

Comprehensive Surface Water Treatment Rules

Quick Reference Guide: Unfiltered Systems

Overview of the Rules

Title*	Surface Water Treatment Rule (SWTR) - 40 CFR 141.70-141.75 Interim Enhanced Surface Water Treatment Rule (IESWTR) - 40 CFR 141.170-141.175 Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) - 40 CFR 141.500-141.571 Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) - 40 CFR 141.700-141.722
Purpose	Improve public health protection through the control of microbial contaminants, particularly viruses, <i>Giardia lamblia</i> , and <i>Cryptosporidium</i> .
General Description	The Surface Water Treatment Rules: <ul style="list-style-type: none"> ▶ Applies to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as "Subpart H systems." ▶ Requires all Subpart H systems to disinfect. ▶ Requires Subpart H systems to filter unless specific filter avoidance criteria are met. ▶ Requires unfiltered systems to perform surface water monitoring and meet site specific conditions for controls of microbials.

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

Overview of Requirements

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

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

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

Filtration Avoidance Criteria

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

Filtration Avoidance Criteria			
		Requirement	Frequency
Source Water Quality Conditions	Microbial Quality	Monitor fecal coliform or total coliform density in representative samples of source water immediately prior to the first point of disinfection application: <ul style="list-style-type: none"> ▶ Fecal coliform density concentrations must be $\leq 20/100$ mL; OR ▶ Total coliform density concentrations must be $\leq 100/100$ mL. Sample results must satisfy the criteria listed above in at least 90% of the measurements from previous 6 months.	<ul style="list-style-type: none"> ▶ 1 to 5 samples per week depending on system size, AND ▶ Every day the turbidity of the source water exceeds 1 NTU
	Turbidity	Prior to the first point of disinfection application, turbidity levels cannot exceed 5 NTU.	Performed on representative grab samples of source water every 4 hours (or more frequently)
Site Specific Conditions	Systems must:	Calculate total inactivation ratio daily and provide 3-log <i>Giardia lamblia</i> and 4-log virus inactivation daily (except any one day each month) in 11 of 12 previous months (on an ongoing basis).	Take daily measurements before or at the first customer at each residual disinfectant concentration sampling point: <ul style="list-style-type: none"> ▶ Temperature ▶ pH (if chlorine used) ▶ Disinfectant contact time (at peak hourly flow) ▶ Residual disinfectant concentration measurements (at peak hourly flow)
	System must comply with:	<ul style="list-style-type: none"> ▶ MCL for total coliforms in 11 of 12 previous months (as per Total Coliform Rule) ▶ Stage 1 Disinfectants and Disinfection Byproducts Rule requirements. 	
	Systems must have:	<ul style="list-style-type: none"> ▶ Adequate entry point residual disinfectant concentration (see disinfection requirements). ▶ Detectable residual disinfectant concentration in the distribution system (see disinfection requirements). ▶ Redundant disinfection components or automatic shut-off whenever residual disinfectant concentration < 0.2 mg/L. ▶ A watershed control program minimizing potential for contamination by <i>Giardia lamblia</i> cysts and viruses in source water; IESWTR and LT1ESWTR update this requirement by adding <i>Cryptosporidium</i> control measures. ▶ An annual on-site inspection by state or approved third party with reported findings. ▶ Not been identified as a source of a waterborne disease outbreak. 	

Disinfection

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

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

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

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

LT2ESWTR Source Water Monitoring and Treatment Requirements

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

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

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

Source water monitoring requirements are as follows:

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

Treatment Requirements		
If Arithmetic Mean <i>Cryptosporidium</i> Level is:	System Must Provide Treatment to:*	Disinfectant System Must Use:
≤ 0.01 oocysts/L	2-log <i>Cryptosporidium</i> inactivation	<ul style="list-style-type: none"> ▶ At least 2 disinfectants to provide 4-log virus, 3-log <i>Giardia lamblia</i> and 2- or 3-log <i>Cryptosporidium</i> inactivation. ▶ Each disinfectant must achieve by itself the total inactivation required for one of these target pathogens
> 0.01 oocysts/L or if PWS chooses not to monitor for <i>Cryptosporidium</i>	3-log <i>Cryptosporidium</i> inactivation	

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

Microbial Toolbox: Inactivation Options, Credits and Criteria

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

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

System Reporting Requirements

System Reporting Requirements	
Report to State:	What to Report:
Within 10 days after the end of the month:	<ul style="list-style-type: none"> ▶ Source water quality information (microbial quality and turbidity measurements). ▶ In addition to the disinfection information above, systems must report the daily residual disinfectant concentration(s) and disinfectant contact time(s) used for calculating the CT value(s).
Within 10 days after the end of the first month following the month when the source water monitoring sample(s) were collected:	<ul style="list-style-type: none"> ▶ Results from the required source water monitoring.
By October 10 each year:	<ul style="list-style-type: none"> ▶ Report compliance with all watershed control program requirements. ▶ Submit report on the on-site inspection, unless that state conducted the inspection, in which case the state must provide the system with a copy of the report.
Within 24 hours:	<ul style="list-style-type: none"> ▶ Turbidity exceedances of 5 NTU and waterborne disease outbreaks.
ASAP but no later than the end of the next business day:	<ul style="list-style-type: none"> ▶ Instance where the residual disinfectant level entering the distribution system was < 0.2mg/L.
Based on system's LT2ESWTR schedule*:	<ul style="list-style-type: none"> ▶ Sampling schedules and monitoring results for source water monitoring ▶ Certain data elements of <i>Cryptosporidium</i>, <i>E. coli</i> and turbidity analyses.

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

Disinfection Profiling and Benchmarking Requirements

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

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

Disinfection Profiling and Benchmarking Requirements			
The purpose of disinfection profiling and benchmarking is to allow systems and states to assess whether a change in disinfection practices reduces microbial protection. Systems must develop a disinfection profile that reflects <i>Giardia lamblia</i> and viruses inactivation, calculate a benchmark (lowest monthly inactivation) based on the profile, and consult with the state prior to making a significant change to disinfection practices.			
Requirement	IESWTR	LT1ESWTR	LT2ESWTR
Affected Systems:	Community water systems (CWS), nontransient noncommunity water systems (NTNCWS), and transient noncommunity water systems (TNCWS) serving $\geq 10,000$.	CWS and NTNCWS serving <10,000 only.	Any CWS, NTNCWS, or TNCWS that proposes to make a significant change in disinfection practice*.
Begin Profiling By:	April 1, 2000	<ul style="list-style-type: none"> ▶ July 1, 2003, for systems serving 500-9,999 people. ▶ January 1, 2004, for systems serving < 500 people. 	<ul style="list-style-type: none"> ▶ Upon completion of initial round of source water monitoring, AND ▶ 12 consecutive months prior to making the proposed change.
Frequency & Duration:	Daily monitoring for 12 consecutive calendar months to determine the total logs of <i>Giardia lamblia</i> inactivation (and viruses, if necessary) for each day in operation.	Weekly inactivation of <i>Giardia lamblia</i> (and viruses, if necessary), on the same calendar day each week over 12 consecutive months.	At least weekly inactivation of <i>Giardia lamblia</i> and viruses, for at least 1 year. May use data collected for profile under IESWTR and LT1SWTR.
States May Waive Disinfection Profiling Requirements If:	TTHM annual average <0.064 mg/L and HAA5 annual average <0.048 mg/L: <ul style="list-style-type: none"> ▶ Collected during the same period. ▶ Annual average is arithmetic average of the quarterly averages of 4 consecutive quarters of monitoring. ▶ At least 25% of samples at the maximum residence time in the distribution system. ▶ Remaining 75% of samples at representative locations in the distribution system. 	One TTHM sample <0.064 mg/L and one HAA5 sample <0.048 mg/L: <ul style="list-style-type: none"> ▶ Collected during the month of warmest water temperature; AND ▶ At the maximum residence time in the distribution system. Samples must have been collected after January 1, 1998.	<ul style="list-style-type: none"> ▶ The system has an existing disinfection profile for both <i>Giardia lamblia</i> and viruses, and has neither made a change in disinfection practices nor changed sources since the profile was developed; OR, ▶ The system has at least 1 year of existing data that can be used to complete a disinfection profile, and has neither made a significant change to its treatment practice nor changed sources since the data were collected.
Disinfection Benchmark Must be Calculated If:	<ul style="list-style-type: none"> ▶ Systems required to develop a disinfection profile and are considering making a significant changes in disinfection practice*. ▶ Systems must consult the state prior to making any modifications to disinfection practices. 	Same as IESWTR, and systems must obtain state approval prior to making any modifications to disinfection practices.	Complete a disinfection profile and benchmark for viruses and <i>Giardia lamblia</i> .

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