



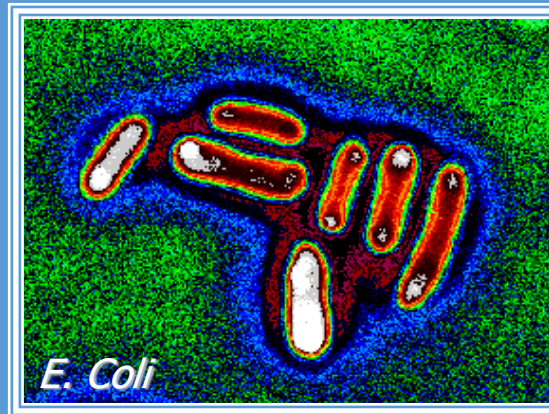
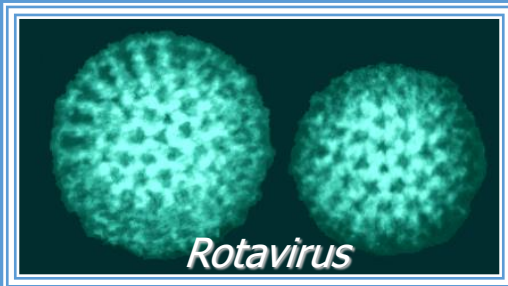
Arkansas Department of Health

Surface Water Treatment Rules **A**

Goal of SWTRs

To improve public health protection from pathogens:

- Protozoans
- Bacteria
- *Viruses*



SWTRs

**Consist of the following regulations
(effective dates):**

Surface Water Treatment Rule (SWTR) (06/29/1993)

**Interim Enhanced Surface Water
Treatment Rule (IESWTR) (01/01/2002)**

Filter Backwash Recycling Rule (FBRR) (06/08/2004)

**Long Term 1 Enhanced Surface Water
Treatment Rule (LT1ESWTR) (01/01/2005)**

**Long Term 2 Enhanced Surface Water
Treatment Rule (LT2ESWTR) (01/05/2006)**



Regulated Pathogens

(Removal/Inactivation Requirements)

SWTR, IESWTR, LT1ESWTR

Systems must comply with the removal/inactivation requirements established for regulated pathogens

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

Who is affected by SWTRs?

All Public Water Systems that use:

- Surface Sources

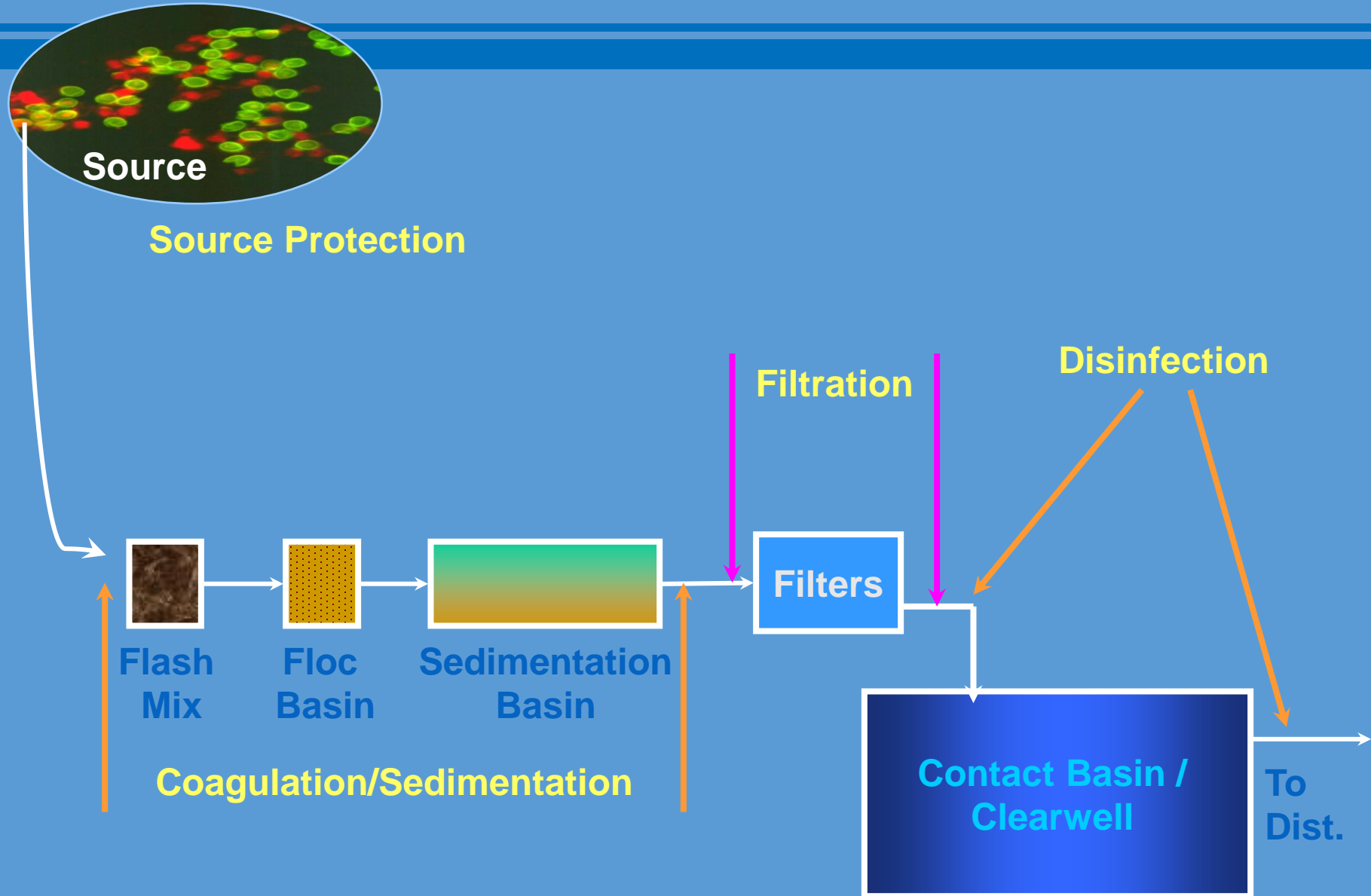
- Lakes
- Rivers/Streams
- Reservoirs
- Springs

- Ground Water Under the Direct Influence of surface water (GWUDI)

Referred to as Subpart H systems



Multi-Barrier Treatment



SWTR Requirements

Source Assessment Requirements for Groundwater Systems (GWUDI Evaluations)

Source Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Filter Backwash Recycling

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification



Source Assessment Requirements

Groundwater Systems

All PWS groundwater well sources:

- Evaluated for direct surface water influence (i.e. GWUDI)

The evaluation process considers:

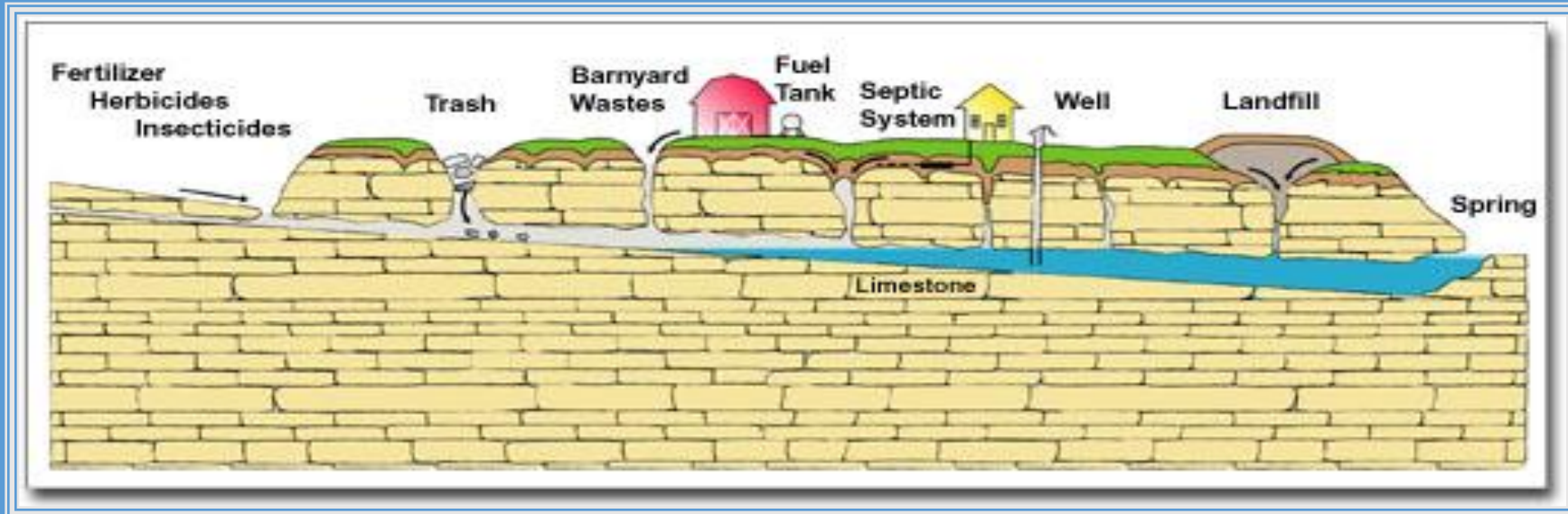
- Microbial and particulate analysis
- Historical water quality data
- Well construction
- Well siting with respect to:
 - Proximity to surface water sources and other potential sources of contamination
 - Surface drainage
- Subsurface geology and aquifer characteristics

Source Assessment Requirements

GWUDI Systems

If a well is determined GWUDI:

- Must be in full compliance with the SWTRs within 18 months after the determination has been finalized.
- Must comply with interim monitoring requirements and a compliance schedule set by the ADH until filtration is installed.



SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

Source Water Monitoring Requirements

Turbidity Performance Standards

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Operator Certification

Source Monitoring Requirements

Source Water Monitoring

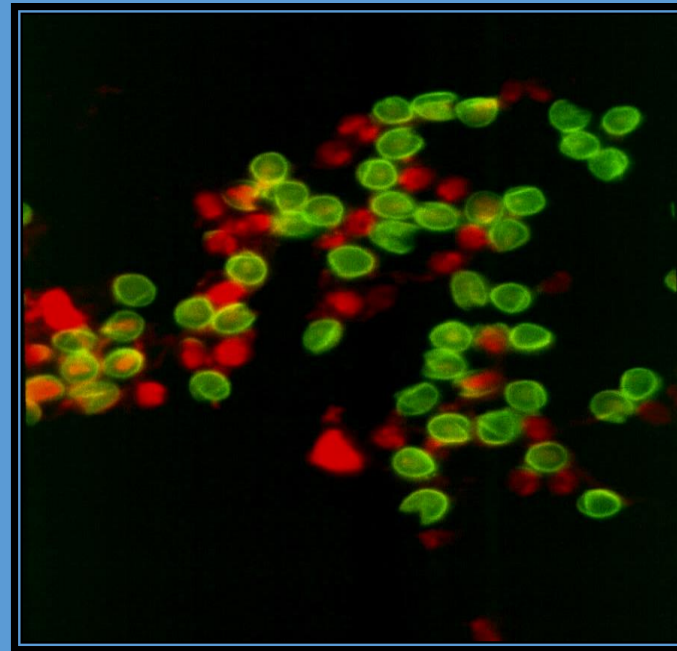
Monitor to determine
Cryptosporidium and/or indicator
levels (24 samples)

LT2ESWTR



What is *Cryptosporidium*?

- A small, single celled parasite which causes the intestinal illness cryptosporidiosis
- Found and transmitted in soil, food, water, or surfaces that have been contaminated with infected human or animal feces
- Protected by an outer shell (oocyst) that allows it to survive in the environment for long periods of time and makes it very resistant to chlorine- based disinfectants



Courtesy: Joint Photographic Group

Cryptosporidiosis

How long after infection do symptoms appear?

- Generally begin 2 to 10 days (average 7 days) after becoming infected with the parasite.

How long will symptoms last?

- In persons with healthy immune systems, symptoms usually last about 1 to 2 weeks.
- The symptoms may go in cycles in which you may seem to get better for a few days, then feel worse again before the illness ends.

Recorded *Cryptosporidium* Outbreaks in the U.S.

1984	Texas	First recorded outbreak
1987	Carrolton, Georgia	13,000 infected
1993	Milwaukee, Wisconsin	400,000 infected
1994	Las Vegas, Nevada	unknown
2005	Upstate, New York	35,000 infected
2013	Baker City, Oregon	28% infected

Source Monitoring Timeline

Sch	Retail Pop Served	1 st Round Monitoring ✓	2 nd Round Monitoring
1	>100,000	October 1, 2006	April 1, 2015 ✓
2	50,000 – 99,999	April 1, 2007	Oct 1, 2015 ✓
3	10,000 – 49,999	April 1, 2008	Oct 1, 2016 ✓
4	<10,000	E. Coli October 1, 2008	E. Coli Oct 1, 2017 ✓
		Crypto April 1, 2010	Crypto Apr 1, 2019 NOW.

Source Monitoring Requirements

Source Water Monitoring

Monitor to determine *Cryptosporidium*
and/or indicator levels
(2 year period – 24 samples)



Treatment Bins and the Microbial Toolbox

Assignment to “bins” based on monitoring results. Additional treatment based on the requirements for each bin, choosing from a set of treatment options.

LT2ESWTR



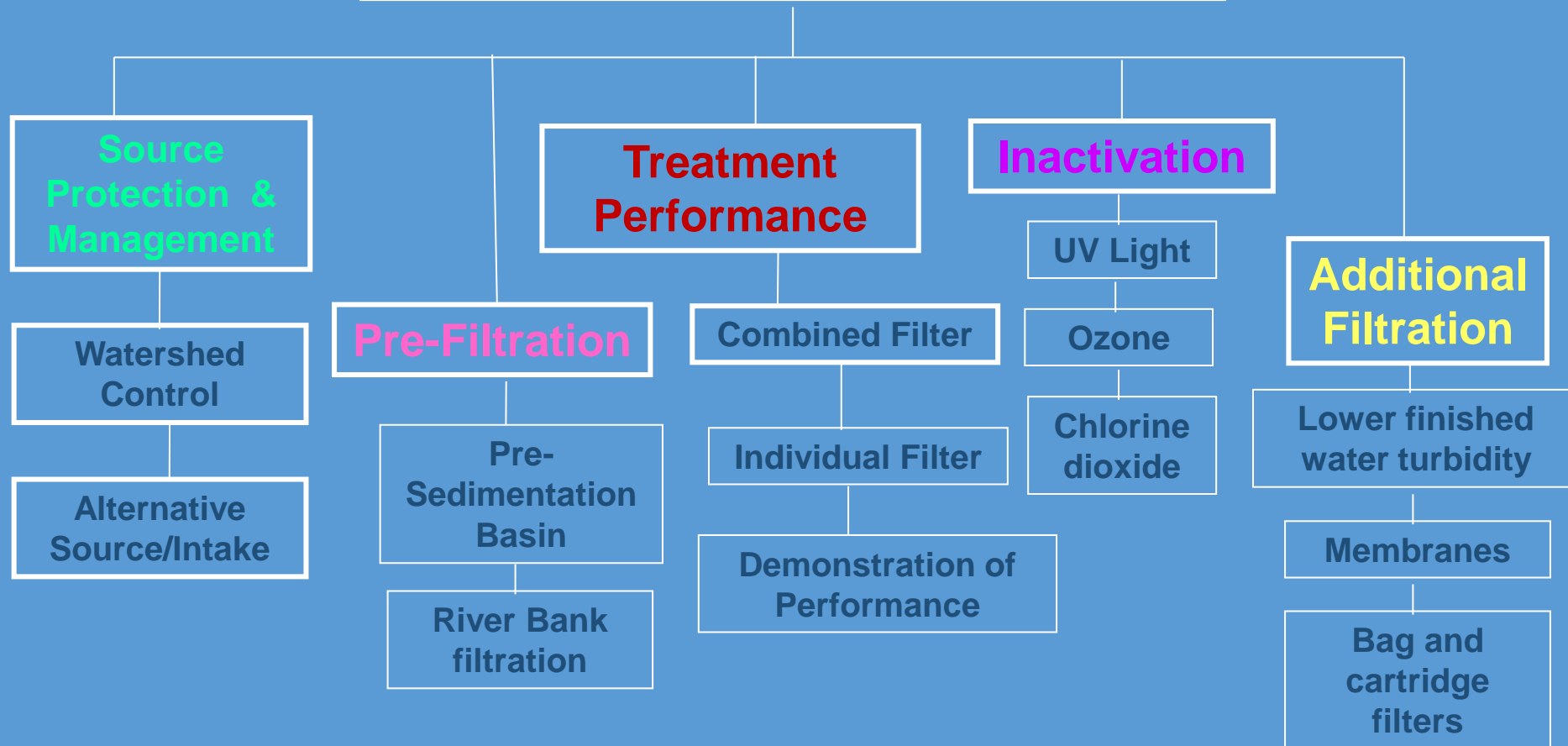
Source Water Monitoring

Bin Classification and Treatment

Conventional Filtration

Bin Number	<i>Cryptosporidium</i> Concentration (in oocysts/L)	Additional Treatment Beyond Current Requirements
1	<i>Crypto</i> < 0.075	No additional treatment
2	$0.075 \leq \textit{Crypto} < 1.0$	1.0 log (90%) 3.0 log total
3	$1.0 \leq \textit{Crypto} < 3.0$	2.0 log (99%) 4.0 log total
4	$3.0 \leq \textit{Crypto}$	2.5 log (99.7%) 4.5 log total

Microbial Toolbox



- Options can be used singly or in combination to meet treatment requirements
- Systems must meet criteria specific to each option to be granted treatment credit
- EPA has made removal/inactivation credit recommendations for each “tool”
- There is a 6-year compliance period from initial monitoring.

Requirements For BLN 2 and Using Toolbox Option: “Treatment Performance”

Monitoring Requirement	Monitoring Frequency	Measurement
CFE	At least every 4 hours	≤ 0.15 NTU in 95% of CFE Measurements
IFE	Continuously	≤ 0.15 NTU in 95% of IFE Measurements
IFE	Continuously	NONE >0.3 NTU in 2 Consecutive 15 Min. Measurements

Source Monitoring Requirements

Source Water Monitoring

Monitor to determine *Cryptosporidium* and/or indicator levels (24 samples)



Treatment Bins and the Microbial Toolbox

Assignment to “bins” based on monitoring results. Additional treatment based on the requirements for each bin, choosing from a set of treatment options.



“Future” Monitoring

Six years after initial source water monitoring ends, monitor again to confirm or revise bin classification. (Doing now.)

SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

Source Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Filter Backwash Recycling

Sanitary Surveys

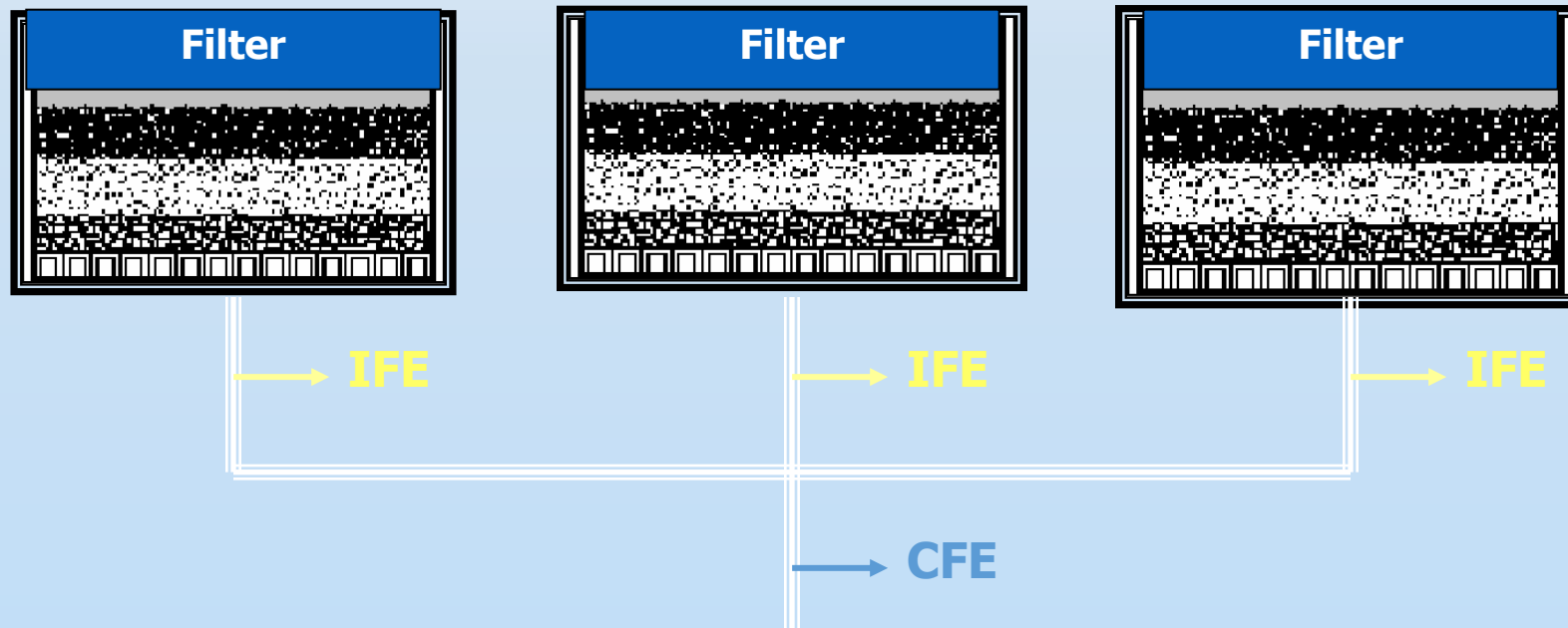
Covered Finished Reservoirs/Water Storage Facilities

Operator Certification



Conventional or Direct Filtration (Rapid Sand Filters)

- Combined Filter Effluent (CFE)
- Individual Filter Effluent (IFE)



Turbidity Performance Standards

CFE Requirements

(Conventional and Direct Filtration)

Monitoring Requirement	Monitoring Frequency	Measurement
CFE 95% Value	At least every 4 hours	≤ 0.3 NTU
CFE Maximum Value	At least every 4 hours	1 NTU

Turbidity Performance Standards

CFE Requirements

(Alternate Filtration)

Filter Rating	Monitoring Location	Monitoring Frequency	Turbidity Performance	
			95% of time	Max
1-micron nominal	CFE	≤ 4 hours	≤ 0.3 NTU	1 NTU
1-micron absolute	CFE	≤ 4 hours	≤ 1.0 NTU	5 NTU

Monitoring / Reporting Requirements

CFE Turbidity

Monitored:

- Every 4 hours that the system produces water
- Continuous turbidity monitors can be substituted for grab samples provided that:
 - Continuous monitoring results are manually or automatically recorded
 - Continuous monitor is calibrated on a regular basis
- ADH may reduce sampling frequency for systems serving <500 people to once per day
 - If ADH determines that less frequent monitoring is sufficient to indicate effective filtration



Turbidity Performance Standards

- Turbidimeter calibration requirements:
 - Must use procedure specified by manufacturer
 - ADH recommends calibration w/ primary standards at least every 3 months.



Turbidity Performance Standards

If turbidimeter fails:

Conduct grab sampling every 4 hours until repaired

Large Systems ($\geq 10,000$ pop.)

- must repair turbidimeter within 5 working days

Small Systems ($< 10,000$ pop.)

- must repair turbidimeter within 14 days

Periodic backup of data is recommended for systems using computers to log data.



Turbidity Performance Standards

IFE Requirements

(Conventional and Direct Filtration only)

Pop. Served	Monitoring Location	Monitoring Frequency	Turbidity Performance
			2 consecutive measurements 15 min. apart
$\geq 10,000$	IFE	Continuously	≤ 0.5 NTU
$< 10,000$	* IFE	Continuously	≤ 1.0 NTU

* If system has 2 filters or less...monitoring location may be CFE.

Monitoring / Reporting Requirements

IFE Report Forms

Filter #	Value in NTU of Turbidity Measurements > 1.0 in 2 Consecutive Measurements Taken 15 Minutes Apart -- <u>During Normal Operation</u>			Conduct a Filter Profile Within 7 Days of the Exceedance(s) or Determine Obvious Reason for Abnormal Filter Performance	
				(Attach Filter Profile Report or Attach Report Outlining Obvious Reason for Exceedance)	
	Date	Initial Reading Exceeding 1.0	2nd Reading Exceeding 1.0	Date Profile Conducted	Date Obvious Reason for Exceedance Determined
1 - 2		No Exceedance			
3	9/15	2.3	2.4	9/21/02	
4 - 8		No Exceedance			

LT1ESWTR: 1.0 NTU exceedance in two consecutive readings taken 15 minutes apart, system must report date, filter number, turbidity value and reason (if known) for exceedance.

Monitoring / Reporting Requirements

IFE Follow-up Steps

(Systems serving at least 10,000 people)

	Condition	Action
1	2 consecutive measurements >0.5 NTU taken 15 minutes apart at the end of the first 4 hours of continuous filter operation after backwash/offline	Produce filter profile within 7 days (if cause is not known)
2	2 consecutive measurements >1.0 NTU taken 15 minutes apart during normal operation	Produce filter profile within 7 days (if cause is not known)
3	2 consecutive measurements >1.0 NTU taken 15 minutes apart at the same filter for 3 months in a row	Conduct a filter self-assessment within 14 days
4	2 consecutive measurements >2.0 NTU taken 15 minutes apart at the same filter for 2 months in a row	Arrange for a CPE within 30 days and submit report within 90 days

Monitoring / Reporting Requirements

IFE Follow-up Steps

(Systems serving less than 10,000 people)

	Condition	Action
1	2 consecutive measurements >1.0 NTU taken 15 minutes apart	Reporting only
2	2 consecutive measurements >1.0 NTU taken 15 minutes apart at the same filter for 3 months in a row	Conduct a filter self-assessment within 14 days
3*	2 consecutive measurements >2.0 NTU taken 15 minutes apart at the same filter for 2 months in a row	Arrange for a CPE within 60 days and submit report within 120 days

*** Exception if a CPE was done in the last 12 months**

Monitoring / Reporting Requirements

Filter Profile

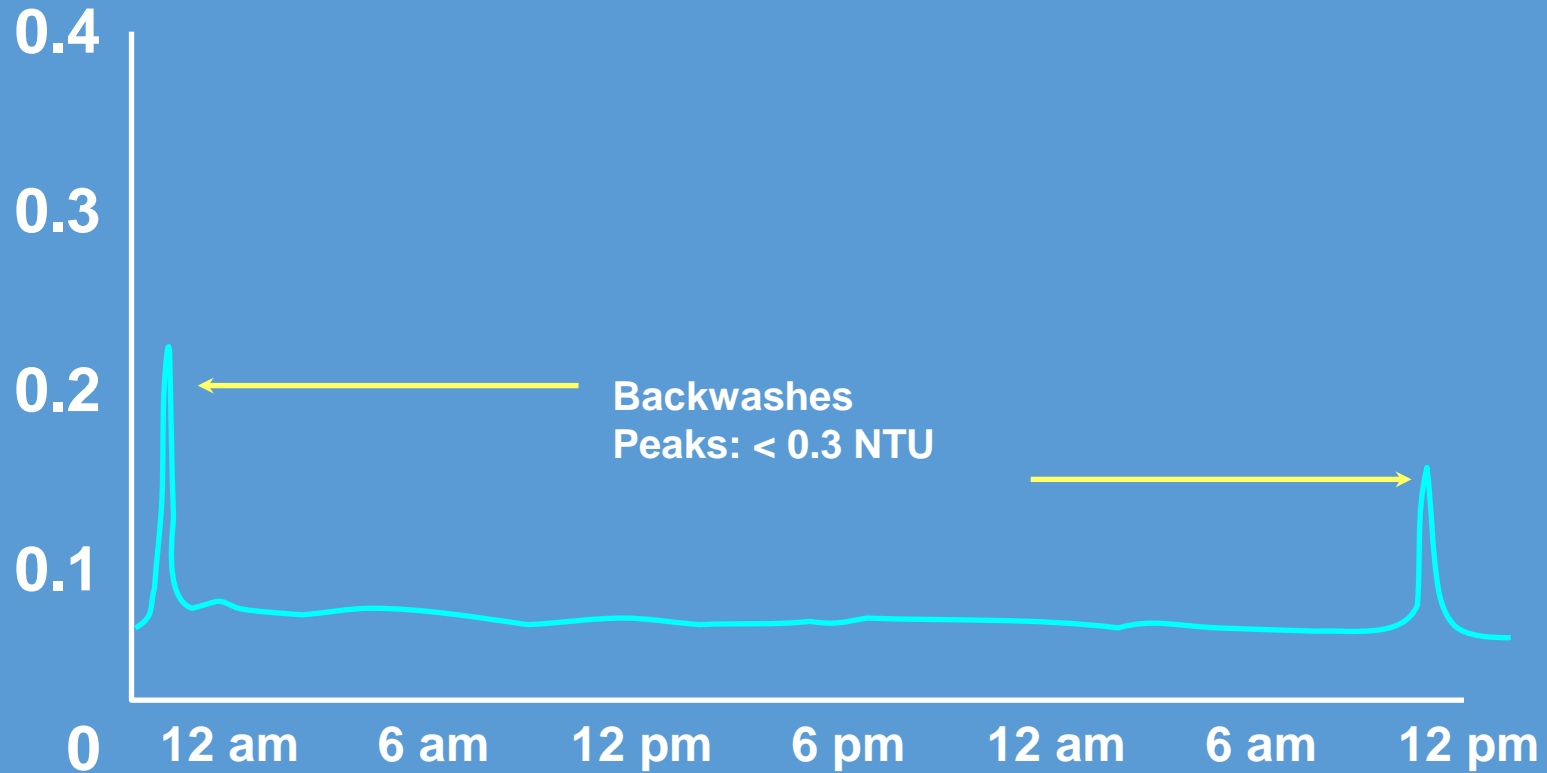
Continuous turbidity measurements of a typical filter run in graphical form.

- Starting at filter startup after backwash
 - Ending at filter startup after next backwash
1. Must include the filter performance while another filter is being backwashed.
 2. Must include explanations of the cause of performance spikes.
 - Flow rate increase, adjoining filter backwash, filter backwash, etc.

Monitoring / Reporting Requirements

Filter Profile — Good Performance

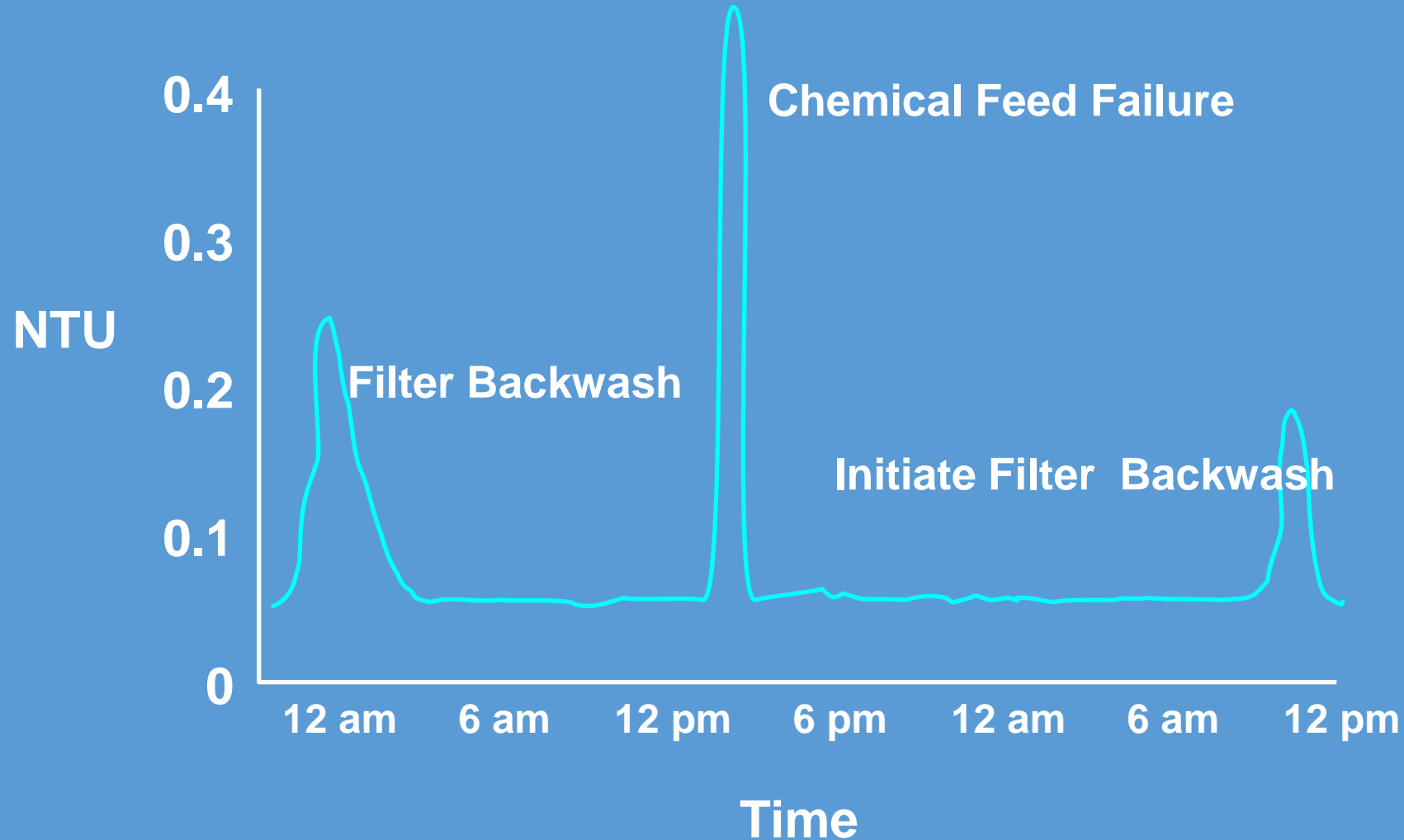
Turbidity (NTU)



Time

Monitoring / Reporting Requirements

Filter Profile — Turbidity Excursion



Monitoring / Reporting Requirements

Filter Self Assessment

- A general description of the filter.
- The development of a filter profile.
- An assessment of the hydraulic loading conditions of the filter.
- An assessment of the actual condition and placement of the filter media.
- A description of backwash practices.
- An assessment of the condition of the support media/underdrain.
- An assessment of the filter rate-of-flow controllers and filter valving adequacy.

Monitoring / Reporting Requirements

Comprehensive Performance Evaluation (CPE)

- Is a thorough review and analysis conducted to identify factors that may be adversely impacting the plant's capability to achieve compliance and /or optimal performance.
- Evaluates:
 - Design
 - Operation
 - Administration
 - Maintenance



SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

Source Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Filter Backwash Recycling Rule

Sanitary Surveys

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Operator Certification



Disinfection Performance Standards

CT

Plant Effluent Disinfectant Residual

Distribution Disinfectant Residual

Disinfection Profiling and Benchmarking

Disinfection Performance Standards

“CT”

“CT” = C x T; where

- (C) is the residual disinfectant concentration (mg/L)
 - The residual disinfectant is measured at the effluent of a basin or pipeline
- (T) is the time credited for disinfectant contact
 - “T” is the time it takes for 10% of the water entering the treatment unit to exit at peak flow
 - Contact time is determine by tracer study or application of a baffle factor

“CT” is an ADH assigned value based on the flow characteristics through the treatment unit and historical data



Disinfection Performance Standards

“CT”

Common Disinfectants in Water Treatment:

- Chlorine
- Chloramines
- Chlorine Dioxide
- Ozone
- Ultraviolet Radiation (UV)



Monitoring / Reporting Requirements

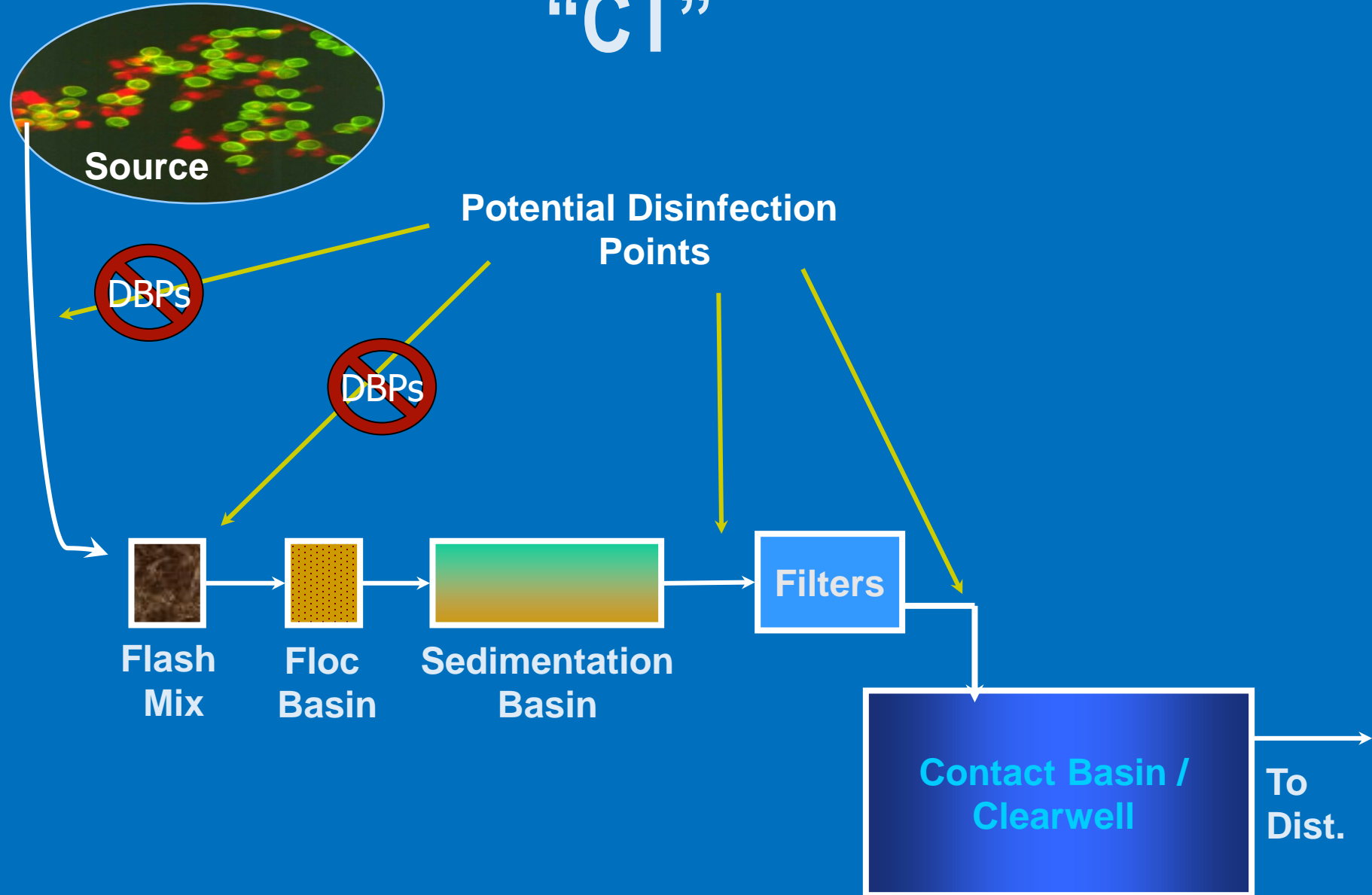
“CT”

- Peak plant flow rate (raw or plant flow rate)
- Peak high service flow rate
- Minimum clearwell depth
- Water temperature at peak flow rate
- Identify disinfection injection points
- Identify CT monitoring points
- pH & disinfectant residual (**free chlorine**) at each monitoring point at peak flow rate
- Determine CT compliance



Disinfection Performance Standards

“CT”



Disinfection Performance Standards

“CT”

Disinfection treatment (CT) must be sufficient to ensure the total treatment processes achieve inactivation of:

ADH establishes removal and inactivation criteria

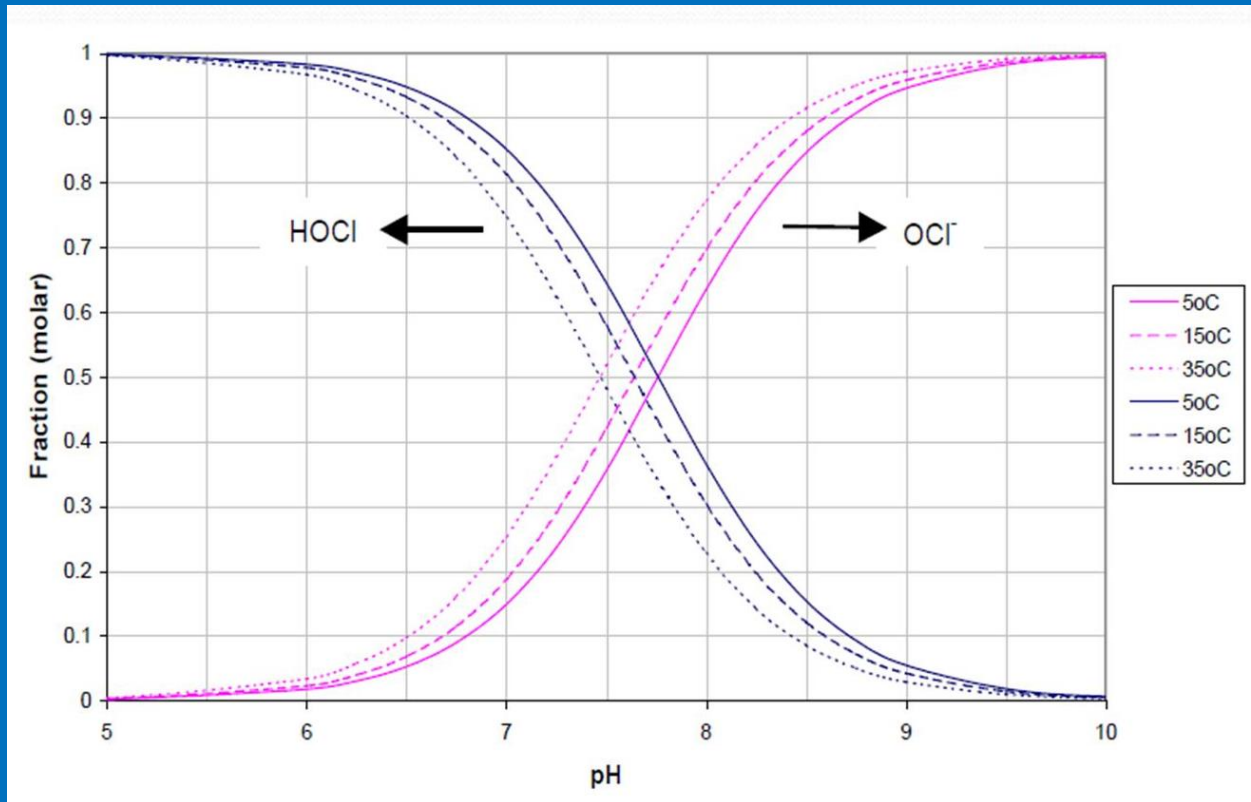
Treatment Method	Microbial	MCLG	Minimum Inactivation Requirements by Disinfection
Conventional	Viruses		99% (2-log)
	<i>Giardia</i> <i>Lamblia</i>	Zero	68% (0.5-log)
Direct	Viruses		99.9% (3-log)
	<i>Giardia</i> <i>Lamblia</i>	Zero	90% (1.0-log)

Disinfection Performance Standards

“CT”

HOCl = Hypochlorous Acid

OCI⁻ = Hypochlorite Ion



No CT credit given by ADH for pH above 9.0.

Disinfection Performance Standards

“CT Letter”



Arkansas Department of Health

4815 West Markham Street • Little Rock, Arkansas 72205-3867 • Telephone (501) 661-2000

Governor Asa Hutchinson

Nathaniel Smith, MD, MPH, Director and State Health Officer

Engineering Section, Slot 37
www.Healthy.Arkansas.gov/eng/

Ph 501-661-2623 Fax 501-661-2032
After Hours Emergency (800) 554-5738

CERTIFIED

February 26, 2018

Mr. Operator
Public Water System
1001 E. Pumphouse Road
Somewhere, AR 72000

RE: Public Water System, PWS ####
Calculated/Tracer CT Analysis Report
Required Inactivation: 0.5 log cyst/2.5 log virus **2.5 log Giardia & 1.5 log Virus Credits**
Revised CT Compliance

Dear Mr. Operator:

The CT criteria for the Public Water System have been revised to meet the required inactivation of 0.5 log cyst/2.5 log virus. This inactivation requirement is based on the results of the plant removal credit evaluation performed by this office.

The CT criteria for the Public Water System have been finalized. Based on current conditions, CT compliance can be achieved. This compliance is based on the following:



Disinfection Performance Standards

“CT Letter”

1. A maximum plant flow rate of 1,000 gpm and a maximum high service flow rate of 1,300 gpm with an approved T_{10} time of **72** minutes in the clearwell. This time is based on 0.5 baffle factor and a minimum water depth of 10 feet in the clearwell.
2. The following parameters must be met and reported daily on the monthly operation report for CT compliance:
 - A. The maximum pH ≤ 9.0 .
 - B. The minimum water temperature ≥ 0.5 °C (33°F)
 - C. The minimum free chlorine residual ≥ 1.1 mg/l at the high service pumps.
3. The water quality parameters in item 2 must be monitored daily at the high service pumps.
4. The maximum plant and high service flow rates and minimum clearwell levels in item 1 must be met and reported daily on the monthly operation report for CT compliance.

Disinfection Performance Standards

“CT Letter”

CT compliance is based on the specific chlorination points as outlined below:

Post-chlorination following filtration and prior to entering the baffled clearwell.

Therefore, no deletion or relocation of a chlorination point for CT compliance is to be completed without first notifying this office and receiving written confirmation of the proposal.

If the above conditions cannot be met, the water system must reanalyze its CT compliance as soon as possible. If necessary, contact this office for assistance. The water system must immediately begin to monitor the above plant parameters to ensure SWTR compliance is being achieved.

As a reminder, the SWTR also requires a chlorine residual be maintained throughout the distribution system and that the residual be recorded when monthly bacteriological samples are taken. Therefore, unless the water system has distribution booster chlorination, the treatment plant residual must be high enough to not only meet CT requirements but also maintain a residual throughout the distribution system.

Measures should also be taken to ensure that the SWTR/IESWTR finished water turbidity requirement of 0.3 NTU in 95% of samples can also be met.

This letter should remain a permanent part of the water system's compliance file for the SWTR/IESWTR until notified or superseded in writing by this office.

If you have any questions concerning the CT analysis or subsequent steps to take for compliance, feel free to contact Vickie Welytok or myself at 501-661-2623.

Sincerely,



Monitoring / Reporting Requirements

“CT”

					(RECORD DISINFECTANT INJECTION POINTS BELOW)							
	Peak	Peak			#1: Flash Mix	#2: Filter Influent	#3: Clearwell Inf.					
D	Raw / Plant	High	Minimum	Water	(RECORD MONITORING LOCATIONS BELOW)						Was	
A	Flow	Service	Clearwell	Temp.	#1: Sed. Basin Eff.	#2: Filter Effluent	#3: Clearwell Eff.				compliance	If no, within
T	Rate	Flow	Level*		pH	Residual	pH	Residual	pH	Residual	met this	12 hours?
E		Rate		Degrees		(mg/l)		(mg/l)		(mg/l)	date?	
	(GPM)	(GPM)	(FEET)	(C / F)							(Yes / No)	(Yes / No)
1	75	100	6	68	6.8	0.3	6.5	0.2	7.8	0.4	No	Yes
2	75	100	8	70	7.1	0.5	6.8	0.4	7.6	0.9	Yes	
3												
4												

EPA approved test methods must be used for CT compliance.

Disinfection Performance Standards

Plant Effluent and Distribution Residuals

Population	Treatment Plant Effluent	Distribution System
All Subpart H Systems	Cannot be < 0.2 mg/L for more than 4 hours	Detectable in at least 95% of samples in a month for any 2 consecutive months

* Heterotrophic plate counts ≤ 500 colonies / mL are deemed to equal to a detectable residual (not used in Arkansas)

Monitoring / Reporting Requirements

Distribution Entry Point Residual

Record lowest measured value each day.

Monitoring Frequency	
Population Served	Samples Per Day
< 500	1
501 - 1000	2
1001 - 2500	3
2501 - 3300	4
> 3300	Continuously

Record results on Operations Report Form

Note: If plant effluent residual < 0.2 mg/L, the system must notify ADH and monitor every 4 hours until > 0.2 mg/L.



Monitoring / Reporting Requirements

Distribution Entry Point Residual

Systems using Chlorine Dioxide:

- Monitor ClO_2 at the entry point to the distribution system daily.
- For any daily sample exceeding 0.8 mg/L, the system must:

Monitoring / Reporting Requirements

Distribution Disinfectant Residual

- Monitor at same points and frequency as TCR samples.
- Failure to meet distribution system residuals is a treatment technique violation (if non-detect in > 5% of samples for two months) .
- Maximum Residual Disinfectant Levels (MRDL).

Chlorine = 4.0 mg/L (as Cl_2) Yearly Avg

Chloramines = 4.0 mg/L (as Cl_2) Yearly Avg

Chlorine Dioxide = 0.8 mg/L (as ClO_2) Max



Monitoring / Reporting Requirements

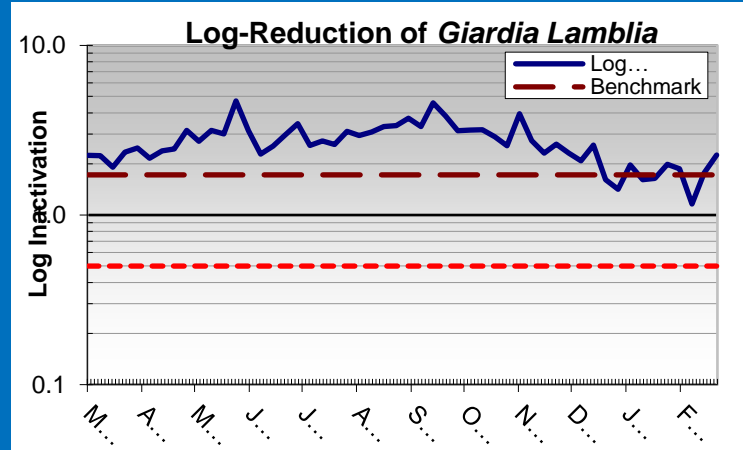
Distribution Disinfectant Residual

Effluent Cl ₂ (ppm)	Chlorite Monitoring (For Systems Using Chlorine Dioxide)		D
Low est Measured Value*	Entry Point Chlorite (ppm)	Dist. Samples Collected (Y/ N)	A
			T
			E
0.6			1
0.5			2
0.7			3
0.1			4
0.2			5
			6

*4 Hr Effluent Residual Monitoring Required if < 0.2 PPM						
	AM			PM		
Date	12 -- 4	4 -- 8	8 -- 12	12 -- 4	4 -- 8	8 --12
4			0.1	0.15	0.5	

Disinfection Performance Standards

Disinfection Profiling



Disinfection Profiling

Monitor and record *giardia* and *virus* inactivation throughout plant.

Develop Disinfection Benchmark

Establish representative benchmark of microbial protection throughout plant based on monitoring results.

Consultation with State

Consult with state prior to making significant changes to disinfection practices.

SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

Source Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Filter Backwash Recycling

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification



Filter Backwash Recycling Rule

- General Description

- Requires that all recycle flows be returned through all treatment processes (i.e., at or prior to the point of primary coagulation).
- Applies to:
 - All Subpart H systems that uses conventional or direct filtration treatment, and
 - Recycles water from:
 - Filter Backwash
 - Thickener Supernatant
 - Dewatering Processes



Monitoring / Reporting Requirements

Filter Backwash Recycling Rule

- Copy of recycle notification and information submitted to the State.
- List of all recycle flows and frequency with which they are returned.
- Average and maximum backwash flow rates & average and maximum duration of backwash process (in minutes.)



Monitoring / Reporting Requirements

Filter Backwash Recycling Rule

- Typical filter run length and written summary of how filter run length is determined.
- Type of treatment provided for recycle flows.
 - Physical dimension of recycle equalization and/or treatment units
 - Typical and maximum hydraulic loading rates
 - Types of chemicals used and average dose
 - Frequency of use
 - Frequency at which solids are removed



SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

Source Monitoring Requirements

Turbidity Performance Standards

Disinfection Performance Standards

Monitoring and Reporting Requirements

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification



Sanitary Surveys

Significant deficiencies

- Defect in a system's design, operation, maintenance, or administration.
- Failure or malfunction of any system component, that the State (ADH) determines to cause, or have the potential to cause, risk to health or safety.

Sanitary Surveys

Significant Deficiencies

If determined to have significant deficiencies:

- Respond in writing to the ADH within 45 days of written notification.
- Provide a corrective action plan and time table for resolving significant deficiencies.
- Correct significant deficiencies according to time table submitted to and approved by ADH.



Sanitary Surveys

Records and Reports

The system must have, at a minimum, the following records on file and available for review during Sanitary Surveys.

- Sanitary Surveys
- Bacteriological and Chemical Analysis Reports
- Source Water Assessment Report
- Sample Site Plans
- Optimal Corrosion Control and Treatment Plan (If Applicable)
- Disinfection Profile and Benchmark Report (If Applicable)
- Individual Filter Monitoring Data (If Applicable)
- Filter Profile Report (If Applicable)
- Filter Self-Assessment Report (If Applicable)
- CPE Report (If Applicable)



SWTR Requirements

Source Assessment Requirements for Groundwater Systems
(GWUDI Evaluations)

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Monitoring and Reporting Requirements

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Covered Finished Reservoirs/Water Storage Facilities

Operator Certification



Covered Finished Reservoirs/Water Storage Facilities



Uncovered Finished Water Reservoirs (LT2)

Systems with uncovered reservoirs must either cover, treat, or implement risk mitigation plan



SWTR Requirements

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(GWUDI Evaluations)

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Disinfection Performance Standards

Monitoring and Reporting Requirements

Sanitary Surveys

Covered Finished Reservoirs/Water Storage Facilities

Operator Certification



Operator Certification

All Subpart H systems must be operated by qualified personnel

To be qualified:

- Treatment License
 - Must be Grade II or higher
(based on system size and job duties)
- Three months to obtain license, however
 - The system will be in violation of the SWTR during this period
 - Violations will be reported to EPA



Analytical Techniques



Analytical Techniques

- Turbidity must be measured in accordance with:
 - EPA Method 180.1, or
 - Method 214A in the 16th or later edition of Standard Methods (2130 B in 22nd edition)
- Chlorine residual (free or combined) must be measured in accordance with:
 - Method 408C (Amperometric Titration Method),
 - Method 408D (DPD Ferrous Titrimetric Method), or
 - Method 408E (DPD Colorimetric Method)
in the 16th, or later, edition of Standard Methods (4500-Cl X-00 (X = D, F, or G) in SM Online)
 - EPA Method 334.0 (On-line analyzer)
 - DPD colorimetric field test kits are also acceptable.



Analytical Techniques

- Ozone

- Residual concentration must be measured by:
 - Method 4500-O3 B of the 17th, or later, edition of Standard Methods

- Chlorine Dioxide

- Residual concentration must be measured by:
 - Method 410B or 410C (Amperometric Titration) of the 16th, or later, edition of Standard Methods
(Method 4500-ClO₂ D or E in 19th or 20th edition)
(Method 4500-ClO₂ C or E in 22nd edition)
(Method 4500-ClO₂ E-00 in SM Online)
 - EPA Method 327.0 Rev. 1.1
 - Amperometric Sensor using ChlordioX™ Plus

Analytical Techniques

- pH

- Measurements must be in accordance with:
 - Method 423 in the 16th, or later, edition of Standard Methods (4500-H⁺ B-00 in Standard Methods Online)
 - (Note: This method requires the use of a specific ion electrode for pH measurements, colorimetric methods are not acceptable.)
 - EPA Method 150.1
 - EPA Method 150.2

- Temperature

- Measurements must be in accordance with:
 - Method 212 in the 16th, or later, edition of Standard Methods (2550-00 in Standard Methods Online)

Analytical Techniques

- Total Trihalomethanes (TTHMs)
 - Must be collected, handled, and analyzed by one of the following analytical methods:
 - EPA 502.2, EPA 524.2 or EPA 551.1
- Haloacetic Acids (five) (HAA5s)
 - Must be collected, handled, and analyzed by one of the following analytical methods:
 - EPA 552.1, EPA 552.2 (or 552.3), or
 - Standard Method 6251B, 19th Edition, of Standard Methods (6251 B-94 at SM Online)

Questions?

Copy of the SWTRs:

Safe Drinking Water Hotline at (800) 426-4791 or
<https://www.epa.gov/dwreginfo/water-system-implementation-resources>

Technical information on the SWTRs:

ADH-Engineering Section

Source Protection Program (501) 661-2623

Aaron Hilborn

Aaron.Hilborn@arkansas.gov

Vickie Welytok

Victoria.Welytok@arkansas.gov

Chris Roberts

Christopher.Roberts@arkansas.gov



To which of the following sources do the SWTRs NOT apply?

- A. Rivers
- B. Springs
- C. Reservoirs
- D. Wells

D. Wells



Under the *Surface Water Treatment Rule*, “CT” stand for _____.

- A. Concentration X Time
- B. Contact Time
- C. Cryptosporidium Total
- D. Clearwell Turbulence

A. Concentration X Time



Individual filters must be monitored for turbidity _____.

A. every 4 hours

B. continually

C. once per day

D. once per shift

B. continually

A filter with an average pore size of 1 micron is designated _____.

- A. 1 micron absolute
- B. 1 micron nominal
- C. uniformly coefficient
- D. 1 micron median

B. 1 micron nominal



If 99.9% of Giardia Lamblia is removed from a water source, that removal is rated as _____.

A. 1 log

B. 2 log

C. 3 log

D. 4 log

C. 3 log

A failure of a system component that poses a threat to health or safety is referred to as a _____.

- A. significant deficiency
- B. sanitary hazard
- C. MRDL
- D. filter profile

A. significant deficiency

The “cloudiness” of water, measured in NTUs is called _____.

- A. alkalinity
- B. turgor potential
- C. combined filter effluent
- D. turbidity

D. turbidity



If a turbidimeter fails, the system must _____.

- A. repair turbidimeter within 24 hours
- B. submit Tier 2 Public Notification
- C. take grab samples every 4 hours
- D. apply for a CPE

C. Take grab samples every 4 hours



The maximum turbidity measurement for combined or individual filter effluent (conventional or direct) is _____.

A. 5.0 NTUs

B. 1.0 NTU

C. 0.3 NTU

D. 0.5 NTU

B. 1.0 NTU



NTU stands for _____.

- A. North Thornton University
- B. Nonbiodegradable Turgor Units
- C. Nostalgic Teletubby Union
- D. Nephelometric Turbidity Unit
- D. Nephelometric Turbidity Unit