

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

Overview of the Rules

Title*	Surface Water Treatment Rule (SWTR) - 40 CFR 141.70-141.75 Interim Enhanced Surface Water Treatment Rule (IESWTR) - 40 CFR 141.170-141.175 Filter Backwash Recycling Rule (FBRR) 40 CFR 141.76 Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) - 40 CFR 141.500-141.571 Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) - 40 CFR 141.700-141.722
Purpose	Improve public health protection through the control of microbial contaminants, particularly viruses, <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. ▶ Applies a treatment technique requirement for control of microbials.

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

Overview of Requirements

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

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

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

Turbidity

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

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

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

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

IFE Turbidity: Follow-Up and Reporting Requirements						
Condition	IESWTR (≥ 10,000)			LT1ESWTR (<10,000)**		
	Action	Report	By	Action	Report	By
2 consecutive recordings > 0.5 NTU taken 15 minutes apart at end of first 4 hours of continuous filter operation after backwash/offline:	Produce filter profile within 7 days (if unknown cause).	<ul style="list-style-type: none"> ▶ Filter # ▶ Turbidity value ▶ Date ▶ Cause (if known) <u>or</u> report profile was produced 	10 th of the following month			
2 consecutive recordings > 1.0 NTU taken 15 minutes apart:	Produce filter profile within 7 days (if unknown cause).	<ul style="list-style-type: none"> ▶ Filter # ▶ Turbidity value ▶ Date ▶ Cause (if known) <u>or</u> report profile was produced 	10 th of the following month		<ul style="list-style-type: none"> ▶ Filter # ▶ Turbidity value ▶ Date ▶ Cause (if known) 	10 th of the following month
2 consecutive recordings > 1.0 NTU taken 15 minutes apart at the same filter for 3 months in a row :	Conduct filter self-assessment within 14 days.	<ul style="list-style-type: none"> ▶ Filter # ▶ Turbidity value ▶ Date ▶ Report filter self-assessment produced 	10 th of the following month	Conduct a filter self-assessment within 14 days Systems with 2 filters that monitor CFE in lieu of IFE must do both filters.	Date filter assessment triggered & completed	10 th of the following month (or within 14 days of filter self-assessment being triggered if triggered in last 4 days of the month).
2 consecutive recordings > 2.0 NTU taken 15 minutes apart at the same filter for 2 months in a row:	Arrange for Comprehensive Performance Evaluation (CPE) within 30 days & submit report within 90 days.	<ul style="list-style-type: none"> ▶ Filter # ▶ Turbidity value ▶ Date 	10 th of the following month	Arrange for CPE within 60 days & submit CPE report within 120 days.	Date CPE triggered	10 th of the following month
		Submit CPE report	90 days after exceedance		Submit CPE report	120 days after exceedance

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

Filter Backwash Recycling Rule

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

Disinfection

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

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

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

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

LT2ESWTR Source Water Monitoring and Bin Classification

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

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

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

Source water monitoring requirements are as follows:

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

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

* Requirements in addition to those met in full compliance with SWTR, IESWTR, and LT1ESWTR

** Or Subpart H systems not required to monitor for *Cryptosporidium*

*** Removal or inactivation

Microbial Toolbox: Inactivation Options, Credits and Criteria

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

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

Disinfection Profiling and Benchmarking Requirements

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

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

Disinfection Profiling and Benchmarking Requirements			
The purpose of disinfection profiling and benchmarking is to allow systems and states to assess whether a change in disinfection practices reduces microbial protection. Systems must develop a disinfection profile that reflects <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) ≥ 10,000.	CWS and NTNCWS <10,000 only.	Any CWS, NTNCWS or TNCWS that proposes to make a significant change in disinfection practice*.
Begin Profiling By:	April 1, 2000	<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 or LT1ESWTR.
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 significant change to its treatment practices nor changed sources since the profile was developed; OR, ▶ The system has at least 1 year of existing data that can be used to complete a disinfection profile, and has neither made a significant change to its treatment practice nor changed sources since the data were collected.
Disinfection Benchmark Must be Calculated If:	<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 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.