Part XXIV
Enhanced Treatment for *Cryptosporidium*

§2401 General requirements.

A. The regulations in this subpart establish or extend treatment technique requirements in lieu of maximum contaminant levels for *Cryptosporidium*. These requirements are in addition to requirements for filtration and disinfection in Parts VIII, XIII, and XXI of these regulations.

B. Applicability. The requirements of these regulations apply to all Part VIII systems, which are public water systems supplied by a surface water source and public water systems supplied by a ground water source under the direct influence of surface water.

1. Wholesale systems, as defined in § 104, must comply with the requirements of this part based on the population of the largest system in the combined distribution system.

2. The requirements of this part for filtered systems apply to systems required by the Navajo Nation Primary Drinking Water Regulations (“NNPDWR”) to provide filtration treatment, whether or not the system is currently operating a filtration system.

3. The requirements of this part for unfiltered systems apply only to unfiltered systems that timely met and continue to meet the filtration avoidance criteria in Parts VIII, XIII, and XXI of these regulations.

C. Requirements. Systems subject to this part must comply with the following requirements:

1. Systems must conduct an initial and a second round of source water monitoring for each plant that treats a surface water or GWUDI source. This monitoring may include sampling for *Cryptosporidium*, *E. coli*, and turbidity as described in §§2402 through 2405 and Appendix G 2401-G through 2402-G, to determine what level, if any, of additional *Cryptosporidium* treatment they must provide.

2. Systems that plan to make a significant change to their disinfection practice must develop disinfection profiles and calculate disinfection benchmarks, as described in §§2407 through 2409.

3. Filtered systems must determine their *Cryptosporidium* treatment bin classification as described in §2409 and provide additional treatment for *Cryptosporidium*, if required, as described in §2410. All unfiltered systems must provide treatment for *Cryptosporidium* as described in §2411. Filtered and unfiltered systems must implement *Cryptosporidium* treatment according to the schedule in §2412.

4. Systems with uncovered finished water storage facilities must comply with the requirements to cover the facility or treat the discharge from the facility as described in §2413.

5. Systems required to provide additional treatment for *Cryptosporidium* must implement microbial toolbox options that are designed and operated as described in §§2414 through 2419.

6. Systems must comply with the applicable recordkeeping and reporting requirements described in §§2420 through 2421.

7. Systems must address significant deficiencies identified in sanitary surveys performed by PWSSP as described in §2422.

Source Water Monitoring Requirements

§2402 Source Water Monitoring Requirements

A. Initial round of source water monitoring. Systems must conduct the following monitoring according to the schedule in Table 2400.1 unless they meet the monitoring exemption criteria in subsection (D) of this section.

1. Filtered systems serving at least 10,000 people must sample their source water for *Cryptosporidium*, *E. coli*, and turbidity at least monthly for 24 months.

2. Unfiltered systems serving at least 10,000 people must sample their source water for *Cryptosporidium* at least monthly for 24 months.

3. a. Filtered systems serving fewer than 10,000 people must sample their source water

for *E. coli* at least once every two weeks for 12 months.

b. A filtered system serving fewer than 10,000 people may avoid *E. coli* monitoring if the system notifies the Director that it will monitor for *Cryptosporidium* as described in paragraph (A)(4) of this section. The system must notify the Director no later than 3 months prior to the date the system is otherwise required to start *E. coli* monitoring under §2402(C).

4. Filtered systems serving fewer than 10,000 people must sample their source water for *Cryptosporidium* at least twice per month for 12 months or at least monthly for 24 months if they meet one of the following, based on monitoring conducted under paragraph (A)(3) of this section:

a. For systems using lake/reservoir sources, the annual mean *E. coli* concentration is greater than 10 *E. coli*/100 mL.

b. For systems using flowing stream sources, the annual mean *E. coli* concentration is greater than 50 *E. coli*/100 mL.

c. The system does not conduct *E. coli* monitoring as described in paragraph (A)(3) of this section.

d. Systems using ground water under the direct influence of surface water (GWUDI) must comply with the requirements of paragraph (A)(4) of this section based on the *E. coli* level that applies to the nearest surface water body. If no surface water body is nearby, the system must comply based on the requirements that apply to systems using lake/reservoir sources.

5. For filtered systems serving fewer than 10,000 people, the Director may approve monitoring for an indicator other than *E. coli* under paragraph (A)(3) of this section. The Director also may approve an alternative to the *E. coli* concentration in paragraph (A)(4)(a), (b) or (d) of this section to trigger *Cryptosporidium* monitoring. This approval by the Director must be provided to the system in writing and must include the basis for the Director's determination that the alternative indicator and/or trigger level will provide a more accurate identification of whether a system will exceed the Bin 1 *Cryptosporidium* level in §2409.

6. Unfiltered systems serving fewer than 10,000 people must sample their source water for *Cryptosporidium* at least twice per month for 12 months or at least monthly for 24 months.

7. Systems may sample more frequently than required under this section if the sampling frequency is evenly spaced throughout the monitoring period.

B. Second round of source water monitoring. Systems must conduct a second round of source water monitoring that meets the requirements for monitoring parameters, frequency, and duration described in subsection (A) of this section, unless they meet the monitoring exemption criteria in subsection (D) of this section. Systems must conduct this monitoring according to the schedule in Table 2400.1.

C. Monitoring schedule. Systems must begin the monitoring required in subsections (A) and (B) of this section no later than the month beginning with the date listed in this table:

TABLE 2400.1 Source Water Monitoring Starting Dates Table

Systems that serve . . .	Must begin the first round of source water monitoring no later than the month beginning . .	And must begin the second round of source water monitoring no later than the month beginning . . .
(1) At least 100,000 people	(a) October 1, 2006	(b) April 1, 2015
(2) From 50,000 to 99,999 people	(a) April 1, 2007	(b) October 1, 2015
(3) From 10,000 to 49,999 people	(a) April 1, 2008	(b) October 1, 2016
(4) Fewer than 10,000 and monitor for *E. coli* [a]	(a) October 1, 2008	(b) October 1, 2017
(5) Fewer than 10,000 and monitor for *Cryptosporidium* [b]	(a) April 1, 2010	(b) April 1, 2019

[a]Applies only to filtered systems.
[b]Applies to filtered systems that meet the conditions of paragraph (A)(4) of this section and unfiltered systems.

D. Monitoring avoidance

1. Filtered systems are not required to conduct source water monitoring under this part if the system will provide a total of at least 5.5-log of treatment for *Cryptosporidium*, equivalent to meeting the treatment requirements of Bin 4 in §2410.

2. Unfiltered systems are not required to conduct source water monitoring under this part if the system will provide a total of at least 3-log *Cryptosporidium* inactivation, equivalent to meeting the treatment requirements for unfiltered systems with a mean *Cryptosporidium* concentration of greater than 0.01 oocysts/L in §2411.

3. If a system chooses to provide the level of treatment in paragraph (D)(1) or (2) of this section, as applicable, rather than start source water monitoring, the system must notify the Director in writing no later than the date the system is otherwise required to submit a sampling schedule for monitoring under §2403. Alternatively, a system may choose to stop sampling at any point after it has initiated monitoring if it notifies the Director in writing that it will provide this level of treatment. Systems must install and operate technologies to provide this level of treatment by the applicable treatment compliance date in §2412.

E. Plants operating only part of the year. Systems with Part VIII plants that operate for only part of the year must conduct source water monitoring in accordance with this part, but with the following modifications:

1. Systems must sample their source water only during the months that the plant operates unless the Director specifies another monitoring period based on plant operating practices.

2. Systems with plants that operate fewer than six months per year and that monitor for *Cryptosporidium* must collect at least six *Cryptosporidium* samples per year during each of two years of monitoring. Samples must be evenly spaced throughout the period the plant operates.

F. New sources

1. A system that begins using a new source of surface water or GWUDI after the system is required to begin monitoring under subsection (C) of this section must monitor the new source on a schedule the Director approves. Source water monitoring must meet the requirements of this part. The system must also meet the bin classification and *Cryptosporidium* treatment requirements of §2409 and §2410 or §2412, as applicable, for the new source on a schedule the Director approves.

2. The requirements of §2402(F) apply to Part VIII systems that begin operation after the monitoring start date applicable to the system's size under subsection (C) of this section.

3. The system must begin a second round of source water monitoring no later than 6 years following initial bin classification under §2409 or determination of the mean *Cryptosporidium* level under §2411, as applicable.

G. Failure to collect any source water sample required under this section in accordance with the sampling schedule, sampling location, analytical method, approved laboratory, and reporting requirements of §§2403 through 2405 and Appendix G 2401-G and 2404-G is a monitoring violation.

H. Grandfathering monitoring data. Systems may use (grandfather) monitoring data collected prior to the applicable monitoring start date in subsection (C) of this section to meet the initial source water monitoring requirements in subsection (A) of this section. Grandfathered data may substitute for an equivalent number of months at the end of the monitoring period. All data submitted under this paragraph must meet the requirements in §2406.

§2403 Sampling schedules

A. Systems required to conduct source water monitoring under §2402 must submit a sampling schedule that specifies the calendar dates when the system will collect each required sample.

1. Systems must submit sampling schedules no later than 3 months prior to the applicable date listed in §2402(C) for each round of required monitoring.

2. All systems must submit their sampling schedule for the initial round of source water

monitoring under §2402(A) to the Director.

3. All systems must submit sampling schedules for the second round of source water monitoring under §2402(B) to the Director.

4. If EPA or the Director does not respond to a system regarding its sampling schedule, the system must sample at the reported schedule.

B. Systems must collect samples within two days before or two days after the dates indicated in their sampling schedule (i.e., within a five-day period around the schedule date) unless one of the conditions of paragraph (B)(1) or (2) of this section applies.

1. If an extreme condition or situation exists that may pose danger to the sample collector, or that cannot be avoided and causes the system to be unable to sample in the scheduled five-day period, the system must sample as close to the scheduled date as is feasible unless the Director approves an alternative sampling date. The system must submit an explanation for the delayed sampling date to the Director concurrent with the shipment of the sample to the laboratory.

2. a. If a system is unable to report a valid analytical result for a scheduled sampling date due to equipment failure, loss of or damage to the sample, failure to comply with the analytical method requirements, including the quality control requirements in Appendix G-2401-G, or the failure of an approved laboratory to analyze the sample, then the system must collect a replacement sample.

b. The system must collect the replacement sample not later than 21 days after receiving information that an analytical result cannot be reported for the scheduled date unless the system demonstrates that collecting a replacement sample within this time frame is not feasible or the Director approves an alternative resampling date. The system must submit an explanation for the delayed sampling date to the Director concurrent with the shipment of the sample to the laboratory.

C. Systems that fail to meet the criteria of subsection (B) of this section for any source water sample required under §2402 must revise their sampling schedules to add dates for collecting all missed samples. Systems must submit the revised schedule to the Director for approval prior to when the system begins collecting the missed samples.

§2404 Sampling locations

A. Systems required to conduct source water monitoring under §2402 must collect samples for each plant that treats a surface water or GWUDI source. Where multiple plants draw water from the same influent, such as the same pipe or intake, the Director may approve one set of monitoring results to be used to satisfy the requirements of §2402 for all plants.

B. 1. Systems must collect source water samples prior to chemical treatment, such as coagulants, oxidants and disinfectants, unless the system meets the conditions of paragraph (B)(2) of this section.

2. The Director may approve a system to collect a source water sample after chemical treatment. To grant this approval, the Director must determine that collecting a sample prior to chemical treatment is not feasible for the system and that the chemical treatment is unlikely to have a significant adverse effect on the analysis of the sample.

C. Systems that recycle filter backwash water must collect source water samples prior to the point of filter backwash water addition.

D. Bank filtration

1. Systems that receive *Cryptosporidium* treatment credit for bank filtration under §805 (D) or §2106 (C), as applicable, must collect source water samples in the surface water prior to bank filtration.

2. Systems that use bank filtration as pretreatment to a filtration plant must collect source water samples from the well (i.e., after bank filtration). Use of bank filtration during monitoring must be consistent with routine operational practice. Systems collecting samples after a bank filtration process may not receive treatment credit for the bank filtration under §2416(C).

E. Multiple sources. Systems with plants that use multiple water sources, including multiple surface water sources and blended surface water and ground water sources, must collect samples as specified in paragraph (E)(1) or (2) of this section. The use of multiple sources during monitoring must be consistent with routine operational practice.

1. If a sampling tap is available where the sources are combined prior to treatment, systems must collect samples from the tap.

2. If a sampling tap where the sources are combined prior to treatment is not available, systems must collect samples at each source near the intake on the same day and must follow either paragraph (E)(2)(a) or (b) of this section for sample analysis.

   a. Systems may composite samples from each source into one sample prior to analysis. The volume of sample from each source must be weighted according to the proportion of the source in the total plant flow at the time the sample is collected.

   b. Systems may analyze samples from each source separately and calculate a weighted average of the analysis results for each sampling date. The weighted average must be calculated by multiplying the analysis result for each source by the fraction the source contributed to total plant flow at the time the sample was collected and then summing these values.

F. Additional Requirements. Systems must submit a description of their sampling location(s) to the Director at the same time as the sampling schedule required under §2403. This description must address the position of the sampling location in relation to the system's water source(s) and treatment processes, including pretreatment, points of chemical treatment, and filter backwash recycle. If the Director does not respond to a system regarding sampling location(s), the system must sample at the reported location(s).

§2405 Reporting Source Water Monitoring Results

A. Systems must report results from the source water monitoring required under §2402 no later than 10 days after the end of the first month following the month when the sample is collected.

B. All systems must report results from the initial source water monitoring required under §2402 (A) to the Director.

C. All systems must report results from the second round of source water monitoring required under §2402 (B) to the Director.

D. Systems must report the applicable information in paragraphs (D)(1) and (2) of this section for the source water monitoring required under §2402.

1. Systems must report the following data elements for each *Cryptosporidium* analysis:

TABLE 2400.2 DATA ELEMENTS FOR EACH *CRYPTOSPORIDIUM* ANALYSIS

Data element
1. PWS ID 2. Facility ID 3. Sample collection date 4. Sample type (field or matrix spike) 5. Sample volume filtered (L), to nearest \1/4\ L 6. Was 100% of filtered volume examined 7. Number of oocysts counted

   a. For matrix spike samples, systems must also report the sample volume spiked and estimated number of oocysts spiked. These data are not required for field samples.

   b. For samples in which less than 10 L is filtered or less than 100% of the sample volume is examined, systems must also report the number of filters used and the packed pellet volume.

   c. For samples in which less than 100% of sample volume is examined, systems must also report the volume of re-suspended concentrate and volume of this resuspension processed through immunomagnetic separation.

2. Systems must report the following data elements for each *E. coli* analysis:

TABLE 2400.3 DATA ELEMENTS FOR EACH *E. COLI* ANALYSIS

Data element.
1. PWS ID 2. Facility ID 3. Sample collection date 4. Analytical method number 5. Method type 6. Source type (flowing stream, lake/reservoir, GWUDI) 7. *E. coli*/100 mL 8. Turbidity[1]

[1]Systems serving fewer than 10,000 people that are not required to monitor for turbidity under § 2402 are not required to report turbidity with their *E. coli* results.

§2406 Grandfathering Previously Collected Data

A. 1. Systems may comply with the initial source water monitoring requirements of §2402 (A) by grandfathering sample results collected before the system is required to begin monitoring (i.e., previously collected data). To be grandfathered, the sample results and analysis must meet the criteria in this section and the Director must approve.

2. A filtered system may grandfather *Cryptosporidium* samples to meet the requirements of §2402 (A) when the system does not have corresponding *E. coli* and turbidity samples. A system that grandfathers *Cryptosporidium* samples without *E. coli* and turbidity samples is not required to collect *E. coli* and turbidity samples when the system completes the requirements for *Cryptosporidium* monitoring under §2402 (A).

B. Sampling location. The sampling location must meet the conditions in § 2404.

C. Sampling frequency. *Cryptosporidium* samples were collected no less frequently than each calendar month on a regular schedule, beginning no earlier than January 1999. Sample collection intervals may vary for the conditions specified in §2403(B)(1) and (2) if the system provides documentation of the condition when reporting monitoring results.

1. The Director may approve grandfathering of previously collected data where there are time gaps in the sampling frequency if the system conducts additional monitoring the Director specifies to ensure that the data used to comply with the initial source water monitoring requirements of §2402 (A) are seasonally representative and unbiased.

2. Systems may grandfather previously collected data where the sampling frequency within each month varied. If the *Cryptosporidium* sampling frequency varied, systems must follow the monthly averaging procedure in §2409(B)(5) or §2411(A)(3), as applicable, when calculating the bin classification for filtered systems or the mean *Cryptosporidium* concentration for unfiltered systems.

D. Reporting monitoring results for grandfathering. Systems that request to grandfather previously collected monitoring results must report the following information by the applicable dates listed in this subsection. Systems serving at least 10,000 people must report this information to EPA unless the Director approves reporting to the Director rather than EPA. Systems serving fewer than 10,000 people must report this information to the Director.

1. Systems must report that they intend to submit previously collected monitoring results for grandfathering. This report must specify the number of previously collected results the system will submit, the dates of the first and last sample, and whether a system will conduct additional source water monitoring to meet the requirements of §2402 (A). Systems must report this information no later than the date the sampling schedule under §2403 is required.

2. Systems must report previously collected monitoring results for grandfathering, along with the associated documentation listed in paragraphs (F)(2)(a) through (d) of this section, no later than two months after the applicable date listed in §2402 (C).

a. For each sample result, systems must report the applicable data elements in §2405.

b. Systems must certify that the reported monitoring results include all results the system generated during the time period beginning with the first reported result and ending with the final reported result. This applies to samples that were collected from the sampling location specified for source water monitoring under this subpart, not spiked, and analyzed using the laboratory's routine process for

the analytical methods listed in this section.

c. Systems must certify that the samples were representative of a plant's source water(s) and the source water(s) have not changed. Systems must report a description of the sampling location(s), which must address the position of the sampling location in relation to the system's water source(s) and treatment processes, including points of chemical addition and filter backwash recycle.

d. For *Cryptosporidium* samples, the laboratory or laboratories that analyzed the samples must provide a letter certifying that the quality control criteria specified in the methods listed in paragraph (C)(1) of this section were met for each sample batch associated with the reported results. Alternatively, the laboratory may provide bench sheets and sample examination report forms for each field, matrix spike, IPR, OPR, and method blank sample associated with the reported results.

E. If the Director determines that a previously collected data set submitted for grandfathering was generated during source water conditions that were not normal for the system, such as a drought, the Director may disapprove the data. Alternatively, the Director may approve the previously collected data if the system reports additional source water monitoring data, as determined by the Director, to ensure that the data set used under §2409 or §2411 represents average source water conditions for the system.

F. If a system submits previously collected data that fully meet the number of samples required for initial source water monitoring under §2402 (B) and some of the data are rejected due to not meeting the requirements of this section, systems must conduct additional monitoring to replace rejected data on a schedule the Director approves. Systems are not required to begin this additional monitoring until two months after notification that data have been rejected and additional monitoring is necessary.

Disinfection Profiling and Benchmarking Requirements

§2407 Requirements when making a significant change in disinfection practice

A. Following the completion of initial source water monitoring under §2402 (A), a system that plans to make a significant change to its disinfection practice, as defined in subsection (B) of this section, must develop disinfection profiles and calculate disinfection benchmarks for *Giardia lamblia* and viruses as described in §2408. Prior to changing the disinfection practice, the system must notify the Director and must include in this notice the information in paragraphs (A)(1) through (3) of this section.

1. A completed disinfection profile and disinfection benchmark for *Giardia lamblia* and viruses as described in §2408.

2. A description of the proposed change in disinfection practice.

3. An analysis of how the proposed change will affect the current level of disinfection.

B. Significant changes to disinfection practice are defined as follows:

1. Changes to the point of disinfection;
2. Changes to the disinfectant(s) used in the treatment plant;
3. Changes to the disinfection process; or
4. Any other modification identified by the Director as a significant change to disinfection practice.

§2408 Developing the disinfection profile and benchmark

A. Systems required to develop disinfection profiles under §2407 must follow the requirements of this section. Systems must monitor at least weekly for a period of 12 consecutive months to determine the total log inactivation for *Giardia lamblia* and viruses. If systems monitor more frequently, the monitoring frequency must be evenly spaced. Systems that operate for fewer than 12 months per year must monitor weekly during the period of operation. Systems must determine log inactivation for *Giardia lamblia* through the entire plant, based on $CT_{99.9}$ values in Tables 800-D-4 through 800-D-9, 800-D-10 and Table 800-D-11 of Appendix D-801-D as applicable. Systems must determine log inactivation for viruses through the entire treatment plant based on a protocol approved by the Director.

B. Systems with a single point of disinfectant application prior to the entrance to the distribution system must conduct the monitoring in paragraphs (B)(1) through (4) of this section. Systems with more than one point of disinfectant application must conduct the

monitoring in paragraphs (B)(1) through (4) of this section for each disinfection segment. Systems must monitor the parameters necessary to determine the total inactivation ratio, using analytical methods in Appendix D-801-D (A).

1. For systems using a disinfectant other than UV, the temperature of the disinfected water must be measured at each residual disinfectant concentration sampling point during peak hourly flow or at an alternative location approved by the Director.

2. For systems using chlorine, the pH of the disinfected water must be measured at each chlorine residual disinfectant concentration sampling point during peak hourly flow or at an alternative location approved by the Director.

3. The disinfectant contact time(s) (t) must be determined during peak hourly flow.

4. The residual disinfectant concentration(s) (C) of the water before or at the first customer and prior to each additional point of disinfectant application must be measured during peak hourly flow.

C. In lieu of conducting new monitoring under subsection (B) of this section, systems may elect to meet the requirements of paragraphs (C)(1) or (2) of this section.

1. Systems that have at least one year of existing data that are substantially equivalent to data collected under the provisions of subsection (B) of this section may use these data to develop disinfection profiles as specified in this section if the system has neither made a significant change to its treatment practice nor changed sources since the data were collected. Systems may develop disinfection profiles using up to three years of existing data.

2. Systems may use disinfection profile(s) developed under §804 or §2104 (A) through (G) in lieu of developing a new profile if the system has neither made a significant change to its treatment practice nor changed sources since the profile was developed. Systems that have not developed a virus profile under §804 or §2104 (A) through (G) must develop a virus profile using the same monitoring data on which the *Giardia lamblia* profile is based.

D. Systems must calculate the total inactivation ratio for *Giardia lamblia* as specified in paragraphs (D)(1) through (3) of this section.

1. Systems using only one point of disinfectant application may determine the total inactivation ratio for the disinfection segment based on either of the methods in paragraph (D)(1)(a) or (b) of this section.

   a. Determine one inactivation ratio ($CTcalc/CT_{99.9}$) before or at the first customer during peak hourly flow.

   b. Determine successive $CTcalc/CT_{99.9}$ values, representing sequential inactivation ratios, between the point of disinfectant application and a point before or at the first customer during peak hourly flow. The system must calculate the total inactivation ratio by determining ($CTcalc/CT_{99.9}$) for each sequence and then adding the ($CTcalc/CT_{99.9}$) values together to determine ($\Sigma(CTcalc/CT_{99.9})$).

2. Systems using more than one point of disinfectant application before the first customer must determine the CT value of each disinfection segment immediately prior to the next point of disinfectant application, or for the final segment, before or at the first customer, during peak hourly flow. The ($CTcalc/CT_{99.9}$) value of each segment and ($\Sigma(CTcalc/CT_{99.9})$) must be calculated using the method in paragraph (D)(1)(b) of this section.

3. The system must determine the total logs of inactivation by multiplying the value calculated in paragraph (D)(1) or (D)(2) of this section by 3.0.

4. Systems must calculate the log of inactivation for viruses using a protocol approved by the Director.

E. Systems must use the procedures specified in paragraphs (E)(1) and (2) of this section to calculate a disinfection benchmark.

1. For each year of profiling data collected and calculated under subsections (A) through (D) of this section, systems must determine the lowest mean monthly level of both *Giardia lamblia* and virus inactivation. Systems must determine the mean *Giardia lamblia* and virus inactivation for each calendar month for each year of profiling data by dividing the sum of daily or weekly *Giardia lamblia* and virus log inactivation by the number of values

calculated for that month.

2. The disinfection benchmark is the lowest monthly mean value (for systems with one year of profiling data) or the mean of the lowest monthly mean values (for systems with more than one year of profiling data) of *Giardia lamblia* and virus log inactivation in each year of profiling data.

Treatment Technique Requirements.

§2409 Bin classification for filtered systems.

A. Following completion of the initial round of source water monitoring required under §2402 (A), filtered systems must calculate an initial *Cryptosporidium* bin concentration for each plant for which monitoring was required. Calculation of the bin concentration must use the *Cryptosporidium* results reported under §2402 (A) and must follow the procedures in paragraphs (B)(1) through (5) of this section.

B. 1. For systems that collect a total of at least 48 samples, the bin concentration is equal to the arithmetic mean of all sample concentrations.

2. For systems that collect a total of at least 24 samples, but not more than 47 samples, the bin concentration is equal to the highest arithmetic mean of all sample concentrations in any 12 consecutive months during which *Cryptosporidium* samples were collected.

3. For systems that serve fewer than 10,000 people and monitor for *Cryptosporidium* for only one year (i.e., collect 24 samples in 12 months), the bin concentration is equal to the arithmetic mean of all sample concentrations.

4. For systems with plants operating only part of the year that monitor fewer than 12 months per year under §2402(E), the bin concentration is equal to the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

5. If the monthly *Cryptosporidium* sampling frequency varies, systems must first calculate a monthly average for each month of monitoring. Systems must then use these monthly average concentrations, rather than individual sample concentrations, in the applicable calculation for bin classification in paragraphs (B)(1) through (4) of this section.

C. Filtered systems must determine their initial bin classification from the following table and using the *Cryptosporidium* bin concentration calculated under subsections (A)-(B) of this section:

TABLE 2400.4 Bin Classification Table for Filtered Systems

For systems that are:	With a *Cryptosporidium* bin concentration of...[1]	The bin classification is
. . . required to monitor for *Cryptosporidium* under §2402	*Cryptosporidium* <0.075 oocyst/L.	Bin 1
	0.075 oocysts/L #*Cryptosporidium* <1.0 oocysts/L.	Bin 2
	1.0 oocysts/L #*Cryptosporidium* <3.0 oocysts/L.	Bin 3
	Cryptosporidium ∃3.0 oocysts/L.	Bin 4
. . . serving fewer than 10,000 people and NOT required to monitor for *Cryptosporidium* under §2402(A)(4)	NA	Bin 1.

[1]Based on calculations in paragraph (A) or (D) of this section, as applicable.

D. Following completion of the second round of source water monitoring required under §2402(B), filtered systems must recalculate their *Cryptosporidium* bin concentration using the *Cryptosporidium* results reported under §2402 (B) and following the procedures in paragraphs (B)(1) through (4) of this section. Systems must then redetermine their bin classification using this bin concentration and Table 2400.4.

E. 1. Filtered systems must report their initial bin classification under subsection (C) of this

section to the Director for approval no later than 6 months after the system is required to complete initial source water monitoring based on the schedule in §2402 (C).

2. Systems must report their bin classification under subsection (D) of this section to the Director for approval no later than 6 months after the system is required to complete the second round of source water monitoring based on the schedule in §2402 (C).

3. The bin classification report to the Director must include a summary of source water monitoring data and the calculation procedure used to determine bin classification.

F. Failure to comply with the conditions of subsection (E) of this section is a violation of the treatment technique requirement.

§2410 Filtered system additional *Cryptosporidium* treatment requirements.

A. Filtered systems must provide the level of additional treatment for *Cryptosporidium* specified in this subsection based on their bin classification as determined under §2409 and according to the schedule in §2412.

TABLE 2400.5 ADDITIONAL *CRYPTOSPORIDIUM* TREATMENT REQUIREMENTS FOR FILTERED SYSTEMS BASED ON BIN CLASSIFICATION

If the system bin classification is...	And the system uses the following filtration treatment in full compliance with Parts VIII, XIII, and XXI of this part (as applicable), then the additional *Cryptosporidium* treatment requirements are . . .			
	Conventional filtration treatment (including softening)	Direct Filtration	Slow sand or diatomaceous earth filtration	Alternative filtration technologies
Bin 1.....	No additional treatment	No additional treatment.....	No additional treatment	No additional Treatment
Bin 2.....	1-log treatment....	1. 5-log treatment	1-log treatment	([1])
Bin 3.....	2-log treatment....	2. 5-log treatment	2-log treatment	([2])
Bin 4.....	2.5 log treatment....	3. 3-log treatment	2.5 log treatment	([3])

[1]As determined by the Director such that the total *Cryptosporidium* removal and inactivation is at least 4.0-log.
[2]As determined by the Director such that the total *Cryptosporidium* removal and inactivation is at least 5.0-log.
[3]As determined by the Director such that the total *Cryptosporidium* removal and inactivation is at least 5.5-log.

B. 1. Filtered systems must use one or more of the treatment and management options listed in §2414, termed the microbial toolbox, to comply with the additional *Cryptosporidium* treatment required in subsection (A) of this section.

2. Systems classified in Bin 3 and Bin 4 must achieve at least 1-log of the additional *Cryptosporidium* treatment required under subsection (A) of this section using either one or a combination of the following: bag filters, bank filtration, cartridge filters, chlorine dioxide, membranes, ozone, or UV, as described in §2415 through §2419.

C. Failure by a system in any month to achieve treatment credit by meeting criteria in §2415 through §2419 for microbial toolbox options that is at least equal to the level of treatment required in subsection (A) of this section is a violation of the treatment technique requirement.

D. If the Director determines during a sanitary survey or an equivalent source water assessment that after a system completed the monitoring conducted under §2402 (A) or §2402 (B) significant changes occurred in the system's watershed that could lead to increased contamination of the source water by *Cryptosporidium*, the system must take actions specified by the Director to

address the contamination. These actions may include additional source water monitoring and/or implementing microbial toolbox options listed in §2414.

§2411 Unfiltered system *Cryptosporidium* treatment requirements

A. Determination of mean *Cryptosporidium* level.

1. Following completion of the initial source water monitoring required under §2402 (A), unfiltered systems must calculate the arithmetic mean of all *Cryptosporidium* sample concentrations reported under §2402 (A). Systems must report this value to the Director for approval no later than 6 months after the month the system is required to complete initial source water monitoring based on the schedule in § 2402 (C).

2. Following completion of the second round of source water monitoring required under §2402 (B), unfiltered systems must calculate the arithmetic mean of all *Cryptosporidium* sample concentrations reported under §2402 (B). Systems must report this value to the Director for approval no later than 6 months after the month the system is required to complete the second round of source water monitoring based on the schedule in §2402 (C).

3. If the monthly *Cryptosporidium* sampling frequency varies, systems must first calculate a monthly average for each month of monitoring. Systems must then use these monthly average concentrations, rather than individual sample concentrations, in the calculation of the mean *Cryptosporidium* level in paragraphs (A)(1) or (2) of this section.

4. The report to the Director of the mean *Cryptosporidium* levels calculated under paragraphs (A)(1) and (2) of this section must include a summary of the source water monitoring data used for the calculation.

5. Failure to comply with the conditions of subsection (A) of this section is a violation of the treatment technique requirement.

B. *Cryptosporidium* inactivation requirements. Unfiltered systems must provide the level of inactivation for *Cryptosporidium* specified in this paragraph, based on their mean *Cryptosporidium* levels as determined under paragraph (A) of this section and according to the schedule in §2412.

1. Unfiltered systems with a mean *Cryptosporidium* level of 0.01 oocysts/L or less must provide at least 2-log *Cryptosporidium* inactivation.

2. Unfiltered systems with a mean *Cryptosporidium* level of greater than 0.01 oocysts/L must provide at least 3-log *Cryptosporidium* inactivation.

C. Inactivation treatment technology requirements. Unfiltered systems must use chlorine dioxide, ozone, or UV as described in §2419 to meet the *Cryptosporidium* inactivation requirements of this section.

1. Systems that use chlorine dioxide or ozone and fail to achieve the *Cryptosporidium* inactivation required in subsection (B) of this section on more than one day in the calendar month are in violation of the treatment technique requirement.

2. Systems that use UV light and fail to achieve the *Cryptosporidium* inactivation required in subsection (B) of this section by meeting the criteria in §2419(D)(3)(b) are in violation of the treatment technique requirement.

D. Use of two disinfectants. Unfiltered systems must meet the combined *Cryptosporidium* inactivation requirements of this section and *Giardia lamblia* and virus inactivation requirements of §804(A) using a minimum of two disinfectants, and each of two disinfectants must separately achieve the total inactivation required for either *Cryptosporidium*, *Giardia lamblia*, or viruses.

§2412 Schedule for compliance with *Cryptosporidium* treatment requirements

A. Following initial bin classification under §2409(C), filtered systems must provide the level of treatment for *Cryptosporidium* required under §2410 according to the schedule in subsection (C) of this section.

B. Following initial determination of the mean *Cryptosporidium* level under §2411(A)(1), unfiltered systems must provide the level of treatment for *Cryptosporidium* required under §2411 according to the schedule in subsection (C) of this section.

C. *Cryptosporidium* treatment compliance dates.

TABLE 2400.6 *Cryptosporidium* Treatment Compliance Dates

Systems that serve . . .	Must comply with *Cryptosporidium* treatment requirements no later than . . . [a]
(1) At least 100,000 people	(a) April 1, 2012.
(2) From 50,000 to 99,999 people	(b) October 1, 2012
(3) From 10,000 to 49,999 people	(c) October 1, 2013
(4) Fewer than 10,000 people	(d) October 1, 2014

[a]The Director may allow up to an additional two years for complying with the treatment requirement for systems making capital improvements.

D. If the bin classification for a filtered system changes following the second round of source water monitoring, as determined under §2409(D), the system must provide the level of treatment for *Cryptosporidium* required under §2410 on a schedule the Director approves.

E. If the mean *Cryptosporidium* level for an unfiltered system changes following the second round of monitoring, as determined under §2411(A)(2), and if the system must provide a different level of *Cryptosporidium* treatment under §2411 due to this change, the system must meet this treatment requirement on a schedule the Director approves.

§2413 Requirements for uncovered finished water storage facilities

A. Systems using uncovered finished water storage facilities must comply with the conditions of this section.

B. Systems must notify the Director of the use of each uncovered finished water storage facility no later than April 1, 2008.

C. Systems must meet the conditions of paragraph (C)(1) or (2) of this section for each uncovered finished water storage facility or be in compliance with a Director-approved schedule to meet these conditions no later than April 1, 2009.

1. Systems must cover any uncovered finished water storage facility.

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

D. Failure to comply with the requirements of this section is a violation of the treatment technique requirement.

Requirements for Microbial Toolbox Components

§2414 Microbial toolbox options for meeting *Cryptosporidium* treatment requirements

E. 1. Systems receive the treatment credits listed in Table 2400.7 by meeting the conditions for microbial toolbox options described in §2415 through §2419. Systems apply these treatment credits to meet the treatment requirements in §2410 or §2411, as applicable.

2. Unfiltered systems are eligible for treatment credits for the microbial toolbox options described in §2419 only.

F. The following table summarizes options in the microbial toolbox:

TABLE 2400.7 Microbial Toolbox Summary Table: Options, Treatment Credits and Criteria

Toolbox Option	*Cryptosporidium* treatment credit with design and implementation criteria
Source Protection and Management Toolbox Options	
(1) Watershed control program	0.5-log credit for Director-approved program comprising required elements, annual program status report to Director, and regular watershed survey. Unfiltered systems are not eligible for credit.

	Specific criteria are in §2415(A).
(2) Alternative source/intake management	No prescribed credit. Systems may conduct simultaneous monitoring for treatment bin classification at alternative intake locations or under alternative intake management strategies. Specific criteria are in §2415(B).
Pre Filtration Toolbox Options	
(3) Presedimentation basin with coagulation	0.5-log credit during any month that presedimentation basins achieve a monthly mean reduction of 0.5-log or greater in turbidity or alternative Director-approved performance criteria. To be eligible, basins must be operated continuously with coagulant addition and all plant flow must pass through basins. Specific criteria are in §2416(A).
(4) Two-stage lime softening	0.5-log credit for two-stage softening where chemical addition and hardness precipitation occur in both stages. All plant flow must pass through both stages. Single-stage softening is credited as equivalent to conventional treatment. Specific criteria are in §2416(B).
(5) Bank filtration	0.5-log credit for 25-foot setback; 1.0- log credit for 50-foot setback; aquifer must be unconsolidated sand containing at least 10 percent fines; average turbidity in wells must be less than 1 NTU. Systems using wells followed by filtration when conducting source water monitoring must sample the well to determine bin classification and are not eligible for additional credit. Specific criteria are in §2418(C).
Treatment Performance Toolbox Options	
(6) Combined filter performance	0.5-log credit for combined filter effluent turbidity less than or equal to 0.15 NTU in at least 95 percent of measurements each month. Specific criteria are in §2417(A).
(7) Individual filter performance.	0.5-log credit (in addition to 0.5-log combined filter performance credit) if individual filter effluent turbidity is less than or equal to 0.15 NTU in at least 95 percent of samples each month in each filter and is never greater than 0.3 NTU in two consecutive measurements in any filter. Specific criteria are in §2417(B).
(8) Demonstration of performance	Credit awarded to unit process or treatment train based on a demonstration to the Director with a Director-approved protocol. Specific criteria are in §2417(C).
Additional Filtration Toolbox Options	
(9) Bag or cartridge filters (individual filters)	Up to 2-log credit based on the removal efficiency demonstrated during challenge testing with a 1.0-log factor of safety. Specific criteria are in §2418(A).
(10) Bag or cartridge filters (in series)	Up to 2.5-log credit based on the removal efficiency demonstrated during challenge testing with a 0.5-log factor of safety. Specific criteria are in §2418(A).
(11) Membrane filtration	Log credit equivalent to removal efficiency demonstrated in challenge test for device if supported by direct integrity testing. Specific criteria are in §2418(B).

(12) Second stage filtration.	0.5-log credit for second separate granular media filtration stage if treatment train includes coagulation prior to first filter. Specific criteria are in §2418(C).
(13) Slow sand filters	2.5-log credit as a secondary filtration step; 3.0-log credit as a primary filtration process. No prior chlorination for either option. Specific criteria are in §2418(D).
Inactivation Toolbox Options	
(14) Chlorine dioxide	Log credit based on measured CT in relation to CT table. Specific criteria are in §2419(B).
(15) Ozone	Log credit based on measured CT in relation to CT table. Specific criteria are in §2419(B).
(16) UV	Log credit based on validated UV dose in relation to UV dose table; reactor validation testing required to establish UV dose and associated operating conditions. Specific criteria are in §2419(D).

§2415 Source toolbox components

A. Watershed control program. Systems receive 0.5-log *Cryptosporidium* treatment credit for implementing a watershed control program that meets the requirements of this section.

1. Systems that intend to apply for the watershed control program credit must notify the Director of this intent no later than two years prior to the treatment compliance date applicable to the system in §2412.

2. Systems must submit to the Director a proposed watershed control plan no later than one year before the applicable treatment compliance date in §2412. The Director must approve the watershed control plan for the system to receive watershed control program treatment credit. The watershed control plan must include the elements in paragraphs (A)(2)(a) through (d) of this section.

   a. Identification of an “area of influence” outside of which the likelihood of *Cryptosporidium* or fecal contamination affecting the treatment plant intake is not significant. This is the area to be evaluated in future watershed surveys under paragraph (A)(5)(b) of this section.

   b. Identification of both potential and actual sources of *Cryptosporidium* contamination and an assessment of the relative impact of these sources on the system's source water quality.

   c. An analysis of the effectiveness and feasibility of control measures that could reduce *Cryptosporidium* loading from sources of contamination to the system's source water.

   d. A statement of goals and specific actions the system will undertake to reduce source water *Cryptosporidium* levels. The plan must explain how the 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 completing specific actions identified in the plan.

3. Systems with existing watershed control programs (i.e., programs in place on January 5, 2006) are eligible to seek this credit. Their watershed control plans must meet the criteria in paragraph (A)(2) of this section and must specify ongoing and future actions that will reduce source water *Cryptosporidium* levels.

4. If the Director does not respond to a system regarding approval of a watershed control plan submitted under this section and the system meets the other requirements of this section, the watershed control program will be considered approved and 0.5 log *Cryptosporidium* treatment credit will be awarded unless and until the Director subsequently withdraws such approval.

5. Systems must complete the actions in paragraphs (A)(5)(a) through (c) of this section to maintain the 0.5-log credit.

a. Submit an annual watershed control program status report to the Director. The annual watershed control program status report must describe the system's implementation of the approved plan and assess the adequacy of the plan to meet its goals. It must explain how the system is addressing any shortcomings in plan implementation, including those previously identified by the Director or as the result of the watershed survey conducted under paragraph (A)(5)(b) of this section. It must also describe any significant changes that have occurred in the watershed since the last watershed sanitary survey. If a system determines during implementation that making a significant change to its approved watershed control program is necessary, the system must notify the Director prior to making any such changes. If any change is likely to reduce the level of source water protection, the system must also list in its notification the actions the system will take to mitigate this effect.

b. Undergo a watershed sanitary survey every three years for community water systems and every five years for noncommunity water systems and submit the survey report to the Director. The survey must be conducted according to Director-guidelines and by persons the Director approves.

i. The watershed sanitary survey must meet the following criteria: encompass the region identified in the Director-approved watershed control plan as the area of influence; assess the implementation of actions to reduce source water *Cryptosporidium* levels; and identify any significant new sources of *Cryptosporidium*.

ii. If the Director determines that significant changes may have occurred in the watershed since the previous watershed sanitary survey, systems must undergo another watershed sanitary survey by a date the Director requires, which may be earlier than the regular date in paragraph (A)(5)(b) of this section.

c. The system must make the watershed control plan, annual status reports, and watershed sanitary survey reports available to the public upon request. These documents must be in a plain language style and include criteria by which to evaluate the success of the program in achieving plan goals. The Director may approve systems to withhold from the public portions of the annual status report, watershed control plan, and watershed sanitary survey based on water supply security considerations.

6. If the Director determines that a system is not carrying out the approved watershed control plan, the Director may withdraw the watershed control program treatment credit.

B. Alternative source.

1. A system may conduct source water monitoring that reflects a different intake location (either in the same source or for an alternate source) or a different procedure for the timing or level of withdrawal from the source (alternative source monitoring). If the Director approves, a system may determine its bin classification under §2409 based on the alternative source monitoring results.

2. If systems conduct alternative source monitoring under paragraph (B)(1) of this section, systems must also monitor their current plant intake concurrently as described in §2402.

3. Alternative source monitoring under paragraph (B)(1) of this section must meet the requirements for source monitoring to determine bin classification, as described in §§2402 through 2405 and Appendix G 2401-G through 2402-G. Systems must report the alternative source monitoring results to the Director, along with supporting information documenting the operating conditions under which the samples were collected.

4. If a system determines its bin classification under §2409 using alternative source 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 withdrawal procedure, as applicable, no later than the applicable treatment compliance date in §2412.

§2416 Pre-filtration treatment toolbox components

A. Presedimentation. Systems receive 0.5-log *Cryptosporidium* treatment credit for a presedimentation basin during any month the process meets the criteria in this subsection.

1. The presedimentation basin must be in continuous operation and must treat the entire plant flow taken from a surface water or GWUDI source.

2. The system must continuously add a coagulant to the presedimentation basin.

3. The presedimentation basin must achieve the performance criteria in paragraph (3)(a) or (b) of this section.

   a. Demonstrates at least 0.5-log mean reduction of influent turbidity. This reduction must be determined using daily turbidity measurements in the presedimentation process influent and effluent and must be calculated as follows: log10 (monthly mean of daily influent turbidity)-log10 (monthly mean of daily effluent turbidity).

   b. Complies with Director-approved performance criteria that demonstrate at least 0.5-log mean removal of micron-sized particulate material through the presedimentation process.

B. Two-stage lime softening. Systems receive an additional 0.5-log *Cryptosporidium* treatment credit for a two-stage lime softening plant if chemical addition and hardness precipitation occur in two separate and sequential softening stages prior to filtration. Both softening stages must treat the entire plant flow taken from a surface water or GWUDI source.

C. Bank filtration. Systems receive *Cryptosporidium* treatment credit for bank filtration that serves as pretreatment to a filtration plant by meeting the criteria in this subsection. Systems using bank filtration when they begin source water monitoring under §2402 (A) must collect samples as described in § 2404 (D) and are not eligible for this credit.

1. Wells with a ground water flow path of at least 25 feet receive 0.5-log treatment credit; wells with a ground water flow path of at least 50 feet receive 1.0-log treatment credit. The ground water flow path must be determined as specified in paragraph (C)(4) of this section.

2. Only wells in granular aquifers are eligible for treatment credit. Granular aquifers are those comprised of sand, clay, silt, rock fragments, pebbles or larger particles, and minor cement. A system must characterize the aquifer at the well site to determine aquifer properties. Systems must extract a core from the aquifer and demonstrate that in at least 90 percent of the core length, grains less than 1.0 mm in diameter constitute at least 10 percent of the core material.

3. Only horizontal and vertical wells are eligible for treatment credit.

4. For vertical wells, the ground water flow path is the measured distance from the edge of the surface water body under high flow conditions (determined by the 100 year floodplain elevation boundary or by the floodway, as defined in Federal Emergency Management Agency flood hazard maps) to the well screen. For horizontal wells, the ground water flow path is the measured distance from the bed of the river under normal flow conditions to the closest horizontal well lateral screen.

5. Systems must monitor each wellhead for turbidity at least once every four hours while the bank filtration process is in operation. If monthly average turbidity levels, based on daily maximum values in the well, exceed 1 NTU, the system must report this result to the Director and conduct an assessment within 30 days to determine the cause of the high turbidity levels in the well. If the Director determines that microbial removal has been compromised, the Director may revoke treatment credit until the system implements corrective actions approved by the Director to remediate the problem.

6. Springs and infiltration galleries are not eligible for treatment credit under this section, but are eligible for credit under §2419(C).

7. Bank filtration demonstration of performance. The Director may approve *Cryptosporidium* treatment credit for bank filtration based on a demonstration of performance study that meets the criteria in this subsection. This treatment credit may be greater than 1.0-log and may be awarded to bank filtration that does not meet the criteria in paragraphs (C)(1)-(5) of this section.

   a. The study must follow a Director-approved protocol and must involve the collection of data on the removal of *Cryptosporidium* or a surrogate for *Cryptosporidium* and related hydrogeologic and water quality parameters during the full range of operating conditions.

   b. The study must include sampling both from the production well(s) and from monitoring wells that are screened and located along the shortest flow path between the surface water source and the production well(s).

§2417 Treatment performance toolbox components

A. Combined filter performance. Systems using conventional filtration treatment or direct filtration treatment receive an additional 0.5-log *Cryptosporidium* treatment credit during any month the system meets the criteria in this subsection. Combined filter effluent (CFE) turbidity must be less than or equal to 0.15 NTU in at least 95 percent of the measurements. Turbidity must be measured as described in Appendix D-801-D (A) and (C).

B. Individual filter performance. Systems using conventional filtration treatment or direct filtration treatment receive 0.5-log *Cryptosporidium* treatment credit, which can be in addition to the 0.5-log credit under subsection (A) of this section, during any month the system meets the criteria in this subsection. Compliance with these criteria must be based on individual filter turbidity monitoring as described in §1306 or §2107, as applicable.

1. The 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.

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

3. Any system that has received treatment credit for individual filter performance and fails to meet the requirements of paragraph (B)(1) or (2) of this section during any month does not receive a treatment technique violation under §2412(C) if the Director determines the following:

a. The failure was due to unusual and short-term circumstances that could not reasonably be prevented through optimizing treatment plant design, operation, and maintenance.

b. The system has experienced no more than two such failures in any calendar year.

C. Demonstration of performance. The Director may approve *Cryptosporidium* treatment credit for drinking water treatment processes based on a demonstration of performance study that meets the criteria in this subsection. This treatment credit may be greater than or less than the prescribed treatment credits in §2410 or §2416 through §2419 and may be awarded to treatment processes that do not meet the criteria for the prescribed credits.

1. Systems cannot receive the prescribed treatment credit for any toolbox option in §2416 through §2419 if that toolbox option is included in a demonstration of performance study for which treatment credit is awarded under this subsection.

2. The demonstration of performance study must follow a Director-approved protocol and must demonstrate the level of *Cryptosporidium* reduction the treatment process will achieve under the full range of expected operating conditions for the system.

3. Approval by the Director 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. The Director may designate such criteria where necessary to verify that the conditions under which the demonstration of performance credit was approved are maintained during routine operation.

§2418 Additional filtration toolbox components

A. Bag and cartridge filters. Systems receive *Cryptosporidium* treatment credit of up to 2.0-log for individual bag or cartridge filters and up to 2.5-log for bag or cartridge filters operated in series by meeting the criteria in paragraphs (A)(1) through (10) of this section. To be eligible for this credit, systems must report the results of challenge testing that meets the requirements of paragraphs (A)(2) through (9) of this section to the Director. The filters must treat the entire plant flow taken from a Part VIII source.

1. The *Cryptosporidium* treatment credit awarded to bag or cartridge filters must be based on the removal efficiency demonstrated during challenge testing that is conducted according to the criteria in paragraphs (A)(2) through (A)(9) of this section. A factor of safety equal to 1-log for individual bag or cartridge filters and 0.5-log for bag or cartridge filters in series must be applied to challenge testing results to determine removal credit. Systems may use results from challenge testing conducted prior to January 5, 2006 if the prior testing was consistent with the criteria specified in paragraphs (A)(2) through (9) of this section.

2. Challenge testing must be performed on full-scale bag or cartridge filters, and the associated filter housing or pressure vessel, that are identical in material and construction to the filters and housings the system will use for removal of

Cryptosporidium. Bag or cartridge filters must be challenge tested in the same configuration that the system will use, either as individual filters or as a series configuration of filters.

3. Challenge testing must be conducted using *Cryptosporidium* or a surrogate that is removed no more efficiently than *Cryptosporidium*. The microorganism or surrogate used during challenge testing is referred to as the challenge particulate. The concentration of the challenge particulate must be determined using a method capable of discreetly quantifying the specific microorganism or surrogate used in the test; gross measurements such as turbidity may not be used.

4. The maximum feed water concentration that can be used during a challenge test must be based on the detection limit of the challenge particulate in the filtrate (i.e., filtrate detection limit) and must be calculated using the following equation:

   Maximum Feed Concentration = 1 H 10^4 H(Filtrate Detection Limit)

5. Challenge testing must be conducted at the maximum design flow rate for the filter as specified by the manufacturer.

6. Each filter evaluated must be tested for a duration sufficient to reach 100 percent of the terminal pressure drop, which establishes the maximum pressure drop under which the filter may be used to comply with the requirements of this part.

7. Removal efficiency of a filter must be determined from the results of the challenge test and expressed in terms of log removal values using the following equation:

$$LRV = LOG_{10}(C_f) - LOG_{10}(C_p)$$

   Where:
   LRV = log removal value demonstrated during challenge testing;
   C_f = the feed concentration measured during the challenge test; and
   C_p = the filtrate concentration measured during the challenge test.
   In applying this equation, the same units must be used for the feed and filtrate concentrations. If the challenge particulate is not detected in the filtrate, then the term C_p must be set equal to the detection limit.

8. Each filter tested must be challenged with the challenge particulate during three periods over the filtration cycle: within two hours of start-up of a new filter; when the pressure drop is between 45 and 55 percent of the terminal pressure drop; and at the end of the cycle after the pressure drop has reached 100 percent of the terminal pressure drop. An LRV must be calculated for each of these challenge periods for each filter tested. The LRV for the filter (LRV_{filter}) must be assigned the value of the minimum LRV observed during the three challenge periods for that filter.

9. If fewer than 20 filters are tested, the overall removal efficiency for the filter product line must be set equal to the lowest LRV_{filter} among the filters tested. If 20 or more filters are tested, the overall removal efficiency for the filter product line must be set equal to the 10th percentile of the set of LRVfilter values for the various filters tested. The percentile is defined by (i/(n+1)) where i is the rank of n individual data points ordered lowest to highest. If necessary, the 10th percentile may be calculated using linear interpolation.

10. If a previously tested filter is modified in a manner that could change the removal efficiency of the filter product line, challenge testing to demonstrate the removal efficiency of the modified filter must be conducted and submitted to the Director.

B. Membrane filtration

1. Systems receive *Cryptosporidium* treatment credit for membrane filtration that meets the criteria of this subsection. Membrane cartridge filters that meet the definition of membrane filtration in §104 are eligible for this credit. The level of treatment credit a system receives is equal to the lower of the values determined under paragraph (B)(1)(a) and (b) of this section.

   a. The removal efficiency demonstrated during challenge testing conducted under the conditions in paragraph (b)(2) of this section.

   b. The maximum removal efficiency that can be verified through direct integrity testing used with the membrane filtration process under the conditions in paragraph (b)(3) of this section.

2. Challenge Testing. The membrane used by the system must undergo challenge testing to evaluate removal efficiency, and the system must report the results of challenge testing to the Director. Challenge testing must be conducted according to the criteria in paragraphs (B)(2)(a) through (g) of this section. Systems may use data from challenge testing conducted prior to January 5, 2006 if the prior testing was consistent with the criteria in paragraphs (b)(2)(a) through (g) of this section.

   a. Challenge testing must be conducted on either a full-scale membrane module, identical in material and construction to the membrane modules used in the system's treatment facility, or a smaller-scale membrane module, identical in material and similar in construction to the full-scale module. A module is defined as the smallest component of a membrane unit in which a specific membrane surface area is housed in a device with a filtrate outlet structure.

   b. Challenge testing must be conducted using *Cryptosporidium* oocysts or a surrogate that is removed no more efficiently than *Cryptosporidium* oocysts. The organism or surrogate used during challenge testing is referred to as the challenge particulate. The concentration of the challenge particulate, in both the feed and filtrate water, must be determined using a method capable of discretely quantifying the specific challenge particulate used in the test; gross measurements such as turbidity may not be used.

   c. The maximum feed water concentration that can be used during a challenge test is based on the detection limit of the challenge particulate in the filtrate and must be determined according to the following equation:

      Maximum Feed Concentration = $3.16 \times 10^6 \times$ (Filtrate Detection Limit)

   d. Challenge testing must be conducted under representative hydraulic conditions at the maximum design flux and maximum design process recovery specified by the manufacturer for the membrane module. Flux is defined as the throughput of a pressure driven membrane process expressed as flow per unit of membrane area. Recovery is defined as the volumetric percent of feed water that is converted to filtrate over the course of an operating cycle uninterrupted by events such as chemical cleaning or a solids removal process (i.e., backwashing).

   e. Removal efficiency of a membrane module must be calculated from the challenge test results and expressed as a log removal value according to the following equation:

      $$LRV = LOG_{10}(C_f) - LOG_{10}(C_p)$$

      Where:
      LRV = log removal value demonstrated during the challenge test;
      C_f = the feed concentration measured during the challenge test; and
      C_p = the filtrate concentration measured during the challenge test.
      Equivalent units must be used for the feed and filtrate concentrations. If the challenge particulate is not detected in the filtrate, the term C_p is set equal to the detection limit for the purpose of calculating the LRV. An LRV must be calculated for each membrane module evaluated during the challenge test.

   f. The removal efficiency of a membrane filtration process demonstrated during challenge testing must be expressed as a log removal value ($LRV_{C\text{-}Test}$). If fewer than 20 modules are tested, then $LRV_{C\text{-}Test}$ is equal to the lowest of the representative LRVs among the modules tested. If 20 or more modules are tested, then $LRV_{C\text{-}Test}$ is equal to the 10th percentile of the representative LRVs among the modules tested. The percentile is defined by (i/(n+1)) where i is the rank of n individual data points ordered lowest to highest. If necessary, the 10th percentile may be calculated using linear interpolation.

   g. The challenge test must establish a quality control release value (QCRV) for a non-destructive performance test that demonstrates the *Cryptosporidium* removal capability of the membrane filtration module. This performance test must be applied to each production membrane module used by the system that was not directly challenge tested in order to verify *Cryptosporidium* removal capability. Production modules that do not meet the established QCRV are not eligible for the treatment credit demonstrated during the challenge test.

   h. If a previously tested membrane is modified in a manner that could change the removal efficiency of the membrane or the applicability of the non-destructive performance test and associated QCRV, additional challenge testing to demonstrate the removal efficiency of, and determine a new QCRV for, the modified membrane must be conducted and submitted to the Director.

3. Direct integrity testing. 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 and meets the requirements described in paragraphs (B)(3)(a) through (f) of this section. A direct integrity test is defined as a physical test applied to a membrane unit in order to identify and isolate integrity breaches (i.e., one or more leaks that could result in contamination of the filtrate).

   a. The direct integrity test must be independently applied to each membrane unit in service. A membrane unit is defined as a group of membrane modules that share common valving that allows the unit to be isolated from the rest of the system for the purpose of integrity testing or other maintenance.

   b. The direct integrity method must have a resolution of 3 micrometers or less, where resolution is defined as the size of the smallest integrity breach that contributes to a response from the direct integrity test.

   c. The direct integrity test must have a sensitivity sufficient to verify the log treatment credit awarded to the membrane filtration process by the Director, where sensitivity is defined as the maximum log removal value that can be reliably verified by a direct integrity test. Sensitivity must be determined using the approach in either paragraph (B)(3)(c)(i) or (ii) of this section as applicable to the type of direct integrity test the system uses.

      i. For direct integrity tests that use an applied pressure or vacuum, the direct integrity test sensitivity must be calculated according to the following equation:

$$LRV_{DIT} = LOG_{10} (Q_p /(VCFHQ_{breach}))$$

      Where:
      LRV_{DIT} = the sensitivity of the direct integrity test;
      Q_p = total design filtrate flow from the membrane unit;
      Q_{breach} = flow of water from an integrity breach associated with the smallest integrity test response that can be reliably measured, and
      VCF = volumetric concentration factor.
      The volumetric concentration factor is the ratio of the suspended solids concentration on the high pressure side of the membrane relative to that in the feed water.

      ii. For direct integrity tests that use a particulate or molecular marker, the direct integrity test sensitivity must be calculated according to the following equation:

$$LRV_{DIT} = LOG_{10}(C_f)-LOG_{10}(C_p)$$

      Where:
      LRV_{DIT} = the sensitivity of the direct integrity test;
      C_f = the typical feed concentration of the marker used in the test;
      and C_p = the filtrate concentration of the marker from an integral membrane unit.

   d. Systems must establish a control limit within the sensitivity limits of the direct integrity test that is indicative of an integral membrane unit capable of meeting the removal credit awarded by the Director.

   e. If the result of a direct integrity test exceeds the control limit established under paragraph (B)(3)(d) of this section, the system must remove the membrane unit from service. Systems must conduct a direct integrity test to verify any repairs, and may return the membrane unit to service only if the direct integrity test is within the established control limit.

   f. Systems must conduct direct integrity testing on each membrane unit at a frequency of not less than once each day that the membrane unit is in operation. The Director may approve less frequent testing, based on demonstrated process reliability, the use of multiple barriers effective for *Cryptosporidium*, or reliable process safeguards.

4. Indirect integrity monitoring. Systems must conduct continuous indirect integrity monitoring on each membrane unit according to the criteria in paragraphs (B)(4)(a) through (e) of this section. Indirect integrity monitoring is defined as monitoring some aspect of filtrate water quality that is indicative of the removal of particulate matter. A system

that implements continuous direct integrity testing of membrane units in accordance with the criteria in paragraphs (B)(3)(a) through (e) of this section is not subject to the requirements for continuous indirect integrity monitoring. Systems must submit a monthly report to the Director summarizing all continuous indirect integrity monitoring results triggering direct integrity testing and the corrective action that was taken in each case.

a. Unless the Director approves an alternative parameter, continuous indirect integrity monitoring must include continuous filtrate turbidity monitoring.

b. Continuous monitoring must be conducted at a frequency of no less than once every 15 minutes.

c. Continuous monitoring must be separately conducted on each membrane unit.

d. If indirect integrity monitoring includes turbidity and if the filtrate turbidity readings are above 0.15 NTU for a period greater than 15 minutes (i.e., two consecutive 15-minute readings above 0.15 NTU), direct integrity testing must immediately be performed on the associated membrane unit as specified in paragraphs (B)(3)(a) through (e) of this section.

e. If indirect integrity monitoring includes a Director-approved alternative parameter and if the alternative parameter exceeds a Director-approved control limit for a period greater than 15 minutes, direct integrity testing must immediately be performed on the associated membrane units as specified in paragraphs (B)(3)(a) through (e) of this section.

C. Second stage filtration. Systems receive 0.5-log *Cryptosporidium* treatment credit for a separate second stage of filtration that consists of sand, dual media, GAC, or other fine grain media following granular media filtration if the Director approves. To be eligible for this credit, 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 surface water or GWUDI source. A cap, such as GAC, on a single stage of filtration is not eligible for this credit. The Director must approve the treatment credit based on an assessment of the design characteristics of the filtration process.

D. Slow sand filtration (as secondary filter). Systems are eligible to receive 2.5-log *Cryptosporidium* treatment credit for a slow sand filtration process that follows a separate stage of filtration if both filtration stages treat entire plant flow taken from a surface water or GWUDI source and no disinfectant residual is present in the influent water to the slow sand filtration process. The Director must approve the treatment credit based on an assessment of the design characteristics of the filtration process. This subsection does not apply to treatment credit awarded to slow sand filtration used as a primary filtration process.

§2419 Inactivation toolbox components

A. Calculation of CT values.

1. CT is the product of the disinfectant contact time (T, in minutes) and disinfectant concentration (C, in milligrams per liter). Systems with treatment credit for chlorine dioxide or ozone under subsection (b) or (c) of this section must calculate CT at least once each day, with both C and T measured during peak hourly flow as specified in Appendix D-801-D (A) through (B).

2. Systems with several disinfection segments in sequence may calculate CT for each segment, where a disinfection segment is defined as a treatment unit process with a measurable disinfectant residual level and a liquid volume. Under this approach, systems must add the *Cryptosporidium* CT values in each segment to determine the total CT for the treatment plant.

B. CT values for chlorine dioxide and ozone.

1. Systems receive the *Cryptosporidium* treatment credit listed in Table 2400.8 by meeting the corresponding chlorine dioxide CT value for the applicable water temperature, as described in subsection (a) of this section.

TABLE 2400.8 CT Values (mg-min/L) for *Cryptosporidium* Inactivation by Chlorine Dioxide[1]

	Water Temperature, EC										
Log credit	#.5	1	2	3	5	7	10	15	20	25	30

(a) 0.25	159	153	140	128	107	90	69	45	29	19	12
(b) 0.5	319	305	279	256	214	180	138	89	58	38	24
(c) 1.0	637	610	558	511	429	360	277	179	116	75	49
(d) 1.5	956	915	838	767	643	539	415	268	174	113	73
(e) 2.0	1275	1220	1117	1023	858	719	553	357	232	150	98
(f) 2.5	1594	1525	1396	1278	1072	899	691	447	289	188	122
(g) 3.0	1912	1830	1675	1534	1286	1079	830	536	347	226	147

[1]Systems may use this equation to determine log credit between the indicated values: Log credit = $(0.001506 \times (1.09116)^{Temp}) \times CT$.

2. Systems receive the *Cryptosporidium* treatment credit listed in Table 2400.9 by meeting the corresponding ozone CT values for the applicable water temperature, as described in subsection (A) of this section.

TABLE 2400.9 CT Values (mg-min/L) for *Cryptosporidium* Inactivation by Ozone[1]

	Water Temperature, EC										
Log credit	#0.5	1	2	3	5	7	10	15	20	25	30
(a) 0.25	6.0	5.8	5.2	4.8	4.0	3.3	2.5	1.6	1.0	0.6	0.39
(b) 0.5	12	12	10	9.5	7.9	6.5	4.9	3.1	2.0	1.2	0.78
(c) 1.0	24	23	21	19	16	13	9.9	6.2	3.9	2.5	1.6
(d) 1.5	36	35	31	29	24	20	15	9.3	5.9	3.7	2.4
(e) 2.0	48	46	42	38	32	26	20	12	7.8	4.9	3.1
(f) 2.5	60	58	52	48	40	33	25	16	9.8	6.2	3.9
(g) 3.0	72	69	63	57	47	39	30	19	12	7.4	4.7

[1]Systems may use this equation to determine log credit between the indicated values: Log credit = $(0.0397 \times (1.09757)^{Temp}) \times CT$.

C. Site-specific study. The Director may approve alternative chlorine dioxide or ozone CT values to those listed in subsection (B) of this section on a site-specific basis. The Director must base this approval on a site-specific study a system conducts that follows a Director-approved protocol.

D. Ultraviolet light. Systems receive *Cryptosporidium*, Giardia lamblia, and virus treatment credits for ultraviolet (UV) light reactors by achieving the corresponding UV dose values shown in Table 2400.10. Systems must validate and monitor UV reactors as described in paragraphs (D)(2) and (3) of this section to demonstrate that they are achieving a particular UV dose value for treatment credit.

1. UV dose table. The treatment credits listed in this table are for UV light at a wavelength of 254 nm as produced by a low pressure mercury vapor lamp. To receive treatment credit for other lamp types, systems must demonstrate an equivalent germicidal dose through reactor validation testing, as described in paragraph (D)(2) of this section. The UV dose values in this table are applicable only to post-filter applications of UV in filtered systems and to unfiltered systems.

TABLE 2400.10 UV Dose Table for *Cryptosporidium*, Giardia lamblia, and Virus Inactivation Credit

Log credit	*Cryptosporidium* UV dose (mJ/cm^2)	*Giardia lamblia* UV dose (mJ/cm^2)	Virus UV dose (mJ/cm^2)
(a) 0.5	1.6	1.5	39
(b) 1.0	2.5	2.1	58
(c) 1.5	3.9	3.0	79
(d) 2.0	5.8	5.2	100
(e) 2.5	8.5	7.7	121
(f) 3.0	12	11	143
(g) 3.5	15	15	163
(h) 4.0	22	22	186

2. Reactor validation testing. Systems must use UV reactors that have undergone validation testing to determine the operating conditions under which the reactor delivers the UV dose required in paragraph (D)(1) of this section (i.e., validated operating conditions). These operating conditions must include flow rate, UV intensity as measured by a UV sensor, and UV lamp status.

   a. When determining validated operating conditions, systems must account for the following factors: UV absorbance of the water; lamp fouling and aging; measurement uncertainty of on-line sensors; UV dose distributions arising from the velocity profiles through the reactor; failure of UV lamps or other critical system components; and inlet and outlet piping or channel configurations of the UV reactor.

   b. Validation testing must include the following: Full scale testing of a reactor that conforms uniformly to the UV reactors used by the system and inactivation of a test microorganism whose dose response characteristics have been quantified with a low pressure mercury vapor lamp.

   c. The Director may approve an alternative approach to validation testing.

3. Reactor monitoring.

   a. Systems must monitor their UV reactors to determine if the reactors are operating within validated conditions, as determined under paragraph (D)(2) of this section. This monitoring must include UV intensity as measured by a UV sensor, flow rate, lamp status, and other parameters the Director designates based on UV reactor operation. Systems must verify the calibration of UV sensors and must recalibrate sensors in accordance with a protocol the Director approves.

   b. To receive treatment credit for UV light, 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, as described in paragraphs (D)(1) and (2) of this section. Systems must demonstrate compliance with this condition by the monitoring required under paragraph (D)(3)(a) of this section.

Reporting and Recordkeeping Requirements

§2420 Reporting requirements

A. Systems must report sampling schedules under §2403 and source water monitoring results under §2405 unless they notify the Director that they will not conduct source water monitoring due to meeting the criteria of §2402.

B. Systems must report the use of uncovered finished water storage facilities to the Director as described in §2413.

C. Filtered systems must report their *Cryptosporidium* bin classification as described in §2409.

D. Unfiltered systems must report their mean source water *Cryptosporidium* level as described in §2411.

E. Systems must report disinfection profiles and benchmarks to the Director as described in §2407 through §2408 prior to making a significant change in disinfection practice.

F. Systems must report to the Director in accordance with Table 2400.11 for any microbial toolbox options used to comply with treatment requirements under §2410 or §2411. Alternatively, the Director may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

TABLE 2400.11 Microbial Toolbox Reporting Requirements

Toolbox option	Systems must submit the following information	On the following schedule
(1) Watershed control program (WCP)	(a) Notice of intention to develop a new or continue an existing watershed control program	No later than two years before the applicable treatment compliance date in §2412.
	(b) Watershed control plan	No later than one year before the applicable treatment compliance date in §2412.
	(c)Annual watershed control program status report	Every 12 months, beginning one year after the applicable treatment compliance date in §2412.
	(d) Watershed sanitary survey report	For community water systems, every three years beginning three years after the applicable treatment compliance date in §2412. For noncommunity water systems, every five years beginning five years after the applicable treatment compliance date in §2412.
(2) Alternative source/intake management.	Verification that system has relocated the intake or adopted the intake withdrawal procedure reflected in monitoring results	No later than the applicable treatment compliance date in §2412.
(3) Presedimentation	Monthly verification of the following: (a) Continuous basin operation (b) Treatment of 100% of the flow (c) Continuous addition of coagulant (d) At least 0.5-log mean reduction of influent turbidity or compliance with alternative Director-approved performance criteria.	Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in §2412.
(4) Two-stage lime softening	Monthly verification of the following: (a) Chemical addition and hardness precipitation occurred in two separate and sequential softening stages prior to filtration (b) Both stages treated with 100% of the plant flow.	Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in §2412.
(5) Bank filtration	(a) Initial demonstration of the following : (i) Unconsolidated, predominantly sandy aquifer (ii) Setback distance of at least 25 ft. (0.5-log credit) or 50 ft. (1.0-log credit)	No later than the applicable treatment compliance date in §2412.
	(b) If monthly average of daily max turbidity is greater than 1 NTU then system must report result and submit an assessment of the cause.	Report within 30 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in §2412.
(6) Combined filter performance.	Monthly verification of combined filter effluent (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.	Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in §2412.

(7) Individual filter performance.	Monthly verification of the following: (i) Individual filter effluent (IFE) turbidity levels less than or equal to 0.15 NTU in at least 95 percent of samples each month in each filter (ii) No individual filter greater than 0.3 NTU in two consecutive readings 15 minutes apart	Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in §2412.
(8) Demonstration of Performance	(a) Results from testing following a Director- approved protocol.	No later than the applicable treatment compliance date in §2412.
	(b) As required by the Director, monthly verification of operation within conditions of Director approval for demonstration of performance credit.	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in §2412,
(9) Bag filters and cartridge filters	(a) Demonstration that the following criteria are met: (i) Process meets the definition of bag or cartridge filtration; (ii) Removal efficiency established through challenge testing that meets criteria in this part.	No later than the applicable treatment compliance date in §2412.
	(b) Monthly verification that 100% of plant flow was filtered.	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in §2412.
(10) Membrane Filtration	(a) Results of verification testing demonstrating the following: (i) Removal efficiency established through challenge testing that meets criteria in this part; (ii) Integrity test method and parameters, including resolution, sensitivity, test frequency, control limits, and associated baseline.	No later than the applicable treatment compliance date in §2412.
	(b) Monthly report summarizing the following: (i) All direct integrity tests above the control limit; (ii) If applicable, any turbidity or alternative Direct-approved indirect integrity monitoring results triggering direct integrity testing and the corrective action that was taken.	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in §2412.
(11) Second Stage filtration	Monthly verification that 100% of flow was filtered through both stages and that first stage was preceded by coagulation step.	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in §2412.
(12) Slow sand filtration (as secondary filter)	Monthly verification that both a slow sand filter and a preceding separate stage of filtration treated 100% of flow from Part VIII sources.	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in §2412.
(13) Chlorine dioxide	Summary of CT values for each day as described in §2419	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in §2412.
(14) Ozone	Summary of CT values for each day as described in §2419	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in §2412.
(15) UV	(a) Validation test results demonstrating operating conditions that	No later than the applicable treatment compliance date in §2412.

	achieve required UV dose.	
	(b) Monthly reporting summarizing the percentage of water entering the distribution system that was not treated by UV reactors operating within validated conditions for the required dose as specified in §2419(D).	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in §2412.

§2421 Recordkeeping requirements

A. Systems must keep results from the initial round of source water monitoring under §2402 (A) and the second round of source water monitoring under §2402 (B) until 3 years after bin classification under §2409 for filtered systems or determination of the mean *Cryptosporidium* level under §2409 for unfiltered systems for the particular round of monitoring.

B. Systems must keep for 3 years any notification to the Director that they will not conduct source water monitoring due to meeting the criteria of §2402(D).

C. Systems must keep the results of treatment monitoring associated with microbial toolbox options under §2415 through §2419 and with uncovered finished water reservoirs under §2413, as applicable, for 3 years.

Requirements for Sanitary Surveys Performed by PWSSP

§2422 Requirements to respond to significant deficiencies identified in sanitary surveys performed by PWSSP

A. A sanitary survey is an onsite review of the water source (identifying sources of contamination by using results of source water assessments where available), facilities, equipment, operation, maintenance, and monitoring compliance of a PWS to evaluate the adequacy of the PWS, its sources and operations, and the distribution of safe drinking water.

B. For the purposes of this section, a significant deficiency includes a defect in design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that PWSSP determines to be causing, or has the potential for causing the introduction of contamination into the water delivered to consumers.

C. For sanitary surveys performed by PWSSP, systems must respond in writing to significant deficiencies identified in sanitary survey reports no later than 45 days after receipt of the report, indicating how and on what schedule the system will address significant deficiencies noted in the survey.

D. Systems must correct significant deficiencies identified in sanitary survey reports according to the schedule approved by PWSSP, or if there is no approved schedule, according to the schedule reported under subsection (C) of this section if such deficiencies are within the control of the system.