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The Interim Enhanced Surface Water Treatment Rule

What Does it Mean to You?

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Definitions and Abbreviations

Definitions

Comprehensive performance evaluation (CPE) — is a thorough review and analysis of a treatment plant's performance-based capabilities and associated administrative, operation and maintenance practices. It is conducted to identify factors that may be adversely impacting a plant's capability to achieve compliance and emphasizes approaches that can be implemented without significant capital improvements.

Disinfection profile — is a summary of daily *Giardia lamblia* inactivation through the treatment plant.

Filter profile — is a graphical representation of individual filter performance, based on continuous turbidity measurements or total particle counts versus time for an entire filter run, from startup to backwash inclusively, that includes an assessment of filter performance while another filter is being backwashed.

Uncovered finished water storage facility ---- is a tank, reservoir, or other facility used to store water that will undergo no further treatment except residual disinfection and is open to the atmosphere.

Abbreviations Used in This Document

CCP:	Composite Correction Program
CDC:	Centers for Disease Control
CPE:	Comprehensive Performance Evaluation
CTA:	Comprehensive Technical Assistance
CWS:	Community Water System
DBP:	Disinfection Byproducts
DBPP:	Disinfection Byproducts Precursors
DBPR:	Disinfectants/Disinfection Byproducts Rule
EC:	Enhanced Coagulation
EPA:	United States Environmental Protection Agency
ES:	Enhanced Softening
ESWTR:	Enhanced Surface Water Treatment Rule
FACA:	Federal Advisory Committee Act
FR:	Federal Register
GAC10:	Granular activated carbon with ten minute empty bed contact time and 180 day reactivation frequency
GWR:	Ground Water Rule
GWUDI:	Ground Water Under the Direct Influence of Surface Water
HAA5:	Haloacetic acids (Monochloroacetic, Dichloroacetic, Trichloroacetic, Monobromoacetic and Dibromoacetic Acids)
hrs:	Hours
ICR:	Information Collection Rule

IESWTR:	Interim Enhanced Surface Water Treatment Rule
Log Inactivation:	Logarithm of (N_0/N_T)
Log:	Logarithm (common, base 10)
LT1ESWTR:	Long Term 1 Enhanced Surface Water Treatment Rule
LT2ESWTR:	Long Term 2 Enhanced Surface Water Treatment Rule
LTESWTR:	Long Term Enhanced Surface Water Treatment Rule
MCL:	Maximum Contaminant Level
MCLG:	Maximum Contaminant Level Goal
M–DBP:	Microbial and Disinfectants/Disinfection Byproducts
MR:	Monitoring/Reporting
MRDL:	Maximum Residual Disinfectant Level
MRDLG:	Maximum Residual Disinfectant Level Goal
NCWS:	Non-Community Water System
NSCEP:	National Service for Environmental Publications
NTIS:	National Technical Information Service
NTNCWS:	Non-Transient Non-Community Water System
NTU:	Nephelometric Turbidity Unit
PWS:	Public Water System
RegNeg.:	Regulatory Negotiation
SDWA or "The Act":	Safe Drinking Water Act
SDWIS:	Safe Drinking Water Information System
Subpart H:	PWS using surface water or ground water under the direct influence of surface water
SUVA:	Specific Ultraviolet Absorption
SWTR:	Surface Water Treatment Rule
TNCWS:	Transient Non-Community Water System
TOC:	Total Organic Carbon
TTHM:	Total Trihalomethanes
x log removal:	Reduction to 1 /10^x of original concentration

1. Introduction

Purpose of the Guide

The purpose of this guide is to detail the regulatory requirements of the Interim Enhanced Surface Water Treatment Rule (IESWTR). The IESWTR, published in the *Federal Register* on December 16, 1998 (63 FR 69478; www.epa.gov/OGWDW/mdbp/ieswtrfr.html; 66 FR 3770; www.epa.gov/safewater/mdbp/iesfr.html; Appendix H—rule language only), is the first part of a series of rules, the "Microbial-Disinfectants/Disinfection Byproducts Cluster" (M-DBP Cluster), to be published over the next several years that are intended to control microbial pathogens while minimizing the public health risks of disinfectants and disinfection byproducts (DBPs). The IESWTR is designed to address the health risks from microbial contaminants without significantly increasing the potential risks from chemical contaminants. This rule was published concurrently with the Stage 1 Disinfectants/Disinfection Byproducts Rule (Stage 1 DBPR), which addresses control of disinfectants and their byproducts.

Background

The 1974 Safe Drinking Water Act (SDWA) called for EPA to regulate drinking water by creating the national interim primary drinking water regulations (NIPDWR). In 1979, the first interim standard addressing DBPs was set for total trihalomethanes (TTHMs), a group of four volatile organic chemicals which form when disinfectants react with natural organic matter in the water.

Although SDWA was amended slightly in 1977, 1979, and 1980, the most significant changes to the 1974 law occurred when SDWA was reauthorized in 1986. Disease-causing microbial contamination had not been sufficiently controlled under the original Act. To safeguard public health, the 1986 Amendments required EPA to set health goals, or maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs) for 83 named contaminants. EPA was also required to establish regulations within certain time frames, require disinfection of all public water supplies, specify filtration requirements for nearly all water systems that draw their water from surface sources, and develop additional programs to protect ground water supplies.

In 1989, EPA issued two important National Primary Drinking Water Regulations (NPDWR): The Total Coliform Rule (TCR) and the Surface Water Treatment Rule (SWTR). The TCR and SWTR provide the foundation for the M-DBP Cluster and are summarized below.

The TCR covers all public water systems. Since coliforms are easily detected in water, they are used to indicate a water system's vulnerability to pathogens in the water. In the TCR, EPA set a MCLG of zero for total coliforms. EPA also set a MCL for total coliforms. If more than 5.0 percent of the samples contain coliforms within a month, water system operators must report this violation to the state and the public. In addition, sanitary surveys are required every five or ten years (depending on the quality of the source water) for every system that collects fewer than five samples per month (typically systems that serve less than 4,100 people).

EPA issued the SWTR in response to Congress' mandate requiring disinfection, and where necessary, filtration of systems that draw their water from surface sources before distribution. The SWTR applies to all systems that use surface water or ground water under the direct influence of surface water (GWUDI). The rule sets MCLGs for *Legionella, Giardia lamblia*, and viruses at zero since any exposure to these contaminants presents some level of health risk.

Specifically, the rule requires that a surface water system have sufficient treatment to reduce the source water concentration of *Giardia lamblia* and viruses by at least 99.9 percent (3 log) and 99.99 percent (4 log), respectively. A detectable disinfection residual must be maintained throughout the entire distribution system. For systems that filter, the adequacy of the filtration process is determined by measuring the turbidity of the treated water since high levels of turbidity often indicate that the filtration process is not working properly. The goal of the SWTR is to reduce risk to less than one infection per year per 10,000 people. However, the SWTR does not account for systems with high pathogen concentrations that, when treated at the levels required under the rule, still may not meet this health goal, and the rule does not specifically control for the protozoan *Cryptosporidium*.

In 1990, EPA's Science Advisory Board, an independent panel of experts established by Congress, cited drinking water contamination as one of the most important environmental risks and indicated that disease-causing microbial contaminants (*i.e.*, bacteria, protozoa, and viruses) are probably the greatest remaining health-risk management challenge for drinking water suppliers. Data from the Centers for Disease Control (CDC) confirm this concern and indicate that between 1980 and 1994, 379 waterborne disease outbreaks were reported, with over 500,000 cases of disease. During this period, a number of agents were implicated as the cause, including protozoa, viruses, bacteria, and several chemicals. Most of the cases (but not the outbreaks) were associated with surface water, including a single outbreak of cryptosporidiosis in Milwaukee (over 400,000 cases).

In response to these findings, the SDWA was further amended in 1996 to improve public health protection by incorporating new data on the adverse health effects of contaminants, the occurrence of contaminants in public water systems, and the estimated reduction in health risks that would result from further regulation. The Act also increased scientific research requirements and emphasized cost-benefit analyses in the regulatory decision process.

Based on prevailing scientific data, the M-DBP Cluster is intended to control microbial pathogens while minimizing the public health risk from disinfectants and DBPs. Since multiple threats require multiple barriers, the IESWTR and Stage 1 DBPR expand on the foundation of the TCR, SWTR, and TTHM standards to target health risk outliers unaddressed by prior regulations. By targeting these gaps, multiple threats can be minimized.

The IESWTR builds on the SWTR by adding protection from *Cryptosporidium* through strengthened combined filter effluent turbidity performance standards and individual filter turbidity provisions for filtered systems that serve greater than 10,000 people. For unfiltered systems, *Cryptosporidium* must be included in the watershed control requirements. In addition, the IESWTR builds on the TCR by requiring sanitary surveys for all public water systems using surface water and ground water under the direct influence of surface water. The IESWTR also requires covers for all new finished water storage facilities and includes disinfection benchmark provisions to ensure continued levels of microbial protection while taking the necessary steps to comply with the DBP standards. Collectively, the SWTR and IESWTR place stringent treatment requirements on systems using surface water as a source.

By building on the foundation set forth by the original SDWA, the quality of drinking water has improved and public health protection has increased. The IESWTR and Stage 1 DBP Rules are part of a series of rules designed to expand on the foundation of prior rulemaking efforts. By encompassing previously unaddressed health risks from microbials and disinfection byproducts, the M-DBP Cluster continues to maximize drinking water quality and public health protection.

Development of the Rule

The new rules are a product of 6 years of collaboration among the water supply industry, environmental and public health groups, and local, state, and federal governments. EPA first launched a rule-making process in 1992 and convened a Regulatory Negotiation (RegNeg) Advisory Committee under the Federal Advisory Committees Act (FACA), representing a range of stakeholders affected by possible regulation. The 1996 SDWA Amendments required EPA to develop rules to balance the risks between microbial pathogens and disinfection byproducts.

In 1997, a similar FACA process was implemented with the Microbial-Disinfectants/Disinfection Byproducts (M-DBP) Advisory Committee. The M-DBP Committee convened to collect, share, and analyze new information available since 1994, review previous assumptions made during the RegNeg process, as well as build consensus on the regulatory implications of this new information. Negotiations resulted in the following three proposals:

- A staged approach to regulation of DBPs (referred to as the Stage 1 and Stage 2 DBPRs) incorporating Maximum Contaminant Levels (MCLs), Maximum Residual Disinfectant Levels (MRDLs), and treatment technique requirements;

- A companion Interim Enhanced Surface Water Treatment Rule (IESWTR) designed to improve control of microbial pathogens and prevent inadvertent reductions in microbial safety as a result of DBP control efforts; and,

- An Information Collection Rule (ICR) to collect information necessary to reduce many key uncertainties prior to subsequent negotiations for the Stage 2 DBPR.

Benefits of the Rule

The IESWTR will improve public health by increasing the level of protection from exposure to *Cryptosporidium* and other pathogens in drinking water supplies through improvements in filtration at water systems. According to the risk assessment performed for the Regulatory Impact Analysis, the IESWTR decreases the likelihood of endemic illness (constant, low-level presence of a disease or infection) from *Cryptosporidium* by 110,000 to 463,000 cases annually. Based on these values, the estimated annual benefits of reducing the illness range from $0.263 billion to $1.240 billion per year. This calculation is based on a valuation of $2,000 per incidence of cryptosporidiosis prevented. The IESWTR will also reduce the risk of more severe health impacts on sensitive populations, including the risk of mortality. Additionally, the IESWTR will reduce the likelihood of outbreaks of cryptosporidiosis and its associated costs by providing a larger margin of safety against such outbreaks in some systems.

2. Applicability and Compliance Dates

The IESWTR applies to *public water systems (PWSs) that use surface water or ground water under the direct influence of surface water (GWUDI) as a source (also known as subpart H systems) and serve 10,000 or more people.* Additionally, it establishes a schedule by which states are required to conduct sanitary surveys for *all* subpart H systems.

Subpart H systems serving at least 10,000 people must comply with the turbidity and monitoring requirements, the primary requirements of the IESWTR, no later than January 1, 2002. However, PWSs with elevated levels of DBPs (total trihalomethanes—TTHM; and five haloacetic acids—HAA5) are

required to develop an evaluation of their existing disinfection practices—a *disinfection profile*—no later than April 2001.

The timetable for the IESWTR is presented in Table 1. The compliance dates for the associated Stage 1 Disinfectants/Disinfection Byproducts Rule (Stage 1 DBPR) are January 2002 and January 2004. Subpart H systems that serve 10,000 or more people will have to comply with the provisions of the Stage 1 DBPR by January 2002. Subpart H systems that serve fewer than 10,000 people and all ground water systems will have to comply with the provisions of the rule by January 2004. The rules to provide additional microbial protection for small subpart H systems (Long Term 1 ESWTR) and ground water systems (Ground Water Rule) are scheduled to be finalized in Spring/Summer 2001, with compliance required by Spring/Summer 2004.

Table 1: Timetable for the IESWTR Requirements

Date	IESWTR Requirement
December 16, 1998	Rule is published in *Federal Register* [63 FR 241 69478].
February 16, 1999	60-day legal challenge period ends.
February 16, 1999	Construction of uncovered finished water storage facilities is prohibited [40 CFR 141.170(c)].
March 16, 1999	After this date, TTHM and HAA5 monitoring must begin for systems that do not have ICR or occurrence data and wish to determine if they must develop a disinfection profile [40 CFR 141.172(a)(2)(iii)].
April 16, 1999	Systems that have 4 consecutive quarters of HAA5 occurrence data that meet the TTHM monitoring requirements must submit those data to the state to determine if they must develop a disinfection profile [40 CFR 141.172(a)(5)(ii)].
December 31, 1999	TTHM and HAA5 data are due for those systems that collected data under the ICR to determine if they must develop a disinfection profile [40 CFR 141.172(a)(5)(i)].
December 31, 1999	Systems that elect to profile without conducting 4 quarters of TTHM and HAA5 monitoring must notify the state of their election [40 CFR 141.172(a)(5)(iv)].
December 31, 1999	Systems that wish to request state approval of "a more representative annual data set" than the ICR data set to determine if they must develop a disinfection profile must do so in writing [40 CFR 141.172(a)(5)(v)].
March 31, 2000	TTHM and HAA5 monitoring must be complete for systems determining if they must develop a disinfection profile [40 CFR 141.172(a)(2)(iii)(A)].
March 31, 2000	If system is using 3 years of existing operational data to develop the disinfection profile, the profile generated from these data and a request for state approval must be submitted [40 CFR 141.172(b)(3)(i)].
April 1, 2000	Systems determining if they must develop a disinfection profile must submit their TTHM and HAA5 data to the state [40 CFR 141.172(a)(5)(iii)].
April 1, 2000	Systems must begin developing a disinfection profile if either their annual average TTHM □ 0.064 mg/L or their annual average HAA5 □ 0.048 mg/L [40 CFR 141.172(b)(2)].
March 31, 2001	Disinfection profile is complete [40 CFR 141.172(b)(2)].

Date	IESWTR Requirement
March 31, 2001	After this date, systems that were required to develop a disinfection profile that wish to make a significant change to their disinfection practice must first calculate a disinfection benchmark and consult with the state [40 CFR 141.172(c)].
December 31, 2001	Systems that are not required to filter must comply with the requirements for TTHM in §141.12 and §141.30 until this date. After this date, systems must comply with the requirements in Subpart L for TTHM, HAA5, bromate, chlorite, chlorine, chloramines, and chlorine dioxide [40 CFR 141.71(b)(6)].
December 31, 2001	Systems that do not meet all of the criteria for avoiding filtration and use conventional/direct filtration must meet the turbidity requirements of the rule [0.3 NTU CFE (combined filter effluent) 95 percent of the time, at no time exceed 1 NTU] [40 CFR 141.173].
December 31, 2001	Alternative technologies for systems that serve at least 10,000 people must remove 99 percent of *Cryptosporidium* oocysts, and the state must establish alternative turbidity performance standards that must be met 95 percent of the time and a maximum [40 CFR 141.173(b)].
January 1, 2002	Systems must comply with the reporting and recordkeeping requirements of 40 CFR 141.175, including turbidity exceptions reporting. Systems must, when appropriate: • Produce filter profiles or identify obvious reason for poor filter performance. • Report profile has been produced or identify obvious reason for poor filter performance. • Conduct filter self-assessments. • Have 3rd party CPEs performed.
December 2004	State must have first round of sanitary surveys completed for Subpart H CWSs [40 CFR 142.16(b)(3)(i)].
December 2006	State must have first round of sanitary surveys completed for Subpart H NCWSs [40 CFR 142.16(b)(3)(i)].

3. Summary of Requirements

Disinfection profiling and benchmarking

Surface water or GWUDI systems having average annual TTHM □ 0.064 mg/L or annual average HAA5 □ 0.048 mg/L must develop a *disinfection profile*. The disinfection profile is a compilation of daily measurements of microbial inactivation by disinfection, collected over the period of 1 year. From the disinfection profile, the PWS calculates the average microbial inactivation potential for each month, and the lowest monthly average inactivation becomes the *disinfection benchmark*.

The purpose of these provisions is to provide a process whereby a public water system (PWS) and the state, working together, assure that there will be no significant reduction in microbial protection as the result of disinfection practice modifications designed to meet the more restrictive maximum contaminant levels (MCLs) for DBPs established in the Stage 1 DBPR. Those PWSs required to develop disinfection profiles, and that then wish to modify their disinfection practices to meet the new MCLs, must establish the disinfection benchmark and consult with the state prior to implementing such modifications. In addition, PWSs must keep the disinfection profile on file for the state to review during their sanitary surveys. The benchmark does not set a new regulatory floor for disinfection practice, but instead

characterizes current practice so that the system, in consultation with the state, can make an informed decision when implementing a modification.

Cryptosporidium

The IESWTR sets a maximum contaminant level goal (MCLG) of zero for the protozoan *Cryptosporidium*. It also establishes a requirement for 2-log (99%) removal of *Cryptosporidium* for systems that must currently filter under the SWTR. Systems that use conventional or direct filtration meet this requirement if they are in compliance with the strengthened turbidity performance standards for combined filter effluent in the IESWTR (discussed below). Systems that use slow sand or diatomaceous earth filtration meet the 2-log removal requirement if they are in compliance with the existing turbidity performance standards under the SWTR.

The IESWTR also extends the existing watershed control requirements for unfiltered systems to include the control of potential sources of *Cryptosporidium*. Such sources must be included in an unfiltered system's watershed control plan.

These new provisions, along with the new turbidity requirements, will better protect consumers from *Cryptosporidium* and other pathogens.

Strengthened turbidity requirements

The IESWTR includes a series of requirements related to turbidity. These requirements strengthen current SWTR requirements for combined filter effluent for systems that use conventional or direct filtration. The turbidity level of a system's combined filtered water at each plant must be less than or equal to 0.3 nephelometric turbidity units (NTUs) in at least 95 percent of the measurements taken each month, and the turbidity level of a system's combined filtered water must at no time exceed 1 NTU (under the SWTR, these turbidity requirements are 0.5 NTU and 5 NTU, respectively).

Individual filter monitoring requirements

The IESWTR requires continuous turbidity monitoring for individual filters. The rule requires that surface water and GWUDI systems that use conventional or direct filtration must conduct continuous turbidity monitoring (every 15 minutes) on the effluent of each individual filter. PWSs must report instances of poor filter performance to the state, and, based on performance triggers, must take prescribed actions to identify and correct the cause(s). This requirement will allow systems to identify filters whose poor performance might be masked in a combined filter effluent.

Uncovered finished water storage facilities

The rule prohibits building any uncovered finished water storage facilities (reservoir, holding tank, or other storage facility) for which construction begins after February 16, 1999. This provision will help limit recontamination of treated water, but does not require that existing uncovered finished water storage facilities be covered.

Public water system recordkeeping and reporting requirements

The IESWTR requires PWSs to submit combined filter effluent monitoring and compliance data and report that they have conducted individual filter turbidity monitoring to states within 10 days after the end of each month the system serves water to the public. Additionally, PWSs must report to the state if certain individual filter monitoring trigger levels are exceeded. In this case, systems must report turbidity

measurements and report that filter profiles, filter self-assessments, or Comprehensive Performance Evaluation (CPE) reports have been produced or conducted when instances of poor filter performance occur or persist based on monitoring of individual filter performance. Systems must maintain the results of individual filter monitoring for at least three years.

Sanitary surveys

The IESWTR requires that the state must conduct sanitary surveys for *all* PWSs using surface water or ground water under the direct influence of surface water (GWUDI), *regardless of the population served*, no less frequently than every 3 years for community water systems and every 5 years for noncommunity systems. For community water systems determined by the state in previous sanitary surveys to have "outstanding performance," successive sanitary surveys may be conducted at up to 5-year intervals.

Unfiltered Systems

The IESWTR requires unfiltered systems to continue to meet the SWTR source water and site-specific requirements to remain unfiltered. In addition, unfiltered systems must include *Cryptosporidium* in their watershed control programs and must meet all Stage 1 DBPR MCLs and MRDLs to remain unfiltered. Like filtered systems, they are subject to disinfection profiling and benchmarking and sanitary surveys.

4. Additional Information

A series of guidance manuals have been developed to support the Interim Enhanced Surface Water Treatment Rule and the Stage 1 Disinfectants/Disinfection Byproducts Rule. The manuals will aid EPA, state agencies and affected public water systems in implementing the two interrelated rules, and will help to ensure that implementation among these groups is consistent. The manuals are available on EPA's website at www.epa.gov/safewater/mdbp/implement.html. Additional information on ordering these manuals is provided below.

The manuals for the IESWTR include:

Disinfection Profiling and Benchmarking Guidance Manual (EPA 815-R-99-013)

Objective: To help determine if a disinfection profile (an evaluation of current disinfection practice) is required and how to do one; when a disinfection benchmark must be determined and how to extract it from the profile; and how a public water system uses the benchmark, in consultation with the state, to protect from microbial risk when the system changes disinfection practice.

Contents: The manual provides detailed information on the following subjects: applicability of the profiling and benchmarking requirements to public water systems; procedures for generating a disinfection profile, including example profiles; methods for calculating the disinfection benchmark, including example calculations; the use of the benchmark in modifying disinfection practices, communicating with the state, and assessing significant changes to disinfection practices; the development of the profiling and benchmarking regulations; the significance of the log inactivation concept and CT values for inactivations achieved by various disinfectants; and the determination of contact time.

Guidance Manual for Compliance with the Interim Enhanced Surface Water Treatment Rule: Turbidity Provisions (EPA 815-R-99-010)

Objective: The first section provides technical information regarding specific requirements of the Interim Enhanced Surface Water Treatment Rule relating to turbidity and is intended for experienced operators and others in the regulated community. The second section of the document provides background on concepts surrounding turbidity and serves as a primer for less experienced operators and individuals.

Contents: The first section contains key regulatory requirements including combined filter effluent monitoring and individual filter monitoring; recordkeeping and reporting requirements; additional compliance issues such as compliance schedule, public notification, variances/exemptions, and follow-up action requirements; approved methods and additional measurement and calibration issues; components and description of a filter self-assessment; and components and description of a Comprehensive Performance Evaluation.The second section of the manual includes more basic information on turbidity; description of the particles (both natural and man-made) which typically contribute to turbidity; discussion of typical steps in a treatment process and how turbidity is removed or created in each step; discussion of turbidity in different source waters with an emphasis of how changes in source water effect turbidity; and basic turbidimeter design.

Alternative Disinfectants and Oxidants Guidance Manual (EPA 815-R-99-014)

Objective: To provide technical data and engineering information on disinfectants and oxidants that are not as commonly used as chlorine, so that systems can evaluate their options for developing disinfection schemes to control water quality problems such as zebra mussels and Asiatic clams, and oxidation to control water quality problems associated with iron and manganese.

Contents: The manual discusses six disinfectants and oxidants: ozone, chlorine dioxide, potassium permanganate, chloramines, ozone/hydrogen peroxide combinations, and ultraviolet light. A decision tree is provided to help evaluate which disinfectant(s) is most appropriate given certain site-specific conditions (e.g., water quality conditions, existing treatment and operator skill). The manual also contains a summary of existing alternative disinfectants use in the United States and cost estimates for the use of alternative disinfectants.

Microbial and Disinfection Byproducts Simultaneous Compliance Manual (EPA 815-R-99-015)

Objective: To help public water systems achieve simultaneous compliance with various drinking water regulations (e.g., Stage 1 Disinfectants and Disinfection Byproducts Rule, Interim Enhanced Surface Water Treatment Rule, Lead and Copper Rule and the Total Coliform Rule). The manual discusses operational problems systems may encounter when implementing these rules.

Contents: The manual provides detailed information on the requirements in the Stage 1 Disinfectants and Disinfection Byproducts Rule and the Interim Enhanced Surface Water Treatment Rule.

Guidance Manual for Conducting Sanitary Surveys of Public Water Systems: Surface Water and Ground Water Under the Direct Influence (GWUDI) (EPA 815-R-99-016)

Objective: The guidance manual provides an overview of how to conduct a sanitary survey of all water systems using surface water and ground water under the direct influence of surface water. It is intended to help state agencies improve their sanitary survey programs where needed.

Contents: The manual provides information about the objective and regulatory context of sanitary surveys. It covers four principal stages of a sanitary survey: planning, including preparatory steps to be taken by inspectors before conducting the onsite portion; conducting the onsite survey; compiling a sanitary survey report; and performing follow-up activities.

Uncovered Finished Water Reservoirs (EPA 815-R-99-011)

Objective: To provide information on ways systems can limit water quality degradation in existing finished water reservoirs.

Contents: The manual provides detailed information on the following subjects: developing and implementing comprehensive open finished water reservoir management plans based on site-specific conditions; identifying potential sources of contamination in open finished water reservoirs and potential mitigation measures; employing different methods to control the degradation of water quality while it resides in the reservoir; monitoring schemes that can be used to characterize water quality and identify water quality degradation before it becomes severe and is difficult to correct.

To order copies of these guidance manuals you may contact the Safe Drinking Water Hotline at (800) 426-4791 or you may download an electronic version from the OGWDW website at:

www.epa.gov/safewater/mdbp/implement.html

Guidance manuals are also available through the National Service Center for Environmental Publications (NSCEP) (free of charge). These documents may also be purchased through National Technical Information Service (NTIS)

NSCEP: 1.800.490.9198
NTIS: 1.800.553.6847

5. Detailed regulatory requirements

Detailed descriptions of the monitoring and reporting requirements for public water systems (PWSs) are presented in the following section. The IESWTR applies only to subpart H systems that serve 10,000 or more people, with the exception of a sanitary survey provision that applies to all subpart H systems (the state or a third party conducts the sanitary survey). These systems are all required to monitor and report similar data, with the exception of turbidity exceedance reports that will be prepared as required.

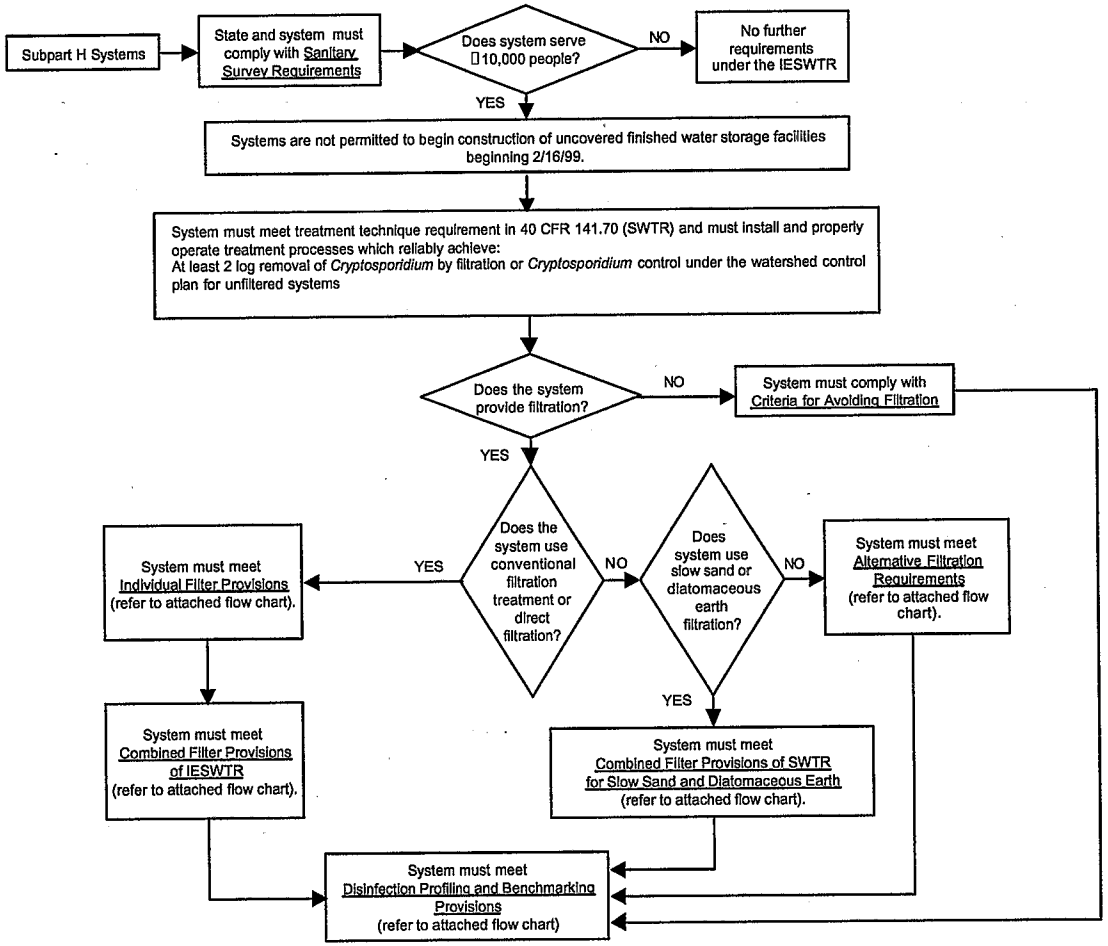
Combined filter effluent turbidity monitoring

The Interim Enhanced Surface Water Treatment Rule (IESWTR) establishes a number of provisions related to the performance of filters used in drinking water treatment. These provisions include treatment technique requirements restricting turbidity levels in the combined filter effluent. These requirements are designed to decrease risk from waterborne microbial pathogens by limiting levels of particulate material in finished water. EPA has used a treatment technique because it is neither technically nor economically feasible to measure pathogens such as Giardia, Cryptosporidium, and viruses in either the source water or treated water.

Which systems must comply with turbidity requirements for the combined filter effluent under the IESWTR?
The treatment technique requirements for combined filter effluent turbidity under the IESWTR apply to public water systems (PWS) that use surface water or ground water under the direct influence of surface water (GWUDI), serve 10,000 or more people, and are required to filter.

What are the maximum allowable levels of turbidity in the combined filter effluent?
For systems using conventional filtration or direct 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, and must never exceed 1 NTU. For slow sand and diatomaceous earth filtration systems, requirements for turbidity levels in the combined filter effluent remain as specified under the SWTR (less than or equal to 1 NTU in 95 percent of the measurements taken each month and never greater than 5 NTU). For systems using filtration technologies other than conventional, direct, slow sand, or diatomaceous earth, the systems must demonstrate to the state, using pilot plant studies or

General Requirements (1998 IESWTR)



other means, that the alternative filtration technology in combination with disinfection treatment consistently achieves 99.9 percent removal and/or inactivation of *Giardia lamblia* cysts, 99.99 percent removal and/or inactivation of viruses, and 99 percent removal of *Cryptosporidium* oocysts. For each approval of an alternative filtration technology, the state will set turbidity performance requirements that the system must meet at least 95 percent of the time, and that the system may not exceed at any time, at values that consistently achieve these levels of removal and/or inactivation of *Giardia lamblia*, viruses, and *Cryptosporidium*. Failure to meet these requirements is a treatment technique violation.

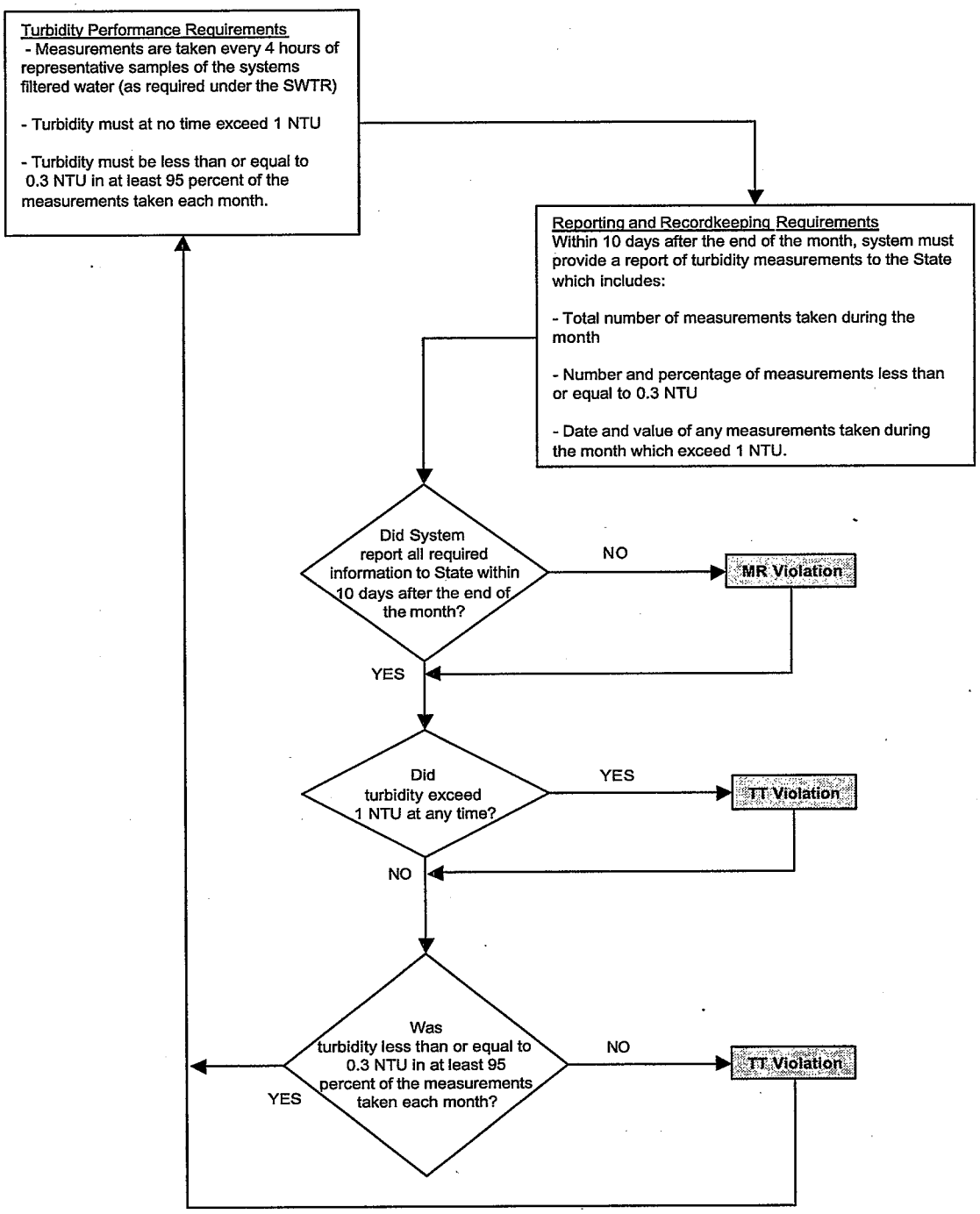
What are the monitoring requirements for combined filter effluent turbidity?
Systems must monitor combined filter effluent turbidity as specified under the SWTR. This specifies that turbidity measurements must be performed on representative samples of the system's filtered water every four hours (or more frequently) that the system serves water to the public. A public water system may substitute continuous turbidity monitoring for grab sample monitoring if it validates the continuous measurement for accuracy on a regular basis using a protocol approved by the state. For any systems using slow sand filtration or filtration treatment other than conventional treatment, direct filtration, or diatomaceous earth filtration, the state may reduce the sampling frequency to once per day if it determines that less frequent monitoring is sufficient to indicate effective filtration performance. Turbidity must be measured using methods approved by EPA and by a party approved by the state. A system that uses lime softening may acidify representative samples prior to analysis using a protocol approved by the state. Failure to meet these requirements is a monitoring violation.

What are the reporting and recordkeeping requirements for turbidity in the combined filter effluent?
The reporting requirements for combined filter effluent turbidity are unchanged from those established under the SWTR, except where reporting levels have been modified to reflect more stringent turbidity requirements established under the IESWTR. Required turbidity measurements must be reported within 10 days after the end of each month the system serves water to the public. Information that must be reported includes: 1) the total number of filtered water turbidity measurements taken during the month; 2) the number and percentage of filtered water turbidity measurements taken during the month which are less than or equal to the turbidity limits established under the SWTR for diatomaceous earth and slow sand filtration systems, and under the IESWTR for conventional, direct, and alternative filtration systems; and 3) the date and value of any turbidity measurements taken during the month which exceed 1 NTU for conventional and direct filtration systems, 5 NTU for slow sand and diatomaceous earth filtration systems, and the maximum level established by the state for alternative filtration technology systems. Failure to meet these requirements is a reporting/recordkeeping violation.

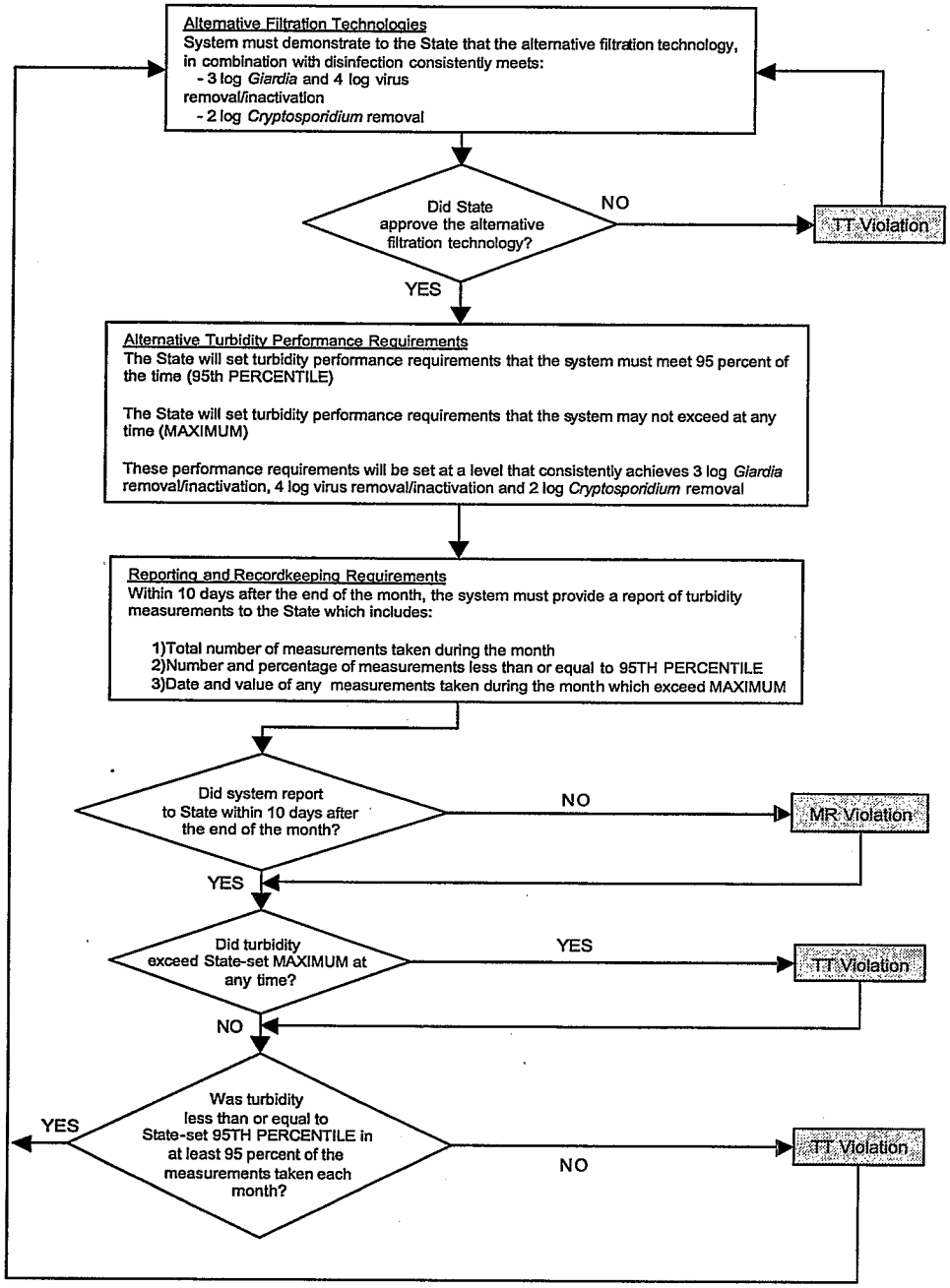
IESWTR COMBINED FILTER EFFLUENT TURBIDITY COMPLIANCE REQUIREMENTS

FILTRATION TECHNOLOGY	95th PERCENTILE TURBIDITY (NTU)	MAXIMUM TURBIDITY (NTU)
Conventional filtration	0.3	1
Direct filtration	0.3	1
Diatomaceous earth filtration	1	5
Slow sand filtration	1	5
Filtration technologies not listed above	as determined by the state	as determined by the state

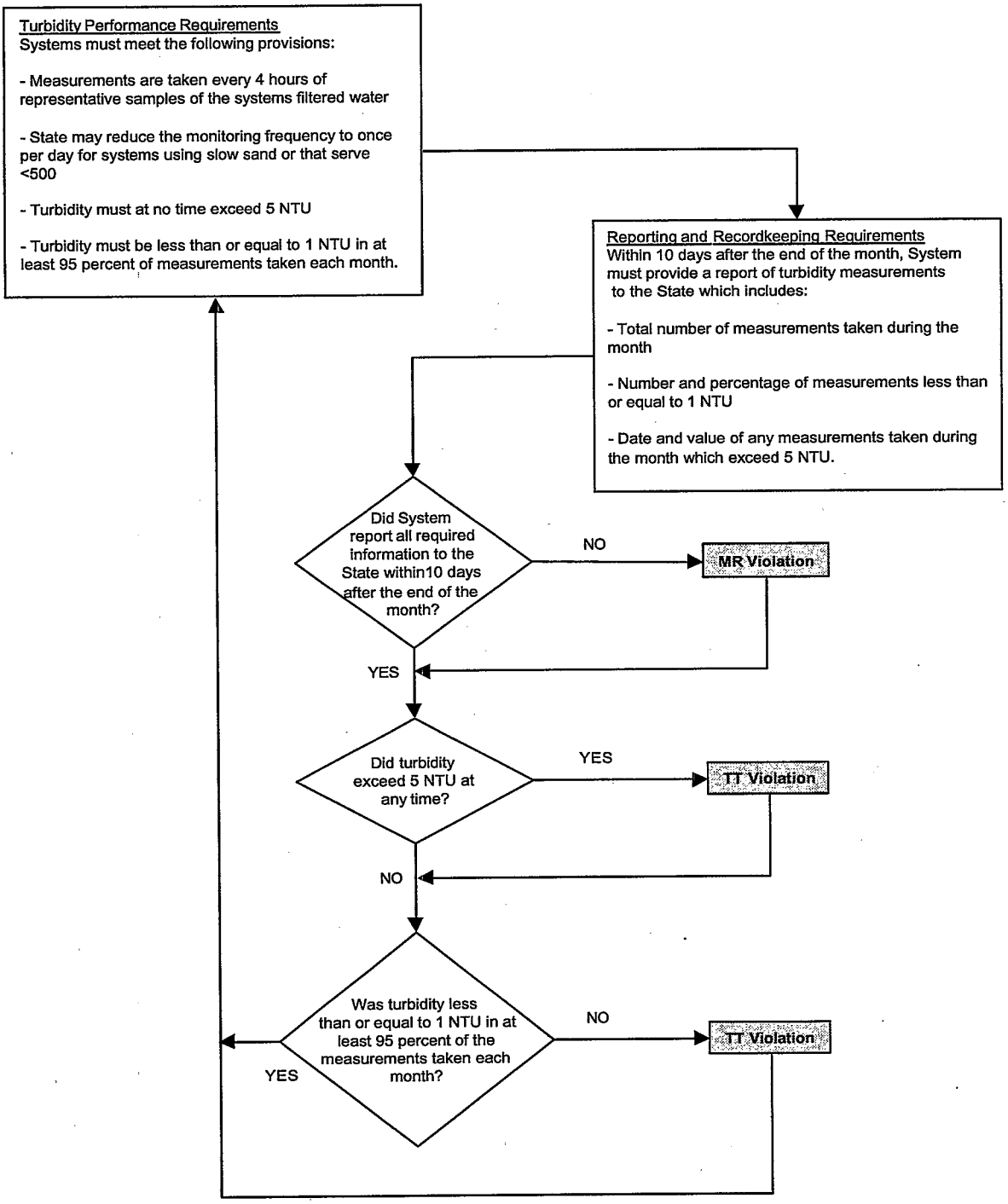
Combined Filter Effluent Provisions of IESWTR
(Applicable to Conventional and Direct Filtration Systems)



Alternative Filtration Requirements of the IESWTR
(Filtration Technologies other than conventional, direct, slow sand or diatomaceous earth)



Combined Filter Effluent Provisions of SWTR
(Applicable to Systems using Slow Sand and Diatomaceous Earth Filtration)



Individual filter turbidity monitoring

The IESWTR establishes a number of requirements related to the performance of filters used in drinking water treatment. Included in these requirements are provisions mandating that certain systems monitor the effluent of individual filters. These provisions are designed to decrease the risk of microbial pathogen contamination of finished waters by focusing greater attention on the performance of individual filters.

Which systems are required to monitor individual filters?
The filtration requirements of the IESWTR apply to PWSs that use surface water or GWUDI, serve 10,000 or more people, and are required to filter. Systems that provide conventional or direct filtration treatment must monitor individual filters.

What are the monitoring requirements for individual filters?
Systems must continuously measure the effluent turbidity of each individual filter using a method approved by EPA, and must record the results every 15 minutes. 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 or replaced, and is in violation if the turbidimeter is not replaced or repaired within five working days following the failure of the equipment. Failure to comply with these requirements is a monitoring violation.

What are the reporting and recordkeeping requirements for individual filter monitoring?
Systems required to monitor individual filters must maintain the results of this monitoring for at least 3 years. Within 10 days after the end of each month, these systems must make a report to the state that they have conducted individual filter turbidity monitoring. Systems must report individual filter turbidity measurements only if the measurements demonstrate any of the following four exceedance conditions:

1) Any individual filter that has a measured turbidity level of greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart. The system must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. The system must also either identify and report an obvious reason for the exceedance or produce a filter profile for the filter within 7 days of the exceedance and report that the profile has been produced. (A filter profile is a graphical representation of turbidity or total particle counts as a function of time for an entire filter run. A discussion of filter profiles is included in EPA's guidance document on turbidity.)

2) Any individual filter that has a measured turbidity level of greater than 0.5 NTU in two consecutive measurements taken 15 minutes apart at the end of the first four hours of continuous filter operation after the filter has been backwashed or otherwise taken offline. The system must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. The system must also either identify and report an obvious reason for the exceedance or produce a filter profile for the filter within 7 days of the exceedance and report that the profile has been produced. (A filter profile is a graphical representation of turbidity or total particle counts as a function of time for an entire filter run. A discussion of filter profiles is included in EPA's guidance document on turbidity.)

3) Any individual filter that has a measured turbidity level of greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of three consecutive months. The system must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. The system must conduct a self-assessment of the filter within 14 days of the exceedance and report that

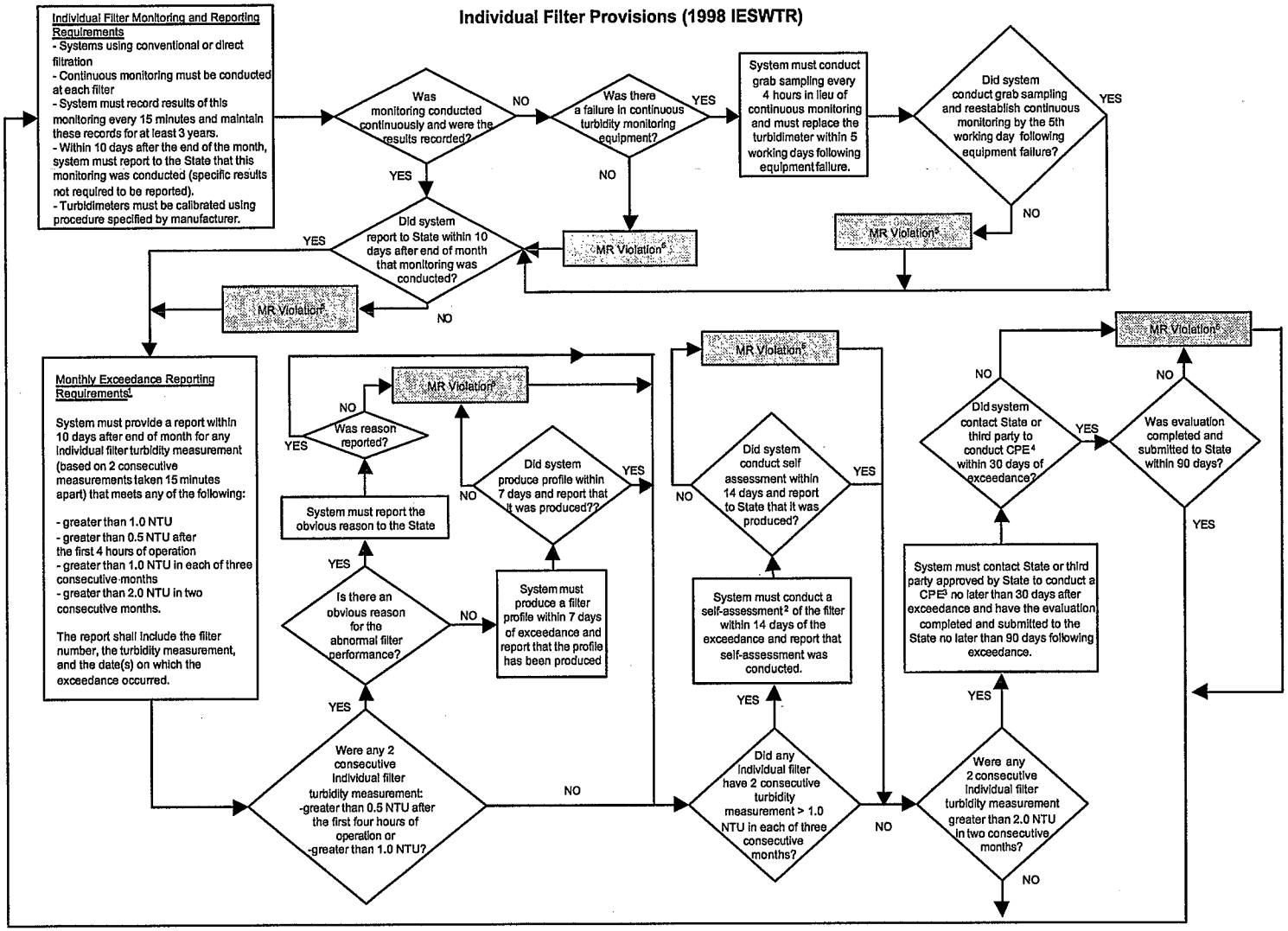
the self-assessment was conducted in the monthly report. The self-assessment must consist of at least the following components: assessment of filter performance, development of a filter profile, identification and prioritization of factors limiting filter performance, assessment of the applicability of corrections, and preparation of a filter self-assessment report.

4) Any individual filter that has a measured turbidity level greater than 2.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of two consecutive months. The system must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. The system must arrange for the conduct of a comprehensive performance evaluation (CPE) by the state or a third part approved by the state no later than 30 days following the exceedance. (A CPE is a thorough review and analysis of a treatment plant's performance-based capabilities and associated administrative, operation and maintenance practices.) The CPE must be completed and submitted to the state no later than 90 days following the exceedance.

The turbidity guidance manual has detailed information about filter profiling, filter self-assessments, and CPEs. Systems using lime softening may apply to the state for alternative exceedance levels to those specified above if they can demonstrate that higher turbidity levels in individual filters are due to lime carryover only and not due to degraded filter performance.

Failure to comply with these requirements is a reporting violation. However, the exceedance criteria are not treatment technique requirements, and systems have not committed a violation solely by demonstrating any of the exceedance conditions in their individual filters.

Individual Filter Provisions (1998 IESWTR)



NOTES

[1] Systems that use lime softening may apply to the State for alternative exceedance levels if they can demonstrate that higher levels are due to lime carry-over only and not due to degraded filter performance.

[2] A self-assessment must consist of at least the following components 1). assessment of filter performance; 2). development of filter profile; 3). Identification and prioritization of factors limiting performance; 4). Assessment of the applicability of corrections; and 5). Preparation of filter assessment report.

[3] CPE- Comprehensive Performance Evaluation.

[4] State has the authority to require full Composite Correction Program (CCP) which consists of CPE and Comprehensive Technical Assistance (CTA).

[5] System has MR violation until relevant task is completed (e.g., filter profile produced).

What* ROUTINE MONITORING *must I conduct under the IESWTR?

What do I have to* REPORT *to the State?

IMPORTANT: The information in the table below *does not* include the requirements for determining profiling applicability, disinfection profiling, and disinfection benchmarking. Please refer to the section on Disinfection Benchmarking for these monitoring and sampling requirements.

Activity	Requirement
Combined filter effluent monitoring	All systems must continue to monitor the combined filter effluent at the same location and frequency as under the SWTR.
Turbidity Monitoring at Individual Filters	• All systems using conventional filtration treatment or direct filtration must conduct continuous turbidity monitoring for each individual filter using an approved method and Individual must calibrate turbidimeters using the procedure specified by the manufacturer. • Systems must record the results of individual filter monitoring every 15 minutes. • If there is a failure in the continuous turbidity monitoring equipment, the system must conduct grab sampling every 4 hours in lieu of continuous monitoring .
Triggers for Turbidity Exceptions Reporting for Individual Filters	• For any individual filter that has a measured turbidity level of greater than 1.0 NTU in 2 consecutive measurements taken 15 minutes apart, the system must report the filter number, turbidity measurement, and date of exceedance. The system must produce a filter profile for the filter within 7 days of the exceedance and report that the profile has been produced or report the obvious reason for the exceedance. • For any individual filter that has a measured turbidity level of greater than 0.5 NTU in 2 consecutive measurements taken 15 minutes apart after the first 4 hours of operation after the filter has been backwashed or otherwise taken offline, the system must report the filter number, turbidity measurement, and date of exceedance. The system must produce a filter profile for the filter within 7 days of the exceedance and report that the profile has been produced or report the obvious reason for the exceedance. • For any individual filter that has a measured turbidity level of greater than 1.0 NTU in 2 consecutive measurements taken 15 minutes apart in each of 3 consecutive months, the system must report the filter number, turbidity measurement, and date of exceedance. The system must conduct a self-assessment of the filter within 14 days of the exceedance and report that the self-assessment was conducted. • For any individual filter that has a measured turbidity level of greater than 2.0 NTU in 2 consecutive measurements taken 15 minutes apart in 2 consecutive months, the system must report the filter number, turbidity measurement, and date of exceedance. The system must contact the state or 3rd party to conduct a CPE no later than 30 days following the exceedance and have the evaluation completed and submitted to the state no later than 90 days following the exceedance.
Reporting and Recordkeeping	<u>Individual Filter Data</u> • Results of individual filter monitoring must be maintained for at least 3 years. • Individual filter data must be reported only if there has been a turbidity exceedance <u>Combined Filter Effluent Data Reporting</u> • Total number of combined filter effluent turbidity measurements taken during last month that do not exceed the turbidity limits. • Date and value of any turbidity measurements taken during the month that exceed 1 NTU for systems using conventional or direct filtration. • Turbidity measurements must be reported within 10 days after the end of each month the system serves water to the public.

Disinfection profiling and benchmarking

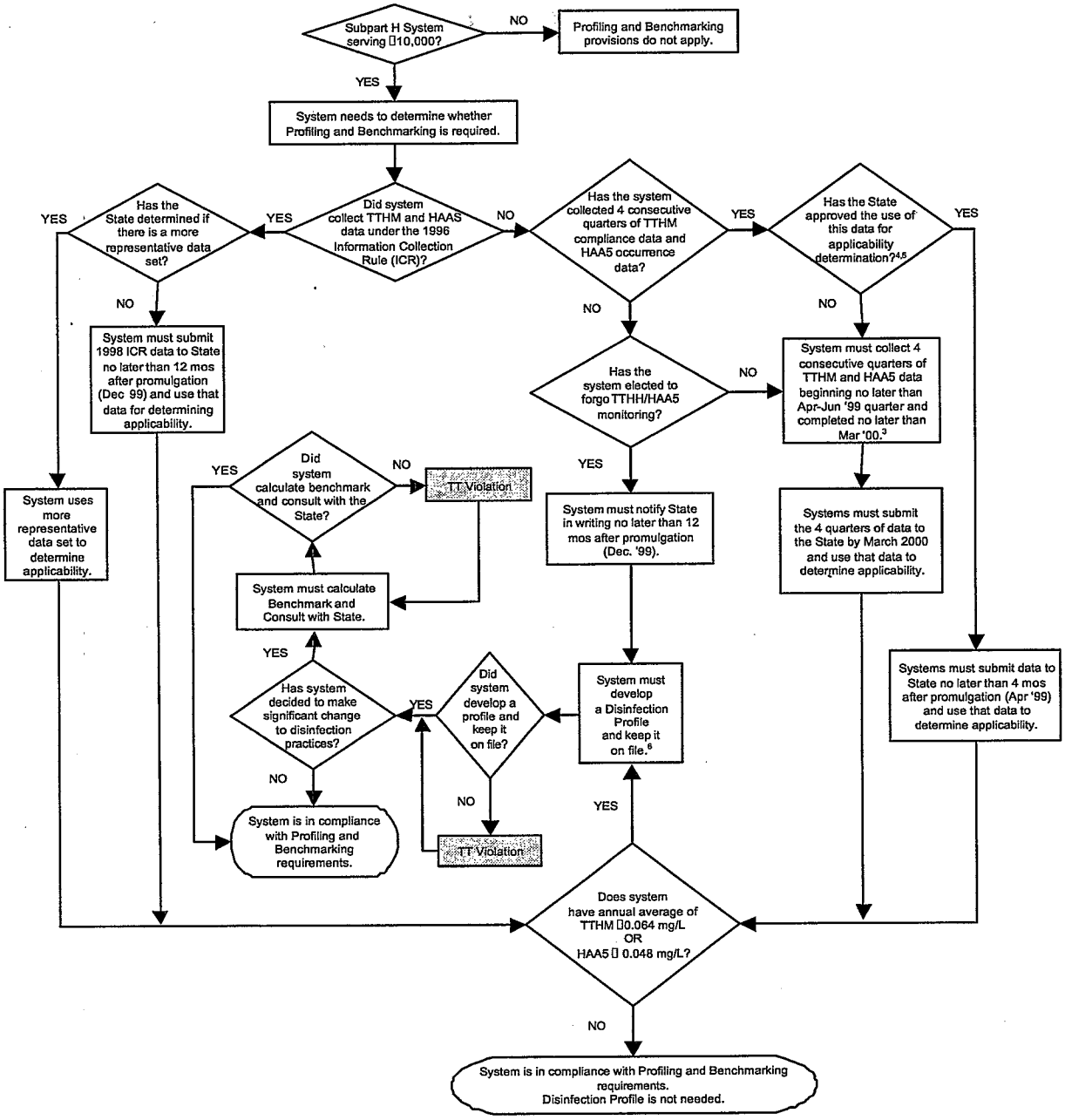
The Interim Enhanced Surface Water Treatment Rule (IESWTR) establishes disinfection benchmarking as a procedure requiring certain public water systems (PWSs) to evaluate the impact on microbial risk of proposed changes in disinfection practice. It is designed to help utilities and states work together to assure that pathogen control is maintained while the provisions of the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) are implemented. This procedure involves a PWS charting daily levels of pathogen inactivation for a period of at least one year to create a profile of inactivation performance. The PWS then uses this profile to determine a baseline or benchmark of inactivation against which proposed changes in disinfection practices can be measured. Profiling and benchmarking is explained in detail in the Disinfection Profiling and Benchmarking Guidance Manual.

Who is required to prepare a disinfection profile?
Surface water or GWUDI systems having average annual TTHM □ 0.064 mg/L or annual average HAA5 □ 0.048 mg/L as a result of data or specific monitoring conducted by March 31, 2000 must develop a *disinfection profile*. These levels, equal to 80% of the MCLs established for these compounds by the Stage 1 DBPR, are intended to include most systems that will modify their disinfection practices to comply with the Stage 1 DBPR. To determine applicability, systems that collected TTHM and HAA5 data under the ICR must use the results of the last 12 months of ICR monitoring unless the state determines there is a more representative data set. Non ICR systems may either use existing TTHM and HAA5 data, if approved by the state, or must conduct TTHM and HAA5 monitoring for four quarters. This monitoring must be completed before April 2000. Alternatively, systems can elect to forgo this monitoring if they construct a disinfection profile.

How are the disinfection profile and benchmark developed?
A disinfection profile consists of a compilation of daily *Giardia lamblia* log inactivations (plus virus inactivations for systems using either chloramines or ozone for primary disinfection) computed over a period of at least one year through the entire treatment plant. It is based on daily measurements of disinfectant residual concentration(s), contact time(s), temperature, and pH. A system with more than one point of disinfection application must conduct this monitoring for each disinfection segment. The profile may also be developed using up to 3 years of existing (i.e. grandfathered) data if the state finds the data acceptable. Systems having less than 3 years of acceptable grandfathered data are required to conduct one year of monitoring to create the profile. This monitoring must be completed by April 2001. The disinfection benchmark is equal to the lowest monthly average inactivation level in the disinfection profile (or average of low months for multi-year profiles).

How are the disinfection profile and benchmark used?
Any system required to develop a disinfection profile under the IESWTR that decides to make a significant change to its disinfection practice must calculate its benchmark and consult with the state prior to and only if making a significant change. Significant changes in disinfection practice are defined as: 1) changes to the point of disinfection; 2) changes to the disinfectant(s) used in the treatment plant; 3) changes to the disinfection process; and 4) any other modification identified by the state. As part of the consultation process, the system must submit to the state the following information: a description of the proposed change; the disinfection profile for *Giardia lamblia* (and, if necessary, viruses) and benchmark; and an analysis of how the proposed change will affect the current levels of disinfection. In addition, the state is required to review the disinfection profile as part of its periodic sanitary survey.

Disinfection Profiling and Benchmarking Provisions (1998 IESWTR)



NOTES
[1]TTHM and HAA5 averages must be taken from same time period.
[2]Any lab approved under the ICR or using ICR-approved methods may conduct HAA5 analyses.
[3]TTHM and HAA5 monitoring must meet same sampling number and location requirements as TTHM in 141.12 and 141.30; and same handling and analytical requirements as the ICR in 141.142(b)(1).
[4]System must conduct HAA5 monitoring until state approves of the existing data.
[5]State may also require a more representative data set.
[6]Disinfection Profile must be kept on file for State to review during Sanitary Survey.