORMANCE.)**

- **Any individual filter has a measured turbidity level of greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of 3 consecutive months**. You must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, you must conduct a self-assessment of the filter within 14 days. If you directly serve fewer than 10,000 persons and have two filters that monitor CFE in lieu of IFE, you must include both filters in the self-assessment.

- **Any individual filter has a measured turbidity level of greater than 2.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of 2 consecutive months**. You must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, you must contact the state or a third party approved by the state to conduct a comprehensive performance evaluation (CPE). Systems directly serving 10,000 or more persons must arrange for the CPE within 30 days and submit the report within 90 days. For systems directly serving fewer than 10,000 persons they must make arrangements for the CPE within 60 days and submit the report within 120 days.

FILTER BACKWASH RECYCLING

The Filter Backwash Recycling Rule (FBRR) establishes additional requirements for Subpart H systems that use conventional or direct filtration and recycle spent filter backwash, thickener supernatant, or liquids from dewatering processes. The purpose of the FBRR is to improve public health protection by assessing and changing, where needed, recycle practices for improved contaminant control, particularly microbial contaminants. Subpart H systems that recycle are required to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or to an alternative location approved by the state. These systems must collect recycle flow information and retain it on file. If applicable, you must have completed all capital improvements associated with relocating recycle return location by June 8, 2006.

RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving 3,300 or fewer persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if your serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if your serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if your serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if your serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Revised Total Coliform Rule (RTCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a "detectable residual." You should check with your state to determine if the state has any additional disinfectant residual requirements.

Reporting and Recordkeeping

Monitoring	Report by:	What to Report
CFE 95 Percent Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95th percentile limit.
CFE Maximum Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.
IFE Monitoring – Monitored continuously and recorded every 15 minutes	10th day of the following month that you served water to the public	IFE monitoring conducted and any follow-up actions.
Minimum Disinfection Residual – Entry to the distribution system	10th day of the following month that you served water to the public	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
Minimum Disinfection Residual – In the distribution system	10th day of the following month that you served water to the public	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable[1] in any 2 consecutive months.

1. Contact your state drinking water program to determine if they have established more stringent requirements.

Disinfection Profiling and Benchmarking

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state **before** making the disinfection change.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice

EPA has developed a guidance manual that provides guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Technical Guidance Manual*, EPA 815-R-20-003, June 2020). This document is available on EPA's website at https://www.epa.gov/dwreginfo/guidance-manuals-surface-water-treatment-rules.

SANITARY SURVEYS

The SWTRs require that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for non-community water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system (*How to Conduct a Sanitary Survey of Drinking Water Systems – A Learner's Guide*, EPA 816-R-17-001, August 2019). This document is available https://www.epa.gov/dwreginfo/sanitary-surveys.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as total trihalomethanes (TTHM).
- Metals.

- Taste and odor.
- Insect larvae.
- *Giardia lamblia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or

- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's website at https://www.epa.gov/dwcapacity/find-epa-drinking-water-operator-certification-contact.

LT2ESWTR SOURCE WATER MONITORING

You were subject to source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

If you did not have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, you were required to conduct initial source water monitoring and monitor for *Cryptosporidium, E. coli*, and turbidity at least monthly for 2 years. You were also required to begin a second round of source water monitoring 6 years after the required date for your water system's initial bin classification determination.

If you begin to use a new surface water or GWUDI source after you were is required to begin initial source water monitoring you must sample the new source on a schedule approved by the state. This requirements also applies to new Subpart H systems that commence operation after the system would have otherwise been required to begin initial source water monitoring. The state may require you to monitor before bringing the new plant or new source on-line or may require you to monitor within a specified time-frame after the source is brought on-line or the system begins operation. Your monitoring must be in compliance with the other requirements of the LT2ESWTR, e.g., the number and frequency of samples and analytical requirements. You must conduct a second round of monitoring within 6 years of the initial bin classification determination.

BIN CLASSIFICATION

You should have completed your source water monitoring and calculated your *Cryptosporidium* concentration to determine your water system's *Cryptosporidium* bin classification. If you are a new Subpart H system or a Subpart H system that developed a new source you must determine the bin classification, based on a schedule provided by the state and no later than 6 months after the source water monitoring is completed.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their bin classification.

Bin	*Cryptosporidium* Concentration (oocysts/L):
1	Less than 0.075 oocysts/L
2	0.075 oocysts/L or higher, but less than 1.0 oocysts/L
3	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
4	3.0 oocysts/L or higher

For more information on determining your bin classification see Chapter 6 of EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* required at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.

Bin	Conventional Filtration (incl. softening)	Direct Filtration
1	None	None
2	1-log	1.5-log
3	2-log	2.5-log
4	2.5-log	3-log

MICROBIAL TOOLBOX

If your bin classification put you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.

- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

See Attachment 10 for more information regarding the Microbial Toolbox.

COMPLIANCE

The requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia lamblia*, and *Cryptosporidium.*
- Turbidity.
- Filter backwash recycling.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Systems that were in bins 2, 3, or 4 following completion of their initial source water monitoring must be in compliance with the additional log inactivation and/or removal requirements. Systems that were in bins 2, 3, and 4 after completing their second round of source water monitoring must either be in compliance with the additional log inactivation and/or removal requirements or be in the process of installing additional treatment.

Schedule	Initial Round of Source Water Monitoring was due no later than:	Calculation of Initial Cryptosporidium Bin Classification was due no later than:	Add Additional Treatment or Control Processes for Systems in Bin 2, 3, and 4 by[2]:	Second Round of Source Water Monitoring was due no later than:
1	September 2008	March 2009	April 1, 2012	April 1, 2017
2	March 2009	September 2009	October 1, 2012	October 1, 2017
3	March 2010	September 2010	October 1, 2013	October 1, 2018

2. States may allow up to an additional 2 years for complying with the treatment requirement for systems making capital improvements.

Attachment 2: I operate a Subpart H water system that: uses conventional or direct filtration and is on LT2ESWTR Schedule 4[3]

BACKGROUND

The purpose of the Suite of Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia.*
- *Cryptosporidium.*

The SWTRs apply 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." Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

This attachment applies to systems that use surface water or GWUDI, use conventional or direct filtration, and:

1) **serve fewer than 10,000 persons and do not sell water; or**
2) **sell water, and the largest system in their CDS serves fewer than 10,000 persons.**

REQUIREMENTS

REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA LAMBLIA*, AND *CRYPTOSPORIDIUM*

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
Giardia lamblia	Zero	99.9% (3-log)
Cryptosporidium	Zero	99% (2-log)

Compliance with the log removal/inactivation requirements for viruses and *Giardia lamblia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in Disinfectants and Disinfection Byproducts Rules

[3] See Section 2 of this document for more information about Schedules.

(DBPRs). EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?*, EPA 815-R-20-005, June 2020] which addresses those rules requirements. This document is available on EPA's website at https://www.epa.gov/dwreginfo/stage-1-and-stage-2-disinfectants-and-disinfection-byproducts-rules.

TURBIDITY

Turbidity is measured in two ways: combined filter effluent (CFE) and individual filter effluent (IFE). CFE is generated when the effluent water from individual filters is combined into one stream. The CFE turbidity results may mask the poor performance of an individual filter. The performance of each individual filter is critical to controlling pathogen breakthrough. Due to this, IFE performance is also measured in systems using conventional or direct filtration.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity for conventional and direct filtration systems:

- Must be less than or equal to 0.3 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and

- Can at no time exceed 1 NTU (based on turbidity measurements recorded every 4 hours).

If you serve 500 or fewer persons, the frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

IFE must be monitored continuously using an approved method and systems must calibrate turbidimeters using the procedure specified by the manufacturer. You must record the results of IFE turbidity monitoring every 15 minutes. If the individual filter is not providing water which contributes to the CFE, (i.e., it is not operating, is filtering to waste, or recycled) you do not need to record or monitor the turbidity for that specific filter.

If there is a failure in continuous IFE turbidity monitoring equipment, you must conduct grab sampling every 4 hours in lieu of continuous monitoring, but must return to 15 minute monitoring no more than 5 working days following the failure of the equipment.

Additionally, you must report IFE turbidity measurements to the state if the measurements demonstrate one of the following:

- **Any individual filter has a measured turbidity level greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart**. You must report the filter number, the turbidity measurement, the date(s) on which the exceedance occurred, and the obvious reason for the exceedance.

- **Any individual filter has a measured turbidity level of greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of 3 consecutive months**. You must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, you must conduct a self-assessment of the filter within 14 days. If you have two filters that monitor CFE in lieu of IFE, you must include both filters in the self-assessment.

- **Any individual filter has a measured turbidity level of greater than 2.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of 2 consecutive**

months. You must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, you must contact the state or a third party approved by the state to conduct a comprehensive performance evaluation (CPE). You must make arrangements for the CPE within 60 days and submit the report within 120 days.

FILTER BACKWASH RECYCLING

The Filter Backwash Recycling Rule (FBRR) establishes additional requirements Subpart H systems that use conventional or direct filtration and recycle spent filter backwash, thickener supernatant, or liquids from dewatering processes. The purpose of the FBRR is to improve public health protection by assessing and changing, where needed, recycle practices for improved contaminant control, particularly microbial contaminants. Subpart H systems that recycle are required to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or to an alternative location approved by the state. These systems must collect recycle flow information and retain it on file. If applicable, you must have completed all capital improvements associated with relocating recycle return location by June 8, 2006.

RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving 3,300 or fewer persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if your serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if your serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if your serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if your serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Revised Total Coliform Rule (RTCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a "detectable residual." You should check with your state to determine if the state has any additional disinfectant residual requirements.

REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
CFE 95 Percent Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95th percentile limit.

Monitoring	Report by:	What to Report
CFE Maximum Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.
IFE Monitoring – Monitored continuously and recorded every 15 minutes	10th day of the following month that you served water to the public	IFE monitoring conducted and any follow-up actions.
Minimum Disinfection Residual – Entry to the distribution system	10th day of the following month that you served water to the public	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
Detectable Disinfection Residual – In the distribution system	10th day of the following month that you served water to the public	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable[1] in any 2 consecutive months.

1. Contact your state drinking water program to determine if they have established more stringent requirements.

DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state **before** making the disinfection change.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

EPA has developed a guidance manual that provides guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Technical Guidance Manual*, EPA 815-R-20-003, June 2020). This document is available on EPA's website at https://www.epa.gov/dwreginfo/guidance-manuals-surface-water-treatment-rules.

SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for non-community water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system (*How to Conduct a Sanitary Survey of Drinking Water Systems – A Learner's Guide*, EPA 816-R-17-001, August 2019). This document is available https://www.epa.gov/dwreginfo/sanitary-surveys.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as total trihalomethanes (TTHM).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia lamblia* and *Cryptosporidium.*
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or

- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's website at https://www.epa.gov/dwcapacity/find-epa-drinking-water-operator-certification-contact.

LT2ESWTR SOURCE WATER MONITORING

You were subject to source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

If you did not have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, you were required to conduct initial source water monitoring and monitor for *E. coli* at least once every 2 weeks for 12 months. Based on the *E. coli* results you may have been required to conduct additional *Cryptosporidium* monitoring. You were also required to begin a second round of source water monitoring 6 years after the required date for your water system's initial bin classification determination.

If you begin to use a new surface water or GWUDI source after you were is required to begin initial source water monitoring you must sample the new source on a schedule approved by the state. This requirements also applies to new Subpart H systems that commence operation after the system would have otherwise been required to begin initial source water monitoring. The state may require you to monitor before bringing the new plant or new source on-line or may require you to monitor within a specified time-frame after the source is brought on-line or the system begins operation. Your monitoring must be in compliance with the other requirements of the LT2ESWTR, e.g., the number and frequency of samples and analytical requirements. You must conduct a second round of monitoring within 6 years of the initial bin classification determination.

BIN CLASSIFICATION

If you were required to conduct *Cryptosporidium* monitoring, you should have completed your source water monitoring and calculated your *Cryptosporidium* concentration to determine your water system's *Cryptosporidium* bin classification. If you are a new Subpart H system or a Subpart H system that developed a new source you must determine the bin classification, based on a schedule provided by the state and no later than 6 months after the source water monitoring is completed.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their bin classification.

Bin	Cryptosporidium Concentration (oocysts/L):
1	Less than 0.075 oocysts/L
2	0.075 oocysts/L or higher, but less than 1.0 oocysts/L
3	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
4	3.0 oocysts/L or higher

For more information on determining your bin classification see Chapter 6 of EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* required at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.

Bin	Conventional Filtration (incl. softening)	Direct Filtration
1	None	None
2	1-log	1.5-log
3	2-log	2.5-log
4	2.5-log	3-log

MICROBIAL TOOLBOX

If your bin classification put you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

See Attachment 10 for more information regarding the Microbial Toolbox.

COMPLIANCE

The requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia lamblia*, and *Cryptosporidium.*
- Turbidity.
- Filter backwash recycling.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified operators.

As a Schedule 4 system, you should be finished with your *E. coli* source water monitoring. Systems that were required to conduct *Cryptosporidium* monitoring and were in bins 2, 3, or 4 after completing their initial source water monitoring must be in compliance with the additional log inactivation and/or removal requirements.

If you were required to conduct *Cryptosporidium* monitoring during the second round of source water monitoring you must have begun that monitoring by April 1, 2019. If, after you calculate your second round of source water monitoring *Cryptosporidium* bin classification and you are in bin 2, 3, or 4, you have until October 1, 2023 (with a possible 2-year extension) to complete any additional treatment or control processes.

Attachment 3: I operate a Subpart H water system that: uses slow sand or diatomaceous earth filtration and is on LT2ESWTR Schedule 1, 2, or 3[4]

BACKGROUND

The purpose of the Suite of Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia.*
- *Cryptosporidium.*

The SWTRs apply 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." Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

This attachment applies to systems that use surface water or GWUDI, use slow sand or diatomaceous earth filtration, and:

1) **serve 10,000 or more persons and do not sell water; or**
2) **sell water, and the largest system in their CDS serves 10,000 or more persons.**

REQUIREMENTS

REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA LAMBLIA*, AND *CRYPTOSPORIDIUM*

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
Giardia lamblia	Zero	99.9% (3-log)
Cryptosporidium	Zero	99% (2-log)

[4] See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia lamblia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in Disinfectants and Disinfection Byproducts Rules (DBPRs). EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?*, EPA 815-R-20-005, June 2020] which addresses those rules requirements. This document is available on EPA's website at https://www.epa.gov/dwreginfo/stage-1-and-stage-2-disinfectants-and-disinfection-byproducts-rules.

TURBIDITY

Turbidity is measured as combined filter effluent (CFE). CFE is generated when the effluent water from individual filters in operation is combined into one stream.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity for slow sand or diatomaceous earth filtration systems:

- Must be less than or equal to 1 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and

- Can at no time exceed 5 NTU (based on turbidity measurements recorded every 4 hours).

If you use slow sand or diatomaceous earth filtration and you serve 500 or fewer persons, the frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving 3,300 or fewer persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if your serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if your serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if your serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if your serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Revised Total Coliform Rule (RTCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a "detectable residual." You should check with your state to determine if the state has any additional disinfectant residual requirements.

REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
CFE 95 Percent Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95th percentile limit.
CFE Maximum Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.
Minimum Disinfection Residual – Entry to the distribution system	10th day of the following month that you served water to the public	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
Detectable Disinfection Residual – In the distribution system	10th day of the following month that you served water to the public	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable[1] in any 2 consecutive months.

1. Contact your state drinking water program to determine if they have established more stringent requirements.

DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state **before** making the disinfection change.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

EPA has developed a guidance manual that provides guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Technical Guidance Manual*, EPA 815-R-20-003, June 2020). This document is available on EPA's website at https://www.epa.gov/dwreginfo/guidance-manuals-surface-water-treatment-rules.

SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for non-community water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system (*How to Conduct a Sanitary Survey of Drinking Water Systems – A Learner's Guide*, EPA 816-R-17-001, August 2019). This document is available https://www.epa.gov/dwreginfo/sanitary-surveys.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as total trihalomethanes (TTHM).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia lamblia* and *Cryptosporidium.*
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or

- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

Qualified Personnel

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's website at https://www.epa.gov/dwcapacity/find-epa-drinking-water-operator-certification-contact.

LT2ESWTR Source Water Monitoring

You were subject to source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

If you did not have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, you were required to conduct initial source water monitoring and monitor for *Cryptosporidium*, *E. coli*, and turbidity at least monthly for 2 years. You were also required to begin a second round of source water monitoring 6 years after the required date for your water system's initial bin classification determination.

If you begin to use a new surface water or GWUDI source after you were is required to begin initial source water monitoring you must sample the new source on a schedule approved by the state. This requirements also applies to new Subpart H systems that commence operation after the system would have otherwise been required to begin initial source water monitoring. The state may require you to monitor before bringing the new plant or new source on-line or may require you to monitor within a specified time-frame after the source is brought on-line or the system begins operation. Your monitoring must be in compliance with the other requirements of the LT2ESWTR, e.g., the number and frequency of samples and analytical requirements. You must conduct a second round of monitoring within 6 years of the initial bin classification determination.

Bin Classification

You should have completed your source water monitoring and calculated your *Cryptosporidium* concentration to determine your water system's *Cryptosporidium* bin classification. If you are a new Subpart H system or a Subpart H system that developed a new source you must determine the bin classification, based on a schedule provided by the state and no later than 6 months after the source water monitoring is completed.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their bin classification.

Bin	Cryptosporidium Concentration (oocysts/L):
1	Less than 0.075 oocysts/L
2	0.075 oocysts/L or higher, but less than 1.0 oocysts/L

Bin	Cryptosporidium Concentration (oocysts/L):
3	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
4	3.0 oocysts/L or higher

For more information on determining your bin classification see Chapter 6 of EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* required at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.

Bin	Slow Sand Filtration	Diatomaceous Earth Filtration
1	None	None
2	1-log	1-log
3	2-log	2.-log
4	2.5-log	2.5-log

MICROBIAL TOOLBOX

If your bin classification put you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

See Attachment 10 for more information regarding the Microbial Toolbox.

COMPLIANCE

The requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia lamblia*, and *Cryptosporidium.*
- Turbidity.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Systems that were in bins 2, 3, or 4 following completion of their initial source water monitoring must be in compliance with the additional log inactivation and/or removal requirements. Systems that were in bins 2, 3, and 4 after completing their second round of source water monitoring must either be in compliance with the additional log inactivation and/or removal requirements or be in the process of installing additional treatment.

Schedule	Initial Round of Source Water Monitoring was due no later than:	Calculation of Initial Cryptosporidium Bin Classification was due no later than:	Add Additional Treatment or Control Processes for Systems in Bin 2, 3, and 4 by[2]:	Second Round of Source Water Monitoring was due no later than:
1	September 2008	March 2009	April 1, 2012	April 1, 2017
2	March 2009	September 2009	October 1, 2012	October 1, 2017
3	March 2010	September 2010	October 1, 2013	October 1, 2018

2. States may allow up to an additional 2 years for complying with the treatment requirement for systems making capital improvements.

Attachment 4: I operate a Subpart H water system that: uses slow sand or diatomaceous earth filtration and is on LT2ESWTR Schedule 4[5]

BACKGROUND

The purpose of the Suite of Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia.*
- *Cryptosporidium.*

The SWTRs apply 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." Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

This attachment applies to systems that use surface water or GWUDI, use slow sand or diatomaceous earth filtration, and:

1) **serve fewer than 10,000 persons and do not sell water; or**
2) **sell water, and the largest system in their CDS serves fewer than 10,000 persons.**

REQUIREMENTS

REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA LAMBLIA*, AND *CRYPTOSPORIDIUM*

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
Giardia lamblia	Zero	99.9% (3-log)
Cryptosporidium	Zero	99% (2-log) (removal only)

[5] See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia lamblia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in Disinfectants and Disinfection Byproducts Rules (DBPRs). EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?*, EPA 815-R-20-005, June 2020] which addresses those rules requirements. This document is available on EPA's website at https://www.epa.gov/dwreginfo/stage-1-and-stage-2-disinfectants-and-disinfection-byproducts-rules.

TURBIDITY

Turbidity is measured as combined filter effluent (CFE). CFE is generated when the effluent water from individual filters in operation is combined into one stream.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity for slow sand or diatomaceous earth filtration systems:

- Must be less than or equal to 1 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and

- Can at no time exceed 5 NTU (based on turbidity measurements recorded every 4 hours).

If you use slow sand or diatomaceous earth filtration and you serve 500 or fewer persons, the frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving 3,300 or fewer persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if your serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if your serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if your serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if your serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Revised Total Coliform Rule (RTCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a "detectable residual." You should check with your state to determine if the state has any additional disinfectant residual requirements.

REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
CFE 95 Percent Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95th percentile limit.
CFE Maximum Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.
Minimum Disinfection Residual – Entry to the distribution system	10th day of the following month that you served water to the public	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
Detectable Disinfection Residual – In the distribution system	10th day of the following month that you served water to the public	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable[1] in any 2 consecutive months.

1. Contact your state drinking water program to determine if they have established more stringent requirements.

DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state **before** making the disinfection change.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

EPA has developed a guidance manual that provides guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Technical Guidance Manual*, EPA 815-R-20-003, June 2020). This document is available on EPA's website at https://www.epa.gov/dwreginfo/guidance-manuals-surface-water-treatment-rules.

SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for non-community water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system (*How to Conduct a Sanitary Survey of Drinking Water Systems – A Learner's Guide*, EPA 816-R-17-001, August 2019). This document is available https://www.epa.gov/dwreginfo/sanitary-surveys.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as total trihalomethanes (TTHM).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia lamblia* and *Cryptosporidium.*
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or

- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's website at https://www.epa.gov/dwcapacity/find-epa-drinking-water-operator-certification-contact.

LT2ESWTR SOURCE WATER MONITORING

You were subject to source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

If you did not have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, you were required to conduct initial source water monitoring and monitor for *E. coli* at least once every 2 weeks for 12 months. Based on the *E. coli* results you may have been required to conduct additional *Cryptosporidium* monitoring. You were also required to begin a second round of source water monitoring 6 years after the required date for your water system's initial bin classification determination.

If you begin to use a new surface water or GWUDI source after you were is required to begin initial source water monitoring you must sample the new source on a schedule approved by the state. This requirements also applies to new Subpart H systems that commence operation after the system would have otherwise been required to begin initial source water monitoring. The state may require you to monitor before bringing the new plant or new source on-line or may require you to monitor within a specified time-frame after the source is brought on-line or the system begins operation. Your monitoring must be in compliance with the other requirements of the LT2ESWTR, e.g., the number and frequency of samples and analytical requirements. You must conduct a second round of monitoring within 6 years of the initial bin classification determination.

BIN CLASSIFICATION

If you were required to conduct *Cryptosporidium* monitoring, you should have completed your source water monitoring and calculated your *Cryptosporidium* concentration to determine your water system's *Cryptosporidium* bin classification. If you are a new Subpart H system or a Subpart H system that developed a new source you must determine the bin classification, based on a schedule provided by the state and no later than 6 months after the source water monitoring is completed.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their bin classification.

Bin	Cryptosporidium Concentration (oocysts/L):
1	Less than 0.075 oocysts/L
2	0.075 oocysts/L or higher, but less than 1.0 oocysts/L
3	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
4	3.0 oocysts/L or higher

For more information on determining your bin classification see Chapter 6 of EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* required at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.

Bin	Slow Sand Filtration	Diatomaceous Earth Filtration
1	None	None
2	1-log	1-log
3	2-log	2-log
4	2.5-log	2.5-log

MICROBIAL TOOLBOX

If your bin classification put you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

See Attachment 10 for more information regarding the Microbial Toolbox.

COMPLIANCE

The requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia lamblia*, and *Cryptosporidium.*
- Turbidity.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

As a Schedule 4 system, you should be finished with your *E. coli* source water monitoring. Systems that were required to conduct *Cryptosporidium* monitoring and were in bins 2, 3, or 4 after completing their initial source water monitoring must be in compliance with the additional log inactivation and/or removal requirements.

If you were required to conduct *Cryptosporidium* monitoring during the second round of source water monitoring you must have begun that monitoring by April 1, 2019. If, after you calculate your second round of source water monitoring *Cryptosporidium* bin classification and you are in bin 2, 3, or 4, you have until October 1, 2023 (with a possible 2-year extension) to complete any additional treatment or control processes.

Attachment 5: I operate a Subpart H water system that: uses alternative filtration and is on LT2ESWTR Schedule 1, 2, or 3[6]

BACKGROUND

The purpose of the Suite of Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia.*
- *Cryptosporidium.*

The SWTRs apply 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." Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

This attachment applies to systems that use surface water or GWUDI, use alternative filtration, and:

1) **serve 10,000 or more persons and do not sell water; or**
2) **sell water, and the largest system in their CDS serves 10,000 or more persons.**

REQUIREMENTS

REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA LAMBLIA*, AND *CRYPTOSPORIDIUM*

In order to use an alternative filtration type you must demonstrate to the state, either through a pilot plant studies or other means determined by the state, that the alternative filtration technology along with the disinfection treatment meet the removal and inactivation requirements for viruses, *Giardia lamblia*, and *Cryptosporidium.*

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
Giardia lamblia	Zero	99.9% (3-log)
Cryptosporidium	Zero	99% (2-log)

[6] See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia lamblia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in Disinfectants and Disinfection Byproducts Rules (DBPRs). EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?*, EPA 815-R-20-005, June 2020] which addresses those rules requirements. This document is available on EPA's website at https://www.epa.gov/dwreginfo/stage-1-and-stage-2-disinfectants-and-disinfection-byproducts-rules.

TURBIDITY

Turbidity is measured as combined filter effluent (CFE). CFE is generated when the effluent water from individual filters in operation is combined into one stream.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity level for alternative filtration systems is set by the state based on the results of the systems demonstration of the technology. However the CFE turbidity for alternative filtration systems:

- Must be less than or equal to 1 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and

- Can at no time exceed 5 NTU (based on turbidity measurements recorded every 4 hours).

If you serve 500 or fewer persons, the frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving 3,300 or fewer persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if your serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if your serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if your serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if your serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Revised Total Coliform Rule (RTCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a "detectable residual." You should check with your state to determine if the state has any additional disinfectant residual requirements.

REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
CFE 95 Percent Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95th percentile limit.
CFE Maximum Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.
Minimum Disinfection Residual – Entry to the distribution system	10th day of the following month that you served water to the public	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
Detectable Disinfection Residual – In the distribution system	10th day of the following month that you served water to the public	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable[1] in any 2 consecutive months.

1. Contact your state drinking water program to determine if they have established more stringent requirements.

DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state **before** making the disinfection change.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

EPA has developed a guidance manual that provides guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Technical Guidance Manual*, EPA 815-R-20-003, June 2020). This document is available on EPA's website at https://www.epa.gov/dwreginfo/guidance-manuals-surface-water-treatment-rules.

SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for non-community water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system (*How to Conduct a Sanitary Survey of Drinking Water Systems – A Learner's Guide*, EPA 816-R-17-001, August 2019). This document is available https://www.epa.gov/dwreginfo/sanitary-surveys.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as total trihalomethanes (TTHM).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia lamblia* and *Cryptosporidium.*
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or

- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

Qualified Personnel

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's website at https://www.epa.gov/dwcapacity/find-epa-drinking-water-operator-certification-contact.

LT2ESWTR Source Water Monitoring

You were subject to source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

If you did not have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, you were required to conduct initial source water monitoring and monitor for *Cryptosporidium*, *E. coli*, and turbidity at least monthly for 2 years. You were also required to begin a second round of source water monitoring 6 years after the required date for your water system's initial bin classification determination.

If you begin to use a new surface water or GWUDI source after you were is required to begin initial source water monitoring you must sample the new source on a schedule approved by the state. This requirements also applies to new Subpart H systems that commence operation after the system would have otherwise been required to begin initial source water monitoring. The state may require you to monitor before bringing the new plant or new source on-line or may require you to monitor within a specified time-frame after the source is brought on-line or the system begins operation. Your monitoring must be in compliance with the other requirements of the LT2ESWTR, e.g., the number and frequency of samples and analytical requirements. You must conduct a second round of monitoring within 6 years of the initial bin classification determination.

Bin Classification

You should have completed your source water monitoring and calculated your *Cryptosporidium* concentration to determine your water system's *Cryptosporidium* bin classification. If you are a new Subpart H system or a Subpart H system that developed a new source you must determine the bin classification, based on a schedule provided by the state and no later than 6 months after the source water monitoring is completed.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their bin classification.

Bin	Cryptosporidium Concentration (oocysts/L):
1	Less than 0.075 oocysts/L
2	0.075 oocysts/L or higher, but less than 1.0 oocysts/L

Bin	Cryptosporidium Concentration (oocysts/L):
3	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
4	3.0 oocysts/L or higher

For more information on determining your bin classification see Chapter 6 of EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* required at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.

Bin	Alternative Filtration Treatment Requirement
1	None
2	As determined by the state so that the total *Cryptosporidium* removal and activation at the treatment plant is at least 4.0-log
3	As determined by the state so that the total *Cryptosporidium* removal and activation at the treatment plant is at least 5.0-log
4	As determined by the state so that the total *Cryptosporidium* removal and activation at the treatment plant is at least 5.5-log

MICROBIAL TOOLBOX

If your bin classification put you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

See Attachment 10 for more information regarding the Microbial Toolbox.

COMPLIANCE

The requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia lamblia*, and *Cryptosporidium.*
- Turbidity.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Systems that were in bins 2, 3, or 4 following completion of their initial source water monitoring must be in compliance with the additional log inactivation and/or removal requirements. Systems that were in bins 2, 3, and 4 after completing their second round of source water monitoring must either be in compliance with the additional log inactivation and/or removal requirements or be in the process of installing additional treatment.

Schedule	Initial Round of Source Water Monitoring was due no later than:	Calculation of Initial Cryptosporidium Bin Classification was due no later than:	Add Additional Treatment or Control Processes for Systems in Bin 2, 3, and 4 by[2]:	Second Round of Source Water Monitoring was due no later than:
1	September 2008	March 2009	April 1, 2012	April 1, 2017
2	March 2009	September 2009	October 1, 2012	October 1, 2017
3	March 2010	September 2010	October 1, 2013	October 1, 2018

2. States may allow up to an additional 2 years for complying with the treatment requirement for systems making capital improvements.

Attachment 6: I operate a Subpart H water system that: uses alternative filtration and is on LT2ESWTR Schedule 4[7]

BACKGROUND

The purpose of the Suite of Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia.*
- *Cryptosporidium.*

The SWTRs apply 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." Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

This attachment applies to systems that use surface water or GWUDI, use alternative filtration, and:

1) **serve fewer than 10,000 persons and do not sell water; or**
2) **sell water, and the largest system in their CDS serves fewer than 10,000 persons.**

REQUIREMENTS

REMOVAL/INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA LAMBLIA*, AND *CRYPTOSPORIDIUM*

In order to use an alternative filtration type you must demonstrate to the state, either through a pilot plant studies or other means determined by the state, that the alternative filtration technology along with the disinfection treatment meet the removal and inactivation requirements for viruses, *Giardia lamblia*, and *Cryptosporidium.*

You must comply with the removal/inactivation requirements established for regulated pathogens. The removal/inactivation requirements are as follows:

Microbial	MCLG	Removal/Inactivation Requirements
Viruses		99.99% (4-log)
Giardia lamblia	Zero	99.9% (3-log)
Cryptosporidium	Zero	99% (2-log)

[7] See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia lamblia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in Disinfectants and Disinfection Byproducts Rules (DBPRs). EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?*, EPA 815-R-20-005, June 2020] which addresses those rules requirements. This document is available on EPA's website at https://www.epa.gov/dwreginfo/stage-1-and-stage-2-disinfectants-and-disinfection-byproducts-rules.

TURBIDITY

Turbidity is measured as combined filter effluent (CFE). CFE is generated when the effluent water from individual filters in operation is combined into one stream.

CFE turbidity must be measured every 4 hours during plant operation. The CFE turbidity level for alternative filtration systems is set by the state based on the results of the systems demonstration of the technology. However the CFE turbidity for alternative filtration systems:

- Must be less than or equal to 1 nephelometric turbidity unit (NTU) for 95 percent of the readings taken each month; and

- Can at no time exceed 5 NTU (based on turbidity measurements recorded every 4 hours).

Your frequency of monitoring may be reduced to once per day if the state determines that less frequent monitoring is sufficient to indicate effective filtration performance. You should check with your state on CFE requirements because the state may require additional monitoring.

RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving 3,300 or fewer persons to take grab samples from 1 to 4 times per day, depending on system size. The state may allow you to reduce your sample to:

- 1 grab sample per day if your serve less than or equal to 500 persons.
- 2 grab samples per day taken at separate times if your serve 501 to 1,000 persons.
- 3 grab samples per day taken at separate times if your serve 1,001 to 2,500 persons.
- 4 grab samples per day taken at separate times if your serve 2,501 to 3,300 persons.

If you are using grab sampling instead of continuous monitoring and the residual disinfectant concentration is below 0.2 mg/L, you must take a grab sample every 4 hours until the residual disinfectant concentration is 0.2 mg/L or greater.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Revised Total Coliform Rule (RTCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a "detectable residual." You should check with your state to determine if the state has any additional disinfectant residual requirements.

REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
CFE 95 Percent Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Total number of CFE measurements and number and percentage of CFE measurements less than or equal to the 95th percentile limit.
CFE Maximum Value – Recorded every 4 hours	10th day of the following month that you served water to the public	Date and time of CFE measurement that exceeds CFE maximum limit.
Minimum Disinfection Residual – Entry to the distribution system	10th day of the following month that you served water to the public	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L.
Detectable Disinfection Residual – In the distribution system	10th day of the following month that you served water to the public	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable[1] in any 2 consecutive months.

1. Contact your state drinking water program to determine if they have established more stringent requirements.

DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state **before** making the disinfection change.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

EPA has developed a guidance manual that provides guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Technical Guidance Manual*, EPA 815-R-20-003, June 2020). This document is available on EPA's website at https://www.epa.gov/dwreginfo/guidance-manuals-surface-water-treatment-rules.

SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for non-community water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system (*How to Conduct a Sanitary Survey of Drinking Water Systems – A Learner's Guide*, EPA 816-R-17-001, August 2019). This document is available https://www.epa.gov/dwreginfo/sanitary-surveys.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as total trihalomethanes (TTHM).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia lamblia* and *Cryptosporidium.*
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or

- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's website at https://www.epa.gov/dwcapacity/find-epa-drinking-water-operator-certification-contact.

LT2ESWTR SOURCE WATER MONITORING

You were subject to source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

If you did not have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, you were required to conduct initial source water monitoring and monitor for *E. coli* at least once every 2 weeks for 12 months. Based on the *E. coli* results you may have been required to conduct additional *Cryptosporidium* monitoring. You were also required to begin a second round of source water monitoring 6 years after the required date for your water system's initial bin classification determination.

If you begin to use a new surface water or GWUDI source after you were is required to begin initial source water monitoring you must sample the new source on a schedule approved by the state. This requirements also applies to new Subpart H systems that commence operation after the system would have otherwise been required to begin initial source water monitoring. The state may require you to monitor before bringing the new plant or new source on-line or may require you to monitor within a specified time-frame after the source is brought on-line or the system begins operation. Your monitoring must be in compliance with the other requirements of the LT2ESWTR, e.g., the number and frequency of samples and analytical requirements. You must conduct a second round of monitoring within 6 years of the initial bin classification determination.

BIN CLASSIFICATION

If you were required to conduct *Cryptosporidium* monitoring, you should have completed your source water monitoring and calculated your *Cryptosporidium* concentration to determine your water system's *Cryptosporidium* bin classification. If you are a new Subpart H system or a Subpart H system that developed a new source you must determine the bin classification, based on a schedule provided by the state and no later than 6 months after the source water monitoring is completed.

After calculating the *Cryptosporidium* concentration, filtered systems must use this concentration to determine their bin classification.

Bin	Cryptosporidium Concentration (oocysts/L):
1	Less than 0.075 oocysts/L
2	0.075 oocysts/L or higher, but less than 1.0 oocysts/L
3	1.0 oocysts/L or higher, but less than 3.0 oocysts/L
4	3.0 oocysts/L or higher

Ultimately, the bin classification determines what, if any, additional treatment for *Cryptosporidium* you are required to provide at your treatment plants. Treatment plants classified in Bin 1 are not required to provide any additional treatment (if they are in compliance with all existing standards, as applicable). Treatment plants classified in Bins 2, 3, and 4 are required to provide additional treatment, the level of which varies according to the type of filtration in place at the treatment plant.

Bin	Alternative Filtration Treatment Requirements
1	None
2	As determined by the state so that the total *Cryptosporidium* removal and activation at the treatment plant is at least 4.0-log
3	As determined by the state so that the total *Cryptosporidium* removal and activation at the treatment plant is at least 5.0-log
4	As determined by the state so that the total *Cryptosporidium* removal and activation at the treatment plant is at least 5.5-log

MICROBIAL TOOLBOX

If your bin classification put you into bins 2, 3, or 4 you will need to use one or more of the Microbial Toolbox options to meet *Cryptosporidium* treatment requirements established during bin classification. Five types of toolbox options are available to systems:

- Source protection and management options.
- Pre-filtration options.
- Treatment performance options.
- Additional filtration options.
- Inactivation options.

There are reporting requirements associated with each type of toolbox option, including when a system must notify a state of their intent to use toolbox options, what a system must verify to be eligible for treatment credit, and what reporting requirements a system must meet in order to continue to receive *Cryptosporidium* treatment credit. Systems must keep results of treatment monitoring for 3 years. The state may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

See Attachment 10 for more information regarding the Microbial Toolbox.

COMPLIANCE

The requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Removal/inactivation requirements for viruses, *Giardia lamblia*, and *Cryptosporidium.*
- Turbidity.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

As a Schedule 4 system, you should be finished with your *E. coli* source water monitoring. Systems that were required to conduct *Cryptosporidium* monitoring and were in bins 2, 3, or 4 after completing their initial source water monitoring must be in compliance with the additional log inactivation and/or removal requirements.

If you were required to conduct *Cryptosporidium* monitoring during the second round of source water monitoring you must have begun that monitoring by April 1, 2019. If, after you calculate your second round of source water monitoring *Cryptosporidium* bin classification and you are in bin 2, 3, or 4, you have until October 1, 2023 (with a possible 2-year extension) to complete any additional treatment or control processes.

Attachment 7: I operate a Subpart H water system that: is unfiltered and is on LT2ESWTR Schedule 1, 2, or 3[8]

BACKGROUND

The purpose of the Suite of Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia.*
- *Cryptosporidium.*

The SWTRs apply 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." Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

This attachment applies to systems that use surface water or GWUDI, avoid filtration, and:

1) **serve 10,000 or more persons and do not sell water; or**
2) **sell water, and the largest system in their CDS serves 10,000 or more persons.**

REQUIREMENTS

INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA LAMBLIA*, AND *CRYPTOSPORIDIUM*

You must comply with the inactivation requirements established for regulated pathogens. The inactivation requirements are as follows:

Microbial	MCLG	Inactivation Requirements
Viruses		99.99% (4-log)
Giardia lamblia	Zero	99.9% (3-log)
Cryptosporidium	Zero	99% (2-log) (through watershed control), and
		99% (2-log) removal of *Cryptosporidium* for systems reporting less than or equal to 0.01 oocysts/L in initial source water monitoring or
		99.9% (3-log) removal of *Cryptosporidium* for systems reporting more than 0.01 oocysts/L in initial source water monitoring

[8] See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia lamblia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in Disinfectants and Disinfection Byproducts Rules (DBPRs). EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?*, EPA 815-R-20-005, June 2020] which addresses those rules requirements. This document is available on EPA's website at https://www.epa.gov/dwreginfo/stage-1-and-stage-2-disinfectants-and-disinfection-byproducts-rules.

You must include in your watershed control programs steps to minimize the potential for contamination by *Cryptosporidium*. Your watershed control program must also minimize the potential for contamination by *Giardia lamblia* and viruses in source water. If you fail to meet *Cryptosporidium* site-specific requirements, you must install filtration within 18 months.

FILTRATION AVOIDANCE CRITERIA

In order to remain unfiltered you must meet certain source water quality and site specific conditions. If any of the Filtration Avoidance Criteria are not meet you must install filtration within 18 months of the failure.

Source Water Quality Conditions

You must measure your source water turbidity. This sample must be taken prior to the first point of disinfection. You must collect a representative grab sample of your source water at least every 4 hours, and the turbidity cannot exceed 5 NTU. You must also monitor fecal coliform or total coliform concentrations in representative samples of source water immediately prior to the first point of disinfection. The number of samples you must take depends on your system size and the turbidity of your source water. If you serve:

- Less than or equal to 500 persons, you must take 1 sample per week.
- 501 to 3,300 persons, you must take 2 samples per week taken on separate days.
- 3,301 to 10,000 persons, you must take 3 samples per week taken on separate days.
- 10,001 to 25,000 persons, you must take 4 samples per week taken on separate days.
- More than 25,000 persons, you must take 5 samples per week taken on separate days.

You must also monitor on any day in which your turbidity sample exceeds 1 NTU.

Fecal coliform density must be less than or equal to 20/100 mL or your total coliform density must less than or equal to 100/100 mL. You must meet one of these criteria in at least 90 percent of the measurements from the previous 6 months.

Site Specific Conditions

You must calculate your system's total inactivation ratio daily and provide 3-log *Giardia lamblia* and 4-log virus inactivation daily except any 1 day each month in 11 of 12 months (on an ongoing basis). You must take daily measurements before or at the first customer at each residual disinfectant concentration sampling point and must measure:

- Temperature.
- pH (if chlorine is used).
- Disinfection contact time (at peak hourly flow).
- Residual disinfectant concentration (at peak hourly flow).

You must comply with the MCL for total coliforms [40 CFR 141.63(a) and (b)] and the MCL for *E. coli* [40 CFR 141.63(c)] in at least 11 of the 12 previous months, and you must meet the requirements of the Stage 1 DBPR and Stage 2 DBPR.

You must have:

- Adequate entry point residual disinfectant concentration.
- Detectable residual disinfectant concentration in the distribution system.
- Redundant disinfection components or automatic shut-off whenever the residual disinfectant concentration is less than 0.2 mg/L.
- A watershed control program minimizing the potential for contamination by *Cryptosporidium*, *Giardia lamblia*, and viruses in source water.
- An annual on-site inspection by state or an approved third party, with reported findings.
- Not been identified as a source of a waterborne disease outbreak.

RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving 3,300 or fewer persons to take grab samples from 1 to 4 times per day, depending on system size.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Revised Total Coliform Rule (RTCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a "detectable residual." You should check with your state to determine if the state has any additional disinfectant residual requirements.

You must meet the combined *Cryptosporidium*, *Giardia lamblia*, and virus inactivation requirements (specified in the Inactivation Requirements table at the beginning of this attachment) using a minimum of two disinfectants. Each disinfectant must be able to achieve the total inactivation required for *Cryptosporidium*, *Giardia lamblia*, or viruses. For example, a system may use UV to meet *Cryptosporidium* and *Giardia lamblia* inactivation requirements and chlorine to meet virus inactivation requirements. To meet the *Cryptosporidium* inactivation requirements, systems must use chlorine dioxide, ozone, or UV.

REPORTING AND RECORDKEEPING

Disinfection requirements are more stringent for unfiltered systems than filtered systems. You will receive a treatment technique violation if:

- You are using chlorine dioxide or ozone that fails to achieve the *Cryptosporidium* log inactivation on more than 1 day in the calendar month.

- You are using UV light and fail to treat in at least 95 percent of the water that is delivered to the public during each calendar month within validated conditions.

Monitoring	Report by:	What to Report
Source Water Quality Conditions	10th day of the following month that you served water to the public	The cumulative number of months for which results are reported. The number of fecal and/or total coliform samples (if a system monitors for both, only fecal coliforms must be reported), the dates of sample collection, and the dates when the turbidity level exceeded 1 NTU. The number of samples during the month that had equal to or less than 20/100 mL fecal coliforms and/or equal to or less than 100/100 mL total coliforms, whichever are analyzed. The cumulative number of fecal or total coliform samples, cumulative number of samples that had equal to or less than 20/100 mL fecal coliforms or equal to or less than 100/100 mL total coliforms, percentage of samples that had equal to or less than 20/100 mL fecal coliforms or equal to or less than 100/100 mL total coliforms, during the previous 6 months the system served water to the public. The maximum turbidity level measured during the month, the date for any measurement that exceeded 5 NTU, and the date the occurrence was reported to the state. The dates and number of times the turbidity exceeded 5 NTU in the previous 12 months. For the first 120 months of recordkeeping, the dates and total number of events during which the turbidity exceeded 5 NTU, and after 10 years of recordkeeping for turbidity measurements, the dates and total number of events during which the turbidity exceeded 5 NTU in the previous 120 months the system served water to the public.
Site Specific Conditions	By October 10 of each year	Compliance with all watershed control program requirements. Report on the on-site inspection, unless the state conducted the inspection.
	Within 24 hours	Any turbidity exceedances of 5 NTU or waterborne disease outbreaks.
	ASAP but no later than the end of the next business day	Any instance where the residual disinfectant level entering the distribution systems was less than 0.2 mg/L.

Monitoring	Report by:	What to Report
Minimum Disinfection Residual – Entry to the distribution system	10th day of the following month that you served water to the public	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L. The daily residual disinfectant concentration (in mg/L) and disinfection contact time (in minutes) used for calculating the CT value. If chlorine is used, the daily measurement of pH of disinfected water following each point of chlorine disinfection. The daily measurement of water temperature in degrees C following each point of disinfection. The daily CT_{calc} and $CT_{calc}/CT_{99.9}$ values for each disinfectant measurement or sequence and the sum of all $CT_{calc}/CT_{99.9}$ values before or at the first customer. The daily determination of whether disinfection achieves adequate *Giardia lamblia* and virus inactivation.
Detectable Disinfection Residual – In the distribution system	10th day of the following month that you served water to the public	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements being undetectable[1] in any 2 consecutive months.
Source Water Monitoring	10th day of the following month that you served water to the public	Monitoring results for *Cryptosporidium.*

1. Contact your state drinking water program to determine if they have established more stringent requirements.

DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state **before** making the disinfection change.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

EPA has developed a guidance manual that provides guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Technical Guidance Manual*, EPA 815-R-20-003, June 2020). This document is available on EPA's website at https://www.epa.gov/dwreginfo/guidance-manuals-surface-water-treatment-rules.

SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for non-community water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system (*How to Conduct a Sanitary Survey of Drinking Water Systems – A Learner's Guide*, EPA 816-R-17-001, August 2019). This document is available https://www.epa.gov/dwreginfo/sanitary-surveys.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as total trihalomethanes (TTHM).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia lamblia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H

systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or

- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008 and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's website at https://www.epa.gov/dwcapacity/find-epa-drinking-water-operator-certification-contact.

LT2ESWTR SOURCE WATER MONITORING

You were subject to source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

You were required to conduct initial source water monitoring and monitor for *Cryptosporidium* at least monthly for 2 years. You were also required to begin a second round of source water monitoring 6 years after the date your water system was required to determine the initial monitoring's mean *Cryptosporidium* level.

If you begin to use a new surface water or GWUDI source after you were is required to begin initial source water monitoring you must sample the new source on a schedule approved by the state. This requirements also applies to new Subpart H systems that commence operation after the system would have otherwise been required to begin initial source water monitoring. The state may require you to monitor before bringing the new plant or new source on-line or may require you to monitor within a specified time-frame after the source is brought on-line or the system begins operation. Your monitoring must be in compliance with the other requirements of the LT2ESWTR, e.g., the number and frequency of samples and analytical requirements. You must conduct a second round of monitoring within 6 years of the initial determination of the mean *Cryptosporidium* concentration.

Upon completing source water monitoring you must calculate your water system's mean *Cryptosporidium* concentration. Note that unfiltered systems are not required to determine the highest 12-month mean; the mean *Cryptosporidium* concentration is always based on all samples taken during LT2ESWTR source water monitoring.

The mean *Cryptosporidium* level is used to determine the level of *Cryptosporidium* inactivation that unfiltered systems are required to provide at each treatment plant. If the mean *Cryptosporidium* level is:

- Less than or equal to 0.01 oocysts/L, the system must provide at least 2-log *Cryptosporidium* inactivation at that treatment plant.

- Greater than 0.01 oocysts/L, the system must provide at least 3-log *Cryptosporidium* inactivation at that treatment plant.

MICROBIAL TOOLBOX

As an unfiltered system you will need to meet any additional treatment requirements using the inactivation options from the Microbial Toolbox.

See Attachment 10 for more information regarding the Microbial Toolbox.

COMPLIANCE

The requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Inactivation requirements for viruses, *Giardia lamblia*, and *Cryptosporidium.*
- Filtration Avoidance Criteria.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Your compliance dates depend on the size of the population served by your system, or the number of persons served by the largest system in your CDS, whichever is greater.

Systems that were required to provide 3-log *Cryptosporidium* inactivation following completion of their initial source water monitoring must be in compliance with the additional log inactivation requirements. Systems that were required to provide 3-log *Cryptosporidium* inactivation after completing their second round of source water monitoring must either be in compliance with the additional log inactivation requirements or be in the process of installing additional treatment.

Schedule	Initial Round of Source Water Monitoring was due no later than:	Calculation of mean *Cryptosporidium* concentration was due no later than:	Add Additional Treatment for Systems Required to Provide 3-log *Cryptosporidium* Inactivation[2]:	Second Round of Source Water Monitoring was due no later than:
1	September 2008	March 2009	April 1, 2012	April 1, 2017
2	March 2009	September 2009	October 1, 2012	October 1, 2017
3	March 2010	September 2010	October 1, 2013	October 1, 2018

2. States may allow up to an additional 2 years for complying with the treatment requirement for systems making capital improvements.

Attachment 8: I operate a Subpart H water system that: is unfiltered and is on LT2ESWTR Schedule 4[9]

BACKGROUND

The purpose of the Suite of Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Giardia lamblia.*
- *Cryptosporidium.*

The SWTRs apply 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." Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

Requirements differ for different types of filtration (Conventional Filtration and Direct Filtration, Slow Sand Filtration and Diatomaceous Earth Filtration, or Alternative Filtration Technologies) or unfiltered systems. Also the timelines with which systems must comply differ based on the population served by the system or the population served by the largest system within a combined distribution system (CDS).

This attachment applies to systems that use surface water or GWUDI, avoid filtration, and:

1) **They serve fewer than 10,000 persons and do not sell water; or**
2) **They sell water, and the largest system in their CDS serves fewer than 10,000 persons.**

REQUIREMENTS

INACTIVATION REQUIREMENTS FOR VIRUSES, *GIARDIA LAMBLIA*, AND *CRYPTOSPORIDIUM*

You must comply with the inactivation requirements established for regulated pathogens. The inactivation requirements are as follows:

Microbial	MCLG	Inactivation Requirements
Viruses		99.99% (4-log)
Giardia lamblia	Zero	99.9% (3-log)
Cryptosporidium	Zero	99% (2-log) (through watershed control) and,
		99% (2-log) removal of *Cryptosporidium* for systems reporting less than or equal to 0.01 oocysts/L in initial source water monitoring or,
		99.9% (3-log) removal of *Cryptosporidium* for systems reporting more than 0.01 oocysts/L in initial source water monitoring

[9] See Section 2 of this document for more information about Schedules.

Compliance with the log removal/inactivation requirements for viruses and *Giardia lamblia* can be met through a combination of filtration and disinfection. You must also comply with the maximum residual disinfection level (MRDL) requirements specified in Disinfectants and Disinfection Byproducts Rules (DBPRs). EPA has developed a companion document [*Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) What Do They Mean to You?*, EPA 815-R-20-005, June 2020] which addresses those rules requirements. This document is available on EPA's website at https://www.epa.gov/dwreginfo/stage-1-and-stage-2-disinfectants-and-disinfection-byproducts-rules.

You must include in your watershed control programs steps to minimize the potential for contamination by *Cryptosporidium*. Your watershed control program must also minimize the potential for contamination by *Giardia lamblia* and viruses in source water. If you fail to meet *Cryptosporidium* site-specific requirements, you must install filtration within 18 months.

FILTRATION AVOIDANCE CRITERIA

In order to remain unfiltered you must meet certain source water quality and site specific conditions. If any of the Filtration Avoidance Criteria are not meet you must install filtration within 18 months of the failure.

Source Water Quality Conditions

You must measure your source water turbidity. This sample must be taken prior to the first point of disinfection. You must collect a representative grab sample of your source water at least every 4 hours, and the turbidity cannot exceed 5 NTU. You must also monitor fecal coliform or total coliform concentrations in representative samples of source water immediately prior to the first point of disinfection. The number of samples you must take depends on your system size and the turbidity of your source water. If you serve:

- Less than or equal to 500 persons, you must take 1 sample per week.
- 501 to 3,300 persons, you must take 2 samples per week taken on separate days.
- 3,301 to 10,000 persons, you must take 3 samples per week taken on separate days.
- 10,001 to 25,000 persons, you must take 4 samples per week taken on separate days.
- More than 25,000 persons, you must take 5 samples per week taken on separate days.

You must also monitor on any day in which your turbidity sample exceeds 1 NTU.

Fecal coliform density must be less than or equal to 20/100 mL or your total coliform density must less than or equal to 100/100 mL. You must meet one of these criteria in at least 90 percent of the measurements from the previous 6 months.

Site Specific Conditions

You must calculate your system's total inactivation ratio daily and provide 3-log *Giardia lamblia* and 4-log virus inactivation daily except any 1 day each month in 11 of 12 months (on an ongoing basis). You must take daily measurements before or at the first customer at each residual disinfectant concentration sampling point and must measure:

- Temperature.
- pH (if chlorine is used).
- Disinfection contact time (at peak hourly flow).
- Residual disinfectant concentration (at peak hourly flow).

You must comply with the MCL for total coliforms [40 CFR 141.63(a) and (b)] and the MCL for *E. coli* [40 CFR 141.63(c)] in at least 11 of the 12 previous months, and you must meet the requirements of the Stage 1 DBPR and Stage 2 DBPR.

You must have:

- Adequate entry point residual disinfectant concentration.
- Detectable residual disinfectant concentration in the distribution system.
- Redundant disinfection components or automatic shut-off whenever the residual disinfectant concentration is less than 0.2 mg/L.
- A watershed control program minimizing the potential for contamination by *Cryptosporidium*, *Giardia lamblia*, and viruses in source water.
- An annual on-site inspection by state or an approved third party, with reported findings.
- Not been identified as a source of a waterborne disease outbreak.

RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals at the entry point to the distribution system and in the distribution system. The concentration for disinfectant residuals at the entry point cannot be less than 0.2 mg/L for more than 4 hours and must be monitored continuously. Your state may allow systems serving 3,300 or fewer persons to take grab samples from 1 to 4 times per day, depending on system size.

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Revised Total Coliform Rule (RTCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a "detectable residual." You should check with your state to determine if the state has any additional disinfectant residual requirements.

You must meet the combined *Cryptosporidium*, *Giardia lamblia*, and virus inactivation requirements (specified in the Inactivation Requirements table at the beginning of this attachment) using a minimum of two disinfectants. Each disinfectant must be able to achieve the total inactivation required for *Cryptosporidium*, *Giardia lamblia*, or viruses. For example, a system may use UV to meet *Cryptosporidium* and *Giardia lamblia* inactivation requirements and chlorine to meet virus inactivation requirements. To meet the *Cryptosporidium* inactivation requirements, systems must use chlorine dioxide, ozone, or UV.

REPORTING AND RECORDKEEPING

Disinfection requirements are more stringent for unfiltered systems than filtered systems. You will receive a treatment technique violation if:

- You are using chlorine dioxide or ozone that fails to achieve the *Cryptosporidium* log inactivation on more than 1 day in the calendar month.

- You are using UV light and fail to treat at least 95 percent of the water that is delivered to the public during each calendar month within validated conditions.

Monitoring	Report by:	What to Report
Source Water Quality Conditions	10th day of the following month that you served water to the public	The cumulative number of months for which results are reported. The number of fecal and/or total coliform samples (if a system monitors for both, only fecal coliforms must be reported), the dates of sample collection, and the dates when the turbidity level exceeded 1 NTU. The number of samples during the month that had equal to or less than 20/100 mL fecal coliforms and/or equal to or less than 100/100 mL total coliforms, whichever are analyzed. The cumulative number of fecal or total coliform samples, cumulative number of samples that had equal to or less than 20/100 mL fecal coliforms or equal to or less than 100/100 mL total coliforms, percentage of samples that had equal to or less than 20/100 mL fecal coliforms or equal to or less than 100/100 mL total coliforms, during the previous 6 months the system served water to the public. The maximum turbidity level measured during the month, the date for any measurement that exceeded 5 NTU, and the date the occurrence was reported to the state. The dates and number of times the turbidity exceeded 5 NTU in the previous 12 months. For the first 120 months of recordkeeping, the dates and total number of events during which the turbidity exceeded 5 NTU, and after 10 years of recordkeeping for turbidity measurements, the dates and total number of events during which the turbidity exceeded 5 NTU in the previous 120 months the system served water to the public.
Site Specific Conditions	By October 10 of each year	Compliance with all watershed control program requirements. Report on the on-site inspection, unless the state conducted the inspection.
	Within 24 hours	Any turbidity exceedances of 5 NTU or waterborne disease outbreaks.
	ASAP but no later than the end of the next business day	Any instance where the residual disinfectant level entering the distribution systems was less than 0.2 mg/L.

Monitoring	Report by:	What to Report
Minimum Disinfection Residual – Entry to the distribution system	10th day of the following month that you served water to the public	Lowest daily value for each day, the date and duration when the residual disinfectant was less than 0.2 mg/L, and when the state was notified of events where residual disinfectant was less than 0.2 mg/L. The daily residual disinfectant concentration (in mg/L) and disinfectant contact time (in minutes) used for calculating the CT value. If chlorine is used, the daily measurement of pH of disinfected water following each point of chlorine disinfection. The daily measurement of water temperature in degrees C following each point of disinfection. The daily CT_{calc} and $CT_{calc}/CT_{99.9}$ values for each disinfectant measurement or sequence and the sum of all $CT_{calc}/CT_{99.9}$ values before or at the first customer. The daily determination of whether disinfection achieves adequate *Giardia lamblia* and virus inactivation.
Detectable Disinfection Residual – In the distribution system	10th day of the following month that you served water to the public	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable[1] in any 2 consecutive months.
Source Water Monitoring	10th day of the following month that you served water to the public	Monitoring results for *Cryptosporidium.*

1. Contact your state drinking water program to determine if they have established more stringent requirements.

DISINFECTION PROFILING AND BENCHMARKING

You must evaluate your disinfection practices and work with the state to ensure there are no unintended reductions in microbial protection if you plan on changing how you disinfect your water. Subpart H systems that intend to make a significant change to their disinfection practice are required to develop a disinfection profile, calculate a disinfection benchmark, and submit the profile and benchmark when consulting with the state **before** making the disinfection change.

Significant changes to disinfection practice include:

- Changes to the point of disinfection.
- Changes to the disinfectant(s) used in the treatment plant.
- Changes to the disinfection process.
- Any other modification identified by the state as a significant change to disinfection practice.

EPA has developed a guidance manual that provides guidance to Subpart H systems that must comply with this requirement (*Disinfection Profiling and Benchmarking Technical Guidance Manual*, EPA 815-R-20-003, June 2020). This document is available on EPA's website at https://www.epa.gov/dwreginfo/guidance-manuals-surface-water-treatment-rules.

SANITARY SURVEYS

The SWTRs requires that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for non-community water systems (NCWSs).

A sanitary survey includes eight elements. The eight elements are:

- Source (protection, physical components, and condition).
- Treatment.
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.
- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system (*How to Conduct a Sanitary Survey of Drinking Water Systems – A Learner's Guide*, EPA 816-R-17-001, August 2019). This document is available https://www.epa.gov/dwreginfo/sanitary-surveys.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, source water vulnerability assessments, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as total trihalomethanes (TTHM).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia lamblia* and *Cryptosporidium*.
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H

systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir that was built before February 16, 1999, must either:

- Cover the uncovered finished water storage facility; or

- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that this type of determinations should be left to the states' discretion. Information about state operator certification programs can be accessed through EPA's website at https://www.epa.gov/dwcapacity/find-epa-drinking-water-operator-certification-contact.

LT2ESWTR SOURCE WATER MONITORING

You were subject to source water monitoring requirements. For more information on source water monitoring requirements see EPA's *Source Water Monitoring Guidance Manual for Public Water Systems for the Final Long Term 2 Enhanced Surface Water Treatment Rule* (EPA 815-R-06-005, February 2006), available at https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents.

If you did not have 5.5-logs of treatment for *Cryptosporidium*, which is equivalent to meeting the treatment requirements of Bin 4, you were required to conduct initial source water monitoring and monitor for *Cryptosporidium* at least twice per month for 12 months, or at least once per month for 24 months. You were also required to begin a second round of source water monitoring 6 years after the date your water system was required to determine the initial monitoring's mean *Cryptosporidium* level.

If you begin to use a new surface water or GWUDI source after you were is required to begin initial source water monitoring you must sample the new source on a schedule approved by the state. This requirements also applies to new Subpart H systems that commence operation after the system would have otherwise been required to begin initial source water monitoring. The state may require you to monitor before bringing the new plant or new source on-line or may require you to monitor within a specified time-frame after the source is brought on-line or the system begins operation. Your monitoring must be in compliance with the other requirements of the LT2ESWTR, e.g., the number and frequency of samples and analytical requirements. You must conduct a second round of monitoring within 6 years of the initial determination of the mean *Cryptosporidium* concentration.

Upon completing source water monitoring you must calculate your water system's mean *Cryptosporidium* concentration. Note that unfiltered systems are not required to determine the highest 12-month mean; the mean *Cryptosporidium* concentration is always based on all samples taken during LT2ESWTR source water monitoring.

The mean *Cryptosporidium* level is used to determine the level of *Cryptosporidium* inactivation that unfiltered systems are required to provide at each treatment plant. If the mean *Cryptosporidium* level is:

- Less than or equal to 0.01 oocysts/L, the system must provide at least 2-log *Cryptosporidium* inactivation at that treatment plant.

- Greater than 0.01 oocysts/L, the system must provide at least 3-log *Cryptosporidium* inactivation at that treatment plant.

MICROBIAL TOOLBOX

As an unfiltered system you will need to meet any additional treatment requirements using the inactivation options from the Microbial Toolbox.

See Attachment 10 for more information regarding the Microbial Toolbox.

COMPLIANCE

The requirements for the SWTRs are in effect and you must be in compliance with these requirements. This includes the requirements for:

- Inactivation requirements for viruses, *Giardia lamblia*, and *Cryptosporidium.*
- Filtration Avoidance Criteria.
- Residual disinfectant monitoring.
- Disinfection profiling and benchmarking.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified personnel.

Systems that were required to provide 3-log *Cryptosporidium* inactivation after completing their initial source water monitoring must be in compliance with the additional log inactivation requirements. You must have begun your second round of source water monitoring for *Cryptosporidium* by April 1, 2019. If, after you calculate your mean *Cryptosporidium* concentration your system is required to provide 3-log *Cryptosporidium* inactivation, you have until October 1, 2023 (with a possible 2-year extension) to complete any additional treatment or control processes.

Attachment 9: I operate a consecutive water system that: purchases finished water from a Subpart H water system and does not have a surface water or GWUDI source of my own

BACKGROUND

The purpose of the Suite of Surface Water Treatment Rules (SWTRs) is to improve public health protection through the control of microbial contaminants, including requirements for removal and/or inactivation of:

- Viruses.
- *Legionella* bacteria.
- *Giardia lamblia.*
- *Cryptosporidium.*

The SWTRs apply 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." Under these rules, all Subpart H systems are required to disinfect and to filter (unless specific filtration avoidance criteria are met). The SWTRs also establish treatment technique requirements for control of microbial contaminants.

This attachment applies to consecutive systems that purchase finished water from a Subpart H water system and does not have a surface water or GWUDI source of their own.

REQUIREMENTS

RESIDUAL DISINFECTANT MONITORING

You must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as Revised Total Coliform Rule (RTCR) sampling. Residual disinfectant concentrations must be detected in at least 95 percent of the samples each month for 2 consecutive months. You may measure HPC in lieu of disinfectant residuals. If HPC is less than 500 colonies/ml, the site has the equivalent of a "detectable residual." You should check with your state to determine if the state has any additional disinfectant residual requirements.

SANITARY SURVEYS

The SWTRs require that the state conduct sanitary surveys for all Subpart H systems, regardless of the population served, no less frequently than every 3 years for community water systems (CWSs) and every 5 years for non-community water systems (NCWSs).

A sanitary survey includes eight elements, however the source water element review is not applicable to consecutive systems. The elements that are reviewed during a sanitary survey at consecutive systems are:

- Treatment (if applicable).
- Distribution system.
- Finished water storage.
- Pumps, pump facilities, and controls.
- Monitoring, reporting, and data verification.

- Water system management and operations.
- Operator compliance with state requirements.

These elements are discussed in EPA's guidance on how to conduct a sanitary survey of a Subpart H system (*How to Conduct a Sanitary Survey of Drinking Water Systems – A Learner's Guide*, EPA 816-R-17-001, August 2019). This document is available https://www.epa.gov/dwreginfo/sanitary-surveys.

You must provide, at the state's request, any existing information that would allow the state to perform a sanitary survey. Examples of existing information that may be necessary to perform the survey include past survey reports, monitoring and maintenance records, construction details of system infrastructure components, and operations and management-related records.

FINISHED RESERVOIRS/WATER STORAGE FACILITIES

The use of uncovered finished water reservoirs can lead to significant water quality degradation and increase health risks to consumers. Finished water quality degradation has been attributed to contamination from both internal and external sources and includes increases in the following:

- Algal growth.
- Coliform bacteria growth.
- Heterotrophic plate count (HPC) bacteria growth.
- Turbidity.
- Particulates.
- Disinfection byproducts such as total trihalomethanes (TTHM).
- Metals.
- Taste and odor.
- Insect larvae.
- *Giardia lamblia* and *Cryptosporidium.*
- Nitrification of chloraminated waters.

Some of these water quality problems are exacerbated by the loss of chlorine residual and poor hydraulic circulation that are characteristic of large open reservoirs. In order to address these concerns, Subpart H systems are no longer allowed to begin construction of an uncovered finished water reservoir. In addition, Subpart H systems that operate with an uncovered finished water reservoir must either:

- Cover the uncovered finished water storage facility; or

- Treat the discharge from the uncovered finished water storage facility to the distribution system to achieve at least 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* inactivation and/or removal using a protocol approved by the state.

You were required to notify the state of each uncovered finished water reservoir by April 1, 2008, and cover or treat the discharge from the reservoir or be in compliance with a state-approved schedule by April 1, 2009.

QUALIFIED PERSONNEL

The SWTRs require that Subpart H systems be operated by qualified personnel who meet the requirements specified by the state. EPA does not specify the amount of time qualified personnel are required to spend on site at the plant. EPA believes that these types of determinations should be left to the states' discretion.

Information about state operator certification programs can be accessed through EPA's website at https://www.epa.gov/dwcapacity/find-epa-drinking-water-operator-certification-contact.

REPORTING AND RECORDKEEPING

Monitoring	Report by:	What to Report
Detectable Disinfection Residual – In the distribution system	10th day of the following month that you served water to the public	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5 percent of the measurements as being undetectable[1] in any 2 consecutive months.

1. Contact your state drinking water program to determine if they have established more stringent requirements.

COMPLIANCE

All of the SWTRs requirements for consecutive systems are in effect, and you must be in compliance with these requirements. This includes the requirements for:

- Residual disinfectant monitoring.
- Sanitary surveys.
- Finished reservoirs/water storage facilities.
- Qualified operators.

Attachment 10: I operate a Subpart H water system that: must implement a Microbial Toolbox Option under the LT2ESWTR

MICROBIAL TOOLBOX

If your bin classification put you into bins 2, 3, or 4, you will need to:

- use one or more of the Microbial Toolbox options (40 CFR 141.715 – 141.720) to meet the *Cryptosporidium* treatment requirements; and
- comply with the applicable Microbial Toolbox reporting [40 CFR 141.721(f)] and recordkeeping [40 CFR 141.722(c)] requirements.

Five types of toolbox options are available to systems:

- Source protection and management options (40 CFR 141.716).
- Pre-filtration options (40 CFR 141.717).
- Treatment performance options (40 CFR 141.718).
- Additional filtration options (40 CFR 141.719).
- Inactivation options (40 CFR 141.720).

Unfiltered systems may only use the inactivation options from the Microbial Toolbox to meet *Cryptosporidium* treatment requirements.

EPA's *Long Term 2 Enhanced Surface Water Treatment Rule: Toolbox Guidance Manual* (EPA 815-R-09-016, April 2010) provides technical information on applying the LT2ESWTR "Toolbox Options" of *Cryptosporidium* treatment and management strategies. The document is available on EPA's website at: https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents#lt2toolkit.

SOURCE PROTECTION AND MANAGEMENT OPTIONS

Microbial Toolbox – Watershed control program

Toolbox Option	*Cryptosporidium* Treatment Credit
1. Source Protection and Management Options	
Watershed control program	0.5-log credit

The watershed control plan must:

- Identify an "area of influence" outside of which *Cryptosporidium* or fecal contamination is not likely to affect the treatment plant intake. This defined "area of influence" will be evaluated in future watershed surveys.
- Identify potential and actual source(s) of *Cryptosporidium* contamination.
- Include assessment of the impact of contamination source on source water quality.
- Assess the relative impact of these sources on the system's source water quality.

- Analyze the effectiveness and feasibility of control measures that could reduce *Cryptosporidium* contamination.

- State goals and specific actions the system will take to reduce source water *Cryptosporidium* levels, explain how actions are expected to contribute to specific goals, identify watershed partners and their roles, identify resource requirements and commitments, and include a schedule for plan implementation with deadlines for specific actions identified in the plan.

If a system submits their plan and does not hear back from the state, they may assume that the plan was approved, and a 0.5-log credit was awarded unless the state subsequently rescinds approval. In addition to Subpart H systems establishing a new watershed control plan, systems with existing watershed control plans may also apply for this credit.

The state may withdraw the 0.5-log credit if it determines that the system is not carrying out its watershed control plan. The watershed control plan and the sanitary survey results must be made available to the public.

Microbial Toolbox Reporting and Recordkeeping – Watershed control program

Systems receiving *Cryptosporidium* treatment credit for watershed control programs must report their intent to the state 2 years before the applicable treatment compliance date and must submit a watershed control plan 1 year before the applicable treatment compliance date. Systems must submit a program status report every 12 months and must undergo a watershed sanitary survey every 3 years (CWSs) or 5 years (NCWSs).

Microbial Toolbox – Alternative source/intake management

Toolbox Option	*Cryptosporidium* Treatment Credit
1. Source Protection and Management Options	
Alternative source/intake management	No prescribed credit

If a system determines its bin classification using alternative source water monitoring results, the system must relocate the intake or permanently adopt the alternative withdrawal procedure no later than the applicable treatment compliance date.

A system may conduct source water monitoring at an alternative intake location (in the same source or in a different source) or using a different procedure for timing or level of withdrawal from the source. If the state approves, the system may determine its bin classification based on the alternative source's monitoring results. A system must concurrently conduct source water monitoring at the original source. Systems must report alternative source water monitoring results to the state, along with information describing the operating conditions under which the samples were collected. If a system determines its bin classification using alternative source water monitoring results that reflect a different intake location or a different procedure for managing the timing or level of withdrawal from the source, the system must relocate the intake or permanently adopt the alternative withdrawal procedure no later than the applicable treatment compliance date.

Microbial Toolbox Reporting and Recordkeeping – Alternative source/intake management

Systems must verify the relocation of their intake or the adoption of alternative withdrawal procedures by the applicable treatment compliance date.

PRE-FILTRATION OPTIONS

Microbial Toolbox – Presedimentation basin with coagulation

Toolbox Option	*Cryptosporidium* Treatment Credit
2. Pre-Filtration Options	
Presedimentation basin with coagulation	0.5-log credit

Systems may receive a 0.5-log *Cryptosporidium* treatment credit for a presedimentation basin that meets the following requirements:

- The presedimentation basin must be in continuous operation.
- The presedimentation basin must treat the entire plant flow taken from a Subpart H source.
- The system must continuously add coagulant to the presedimentation basin.
- The presedimentation basin must demonstrate at least a 0.5-log reduction of influent turbidity.
    - Using daily turbidity measurements and calculated as follows: $\log_{10}$(monthly mean of daily influent turbidity) – $\log_{10}$(monthly mean of daily effluent turbidity), or
    - Complying with state-approved performance criteria that demonstrate at least a 0.5-log mean removal of micron-sized particulate material.

Microbial Toolbox Reporting and Recordkeeping – Presedimentation basin with coagulation

Systems receiving *Cryptosporidium* treatment credit for a presedimentation basin must report monthly that the basin was in continuous operation, the basin treated the entire plant flow taken from a Subpart H source, coagulant was continuously added, and the basin achieved at least a 0.5-log reduction of turbidity or complied with alternative state-approved performance criteria. Monthly results must be submitted within the first 10 days of the following month.

Microbial Toolbox – Two-stage lime softening

Toolbox Option	*Cryptosporidium* Treatment Credit
2. Pre-Filtration Options	
Two-stage lime softening	0.5-log credit

Systems may receive a 0.5-log credit for two-stage lime softening if:

- Chemical addition and hardness precipitation must occur in two separate and sequential softening stages prior to filtration, and
- Both softening stages treat the entire plant flow taken from a Subpart H source.

Microbial Toolbox Reporting and Recordkeeping – Two-stage lime softening

Systems receiving a 0.5-log credit for two-stage lime softening must verify that chemical addition and hardness precipitation occurred in two separate stages and that both stages treated the entire plant flow

taken from a Subpart H source. Systems must report this information to the state monthly, beginning on the applicable treatment compliance date. Monthly results must be submitted within the first 10 days of the following month.

Microbial Toolbox – Bank filtration

Toolbox Option	*Cryptosporidium* Treatment Credit
2. Pre Filtration Options	
Bank filtration	0.5-log credit for 25-foot setback 1.0-log credit for 50-foot setback

Systems using bank filtration when they begin the source water monitoring process are not eligible for this credit. Systems may receive a 0.5-log credit for a bank filtration process with at least a 25-foot ground water flow path or a 1.0-log credit for a bank filtration process with at least a 50-foot ground water flow path, if:

- Wells are located in granular aquifers;
- Wells are horizontal or vertical;
- Vertical well flowpaths are measured from the edge of the surface water body under high flow conditions;
- Horizontal well flowpaths are the measured distance from the bed of the river under normal flow conditions to the closest well lateral screen;
- Systems monitor turbidity at each wellhead at least once every four hours while the process is in operation.

The state may approve *Cryptosporidium* treatment credit for bank filtration based on a demonstration of performance study that meets certain requirements.

Springs and infiltration galleries, which are not eligible for treatment credit under the bank filtration option, are eligible for demonstration of performance credit.

Microbial Toolbox Reporting and Recordkeeping – Bank Filtration

Systems receiving *Cryptosporidium* treatment credit for bank filtration must verify their aquifer type and their setback distance by the applicable treatment compliance date. Systems must report any monthly average turbidity level, based on daily maximum values, exceeding 1 NTU and provide a report on an assessment of the cause within 30 days following the month in which the monitoring was conducted.

TREATMENT PERFORMANCE OPTIONS

Microbial Toolbox – Combined filter performance

Toolbox Option	*Cryptosporidium* Treatment Credit
3. Treatment Performance Options	
Combined filter performance	0.5-log credit

Systems using conventional or direct filtration treatment receive this credit during any month when the system's CFE turbidity is less than or equal to 0.15 NTU in at least 95 percent of measurements.

Microbial Toolbox Reporting and Recordkeeping – Combined filter performance

Systems must submit monthly verification of CFE turbidity levels less than or equal to 0.15 NTU in at least 95 percent of the 4 hour CFE measurements taken each month within the first 10 days of the following month.

Microbial Toolbox – Individual filter performance

Toolbox Option	*Cryptosporidium* Treatment Credit
3. Treatment Performance Options	
Individual filter performance	0.5-log credit

Systems using conventional or direct filtration may receive this credit, which can be in addition to the 0.5-log combined filter performance credit.

- Filtered water turbidity for each individual filter must be less than or equal to 0.15 NTU in at least 95 percent of the measurements recorded each month.

- No individual filter may have a measured turbidity greater than 0.3 NTU in two consecutive measurements taken 15 minutes apart.

Microbial Toolbox Reporting and Recordkeeping – Individual filter performance

Systems must submit monthly verification of IFE turbidity levels less than or equal to 0.15 NTU in at least 95 percent of samples each month in each filter and No individual filter greater than 0.3 NTU in two consecutive readings 15 minutes apart within the first 10 days of the following month.

Microbial Toolbox – Demonstration of performance

Toolbox Option	*Cryptosporidium* Treatment Credit
3. Treatment Performance Options	
Demonstration of performance	Determined by state

Systems may receive *Cryptosporidium* treatment credit for drinking water treatment processes based on a demonstration of performance study. The study must follow a state-approved protocol and must demonstrate the level of *Cryptosporidium* reduction the treatment process will achieve under the full range of expected operating conditions. State approval must be in writing and may include monitoring and treatment performance criteria that the system must demonstrate and report on an ongoing basis to remain eligible for the treatment credit.

Microbial Toolbox Reporting and Recordkeeping – Demonstration of performance

Systems must submit initial testing results by the applicable treatment compliance date and must verify and report that operating conditions are within state-approved limits monthly. Monthly results must be submitted within the first 10 days of the following month.

ADDITIONAL FILTRATION OPTIONS

Microbial Toolbox – Bag or cartridge filters (individual or in series)

Toolbox Option	*Cryptosporidium* Treatment Credit
4. Additional Filtration Options	
Bag or cartridge filters (individual)	Up to 2.0-log
Bag or cartridge filters (in series)	Up to 2.5-log

Systems must treat the entire plant flow taken from a Subpart H source and must conduct challenge testing to be eligible for this credit. The exact log credit is determined by removal efficiency during challenge testing, as specified in 40 CFR 141.719(a).

Microbial Toolbox Reporting and Recordkeeping – Bag or cartridge filters (individual or in series)

Systems receiving *Cryptosporidium* treatment credit for bag or cartridge filters must verify that their process meets the definition of bag or cartridge filtration and must report their removal efficiency (determined during challenge testing) to the state by the applicable treatment compliance date. Systems must also report monthly to the state that they treat the entire plant flow taken from a Subpart H source within the first 10 days of the following month.

Microbial Toolbox – Membrane filtration

Toolbox Option	*Cryptosporidium* Treatment Credit
4. Additional Filtration Options	
Membrane filtration	Equivalent to removal efficiency

The level of *Cryptosporidium* treatment credit a system receives is equal to the lower value of the removal efficiency determined during challenge testing or the removal efficiency determined during direct integrity testing, as specified in 40 CFR 141.719(b).

The membrane used by the system must undergo challenge testing to evaluate removal efficiency. Systems must conduct direct integrity testing in a manner that demonstrates a removal efficiency equal to or greater than the removal credit awarded to the membrane filtration process. Systems that do not implement continuous direct integrity testing of membrane unit must conduct continuous indirect integrity monitoring on each membrane unit. EPA's Membrane Filtration Guidance Manual (EPA 815-R-06-009, November 2005) provides additional information on membrane filtration system design and operation; membrane filtration testing requirements; and startup and implementation considerations. The document is available on EPA's website at: https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents#membrane.

Microbial Toolbox Reporting and Recordkeeping – Membrane filtration

Systems receiving *Cryptosporidium* treatment credit for membrane filtration must conduct challenge and integrity testing and report the results by the applicable treatment compliance date. Systems must submit a monthly report to the state on any direct integrity tests above the control limit monthly and, if applicable, any continuous indirect integrity monitoring results triggering direct integrity testing and the corrective action taken. Monthly results must be submitted within the first 10 days of the following month.

Microbial Toolbox – Second stage filtration

Toolbox Option	*Cryptosporidium* Treatment Credit
4. Additional Filtration Options	
Second stage filtration	0.5-log

The second stage must consist of sand, dual media, granular activated carbon (GAC), or other fine grain media approved by the state. The first stage of filtration must be preceded by a coagulation step, and both filtration stages must treat the entire plant flow taken from a Subpart H source. A cap, such as GAC, on a single stage of filtration is not eligible for this credit. The state must approve the treatment credit based on an assessment of the design characteristics of the filtration process.

Microbial Toolbox Reporting and Recordkeeping – Second stage filtration

Systems receiving *Cryptosporidium* treatment credit for second stage filtration must report monthly that second stage filtration was preceded by coagulation and that both stages of filtration treat the entire plant flow taken from a Subpart H source. Monthly results must be submitted within the first 10 days of the following month.

Microbial Toolbox – Slow sand filtration (as secondary filter)

Toolbox Option	*Cryptosporidium* Treatment Credit
4. Additional Filtration Options	
Slow sand filters	2.5-log as secondary filtration 3.0-log as primary filtration

When used as a secondary process, both steps of filtration must treat the entire plant flow taken from a Subpart H source and no disinfectant residual may be present in the influent water. The state must approve the treatment credit based on an assessment of the design characteristics of the filtration process.

Note: Water systems that use slow sand filters as their primary filtration process received 3-log *Cryptosporidium* credit under 40 CFR 141.711(a). If a system runs two slow sand filters in series it could receive a total of 5.5 log *Cryptosporidium* removal credit.

Microbial Toolbox Reporting and Recordkeeping – Slow sand filters

Systems receiving *Cryptosporidium* treatment credit for secondary slow sand filters must report monthly that the slow sand filter was preceded by a separate stage of filtration and that both steps treated 100 percent of plant flow taken from a Subpart H sources. Monthly results must be submitted within the first 10 days of the following month.

INACTIVATION OPTIONS

Unfiltered systems will need to meet any additional treatment requirements using the inactivation options from the Microbial Toolbox.

Microbial Toolbox – Chlorine dioxide

Toolbox Option	*Cryptosporidium* Treatment Credit
5. Inactivation Options	
Chlorine dioxide	Based on CT

Systems may receive *Cryptosporidium* treatment credit for chlorine dioxide inactivation. *Cryptosporidium* treatment credit is determined by calculating the CT value (product of contact time in minutes and concentration in mg/L) for the disinfection segment. Systems with several disinfection segments may calculate CT for each segment and sum these values to determine the total CT for the treatment plant. Systems must calculate CT at least once a day during peak hourly flow.

EPA has developed a guidance manual that provides guidance to Subpart H systems that must comply with the disinfection profiling and benchmarking requirement that provides information on calculating the CT value for systems using chlorine dioxide. (*Disinfection Profiling and Benchmarking Technical Guidance Manual*, EPA 815-R-20-003, June 2020). This document is available on EPA's website at https://www.epa.gov/dwreginfo/guidance-manuals-surface-water-treatment-rules.

Microbial Toolbox Reporting and Recordkeeping – Chlorine dioxide

Systems receiving *Cryptosporidium* treatment credit for inactivation with chlorine dioxide must report a monthly summary of daily CT values. Monthly results must be submitted within the first 10 days of the following month.

Microbial Toolbox – Ozone

Toolbox Option	*Cryptosporidium* Treatment Credit
5. Inactivation Options	
Ozone	Based on CT

Systems may receive *Cryptosporidium* treatment credit based on calculating the CT value (product of contact time in minutes and concentration in mg/L) for the disinfection segment. Systems with several disinfection segments may calculate CT for each segment and sum these values to determine the total CT for the treatment plant. Systems must calculate CT at least once a day during peak hourly flow.

EPA has developed a guidance manual that provides guidance to Subpart H systems that must comply with the disinfection profiling and benchmarking requirement that provides information on calculating the CT value for systems using ozone. (*Disinfection Profiling and Benchmarking Technical Guidance Manual*, EPA 815-R-20-003, June 2020). This document is available on EPA's website at https://www.epa.gov/dwreginfo/guidance-manuals-surface-water-treatment-rules.

Microbial Toolbox Reporting and Recordkeeping – Ozone

Systems receiving *Cryptosporidium* treatment credit for inactivation with ozone must report a monthly summary of daily CT values. Monthly results must be submitted within the first 10 days of the following month.

Microbial Toolbox – Ultraviolet (UV) Light

Toolbox Option	*Cryptosporidium* Treatment Credit
5. Inactivation Options	
UV	Based on UV dose

Systems may receive *Cryptosporidium, Giardia lamblia*, and virus treatment credit for UV light reactors by achieving UV dose values provided in 40 CFR 141.720(d) and meeting the following requirements:

- Systems must validate and monitor UV reactors to determine the operating conditions under which the reactor delivers the UV does required to achieve treatment credit.
- These operating conditions must include flow rate, UV intensity as measured by a UV sensor, and UV lamp status.
- UV reactors must have undergone validation testing that includes full scale testing of the reactor and inactivation of a test microorganism whose dose response characteristics have been quantified with a low pressure mercury vapor lamp.
- Systems must also monitor their UV reactors to determine if the reactors are operating within validated conditions.
- To receive treatment credit, systems must treat at least 95 percent of the water delivered to the public during each month by UV reactors operating within validated conditions for the required UV dose.

EPA has developed the *Ultraviolet Disinfection Guidance Manual For The Final Long Term 2 Enhanced Surface Water Treatment Rule (*EPA 815-R-06-007, November 2006). This document provides background information and guidance on UV light, microbial response to UV light, and UV reactors and is available on EPA's website at: https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents#ultraviolet.

Microbial Toolbox Reporting and Recordkeeping – UV

Systems receiving *Cryptosporidium* treatment credit for UV inactivation must submit validation test results by the applicable treatment compliance date and must submit a monthly report summarizing the percentage of water entering the distribution system that was not treated by UV reactors operating within validated conditions for the required dose. Monthly results must be submitted within the first 10 days of the following month.