

567—43.5(455B) Filtration and disinfection for surface water (SW) and influenced groundwater (IGW) PWSs.

43.5(1) Applicability/general requirements. These rules apply to all PWSs using SW or IGW, in whole or in part, and establish criteria under which filtration is required as a treatment technique (TT). In addition, these rules establish TT requirements in lieu of MCLs for *Giardia lamblia*, heterotrophic plate count (HPC) bacteria, *Legionella*, viruses and turbidity. Each PWS with a SW or IGW must provide source water treatment that complies with these TT requirements. Systems that serve at least 10,000 persons must also comply with 567—43.9(455B). Systems that serve fewer than 10,000 persons must also comply with 567—43.10(455B).

a. TT requirements. The TT requirements consist of installing and properly operating water treatment processes which reliably achieve:

(1) At least 99.9 percent (3-log) removal or inactivation of *Giardia lamblia* cysts between a point where the raw water is not subject to recontamination by SW runoff and a point downstream before or at the first customer; and

(2) At least 99.99 percent (4-log) virus removal or inactivation between a point where the raw water is not subject to recontamination by SW runoff and a point downstream before or at the first customer.

b. Criteria for identification of IGW. Direct GW influence must be determined for individual sources in accordance with department criteria. The department determination of direct influence may be based on site-specific measurements of water quality or documentation of well construction characteristics and geology with field evaluation.

c. Sources subject to this rule. Only SW and IGW that are at risk to the contamination from *Giardia* cysts are subject to this rule. GW sources shall not be subject to this rule.

d. Source evaluation criteria. The identification of a source as SW or IGW shall be determined for an individual source, by the department, in accordance with the criteria in this rule. These criteria shall be used to delineate between SW, IGW, and GW. The PWS shall provide to the department that information necessary to make the determination.

e. Preliminary evaluation. For all sources, the department shall conduct a preliminary evaluation of information provided by the PWS to determine if the source is an obvious SW or is an IGW. The source shall be evaluated during that period of highest susceptibility to influence from SW. A preliminary evaluation may include a review of surveys, reports, geological information of the area, physical properties of the source, and departmental and PWS records.

(1) If the source is identified as a SW, no additional evaluation is needed.

(2) If the source is GW and identified as a deep well, no additional evaluation is needed unless through direct knowledge or documentation the source does not meet the well source evaluation requirements in 43.5(1)“f.” The deep well shall then be evaluated using a formal evaluation in accordance with 43.5(1)“g.”

(3) If the source is a shallow well, a well source evaluation shall be conducted in accordance with 43.5(1)“f.”

(4) If the source is a spring, infiltration gallery, radial collector well, or any other subsurface source, a formal evaluation shall be conducted in accordance with 43.5(1)“g.”

f. Well source evaluation. Shallow wells greater than 50 feet in lateral distance from a SW source shall be evaluated for direct influence of SW through a review of departmental or PWS files in accordance with this paragraph. Sources that meet these criteria shall be considered to be not under the direct influence of SW, and no additional evaluation will be required. Shallow wells 50 feet or less in lateral distance from a SW shall be evaluated in accordance with 43.5(1)“g” and “h.”

(1) Well construction criteria. The well shall be constructed so as to prevent SW from entering the well or traversing the casing.

(2) Water quality criteria. Water quality records shall indicate:

1. No record of total coliform or fecal coliform contamination in untreated samples collected over the past three years.

2. No history of turbidity problems associated with the well, other than turbidity as a result of inorganic chemical precipitates.

3. No history of known or suspected outbreak of *Giardia* or other pathogenic organisms associated with SW (e.g., *Cryptosporidium*) that has been attributed to the well.

(3) Other available data. If data on particulate matter analysis of the well are available, there shall be no evidence of particulate matter present that is associated with SW. If information on turbidity or temperature monitoring of the well and nearby SW is available, there shall be no data on the source which correlates with that of a nearby SW.

(4) Further evaluation. Wells that do not meet all the requirements of this paragraph shall require a formal evaluation in accordance with 43.5(1)“g” and may require a particulate analysis and physical properties evaluation in accordance with 43.5(1)“h.”

g. *Formal evaluation.* A formal evaluation shall be conducted by the department or a licensed professional engineer at the direction of the PWS.

(1) A formal evaluation shall include a complete file review and may include a field survey, as noted below.

1. Complete file review. In addition to the information gathered in a preliminary evaluation in 43.5(1)“e,” a complete file review for a well source shall consider, but not be limited to, design and construction details; evidence of direct SW contamination; water quality analysis; indications of waterborne disease outbreaks; operational procedures; and customer complaints regarding water quality or water-related infectious illness.

2. Field survey. An evaluation of a source other than a well source shall include a complete file review and a field survey. A field survey shall substantiate findings of the complete file review and determine if the source is at risk to pathogens from direct SW influence. A survey shall examine the source for evidence that SW enters the source through defects, which may include but is not limited to infiltration gallery laterals exposed to SW, springs open to the atmosphere, or surface runoff entering a spring or other collector. A field survey shall note the distances to obvious SW sources.

(2) A report summarizing the findings of the complete file review and the field survey, when conducted, shall be submitted to the department for final review and classification of the source. Either method or both may be used to demonstrate that the source is an SW or an IGW.

1. If the complete file review or field survey demonstrates conclusively that the source is subject to the direct SW influence, the source shall be classified as an IGW.

2. If the findings do not demonstrate conclusive evidence of direct influence of SW, the analysis and evaluation in 43.5(1)“h” should be conducted.

h. *Particulate analysis and physical properties evaluation.*

(1) SW indicators. Particulate analysis shall be conducted to identify organisms that only occur in SWs as opposed to GWs, and whose presence in GW would indicate the direct influence of SW.

1. Identification of a *Giardia* cyst, live diatoms, and blue-green, green, or other chloroplast containing algae in any source water shall be considered evidence of direct SW influence.

2. Rotifers and insect parts are indicators of SW. Without knowledge of which species is present, the finding of rotifers indicates that the source is either directly influenced by SW, or the water contains organic matter sufficient to support the growth of rotifers. Insects or insect parts shall be considered strong evidence of SW influence, if not direct evidence.

3. The presence of coccidia (e.g., *Cryptosporidium*) in the source water is considered a good indicator of direct influence of SW. Other macroorganisms (greater than 7 um) that are parasitic to animals and fish, such as, but not limited to, helminths (e.g., tapeworm cysts), ascaris, and *Diphyllobothrium*, shall be considered as indicators of direct influence of SW.

(2) Physical properties. Turbidity, temperature, pH and conductivity provide supportive, but less direct, evidence of direct influence of SW. Temperature fluctuations or turbidity fluctuations of greater than 0.5-1.0 NTU over the course of a year may indicate direct influence of SW. Changes in other chemical parameters such as pH, conductivity, or hardness may indirectly indicate influence by nearby SW.

i. *Compliance.* A PWS using a SW source or an IGW is considered to be in compliance with this subrule if it meets the filtration requirements in 43.5(3) and the disinfection requirements in 43.5(2).

j. *Certified operator requirement.* Each PWS using a SW source or an IGW must be operated by a certified operator who meets the requirements of 567—Chapter 81.

43.5(2) Disinfection requirements. All CWS, NTNC, and TNC using SW or IGW in whole or in part shall be required to provide disinfection in compliance with this subrule and filtration in compliance with 43.5(3). If the department has determined that filtration is required, the system must comply with any interim disinfection requirements the department deems necessary before filtration is installed. A system providing filtration on or before December 30, 1991, must comply with this subrule beginning June 29, 1993. A system providing filtration after December 30, 1991, must comply with this subrule when filtration is installed. Failure to meet any requirement of this subrule after the applicable date is a TT violation.

a. Disinfection treatment criteria.

(1) Disinfection treatment must be sufficient to ensure that the total treatment processes of a system achieve at least 99.9 percent (3-log) inactivation or removal of *Giardia lamblia* cysts and at least 99.99 percent (4-log) virus inactivation or removal, acceptable to the department.

(2) At least 0.5 log inactivation of *Giardia lamblia* cysts must be achieved through disinfection treatment using a chemical disinfectant even if the required inactivation or removal is met or exceeded through physical treatment processes.

(3) Each system must calculate the total inactivation ratio ($CT_{\text{calculated}}/CT_{\text{required}}$) each day the treatment plant is in operation. A system's total inactivation ratio must be equal to or greater than 1.0 to ensure that the minimum inactivation and removal requirements have been achieved. If a system's total inactivation ratio for the day is below 1.0, it must notify the department within 24 hours.

b. Disinfection system. The disinfection system must include either:

(1) Redundant components, including an auxiliary power supply with automatic start-up and alarm, to ensure that disinfectant application is maintained continuously while water is being delivered to the distribution system, or

(2) Automatic shutoff of delivery of water to the distribution system when the residual disinfectant concentration (RDC) in the water is less than 0.3 mg/L free residual or 1.5 mg/L total residual chlorine. If the department determines that automatic shutoff would cause unreasonable risk to health or interfere with fire protection, the system must comply with 43.5(2) "b"(1).

c. Residual disinfectant entering system. The RDC in the water entering the distribution system, measured as specified in 43.5(4) "a"(4) and 43.5(4) "b"(2) "1," cannot be less than 0.3 mg/L free residual or 1.5 mg/L total residual chlorine for more than four hours.

d. Residual disinfectant in the system. The RDC in the distribution system, measured as total chlorine, combined chlorine, or chlorine dioxide, as specified in 43.5(4) "a"(4) and 43.5(4) "b"(2) "2," cannot be undetectable in more than five percent of the samples each month for any two consecutive months that the system serves water to the public. Water within the distribution system with an HPC bacteria concentration less than or equal to 500/mL, measured as HPC as specified in 567—paragraph 41.2(2) "b," is deemed to have a detectable disinfectant residual for purposes of determining compliance with this requirement. Therefore, the value "V" in the following formula cannot exceed five percent in one month for any two consecutive months.

$$V = [(c + d + e) / (a + b)] \times 100$$

where the letters indicate the number of instances in which:

a = RDC is measured

b = RDC is not measured but HPC bacteria is measured

c = RDC is measured but not detected and no HPC is measured

d = no RDC is detected and where the HPC is greater than 500/mL

e = RDC is not measured and HPC is greater than 500/mL

43.5(3) Filtration requirements. Turbidity measurements required by this subrule shall be made in accordance with 43.5(4) "a"(1) and 43.5(4) "b"(1).

a. Applicability. A PWS that uses a SW source or an IGW source must provide treatment consisting of both disinfection, as specified in 43.5(2), and filtration treatment that complies with the turbidity requirements of 43.5(3), 43.5(4), and 43.5(5). A system shall install filtration within 18 months after the department determines, in writing, that filtration is required. The department may require, and a system

shall comply, with any interim turbidity requirements the department deems necessary. Failure to meet any requirements of the subrules referenced below after the dates specified is a TT violation.

- (1) A system providing or required to provide filtration:
 1. On or before December 30, 1991, must comply with this subrule by June 29, 1993; and
 2. After December 30, 1991, must comply with this subrule when filtration is installed.
- (2) Beginning:
 1. January 1, 2002, systems serving at least 10,000 people must meet the turbidity requirements in 567—43.9(455B); and
 2. January 1, 2005, systems serving fewer than 10,000 people must meet the turbidity requirements in 567—43.10(455B).
 - b. *Conventional filtration treatment or direct filtration.*
 - (1) Systems using conventional filtration serving at least 10,000 people must meet the turbidity level requirements in 43.9(3)“a.”
 - (2) Systems using conventional filtration or direct filtration serving fewer than 10,000 people must meet the turbidity level requirements in 43.10(4)“c.”
 - c. *Slow sand filtration.*
 - (1) For systems using slow sand filtration, the turbidity level of representative samples of a system’s filtered water must be less than or equal to 0.3 NTU in at least 95 percent of the measurements taken each month.
 - (2) The turbidity level of representative samples of a system’s filtered water must not exceed 1 NTU in two consecutive 15-minute recordings.
 - d. *Diatomaceous earth filtration.*
 - (1) For systems using diatomaceous earth filtration, the turbidity level of representative samples of a system’s filtered water must be less than or equal to 0.3 NTU in at least 95 percent of the measurements taken each month.
 - (2) The turbidity level of representative samples of a system’s filtered water must not exceed 1 NTU in two consecutive 15-minute recordings.
 - e. *Other filtration technologies.* A PWS may use either a filtration technology not listed in 43.5(3)“b” through “d” or a filtration technology listed in 43.5(3)“b” or “c” at a higher turbidity level if it demonstrates to the department, through a preliminary report submitted by a licensed professional engineer using pilot plant studies or other means, that the alternative filtration technology, in combination with disinfection treatment that meets the requirements of 43.5(2), consistently achieves 99.9 percent removal or inactivation of *Giardia lamblia* and 99.99 percent virus removal or inactivation. For a system that uses alternative filtration technology and makes this demonstration, the turbidity TT requirements are as follows:
 - (1) The turbidity level of representative samples of a system’s filtered water must be less than or equal to 0.3 NTU in at least 95 percent of the measurements taken each month.
 - (2) The turbidity level of representative samples of a system’s filtered water must not exceed 1 NTU. Beginning January 1, 2002, systems serving at least 10,000 people must meet the requirements for other filtration technologies in 43.9(3)“b.” Beginning January 1, 2005, systems serving fewer than 10,000 people must meet the requirements for other filtration technologies in 43.10(4).

43.5(4) Analytical and monitoring requirements.

a. *Analytical methods.* Only the analytical method(s) specified in this paragraph, or otherwise approved by the department, may be used to demonstrate compliance with 43.5(2) and 43.5(3). Measurements for pH, temperature, turbidity, and RDCs must be conducted by a Grade II, III or IV operator meeting the requirements of 567—Chapter 81, any person under the supervision of such an operator, or a laboratory certified in accordance with 567—Chapter 83. For consecutive PWSs from a SW or IGW system, the disinfectant concentration analyses must be conducted by a certified operator who meets the requirements of 567—Chapter 81. Heterotrophic plate count (HPC) bacteria measurements must be conducted by a laboratory certified by the department to do such analysis.

(1) Turbidity shall be analyzed using the methodology in the following table. Calibrate each turbidimeter at least once every 90 days with a primary standard. The calibration of each turbidimeter used

for compliance must be verified at least once per week with a primary standard, secondary standard, the manufacturer's proprietary calibration confirmation device, or by a department-approved method. If the verification is not within plus or minus 0.05 NTU for measurements of less than or equal to 0.5 NTU, or within plus or minus 10 percent of measurements greater than 0.5 NTU, the turbidimeter must be recalibrated.

Turbidity Methodology

Methodology	Analytical Method				
	EPA	SM	GLI	HACH	Other
Nephelometric ⁵	180.1 ¹	2130B ²	Method 2 ³	FilterTrak 10133 ⁴ ; Hach Method 8195, Rev. 3.015	
Laser Nephelometry (online)					Mitchell M5271 ⁶ ; Mitchell M5331 Rev. 1.2 ¹⁰ ; Lovibond PTV 600013
LED Nephelometry (online)					Mitchell M5331 ⁷ ; Mitchell M5331 Rev. 1.2 ¹⁰ ; AMI Turbiwell ⁹ ; Lovibond PTV 200012; Lovibond PTV 100014
LED Nephelometry (portable)					Orion AQ4500 ⁸
360-degree Nephelometry					Hach Method 10258 ¹¹

¹“Methods for the Determination of Inorganic Substances in Environmental Samples,” EPA-600/R-93-100, August 1993. NTIS, PB94-121811.

²SM, 18th (1992), 19th (1995), 20th (1998), 21st (2005), 22nd (2012), and 23rd (2017) editions (any of these editions may be used).

³GLI Method 2, “Turbidity,” November 2, 1992, Great Lakes Instruments, Inc., 8855 North 55th Street, Milwaukee, WI 53223.

⁴Hach FilterTrak Method 10133, “Determination of Turbidity by Laser Nephelometry,” January 2000, Revision 2.0, www.hach.com.

⁵Styrene divinyl benzene beads (e.g., AMCO-AEPA-1 or equivalent) and stabilized formazin (e.g., Hach StablCalTM or equivalent) are acceptable substitutes for formazin.

⁶Mitchell Method M5271, Revision 1.1. “Determination of Turbidity by Laser Nephelometry,” March 5, 2009, www.nemi.gov.

⁷Mitchell Method M5331, Revision 1.1. “Determination of Turbidity by LED Nephelometry,” March 5, 2009, www.nemi.gov.

⁸Orion Method AQ4500, Revision 1.0. “Determination of Turbidity by LED Nephelometry,” May 8, 2009, www.nemi.gov or Thermo Scientific, www.thermo.com.

⁹AMI Turbiwell, “Continuous Measurement of Turbidity Using a SWAN AMI Turbiwell Turbidimeter,” August 2009, www.nemi.gov.

¹⁰Mitchell Method M5331, Revision 1.2. “Determination of Turbidity by LED or Laser Nephelometry,” February 2016, www.nemi.gov.

¹¹Hach Company. “Hach Method 10258 – Determination of Turbidity by 360-Degree Nephelometry,” January 2016 and March 2018, revision 2.0, www.hach.com.

¹²Lovibond PTV 2000. “Continuous Measurement of Drinking Water Turbidity Using a Lovibond PTV 2000 660-nm LED Turbidimeter,” December 2016, Revision 1.0, Tintometer, Inc., 6456 Parkland Drive, Sarasota, FL 34243.

¹³Lovibond PTV 6000. “Continuous Measurement of Drinking Water Turbidity Using a Lovibond PTV 6000 Laser Turbidimeter,” December 2016, Revision 1.0, Tintometer, Inc., 6456 Parkland Drive, Sarasota, FL 34243.

¹⁴Lovibond PTV 1000. “Continuous Measurement of Drinking Water Turbidity Using a Lovibond PTV 1000 White Light LED Turbidimeter,” December 2016, Revision 1.0, Tintometer, Inc., 6456 Parkland Drive, Sarasota, FL 34243.

¹⁵Hach Company. “Hach Method 8195-Determination of Turbidity by Nephelometry,” March 2018, Revision 3.0, www.hach.com.

(2) The temperature and pH (hydrogen ion concentration) shall be determined in compliance with the methodology in 567—subparagraph 41.4(1)“g”(1).

(3) The HPC bacteria sampling and analysis shall be conducted in compliance with 567—subrule 41.2(2) and 43.5(2)“d.” The time from sample collection to initiation of analysis shall not exceed eight hours, and the samples must be held below 10 degrees Celsius during transit.

(4) The residual disinfectant concentrations (RDCs) shall be determined using one of the analytical methods in the following table. RDCs for free chlorine and total chlorine may also be measured by using DPD colorimetric test kits. Free and total chlorine residuals may be measured continuously by adapting a specified chlorine residual method for use with a continuous monitoring instrument provided the chemistry,

accuracy, and precision remain the same. Instruments used for continuous monitoring must be verified with a grab sample measurement at least every seven days. The analyzer concentration must be within plus or minus 0.1 mg/L or plus or minus 15 percent (whichever is larger) of the grab sample measurement. If the verification is not within this range, immediate actions must be taken to resolve the issue and another verification must be conducted.

Disinfectant Analytical Methodology

Residual	Methodology	SM ^{1,2}	SM Online ⁶	Other
Free chlorine	Amperometric Titration	4500-CI D	4500-CI D-00	D1253-03 ⁴ , 08, 14
	DPD Ferrous Titrimetric	4500-CI F	4500-CI F-00	Hach Method 10260 ¹⁰
	DPD Colorimetric	4500-CI G	4500-CI G-00	
	Syringaldazine (FACTS)	4500-CI H	4500-CI H-00	EPA 334.0 ⁷
	Online Chlorine Analyzer			ChloroSense ⁸
	Amperometric Sensor			Hach Method 10241 ¹¹
Total chlorine	Amperometric Titration	4500-CI D	4500-CI D-00	D1253-03 ⁴ , 08, 14
	Amperometric Titration (low-level measurement)	4500-CI E	4500-CI E-00	Hach Method 10260 ¹⁰
	DPD Ferrous Titrimetric	4500-CI F	4500-CI F-00	
	DPD Colorimetric	4500-CI G	4500-CI G-00	EPA 334.0 ⁷
	Iodometric Electrode	4500-CI I	4500-CI I-00	ChloroSense ⁸
	Online Chlorine Analyzer			
Chlorine dioxide	Amperometric Titration	4500-CIO ₂ C	4500-CIO ₂ C-00	ChlordioX Plus ⁹ 327.0, Revision 1.1 ⁵
	DPD Method	4500-CIO ₂ D		
	Amperometric Titration	4500-CIO ₂ E	4500-CIO ₂ E-00	
	Amperometric Sensor			
	Spectrophotometric			
Ozone	Indigo method	4500-O ₃ B ³	4500-O ₃ B-97	

¹SM, 18th (1992), 19th (1995), 20th (1998), 21st (2005), 22nd (2012), and 23rd (2017) editions (any of these editions may be used). Only the 18th, 19th, and 20th editions may be used for chlorine dioxide Method 4500-CIO₂ D.

²Other analytical test procedures are contained within Technical Notes on Drinking Water Methods, EPA-600/R-94-173, October 1994, NTIS PB95-104766.

³SM, 18th (1992), 19th (1995), 21st (2005), and 22nd (2012) editions (any edition may be used).

⁴ASTM, Vol. 11.01, 2004; any year containing the cited version of the method may be used.

⁵EPA Method 327.0, Revision 1.1, "Determination of Chlorine Dioxide and Chlorite Ion in Drinking Water Using Lissamine Green B and Horseradish Peroxidase with Detection by Visible Spectrophotometry," May 2005, EPA 815-R-05-008, www.nemi.gov.

⁶SM Online, www.standardmethods.org. The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

⁷EPA Method 334.0, "Determination of Residual Chlorine in Drinking Water Using an On-Line Chlorine Analyzer," September 2009, EPA 815-B-09-013, www.nemi.gov.

⁸ChloroSense, "Measurement of Free and Total Chlorine in Drinking Water by Palintest ChloroSense," September 2009, www.nemi.gov or Palintest Water Analysis Technologies, www.palintest.com.

⁹ChlordioX Plus. "Chlorine Dioxide and Chlorite in Drinking Water by Amperometry Using Disposable Sensors," November 2013, Palintest Water Analysis Technologies, www.palintest.com.

¹⁰Hach Company. "Hach Method 10260 – Determination of Chlorinated Oxidants (Free and Total) in Water Using Disposable Planar Reagent-Filled Cuvettes and Mesofluidic Channel Colorimetry," April 2013, www.hach.com.

¹¹Hach Company. "Hach Method 10241 – Spectrophotometric Measurement of Free Chlorine in Finished Drinking Water," November 2015, Revision 1.2, www.hach.com.

b. Monitoring. A PWS that uses a SW or IGW source must monitor in accordance with this paragraph.

(1) Turbidity.

1. Routine monitoring. Turbidity measurements required by 43.5(3) must be performed on representative samples of the system's filtered water utilizing continuous turbidity monitoring equipment. Turbidity monitoring results must be recorded at least every 15 minutes. Turbidity must be monitored according to a written turbidity protocol approved by the department and audited for compliance during sanitary surveys.

2. Monitoring protocol. The turbidity monitoring protocol shall include but is not limited to: sample measurement location; calibration method, frequency, and standards; verification method, frequency, and documentation; and data collection, recording frequency, and reporting.

3. Failure of continuous monitoring equipment. If there is a failure in the continuous turbidity monitoring equipment, the system must conduct grab sampling every four hours in lieu of continuous monitoring until the turbidimeter is repaired and back online. A system has a maximum of five working days after failure to repair the equipment or else the system is in violation. The system must notify the department within 24 hours of both when the turbidimeter was taken offline and when it was returned online. It is a TT violation if the turbidity exceeds 1 NTU at any time during grab sampling. The system must inform the department as soon as possible, but no later than 24 hours after the exceedance is known, in accordance with 567—subparagraph 40.5(3) "b"(3).

(2) Residual disinfectant.

1. Residual entering the system. The RDC of the water entering the distribution system shall be monitored continuously, and the lowest value recorded each day. If there is a failure in the continuous monitoring equipment, grab sampling every four hours may be conducted in lieu of continuous monitoring, but shall not exceed five working days following the equipment failure. If acceptable to the department, systems serving 3,300 or fewer persons may take grab samples in lieu of providing continuous monitoring on an ongoing basis at the frequencies prescribed below:

Residual Disinfectant Samples Required of SW or IGW PWS

System size (persons served)	Samples per day*
500 or fewer	1
501 to 1,000	2
1,001 to 2,500	3
2,501 to 3,300	4

*When more than one grab sample is required per day, the day's samples cannot be taken at the same time. The sampling intervals must be a minimum of four-hour intervals.

If at any time the disinfectant concentration falls below 0.3 mg/L free residual or 1.5 mg/L total residual chlorine (TRC) in a system using grab sampling in lieu of continuous monitoring, the system shall take a grab sample every four hours until the RDC is equal to or greater than 0.3 mg/L free residual or 1.5 mg/L TRC.

2. Residual in the system. The RDC must be measured at least daily in the distribution system. Residual disinfectant measurements that are required as part of the total coliform bacteria sample collection under 567—subparagraph 41.2(1) "c"(7) shall be used to satisfy this requirement on the day(s) when a bacteria sample(s) is collected. The department may allow a PWS that uses both a GW source and a SW source or uses an IGW to take residual disinfectant samples at points other than the total coliform sampling points, if these points are included as a part of the coliform sample site plan meeting the requirements of 567—paragraph 41.2(1) "c"(1) "1" and if the department determines that such points are representative of treated (disinfected) water quality within the distribution system. HPC may be measured in lieu of RDC, using the analytical methods in 567—paragraph 41.2(2) "b." The time from sample collection to initiation of analysis shall not exceed eight hours. All HPC samples must be kept below 10 degrees Celsius during laboratory transit, and must be analyzed by a laboratory certified in accordance with 567—Chapter 83.

43.5(5) Reporting. PWSs shall report the results of routine monitoring required to demonstrate compliance with rule 567—43.5(455B) and TT violations as follows:

a. *Waterborne disease outbreak.* Each system, upon discovering that a waterborne disease outbreak potentially attributable to that system has occurred, must report that occurrence to the department as soon as possible, but no later than by the end of the next business day.

b. *Turbidity exceeds 5 NTU.* If at any time the turbidity exceeds 5 NTU, the system must inform the department as soon as possible, but no later than 24 hours after the exceedance is known, in accordance with the PN requirements in 567—subparagraph 40.5(3)“b”(3).

c. *Residual disinfectant entering distribution system below 0.3 mg/L free residual chlorine or 1.5 mg/L total residual chlorine (TRC).* If at any time the residual falls below 0.3 mg/L free residual chlorine or 1.5 mg/L TRC in the water entering the distribution system, the system must notify the department as soon as possible, but no later than by the end of the next business day. The system also must notify the department by the end of the next business day whether or not the residual was restored to at least 0.3 mg/L free residual chlorine or 1.5 mg/L TRC within four hours.

d. *Routine monitoring.* Routine monitoring results shall be provided as part of the MORs in accordance with rule 567—40.3(455B) and 567—subrule 40.8(3).

e. *Total inactivation ratio below 1.0.* If the system’s total inactivation ratio for the day is below 1.0, the system must notify the department within 24 hours.

43.5(6) Filter backwash recycle provisions. All SW or IGW systems that employ conventional filtration or direct filtration treatment and that recycle spent filter backwash water, thickener supernatant, or liquids from dewatering processes must comply with this subrule.

a. *Reporting.* A system must notify the department in writing by December 8, 2003, if it recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes. This notification must include the following information.

(1) A plan schematic showing the origin of all recycled flows (including, but not limited to, spent filter backwash water, thickener supernatant, and liquids from dewatering processes), the hydraulic conveyance used to transport them, and the location where they are reintroduced back into the treatment plant.

(2) In gallons per minute (GPM), the typical recycle flow, highest observed plant flow experience in the previous year, design flow for the treatment plant, minimum plant rate during which the filter backwash will be recycled, and the department-approved operating capacity for the plant where the department has made such determinations.

b. *Treatment technique (TT) requirement.* Any system that recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes must return these flows through the processes of its existing conventional or direct filtration system or at an alternate location approved by the department by June 8, 2004. However, if capital improvements are necessary to modify the recycle location to meet this requirement, all capital improvements must be completed no later than June 8, 2006.

c. *Recordkeeping.* The system must collect and retain on file the recycle flow information specified below for department review and evaluation.

- (1) A copy of the recycle notification and information submitted to the department under 43.5(6)“a”;
- (2) A list of all recycle flows and their return frequency;
- (3) The average and maximum backwash flow rate through the filters and the average and maximum duration of the filter backwash process in minutes;
- (4) The typical filter run length and a written summary of how filter run length is determined;
- (5) The type of treatment provided for the recycle flow; and
- (6) Data on the physical dimensions of the equalization and treatment units, typical and maximum hydraulic loading rates, type of treatment chemicals used including average dose and frequency of use, and frequency of solids removal, if applicable.

[ARC 9397C, IAB 7/9/25, effective 8/13/25]