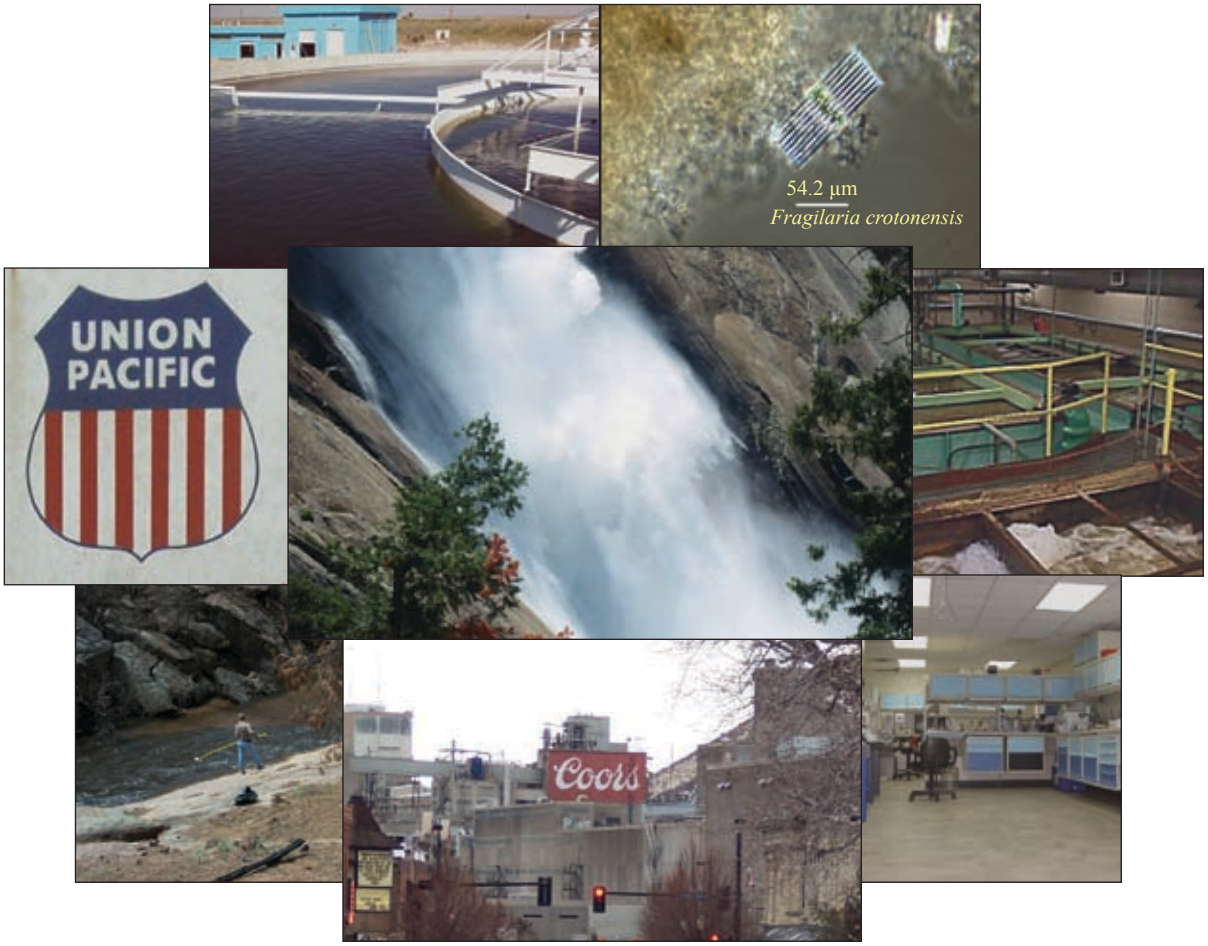
Safe Drinking Water
A Colorado Guide for Non-Transient Non-Community Public Water Systems That Use Surface Water



Colorado Public Water Systems *(serve 25 or more persons for 60 or more days per year)*					
		Non-Community Systems (consumers, NOT residents)			
Community Systems (serve residential populations)		**Non-Transient** (same non-resident users daily)		**Transient** (different users daily)	
Surface Water Source	Ground Water Source	Surface Water Source	Ground Water Source	Surface Water Source	Ground Water Source

Summary of Reporting Requirements for Non-Transient Non-Community Public Water Systems That Use Surface Water	
Event	**Notification Deadlines**
Acute risk to the health of consumers, such as fecal coliform or *E. coli*–positive routine or repeat microbiological sample results, treatment process failure, chemical shortage, or power disruption	Report to the state as soon as possible. During normal work hours, contact any Drinking Water Program Rule Manager, Drinking Water Engineer, or the District Engineer. After hours or on weekends, call the 24-hour Environmental Release/Incident Report Line at 1-877-518-5608 and page the person on call.
Routine testing results (e.g., IOCs, SOCs, VOCs, turbidity)	Report to the state within 10 days following the month in which the results are received or within 10 days after the end of the monitoring period, whichever is sooner.
Repeat and confirmation testing results	Notify the state no later than the end of the next business day.
Nitrate or nitrite MCL violation	Notify the state within 24 hours.
Failure to comply with any regulation (i.e., MCL violations [other than nitrate or nitrite], failure to monitor, or any other requirement)	Notify the state within 48 hours.
Tampering	Notify the state as soon as possible or by 10 a.m. the next calendar day.
Total coliform, fecal coliform, or *E. coli*–positive sample	Notify the state no later than the end of the next business day.
Turbidity exceeding the MCL	Notify the state as soon as possible but no later than the end of the next business day.
Chlorine residual entering the distribution system less than 0.2 mg/L	Notify the state as soon as possible but no later than the end of the next business day.
Chlorine dioxide residual entering the distribution system greater than 0.8 mg/L	Notify the state as soon as possible but no later than the end of the next business day.
Tier 1 Public Notification	Deliver to customers within 24 hours.
Repeat Tier 1 Public Notification	Deliver to customers every 2 weeks as long as the violation persists.
Tier 2 Public Notification	Deliver to customers within 30 days.
Repeat Tier 2 Public Notification	Deliver to customers every calendar quarter as long as the violation persists.
Tier 3 Public Notification	Deliver to customers within 1 year.
Public Notification Certificate of Delivery	A signed Certificate of Delivery verifying to the state that the notice was delivered to customers is due 10 days after delivery of each notice to customers (attach copies of the notices).
Monitoring plans	10 calendar days following the end of the first required monitoring period.
Monitoring plan updates	30 calendar days following the effective date of any change to Parts 1–5.

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Colorado Department of Public Health and Environment

Water Quality Control Division
Colorado Department of Public Health and Environment

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January 2008

ACKNOWLEDGMENTS

This document was developed with funding under the Colorado Capacity Development Program and administered by the Colorado Water Resources and Power Development Authority and the Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division (WQCD). The documents were produced by Oxenford Consulting, LLC, and Glacier Publishing Services, Inc.

This document represents the efforts of many people at CDPHE, water utilities, and contractors. These people include the following:

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John McEncroe, Centennial Water and Sanitation District

Printed on recycled paper

Contents

Introduction

Consumers expect, and Colorado law requires, that all public water systems provide consistently safe drinking water. This is a formidable challenge for all systems but especially for community public water systems that use any amount of surface water as their source. These systems must first treat their constantly changing water supply to make it safe for all consumers, including populations with special needs. Then they must protect the quality of their treated water as it travels through the distribution system to the consumer.

The Colorado Primary Drinking Water Regulations (CPDWR) were developed and are enforced to ensure adequate treatment and delivery of safe water to all Colorado consumers. When viewed in their entirety, the 250 or so pages of the regulations can be very intimidating. Add to these the additional regulations applicable to treatment and distribution system operators, the voluntary prevention practices recommended by the federal Safe Drinking Water Act, and overarching management issues, and the requirements can seem impenetrable indeed!

But in fact the regulations and recommended management and voluntary practices form a very organized and complete set of actions that match the complexity faced by water systems in providing safe drinking water. If consistently applied, these actions will ensure the delivery of consistently safe drinking water.

This Guide assists owners and operators of non-community water systems using surface waters (see box) to understand the full scope of the Colorado Drinking Water Program, both voluntary and regulatory. The Guide provides

- A summary of important regulatory requirements;
- A framework to help readers understand the context of both the regulations and the voluntary and management practices necessary to ensure consistent production and delivery of safe drinking water;
- References for more information; and
- Explanations of selected portions of the regulations that, based on the experience of the Drinking Water Program, present compliance challenges to water systems.

Water System Categories

Public Water System (PWS): *A system for the provision to the public of water for human consumption, through pipes or conveyances, that has at least 15 service connections or that regularly serves at least 25 people at least 60 days per year.*

- ***Community Water System (CWS):*** *A public water system that serves at least 15 service connections used by year-round residents or that regularly serves at least 25 year-round residents.*
- ***Non-Community Water System (NCWS):*** *A public water system that is not a community water system (i.e., does not serve 25 or more year-round residents).*
  - ***Non-Transient Non-Community Water System (NTNCWS):*** *A water system that regularly serves 25 or more of the same people for more than 6 months per year.*
  - ***Transient Non-Community Water System (TNCWS):*** *A non-community water system that does not regularly serve at least 25 of the same people for more than 6 months per year.*

This guide is organized into five parts:

- Part I. Safe Drinking Water: An Overview
- Part II. Applicable Colorado Regulations
- Part III. Management and Administration Tools
- Part IV. EPA Quick Reference Guides
- Part V. Additional Help

Part I. Safe Drinking Water: An Overview Part I summarizes the multiple risks that threaten the safety of drinking water and the multiple barriers available to protect drinking water from these risks. It illustrates how these barriers are comprehensively integrated into the voluntary and regulatory components of the Drinking Water Program. Part I provides additional information about the major barriers that protect against the risk of drinking water contamination. Specifically, it briefly discusses the importance of

- Source water protection;
- Effective treatment of raw water;

- Storage and distribution;
- Water quality monitoring; and
- Proper management.

When each of these components is understood and properly implemented, compliance with drinking water quality standards is achieved much more easily. It is the diligent application of the described practices that makes water safe and protects both consumers and water system owners and operators from the many undesirable consequences of unsafe drinking water.

Part II. Applicable Colorado Regulations Part II provides a simplified version of the CPDWR (January 19, 2005). The complete regulation document is available from the Drinking Water Program of the Colorado Department of Public Health and Environment (CDPHE), is contained on the reference CD, and is available via the Internet at www.cdphe.state.co.us/wq.

It is important to note that the regulations summarized in Part II do *not* address the additional requirements applicable to entities that discharge to any waters of the state. These are established by the Colorado Water Quality Control Act (the Act) Sect. 25-8-101 to 703, C.R.S., and its implementing regulations. Nor does Part II include any of the additional regulations that apply to entities that dispose of solid wastes. These are contained in Regulations Pertaining to the Beneficial Use of Water Treatment Sludge and Fees Applicable to the Beneficial Use of Sludges (5 CCR 1003-7, amended 10/19/05, effective 1/1/06), Regulations Pertaining to Solid Waste Disposal Sites and Facilities (6 CCR 1007-2), and possibly Rules and Regulations Pertaining to Radiation Control (6 CCR 1007-1). These regulations are also available on CDPHE's Web site at www.cdphe.state.co.us or from the Water Quality Control Division or the Hazardous Materials and Waste Management Division.

Part III. Management and Administration Tools Part III provides the most commonly used forms and templates to assist utilities in improving performance, operations, and compliance. The section also includes useful examples for complex components of the regulations and public notification guidance. These are also included on the reference CD, along with additional information, forms, and templates.

Part IV. EPA Quick Reference Guides Part IV provides quick reference guides developed by the U.S. Environmental Protection Agency.

Part V. Additional Help Part V provides additional references and descriptions of the Drinking Water Program services and organization.

Reference CD A reference CD provided with this document includes electronic copies of all forms and templates from Part III along with supplemental forms, guidance documents, and the complete CPDWR. The majority of the information is also available on the Drinking Water Program's Web site, www.cdphe.state.co.us/wq/drinkingwater/.

Part I. Safe Drinking Water: An Overview

Part I. Safe Drinking Water: An Overview

The federal Safe Drinking Water Act (SDWA) was promulgated by Congress in 1974 and significantly amended in 1986 and 1996. It establishes a national program to monitor and increase the safety of the nation's drinking water supply. The SDWA authorizes the U.S. Environmental Protection Agency (EPA) to set and implement health-based standards to protect against both naturally occurring and human-made contaminants in drinking water.

The EPA establishes national standards for tap water, called the National Primary Drinking Water Regulations (NPDWR; Title 40, Code of Federal Regulations, Part 141 [40 CFR 141] to address health risks. For each specific contaminant regulated, the EPA sets a maximum contaminant level goal (MCLG). This goal is the level of a contaminant in drinking water below which there is no known or expected risk to health, allowing for sensitive populations and a margin of safety. The EPA then sets a legal enforceable limit, or maximum contaminant level (MCL), set as close to the goal as feasible after considering known or anticipated adverse health effects, available technologies and their effectiveness, and the cost of treatment. The MCL represents the highest permissible level of a contaminant in water that is delivered to any user of a public water system. The EPA has set MCLs for more than 90 drinking water contaminants.

In addition, EPA regulations include requirements for water systems to

- Implement treatment techniques for risks not adequately addressed by MCLs;
- Monitor, report, and retain specified records;
- Use EPA-approved analytical methods;
- Provide consumers with information; and
- Notify consumers of health threats associated with violations of the regulations.

These regulations are directly enforceable by the EPA in the event Colorado fails to meet its delegated "primacy" responsibilities.

The EPA also establishes recommended maximum levels for contaminants that primarily affect aesthetic qualities (appearance, taste, odor) and public acceptance of drinking water. These are called the National Secondary Drinking Water Regulations (40 CFR 143), are not federally enforceable but rather serve as guidelines.

Before the SDWA Amendments of 1996, the act and associated EPA primary drinking water regulations focused primarily on enforcing MCLs as a means of ensuring safe drinking water at the tap. The 1996 Amendments greatly enhanced the act by recognizing the benefits of proactive action to erect barriers to contamination rather than to simply respond to contamination after it occurred. The 1996 Amendments also recognized the importance of and provided additional federal funding to encourage the use of specific risk barriers that

- Provide source water assessment and protection;
- Improve water system infrastructure through funding of a below-market loan program;
- Ensure certified operators are in responsible charge of treatment and distribution systems;
- Improve a water system's technical, managerial, and financial (TMF) capacity; and
- Increase consumer knowledge of drinking water safety risks.

*The **maximum contaminant level (MCL)** is the maximum permissible level of a contaminant in water that is delivered to any user of a public water system.*

***The maximum contaminant level goal (MCLG)** is a non-enforceable level at which no known or anticipated adverse effect on the health of persons would occur and that allows an adequate margin of safety.*

State Responsibility for Administering and Enforcing the SDWA

In Colorado, program administration, including compliance determination, compliance, technical and financial assistance, and enforcement of the SDWA, is under the jurisdiction of the Drinking Water Program of the Colorado Department of Public Health and Environment (CDPHE). Under an agreement with the EPA, the Drinking Water Program is granted primary enforcement authority or primacy to implement the SDWA. Under this agreement the Drinking Water

Program must show that it will adopt and make sure water systems meet drinking water regulations at least as stringent as the NPDWR established by the EPA. The Drinking Water Program must also comply with federal primacy requirements contained in the document titled "National Primary Drinking Water Regulations Implementation" (40 CFR 142), established by the EPA under authority of the SDWA. Requirements applicable to Colorado public water systems that result from this primacy delegation process are contained in the Colorado Primary Drinking Water Regulations (CPDWR, 5 CCR 1003-1).

Multiple Barrier Approach to Ensure Water Safety

A guiding principle incorporated into the federal SDWA and the Drinking Water Program is the need for multiple barriers to combat the multiple sources of risk to safe drinking water. **Table 1** provides a simplified list of risks to safe drinking water, and **Figure 1** depicts contamination risks associated with source waters.

Conceptually, the barriers to these safety risks can be visualized in three components: risk monitoring, risk prevention, and risk management. Within this framework, the Drinking Water Program has developed individual barriers, both voluntary and regulatory, that address the various risks. Because there is always potential for these risks to present themselves, each of the barriers must be continuously effective. Because of the dynamic and unpredictable nature of the risks, each of the major barriers is made up of a combination of additional barriers, often nested within one another. This risk management system provides redundant capacity to address risks in the event that a barrier is compromised or multiple risks present themselves intensely and simultaneously. This multiple barrier system is exemplified by the conventional treatment train used successfully by many water systems treating surface water that may contain microbial contaminants which have the potential to make consumers immediately and severely sick. In these treatment plants, each unit treatment process, including coagulation, flocculation, sedimentation, filtration, and disinfection, presents a barrier to contamination and has a significant part in removing or inactivating microbial contaminants.

Table 1
Summary of Risks to Safe Drinking Water

Source Water Contamination
Microbial
Chemical
Inadequate Water Treatment
Improper Design
Improper Operation
Treatment chemical impurities and excessive treatment chemical concentrations
Reactions of naturally occurring contaminants with treatment chemicals
Inadequate Distribution and Storage
Sanitary integrity breaches
Improper operation
Leaching of distribution system components
Inadequate Monitoring
Compliance
Process
Inadequate Management
Public water system
Regulatory agency

Figure 2 provides a conceptual overview of contamination risks and some of the regulatory and voluntary barriers to these risks. **Table 2** provides a detailed roadmap to many of the components of the Drinking Water Program that provide either regulatory or voluntary barriers to the risks. In addition to associating barriers with risks, the table provides regulatory citations from the CPDWR or Regulation 100 for barriers that are mandatory and sources of assistance for barriers that are voluntary (i.e., there is no regulatory mandate that they be implemented).

Source Water Protection

In general, drinking water systems rely on water from two sources: surface water and ground water. Surface water originates from sources open to the atmosphere, such as streams, rivers, lakes, reservoirs, and wetlands. Surface waters are frequently used as the source for public water systems that serve large populations because the volume they provide often is greater than that available from ground water sources. Though typically plentiful, surface waters generally are more susceptible than ground waters to contamination. Ground waters that are found to be under the direct influence of surface water are at similarly high risk and therefore regulated with the same requirements as surface water systems. A list of potential contaminants is provided in **Table 3**.

Figure 1. Multiple risks to safe drinking water

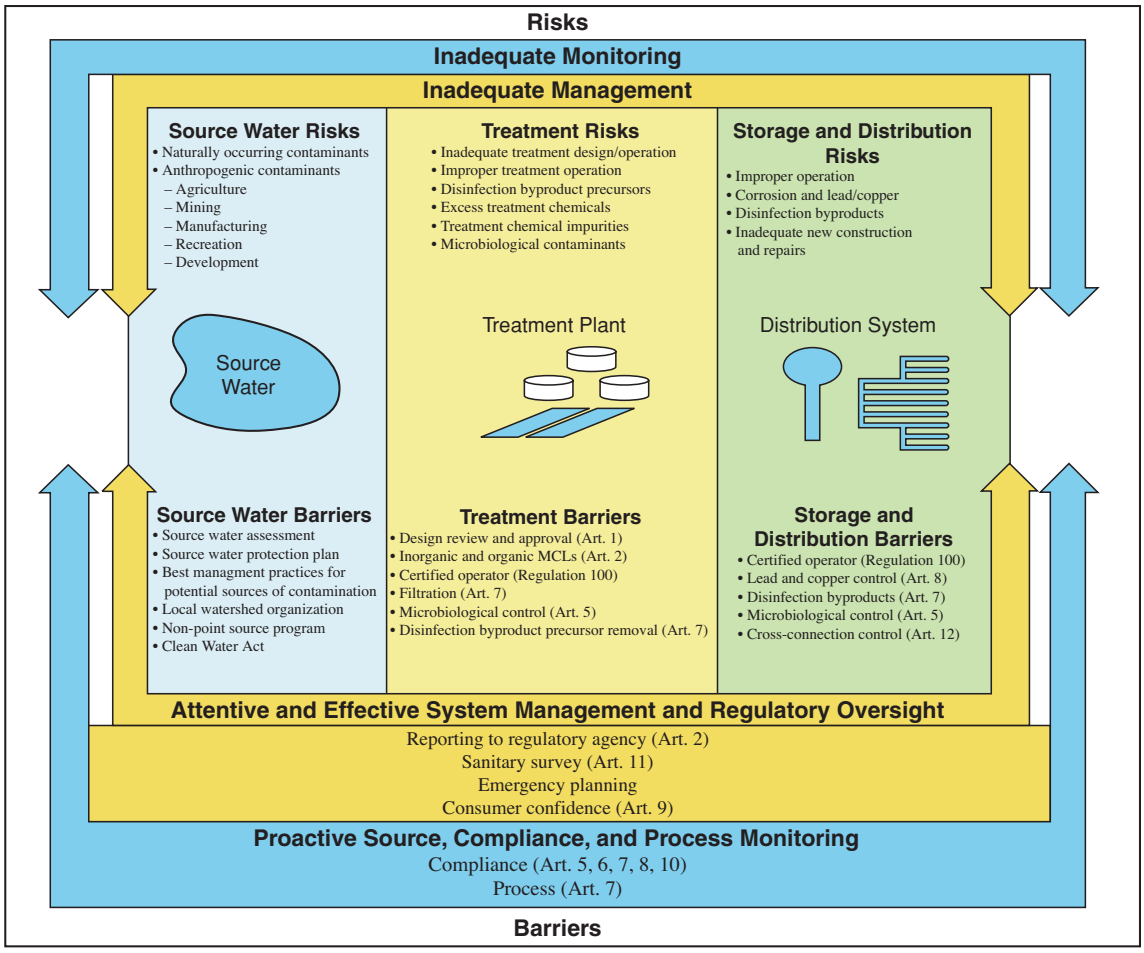


Figure 2. Overview of risks to safe water and regulatory and voluntary barriers to these risks for NTNCWS-SW

A public water system cannot unilaterally control enough of the watershed to prevent the presence of all contaminants in its source water. Nevertheless, the first line of defense against waterborne disease is to prevent disease-causing microbiological organisms and human-made or naturally occurring contaminants from entering the source water. Although contaminants that reach the water treatment plant generally can be removed, it is typically much less expensive to prevent contamination than it is to remove contaminants.

Public water systems and their consumers have a vital interest in protecting their source waters from contamination and therefore have significant standing in their communities where local land use decisions are made. CDPHE encourages water system representatives and consumers to use this standing to participate in official forums or voluntary efforts to control potential sources of contamination of the public water system's source waters.

To help water systems and their consumers effectively participate in local decision making, the CDPHE's Source Water Protection Program, with federal funding, developed a source water assessment report for each Colorado public water system. This report, developed in 2004, provides most public water systems with a starting point for estimating contamination risk to each source. Water system owners and operators are encouraged to use these reports to help

- Verify and update all potential sources of contamination;
- Identify and prioritize the most prevalent and most threatening sources of contamination; and
- Develop source water protection plans and implement best management practices.

More information about source water protection can be found at the Source Water Assessment and Protection (SWAP) Web site at www.cdphe.state.co.us/wq/sw/swaphom.html or from the SWAP Program coordinator.

Table 2
Safe Drinking Water Risks & Barriers for NTNCWS-SW

RISK			BARRIERS TO RISK		
TOPIC	Subtopic		REGULATORY (Required by CPDWR or Regulation 100)		NON-REGULATORY OR VOLUNTARY (Not required by CPDWR or Regulation 100)
			REGULATORY CITATION		SOURCE OF ASSISTANCE
SOURCE WATER CONTAMINATION	Unidentified Potential Sources of Contamination				CDPHE Source Water Assessment
					Local watershed associations
	Insufficient Funding of Source Water Protection Activities				CDPHE SWAP Pilot Planning Project Grant (≤$50,000) www.cdphe.state.co.us/wq/sw/planninggrantguidance.html
					CDPHE SWAP Development & Implementation Grant (<$5,000) www.cdphe.state.co.us/wq/sw/swaphom.html
	Uncontrolled Potential Sources of Contamination				Protection plan development assistance www.cdphe.state.co.us/wq/sw/swaphom.html
					Promote local land use ordinances
					Use local steering committees to develop "Best Management Practices" for most critical sources and seek voluntary compliance
INADEQUATE TREATMENT FOR CONTAMINANT CONTROL	Inadequate Knowledge of Contaminant Concentrations	Non-microbial	Lead and copper	Art. 2, Sect. 2.7 Art.8, Sect. 8.12	
			VOCs	Art. 2, Sect. 2.1	
			SOCs	Art. 2, Sect. 2.1	
			IOCs	Art. 2, Sect. 2.2	
		Microbial	*Giardia lamblia* Viruses *Legionella* Coliform *Cryptosporidium* Turbidity Disinfection profiling	Art. 2, Sect. 2.3, Art. 2, Sect. 2.8 Art. 7, Sect. 7.3.2	
		Other	Secondary MCLs	Art. 3, Sect. 3.2	
	Reaction of Naturally Occurring Organic Materials with Treatment Disinfectants		Disinfection byproducts (haloacetic acids and trihalomethanes), disinfection byproduct precursor (TOC) removal	Art. 2, Sect. 2.4 Art. 2, Sect. 2.10	*Enhanced Coagulation and Enhanced Precipitative Softening Guidance Manual*, EPA 815-R-99-012, May 1999 **www.epa.gov/safewater/mdbp/mdbptg.html#coag**
					Alternative Disinfectants and Oxidants Guidance Manual, EPA 815-R-99-014, Apr. 1999 **www.epa.gov/safewater/mdbp/mdbptg.html#disinfect**
					Microbial and Disinfection Byproduct Rules Simultaneous Compliance Guidance Manual, Chapter 4, EPA 815-R-99-015, Aug. 1999 **www.epa.gov/safewater/mdbp/mdbptg.html#disinfect**

Table 2 (continued)
Safe Drinking Water Risks & Barriers for NTNCWS-SW

RISK			BARRIERS TO RISK		
			REGULATORY (Required by CPDWR or Regulation 100)		NON-REGULATORY OR VOLUNTARY (Not required by CPDWR or Regulation 100)
TOPIC	Subtopic		REGULATORY CITATION		SOURCE OF ASSISTANCE
INADEQUATE TREATMENT FOR CONTAMINANT CONTROL (Continued)	Excessive Concentration of Treatment Chemicals		MRDLs	Art. 2, Sect 2.5	NSF/ANSI Standard 60 *Alternative Disinfectants and Oxidants Guidance Manual*, EPA 815-R-99-014, Apr. 1999 **www.epa.gov/safewater/mdbp/mdbptg.html#disinfect**
	Ineffective Treatment Techniques	Corrosion Control	Lead and copper	Art. 8, Sect. 8.1	*Revised Guidance Manual for Selecting Lead and Copper Control Strategies*, EPA 816-R-03-001, Mar. 2003 **www.epa.gov/leadcopperrule/pdfs/guidance_lcmr_control_strategeis_revised.pdf**
					Microbial and Disinfection Byproduct Rules Simultaneous Compliance Guidance Manual, Chapter 4, EPA 815-R-99-015, Aug. 1999 **www.epa.gov/safewater/mdbp/mdbptg.html#disinfect**
		Turbidity	Filtration performance	Art. 2, Sect. 2.8	*Guidance Manual for Compliance with the Interim Enhanced Surface Water Treatment Rule*: *Turbidity Provisions*, EPA 815-R-99-010, Apr. 1999 **www.epa.gov/safewater/mdbp/mdbptg.html#turbidity**
					Optimizing Water Treatment Plant Performance Using the Composite Correction Program, EPA/625/6-91/027, Aug. 1998 **www.epa.gov/nrmrl/pubs/625691027/625691027.pdf**
					AWWA Partnership for Safe Water **www.awwa.org/Resources/utilitymanage.cfm?ItemNumber=3787&navitemNumber=29261**
		Treatment Chemical Impurities	Acrylamide and epichlorohydrin (coagulant impurities)	Art. 2, Sect. 2.9 Art. 6, Sect. 6.2.2	NSF/ANSI Standard 60
	Improper Design/ Installation of Treatment Facility Components		Prior approval before construction or modification of treatment	Art. 7, Sect. 7.3.2	
			Siting requirements	Art. 1, Sect. 1.11.3	
			Proper recycling of backwash, thickener, supernatant, or dewatering liquids	Art. 7., Sect. 7.4.3	Filter Backwash Recycling Rule Technical Guidance Manual, EPA 816-R-02-014, Dec. 2002 **www.epa.gov/safewater/mdbp/pdf/filterbackwash/fbrr_techguidance.pdf**
	Breaches in Sanitary Integrity of Treatment		Sanitary survey review	Art. 11, Sect. 11.3	*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, Apr. 1999 **www.epa.gov/safewater/mdbp/pdf/sansurv/sansurv.pdf**

Table 2 (continued)
Safe Drinking Water Risks & Barriers for NTNCWS-SW

RISK			BARRIERS TO RISK		
			REGULATORY (Required by CPDWR or Regulation 100)		NON-REGULATORY OR VOLUNTARY (Not required by CPDWR or Regulation 100)
TOPIC	Subtopic		REGULATORY CITATION		SOURCE OF ASSISTANCE
IMPROPER STORAGE & DISTRIBUTION	Contaminant Leaching from Distribution System Components		Tap water monitoring for excessive lead and copper	Art. 8, Sect. 8.7	*Revised Guidance Manual for Selecting Lead and Copper Control Strategies*, EPA 816-R-03-001, Mar. 2003 **www.epa.gov/leadcopperrule/pdfs/guidance_lcmr_control_stratageis_revised.pdf**
			Report the presence of specific materials to the state	Art. 1, Sect. 1.6.9	
			Control corrosivity to minimize leaching of lead and copper	Art. 8, Sect. 8.3	National Drinking Water Clearinghouse Tech Brief on Corrosion Control **www.nesc.wvu.edu/ndwc/pdf/ot/tb/tb3_corrosion.pdf**
			Prohibition on use of lead pipes, solder, and flux	Art. 8, Sect. 8.12	
					NSF/ANSI Standard 61
	Breaches in Sanitary Integrity of Storage or Distribution System Components		Control of cross-connections	Art. 12, Sect. 12.1	*Colorado Cross-Connection Control Manual* **www.bpecc.org/cross_connection_manual.htm**
			Sanitary survey review	Art. 11, Sect. 11.3	*Water Distribution System Operation and Maintenance – A Field Study Training Program*, California State University–Sacramento, **www.owp.csus.edu/courses/wds.php**
					Water Distribution Operator Training Handbook, 3rd ed., AWWA, **www.awwa.org/bookstore**
INADEQUATE MONITORING	Incomplete Monitoring Plan		Monitoring plan	Art. 1, Sect. 1.12	CDPHE Monitoring Plan Template, Apr. 2003 **www.cdphe.state.co.us/wq/pdf/MonitoringPlanTemplate_April_2003.pdf**
	Incomplete Monitoring	Microbial	Microbials	Art. 5, Sect. 5.1	*A Small Systems Guide to the Total Coliform Rule*, Appendix B EPA-816-R-01-017A, June 2001 **www.epa.gov/safewater/smallsys/small-tcr.pdf**
		Non-microbial	Organics	Art. 6, Sect. 6.2.5 Art. 6, Sect. 6.2.6	
			Inorganics	Art. 6, Sect. 6.15	
			Unregulated compounds	Art. 6, Sect. 6.4	
			Lead and copper	Art. 8, Sect. 8.9	
			Disinfectants, DBP precursors, and associated water quality parameters	Art. 7, Sect. 7.5.3	CDPHE Laboratory Methods Manual for Colorado Certified Operators, Mar. 2003. Contact CDPHE Drinking Water Program.
	Improper Sampling, Analytical Methods, or Laboratory Methods	Analytical Methods	Microbials	Art. 10, Sect. 10.1	EPA's Interactive Sampling Guide for Drinking Water System Operators, **www.epa.gov/safewater/smallsys/samplingcd.html** or call 1-800-490-9198
			Inorganics	Art. 10, Sect. 10.2	
			Organics	Art. 10, Sect. 10.3	
			Disinfectants and turbidity	Art. 10, Sect. 10.5	
			Disinfectants and DBP precursors	Art. 10, Sect. 10.7	
			Lead and copper	Art. 10, Sect. 10.8	
			Laboratory certification	Art. 10, Sect. 10.10	*Manual for the Certification of Laboratories Analyzing Drinking Water,* EPA 815-R-05-004, Jan. 2005, **www.epa.gov/safewater/labcert/pdfs/manual_labcert_2005.pdf**

Table 2 (continued) Safe Drinking Water Risks & Barriers for NTNCWS-SW					
RISK			**BARRIERS TO RISK**		
TOPIC	**Sub Topic**		**REGULATORY (Required by CPDWR or Regulation 100)**		**NON-REGULATORY OR VOLUNTARY (Not required by CPDWR or Regulation 100)**
			REGULATORY CITATION		**SOURCE OF ASSISTANCE**
INADEQUATE MANAGEMENT	Insufficient Staff Qualifications or Training		Certified operator	Regulation 100	1. CDPHE Drinking Water Capacity Development Program **www.cdphe.state.co.us/wq/drinkingwater/CapacityDevelopment.html**
					2. American Water Works Association, **www.awwa.org**
					3. Rocky Mountain Section AWWA, **www.rmsawwa.net**
					4. Colorado Rural Water Association, **www.crwa.net**
					5. Montana University System Water Center **http://watercenter.montana.edu/training/default.htm**
					6. Colorado State University – Sacramento, Office of Water Programs, **www.owp.csus.edu/drinkingwater.php**
	Lack of Sufficient Infrastructure				Grants for planning and construction and below market rate loans to improve infrastructure are available from multiple sources. Contact CDPHE, WQCD Outreach and Project Assistance Unit, 303-692-3562.
	Unbalanced Internal or External Oversight	Internal			CDPHE *Water System Self-Evaluation,* **www.cdphe.state.co.us/wq/drinkingwater/pdf/ColoradoPWSSelf-Evaluation.pdf**
					Manager and/or Board Training, Managing a Small Drinking Water System: A Short Course for Local Officials **www.nesc.wvu.edu/netcsc/netcsc_newproducts.htm**
		External	Public notification	Art. 9, Sect 9.2	EPA *Revised Public Notification Handbook*, EPA 816-R-07-003, Mar. 2007 **www.epa.gov/safewater/publicnotification/pdfs/guide_publicationnotification_pnhandbook.pdf**
			Public education for lead and copper	Art. 8, Sect 8.6	EPA *Lead in Drinking Water Regulation: Public Education Guidance*, EPA 816-R-02-010, June 2002, **www.epa.gov/safewater/lcrmr/pdfs/guidance_lcmr_lead_public_education.pdf**
	Inadequate Emergency Planning		Notify the state of suspected tampering, threats, or evidence of tampering	Art. 1, Sect. 1.6.8	EMERGENCY REPORTING: 1-877-518-5608; Information: CDPHE Drinking Water Security and Emergency Response Program **www.cdphe.state.co.us/wq/drinkingwater/EmergencyResponse.html**
					EPA Rural Community Assistance Program Security Toolbox **www.rcac.org/doc.aspx?120**
					EPA Response Protocol Toolbox **www.epa.gov/safewater/watersecurity**

Table 3 Potential Source Water Contaminants	
Contaminant	**Potential Sources of Contamination**
Microbial: viruses, bacteria, protozoa	Sewage treatment plants; septic systems; agricultural livestock operations; wildlife
Inorganic: salts, metals	Naturally occurring; urban storm-water runoff; industrial or domestic wastewater discharges; oil and gas production; mining; farming
Organic chemicals, synthetic chemicals, volatile organic compounds	Byproducts of industrial processes and petroleum production; gas stations; urban storm-water runoff; septic systems
Pesticides and herbicides	Agricultural; urban storm-water runoff; residential landscaping
Radioactive contaminants	Naturally occurring; oil and gas production; mining activities; waste disposal practices (e.g., medical wastes)

Effective Treatment of Raw Water

Water for human consumption generally is treated for two basic reasons: to make it safe to drink (potable) and to make it more aesthetically pleasing (appearance, taste, odor).

The importance of proper treatment design and associated operational practices cannot be overstated. These ensure that any contaminants present (or likely to be present) in untreated water are removed or inactivated and that any contaminants likely to be formed as a result of disinfection practices are reduced to safe levels before the treated water enters the storage and distribution systems. Treatment provides protection from contaminants that cause both immediate (acute) and long-term (chronic) health effects. Treatment is so important to the safety of drinking water that all new treatment processes and modifications to existing treatment processes must be approved by the Drinking Water Program before construction. In addition, Colorado water treatment operators must be certified in accordance with Regulation 100 (5 CCR 1003-2) to ensure proper operation of such treatment processes.

All new treatment processes and modifications to existing treatment processes must be approved by the Drinking Water Program before construction.

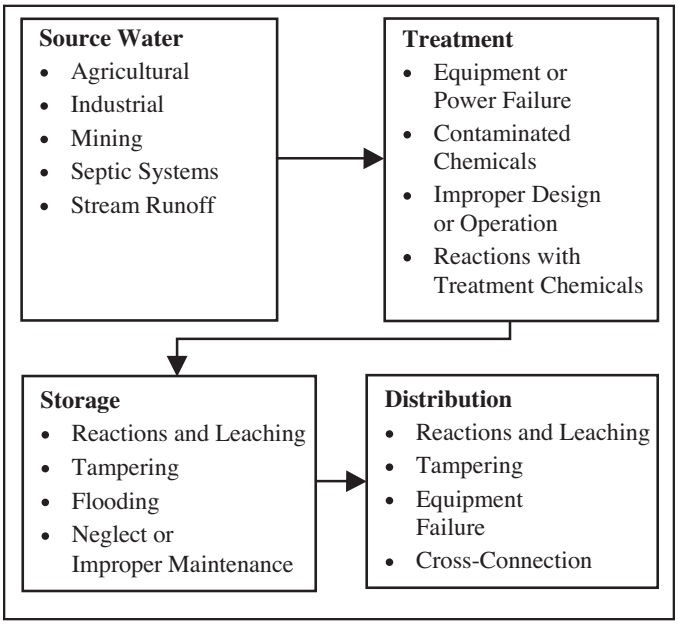


Figure 3. Sources of contamination

Treatments needed to make water safe to drink depend on both the initial raw water *quality,* as measured by the concentration of organic, inorganic, radiological, and microbiological contaminants present in the untreated water, and the *risk* that microbiological contaminants may be present (even if the monitoring of raw water does not always detect their presence). **Figure 3** identifies possible sources of contamination.

To protect consumers from this wide range of contaminants, surface water treatment systems need a nested multiple barrier approach.

- For microbial contaminants, the treatment barriers consist of filtration and disinfection. Installation and proper operation of these specified treatment techniques are needed to remove or inactivate various pathogenic organisms, including *Giardia, Cryptosporidium,* and viruses, the presence of which is difficult to monitor.
- For chemical contaminants (organic and inorganic), the treatment barrier often consists of applying best available technologies (BATs) that have been identified by the EPA for removal of these contaminants. Neither the NPDWR nor the CPDWR mandate that water systems use BATs to reduce contaminant levels below the applicable MCL. However, systems that install a treatment process which is not the BAT are not eligible for a variance if they fail to meet the MCL.

Effective treatment also includes ensuring that new contaminants are not introduced during the treatment process and that water will not undergo undesirable changes in quality during its transit in the distribution system. To deal with these issues,

- Maximum residual disinfectant levels (MRDLs) have been specified to identify the level of disinfectants (i.e., chlorine, chloramines, and chlorine dioxide) that may not be exceeded without an unacceptable possibility of adverse health effects.
- Disinfection byproducts (DBPs) are measured at locations in the distribution system that result in the highest concentrations of byproducts (maximum residence time in the distribution system often is used as a surrogate sampling location to approximate anticipated maximum concentration). DBPs are produced by the reaction of disinfectants with organic matter (DBP precursors) and may continue to form in the distribution system. Because the best way of reducing DBPs is to prevent them from being formed, treatment is often required to remove DBP precursors (measured as total organic carbon [TOC]).
- Lead and copper are measured at the consumer's tap. Typically, lead and copper in tap water originate from the consumer's plumbing through corrosion, although they can also be present in the source water or result from corrosion of distribution system components, particularly lead service lines. By adjusting the water quality entering the distribution system, water systems can reduce the corrosivity of their water and the risk of elevated lead and copper at the consumer's tap. If elevated levels of lead or copper are detected, it may be necessary to conduct a corrosion control study to determine the cause.

Changing the source water or any one treatment process can cause unintended and undesirable impacts, such as

- *Cancer-causing byproducts formed during disinfection;*
- *Increased lead concentrations from changes in water sources, treatments, disinfectants, additives, pH, or alkalinity of the finished water.*

Finally, water systems must address a more subtle but still very important challenge to ensure safe drinking water: the unintended consequences of treatment process and source water changes. BATs and treatment techniques are established to address each specific known risk or contaminant, and each of these processes can be designed, studied, and discussed separately. However, in practice each unit treatment process in the overall treatment train affects subsequent processes and produces changes in water quality both at the treatment plant and later in the distribution system. Accordingly, changes in source water or treatment can have significant unintended effects on the quality and safety of the finished water. This interdependence necessitates that all treatment process changes be reported to the Drinking Water Program, approached cautiously, and possibly pilot tested before full-scale implementation. In this way, the unintended consequences can be evaluated and the undesirable consequences controlled before they adversely affect the consumer and the compliance status, liability, or reputation of the water system.

From a public health perspective, there is no direct requirement for any Colorado public water system to treat its water to improve its aesthetic characteristics. However, aesthetic quality can have important indirect public health consequences (*see* Part II, Art. 3).

Storage and Distribution

Storage

In water systems, storage is primarily used to balance fluctuation in demands for water and to provide a supply suitable for emergencies. Storage can also be used to increase operating convenience, stabilize pumping needs, and decrease power costs. Storage helps maintain uniform water pressures throughout the service area and, in a large public water system, functions as a reserve water supply during power outages, fires, and equipment failures. Storage tanks can be situated above or below ground, and the contamination threats to both locations include infiltration or flooding by untreated water; penetration by insects, birds, or animals; tampering or vandalism; and the leaching of contaminants from improperly applied or cured protective coatings. Unscreened overflow pipes and vents are common sources of contamination. Storage tanks that "float" on the distribution system (i.e., have only one pipe for both inlet and outlet) are often associated with positive routine total coliform sample results and elevated levels of DBPs if they are not properly operated or maintained.

Specifications for storage and distribution construction, design, and materials are found in Appendix A of the Design Criteria for Potable Water Systems *manual, available on-line at* www.cdphe.state.co.us/wq/engineering/DesigncriteriaPotablewatersystem.pdf *or from the Drinking Water Program.*

Proper design and operation of a system's storage facilities can have a very significant impact on the levels of DBPs and their associated health risks. Accordingly, these risks should be considered and balanced with the needs to ensure an adequate supply of finished water in designing and operating storage facilities.

Distribution

The distribution system must transport water in adequate quantities and at sufficient pressures to meet consumer needs while still protecting water quality. Components of distribution systems can include pumps, piping, associated valves, and finished water storage.

*A **cross-connection** is any unprotected actual or potential connection or structural arrangement between a potable water system and any other source, through which it is possible to introduce into any part of the potable system any substance not meeting CPDWR. These connections may include bypasses, jumper connections, removable sections, swivel or changeover devices, submerged hoses, or any devices through which backflow can occur.*

After the distribution system is properly constructed, it must be operated by a properly certified operator as specified by Regulation 100. Cross-connection control, proper maintenance and repair, and proactive monitoring are important ways to preserve the availability and quality of the finished water.

Uncontrolled cross-connections in the treatment, storage, or distribution components of the system can allow treated water to become contaminated by backflow of water from other unsafe sources and are prohibited by Section 12.1 of the CPDWR. Water systems are required to implement a multi-faceted program to detect and control cross-connections in their systems.

Public water systems are not required by the CPDWR to use any specific distribution system maintenance program. However, compliance with mandated water quality parameters (such as byproduct concentrations and the absence of total coliform organisms) is greatly facilitated by an effective maintenance and repair program. Improper disinfection of new and repaired sections of distribution system components before they are returned to service is a common source of microbial contamination.

Proactive monitoring is another valuable barrier to distribution system contamination risks. Water systems are encouraged to use and augment mandated monitoring results to document the range of water characteristics, disinfectant residuals, and consumption patterns associated with normal operating conditions such that changes in conditions can trigger investigations that can discover emerging problems before they become health risks to consumers.

Water Quality Monitoring

Water quality monitoring is a critical part of the operation of every public water system and one of the multiple barriers used to verify that individual processes are operating properly and the water delivered to consumers is safe to drink, and to demonstrate compliance with CPDWR requirements.

However, it is important to understand that monitoring finished water quality does not by itself ensure that the water supplied is safe. Rather, monitoring *verifies* that the ongoing, consistent application of treatment and operational procedures in use is successful and that safe drinking water is being provided to consumers at the time the sample is collected.

To obtain this benefit, compliance monitoring samples must be

- Collected at proper locations as specified in the regulations;
- Representative of the water consumed;
- Collected at least as frequently as specified in the regulations;
- Preserved as required; and
- Analyzed using certain approved methods by entities approved by CDPHE.

Results must also be reviewed and submitted to the Drinking Water Program in a timely manner.

Generally, monitoring is conducted (1) in the treatment plant, (2) at entry points to the distribution system, (3) from representative points in the distribution system, and

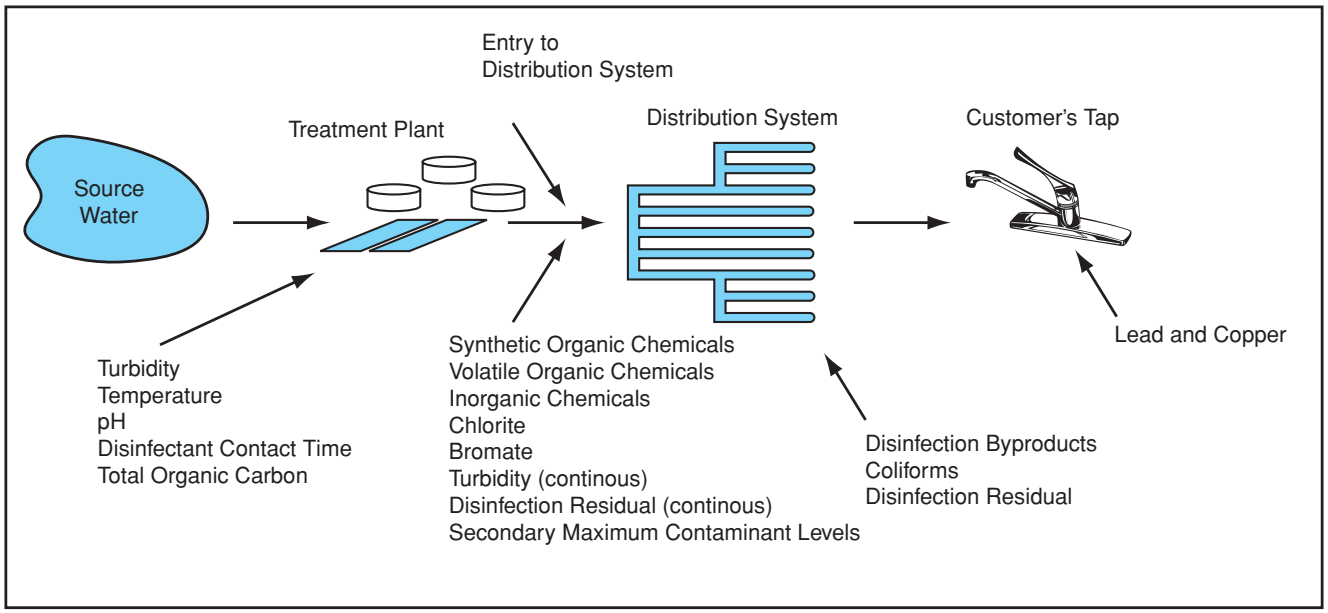


Figure 4. Monitoring locations for NTNCWS-SW

(4) at specific consumer taps in the distribution system (*see* **Figure 4**).

Systems must develop a monitoring plan to represent the physical water system and the monitoring that will be conducted to meet CPDWR requirements. Water system representatives, who have firsthand knowledge of their system's components and physical layout, develop the monitoring plan and can use it to demonstrate to Drinking Water Program Rule Managers that the monitoring they conduct is consistent with that required by the CPDWR.

Though important to verify delivery of safe drinking water and to maintain compliance, compliance monitoring is not the only type of monitoring that merits attention by owners and operators. Process monitoring is probably even more important because it verifies – on a more frequent and less costly basis – that all the important control processes are functioning as designed.

Compliance monitoring for disinfectant residuals, for example, is required at the same frequency as microbiological testing for coliform organisms. The required frequency may range from daily to quarterly, depending on the type of system, the source water used, and the population being served. Process monitoring ensures on a continuous basis that the disinfection process is functioning properly.

Discovering a violation or a disease outbreak among consumers after it has occurred is the likely outcome if a water system relies only on compliance monitoring to ensure that the water produced is always safe. It could result in a very unsatisfactory situation, both for consumers and for the public water system.

Proper Management

In the end, it is the owners, not the operators, who are responsible for ensuring that their systems provide safe drinking water. Owners of public water systems must comply with all CPDWR requirements and certain articles of Regulation 100. Regulation 100 requires that "No owner of a water or wastewater facility shall allow the facility to be operated without the direct supervision of an operator in responsible charge (ORC) certified in a classification equivalent to or higher than the classification of the facility as specified in these regulations." Furthermore, owners are required to ensure that all process control and system integrity decisions about water quality or quantity which may affect public health or the environment are made by either an ORC or another certified operator.

Regulation 100 also specifies the duties of certified operators and the ORC. Although the duties of the ORC can be very broad, owners are still responsible for ensuring the delivery of safe drinking water and are prohibited (unless they are properly certified) from performing the activities defined by Regulation 100 as duties of a certified operator or ORC.

Proper management involves active oversight of operators and their availability, and proper application of adequate resources. A facility must be supervised by an operator in responsible charge certified in a classification equal to or higher than the system classification.

Just hiring an ORC is not sufficient. Proper management involves, among other things, active oversight of operators and their availability, and proper application of adequate resources. Like the other aspects of ensuring safe drinking water already discussed, this presents significant challenges and requires the following:

- Administration
  - Recordkeeping
  - Policymaking
  - Timekeeping
  - Procurement
- Institutional and Organizational Capability
  - Staffing structure and responsibilities
  - Constructive relationships with external entities, including customers, regulators, and assistance providers
  - Staff acquisition, training, evaluation, development, and succession planning
  - Internal controls to prevent waste, fraud, and abuse of resources
  - Operation control to provide adequate staffing, equipment, and materials
  - Emergency planning
- Financial Capability
  - Sufficient revenue and access to credit
- Fair and adequate rate structure and effective collection practices
  - Use of standardized budget, accounting, and capital planning techniques

In very small systems, the owner, manager, and operator may be the same person. In such cases, he or she will be responsible for all of the operational and managerial functions described here. Proper management of the system, regardless of its size or complexity, must be addressed and integrated across the multiple risk barriers to ensure safe drinking water. The EPA has developed a broad model that uses the concept of ongoing capacity development, or the process of acquiring, maintaining, and improving technical, managerial, and financial capabilities of the overall system to provide consistently safe drinking water. Applying this multi-dimensional concept of capacity development is a key risk control barrier to both meeting the compliance requirements of the CPDWR and preventing waterborne diseases. It is beyond the scope of this document to provide detailed information on how to accomplish all these tasks. However, some management failures are associated frequently with violations of the CPDWR and expose consumers to health risks that the Drinking Water Program is charged with addressing. Accordingly, some are briefly addressed here.

Technical Capacity

The EPA defines technical capacity as the physical and operational ability to acquire, treat, distribute, and maintain safe drinking water. It involves the adequacy of the physical system itself and the ability of the operator to operate and maintain the system.

Managerial Capacity

Managerial capacity refers to the system's institutional and administrative capabilities. It addresses the accountability of the owner(s), an effective staffing and organizational structure, and constructive relationships with external entities, including customers, regulators, and assistance sources.

One of the most important topics to address to manage a drinking water system properly is the formal assignment of responsibilities, foremost between the owner and operator in responsible charge (ORC), considering the requirements of the CPDWR and Regulation 100, and then to all other employees of the system. This can help ensure that the important activities outlined here are appropriately delegated and not ignored.

Constructive relationships with external entities, including customers, regulators, and assistance providers, are often overlooked yet remain valuable resources in the effort to provide safe drinking water.

The constructive relationship with customers should include a process for using customer feedback and complaints in a positive manner. Customer feedback

is an important indication of how well the system is functioning, from both business and health standpoints. Water system attention to resolving customer complaints and inquiries builds trust and support for the system that will pay dividends when it becomes necessary to seek support for new infrastructure or rate increases.

Customer feedback and complaints are important indicators of how well the system is functioning.

A constructive relationship with regulators such as CDPHE provides a water system with multiple benefits. First and foremost, the CDPHE has staff trained and available to help water systems cope with emergencies that may threaten the acute health of their consumers. If a water system has an acute violation of the total coliform rule or encounters any other situation that may endanger consumers' health, such as a treatment failure or suspected tampering, system representatives are obligated to notify the Drinking Water Program. Upon receiving such notification, the Drinking Water Program assembles a team of experts called the acute team. The acute team then works with water system representatives to assess the situation and determine whether emergency actions such as a boil- or bottled water advisory are necessary. When the necessity for any immediate action is determined, compliance status and the need for public notification are determined and conveyed to water system representatives. Use of the Drinking Water Program acute team in consultation with system representatives greatly improves the chances that emergency actions will be instituted only when they are truly necessary to protect the health of consumers.

Notify any Drinking Water Program Rule Manager, Drinking Water Engineer, or the District Engineer of any acute health threats to consumers. On weekends or nights, call the 24-hour Environmental Release/ Incident Report Line at 1-877-518-5608 and immediately page the person on call.

A second benefit of a constructive relationship with the Drinking Water Program is the ability to take maximum advantage of the periodic sanitary survey. The CDPHE is required by the EPA to conduct a sanitary survey of every water system that uses surface water at least every 3 years. The great value of a sanitary survey is that it helps identify any existing or potential sanitary risks that can lead to compliance violations or public health threats. The survey results in a written report that identifies risks and can help justify needed capital improvements, equipment, and operational revisions.

A sanitary survey is a systematic on-site examination of the sources, processes, and equipment used by a public water system to produce and distribute safe drinking water.

Third, the Drinking Water Program provides a powerful tool to help public water systems ensure consistently safe drinking water through comprehensive performance evaluations (CPEs). The CPE is a thorough on-site review and analysis of a facility's design capabilities and associated administrative, operational, and maintenance practices as they relate to achieving optimum performance from the facility. A primary objective is to determine whether significant improvement in treatment performance can be achieved without major capital expenditure. Like the sanitary survey, the CPE results in a written report that can help the system determine whether their performance would benefit from operational revisions. Additional information about CPEs is available on the reference CD.

Finally, the benefit of maintaining a constructive relationship with regulators, including the Drinking Water Program, is to take advantage of the full range of compliance, technical, and financial assistance available. For example, the Drinking Water Program is developing and will soon deploy an excellence program for Colorado water systems that will recognize water systems and water system operators who meet stringent excellence criteria. The excellence program will also sponsor advanced performance-based training for system representatives to increase their skills.

The benefits of constructive relationships with assistance providers are also significant. Entities such as the Colorado Rural Water Association and the Rocky Mountain Section of the American Water Works Association provide many training and educational opportunities to water system representatives, including owners, managers, and board members.

A management function often unwisely neglected is the need for emergency planning. Public water systems have always been exposed to disruption from the forces of nature, vandalism, accidents, and sabotage. More recently, the possibility of purposeful tampering to inflict harm or to secure publicity has made the need for emergency planning even more important. Owners of all water systems should protect their investments and their customers from these threats by safeguarding drinking water sources and treated water supplies, and by developing and practicing a comprehensive emergency response plan. With regard to safeguarding water system components, at a minimum all tanks, hatches, and pump houses, and other unmanned components of the water system should be secured with tamper-proof locks. Direct access to wells or treated water, including vents or other access routes, should be protected against intrusion. Although it may be impossible to prevent all such emergencies, it is prudent (and required for systems serving a population of 3,300 or more) for systems to assess their vulnerabilities and develop a tailored emergency response plan. If the water system does experience an emergency, its liability and the reaction of its customers is likely to hinge on how quickly the water system is able to respond and to assure customers that the drinking water is safe.

For more information on protecting drinking water, visit the EPA Web site at www.epa.gov/safewater/watersecurity.

Financial Capacity

Financial capacity is the ability to acquire and manage sufficient financial resources. Associated elements include having sufficient revenue to cover the true costs of service, access to credit through public or private sources, and the use of standardized and accepted budgeting, accounting, and capital planning techniques. Revenue to cover the true costs of service demands that the water system develop and adjust a fair rate structure that provides sufficient income to cover current and future operations, including repairs and capital and equipment replacements, and to provide sufficient emergency reserves for unexpected events. Additional information about federal and Colorado programs to provide loans and grants for infrastructure improvement is provided in Part V.

Effectively addressing the TMF elements of water system capacity helps avoid most situations that lead to non-compliance or unsafe conditions. A simple checklist of some of the most important TMF characteristics of a properly managed water system is included in Part III. Additionally, a more sophisticated questionnaire, along with a reference to an electronic assessment tool developed by the Maryland Center for Environmental Training and other references, are provided on the reference CD.

Summary and Additional Resources

Constant diligence is needed to maintain safe drinking water. It is a difficult and demanding business. But water system representatives do not have to conquer these challenges on their own. Whether the necessary practices to ensure continuously safe drinking water are voluntary or mandated by regulation, assistance is available to facilitate their accomplishment.

- The CDPHE Drinking Water Program is available to help water system representatives understand all regulatory requirements. They provide training on new regulatory requirements, develop and distribute guidance material, and are available daily via e-mail or telephone to respond to specific questions from all regulated entities and their consumers.
- The Drinking Water Program is also active, along with a host of third-party entities and other government agencies, to provide assistance with the voluntary aspects of producing safe drinking water. The Drinking Water Program has a capacity development effort dedicated to public water systems, and its strategy and annual work plan are available on the Drinking Water Program Web site. The capacity development effort is coordinated with and supports the efforts of third-party entities including the Colorado Rural Water Association, the Rocky Mountain Section of the American Water Works Association, and the Operator Certification Program Office. Additional information on capacity development is available in Part V and on the reference CD.
- The Drinking Water Program, through its source water protection staff, helps water systems develop management plans to address significant threatening sources of potential contamination. Additional information about the Source Water Assessment and Protection Program is available in Part V.

- Through its Outreach and Assistance Unit, the CDPHE provides a coordinated resource to multiple grant and loan funding sources to improve drinking water system infrastructure. In this effort, CDPHE is partnered with the Colorado Water Resources and Power Development Authority and the Department of Local Affairs to provide loans and grants for eligible public water systems. Additional information about financial assistance is available in Part V.

Finally, the EPA provides a rich source of regulatory and technical, managerial, and financial information for public water systems. Their Web site (www.epa.gov/safewater/) has many of these resources posted, and their Safe Drinking Water Hotline (1-800-426-4791) refers callers to sources of additional information.

Part II. Applicable Colorado Regulations

Part II. Applicable Colorado Regulations

This Guide was designed to help system representatives understand the regulations and how to apply them. However, questions will arise that are not fully addressed in this document, so system representatives are strongly encouraged to contact the Rule Managers at the Drinking Water Program within the Water Quality Control Division (WQCD) to clarify the rules before confusion results in a violation. Moreover, if a system is experiencing problems that have led or will lead to a violation, representatives should contact the Drinking Water Program as soon as possible so that the acute team (described in Part I) can assemble to provide assistance.

After each requirement, a citation is shown in parentheses indicating where in the Colorado regulations that requirement can be found. The Colorado Primary Drinking Water Regulations (CPDWR) are found in Title 5 of the Code of Colorado Regulations, Section 1003-1 (abbreviated as 5 CCR 1003-1), January 19, 2005, and are on-line at the Drinking Water Program Web site at www.cdphe.state.co.us/wq/drinkingwater/index.html.

The CPDWR discussed in this guidance apply to all non-transient, non-community water systems (NTNCWSs) that use surface water or ground water under the direct influence of surface water.

Surface water is defined as any water source that is open to the atmosphere and subject to surface runoff. Ground water under the direct influence of surface water (GWUDI) is defined as any water beneath the surface of the ground with 1 of the following characteristics (Art. 1, Sect. 1.5.2 of CPDWR):

- Significant occurrence of insects or other macro-organisms, algae, or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium;* or
- Significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH that closely correlate to climatological or surface water conditions.

GWUDI sources are classified together with surface water sources and must meet the same requirements as surface water systems. In this document, the term "surface water system" includes GWUDI systems (Art. 1, Sect. 1.5.2).

A non-transient population is the average number of individuals served per day during the year or normal operating period(s) who do not reside at the place served by the water system but have regular opportunities to consume water produced by the system. Regular opportunity is defined as 4 or more hours per day, for 4 or more days per week, for 6 months or more per year (Art. 1, Sect. 1.5.2(77)).

An NTNCWS is defined as a water system that regularly serves 25 or more of the same people for more than 6 months per year (Art. 1, Sect. 1.5.2(76)) unless a system meets all of the following conditions:

- Consists only of distribution and storage facilities;
- Obtains all of its water from a public water system subject to the CPDWR;
- Does not sell water to any person; and
- Does not engage in interstate commerce (Art. 1, Sect. 1.2).

Article 1. General Requirements

This article addresses general requirements common to all systems. Special attention should be paid to reporting, plan approval, and monitoring plan requirements because historically they represent the most common areas of non-compliance in this article of the CPDWR.

Reporting

Unless otherwise specified, a system must report to the state any required test results within the first 10 days following the month in which the result is received or the end of the required monitoring period, whichever is sooner (Art. 1, Sect. 1.6.4(a)).

Unless otherwise specified, a system must report the failure to comply with any CPDWR requirement (including monitoring requirements) to the state within 48 hours (Art. 1, Sect. 1.6.4(b)).

Systems are not required to report analytical results if a state laboratory performs the analysis and reports the results to the state (Art. 1, Sect. 1.6.4(c)).

Within 10 days of conducting public notification, the public water system must submit to the state a certification that it has fully complied with the public

notification regulations. The system must include with this certification a copy of each type of notice distributed, published, and posted (Art. 1, Sect. 1.6.4(d)).

Systems should use the following reporting forms:
- Tier 1 Certificate of Delivery Form (page 99)
- Tier 2 Certificate of Delivery Form (page 100)
- Tier 3 Certificate of Delivery Form (page 101)

Recordkeeping

Upon request, the system must submit to the state copies of any records required to be maintained or copies of any documents that the state or the U.S. Environmental Protection Agency (EPA) Administrator is entitled to inspect (Art. 1, Sect. 1.6.3).

Any owner or operator of a public water system must retain on or near its premises the following records:
- Microbiological analysis records (for at least 5 years) and chemical analysis records (for at least 10 years). Actual laboratory reports may be kept, or data may be transferred to tabular summaries, provided that the following information is included (Art. 1, Sect. 1.6.3(a)):
  - Date, place, and time of sampling and person who collected the sample;
  - Identification of the sample as a routine distribution system sample, check sample, raw or processed water sample, or other special-purpose sample;
  - Date of analysis;
  - Laboratory and person performing analysis;
  - Analytical technique or method used; and
  - Results of the analysis.
- Records of actions taken to correct violations of CPDWR must be kept for at least 3 years after the last action taken in response to a particular violation (Art. 1, Sect. 1.6.3(b)).
- Copies of any documents relating to sanitary surveys must be kept for at least 10 years after completion of the sanitary survey involved (Art. 1, Sect. 1.6.3(c)).
- Records concerning a variance or exemption granted to the system must be kept for at least 5 years after the expiration of such variance or exemption (Art. 1, Sect. 1.6.3(d)).
- Copies of public notices issued and certifications made to the state must be kept for 3 years after issuance (Art. 1, Sect. 1.6.3(e)).

Tampering

The public water system shall notify the state as soon as possible, but no later than 10 a.m. of the day following any tampering or receipt of tampering threat to the system. Within 5 days the system must provide the state with written notice explaining the circumstances of the event and actions taken (Art. 1, Sect. 1.6.8).

> ***Tamper**: To introduce a contaminant into a public water system or into drinking water or to otherwise interfere with drinking water or the operation of a public water system with the intention of harming people or public water systems.*

Examples of incidents that should be reported include vandalism, theft, threats against the water system or its employees, damage to equipment, intentional disruption of operations, criminal or terrorist activities, and suspicious activities or people near water facilities. Although some incidents, such as defacing or "tagging," may not adhere to the strict definition of tampering, they may correlate with other events in the system or community that do indicate tampering. When in doubt, report!

Use of Point-of-Entry Devices and Bottled Water

Point-of-Entry Devices

A point-of-entry (POE) device may be a feasible treatment for maximum contaminant level (MCL) compliance in lieu of central treatment in some situations. Public water systems may use POE devices to comply with MCLs only if systems meet the following requirements (Art. 1, Sect. 1.6.10):
- Must operate and maintain the POE treatment system.
- Must develop and obtain state approval for a monitoring plan before POE devices are installed. POE devices must provide water that meets all National Primary Drinking Water Regulations (NPDWR).
- Every building connected to the system must have a POE device installed, maintained, and adequately monitored. The rights and responsibilities of the water system customer must be conveyed with the title when the property is sold.

Bottled Water

Public water systems may not use bottled water to achieve MCL compliance; however, bottled water may be used temporarily to avoid unreasonable risk to health (Art. 1, Sect. 1.6.11).

Consecutive and Integrated Systems

A consecutive system is a public water system that receives, through purchase or other means, treated water from another system and distributes that water only through a distribution system it owns. Consecutive systems are subject to the monitoring, reporting, MCLs, and other provisions of the regulations unless the supply system has assumed the responsibility for regulatory compliance and meets the requirements for an integrated system (Art. 1, Sect. 1.9).

An integrated system consists of 2 or more public water systems that are physically connected and have agreed to operate using a common set of standards. The supply system shall establish and ensure compliance with requirements for the integrated system (Art. 1, Sect. 1.10).

Plan Approval for Location and Construction of Waterworks

Before constructing a new public water system or increasing the capacity of an existing system, the water system must perform and receive Drinking Water Program approval of a capacity assessment conducted in accordance with the criteria of the *New Public Water System Capacity Planning Manual* (on reference CD). To the extent practicable, the site should not be subject to a significant risk from earthquakes, floods, fires, or other disasters and, except for intake structures, should not be within the floodplain of a 100-year flood. Construction may not begin until the state has approved the design plans and specifications for a new system or modifications to an existing system (Art. 1, Sects. 1.11.2 and 1.11.3).

Monitoring Plans

Each public water system shall develop and implement a monitoring plan (Art. 1, Sect. 1.12). The system shall maintain the plan and make it available for inspection by the state. Two copies of the plan must be submitted to the Drinking Water Program. Any changes to the plan must be submitted within 30 calendar days following the effective date of the change (Art. 1, Sect. 1.12.3).

A monitoring plan must include the following:

- System summary;
- Water source details;
- Water treatment details;
- Distribution system details; and
- Individual rule sampling plans.

These elements are described in detail in the CPDWR (Art.1, Sect. 1.12.1). Instructions for designing a monitoring plan are provided on the reference CD.

Article 2. Maximum Contaminant Levels

Maximum contaminant levels (MCLs) for specific compounds are provided in Articles 5–8 of this Guide.

MCLs, maximum residual disinfectant levels (MRDLs), action levels, and treatment techniques (TTs) for drinking water contaminants are established by the EPA and adopted by the Drinking Water Program. Within the articles that follow, these contaminants and their MCLs are listed by contaminant category, along with common sources of contamination, public health effects, and public health goals.

Article 3. Secondary MCLs

Consumers often judge the acceptability of water by aesthetic qualities. Secondary standards have been developed to prevent undesirable aesthetic water quality. Although they are non-enforceable, meeting secondary standards is essential for customer satisfaction.

Secondary MCLs (SMCLs) are non-enforceable standards that address properties of drinking water that may have undesirable aesthetic effects such as color, taste, and odor. At higher concentrations of these contaminants, health implications might also exist along with the aesthetic degradation. These standards are intended as guidelines and are provided in **Table 4**. They represent reasonable goals for drinking water quality, or levels above which the contaminants may trigger customer complaints about appearance, taste, odor, or staining of laundry and plumbing fixtures.

Although the SMCLs are non-enforceable standards, public water systems that exceed the secondary standard for fluoride must provide a special public notification to their customers annually (Art. 9, Sect. 9.2.8).

All water suppliers should be aware that when their water is safe to drink (i.e., meets all CPDWR requirements) but has disagreeable taste, color, or odor or causes diarrhea among the unacclimated, then consumers are likely to substitute a source that looks, tastes, and smells good but may be unsafe (such as a local untreated or untested spring). It is for this reason that water supply professionals developed the SMCLs. Water that meets all the SMCLs is most likely to be

Table 4 Secondary Drinking Water Standards	
Contaminant	**Secondary Standard**
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	Non-corrosive
Fluoride	2.0 mg/L
Foaming agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5–8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total dissolved solids	500 mg/L
Zinc	5 mg/L

aesthetically pleasing to the consumer, and when it meets all CPDWR requirements, it is also safe to drink.

Article 4. Variances and Exemptions

Variances and exemptions are granted infrequently because the qualification requirements are stringent and apply only to specific parts of the CPDWR. A public water system may be eligible for a variance if it fails to meet an MCL after installation of best available technology (as defined by EPA) because of the nature of its source water. A public water system may be eligible for an exemption from an MCL or TT if, among other factors, it is unable to comply with or secure an alternative source of water supply for compelling factors and the exemption will not result in an unreasonable risk to health.

The state may grant variances or exemptions from certain provisions of the CPDWR, subject to terms and conditions that the EPA Administrator shall deem appropriate to protect public health. Circumstances in which no variance or exemptions may be granted include the following (Art. 4, Sect. 4.1):

- MCL for total coliform;
- TT requirements for the filtration for surface water sources; and
- Disinfection residual requirement at point of entry for systems using surface water.

The state may grant 1 or more variances from applicable regulations because the system cannot reasonably meet the MCL and the variance will not result in an unreasonable risk to health (Art. 4, Sect. 4.2).

Public water systems serving 3,300 or fewer people (and, with approval of the EPA Administrator, systems serving between 3,300 and 10,000 people) may receive a small-system variance to certain MCL or TT requirements as contained in the regulations (Art. 4, Sect. 4.3).

The state may exempt a public water system from any MCL or TT requirements upon identification of compelling factors, providing the exemption does not pose an unreasonable risk to public health (Art. 4, Sect. 4.4).

Article 5. Microbiological Contaminants

Violations of the total coliform monitoring and MCL requirements are among the most common in public water systems. A well-managed water system will never encounter a violation of the monitoring requirements. It is especially rare that a positive routine total coliform sample result is not caused by improper management, operation, or sampling technique. Total coliform monitoring is essential for protecting public health. Receipt of any positive routine total coliform sample necessitates immediate repeat sampling followed by a complete investigation to determine the cause of the positive result. If total coliforms are present in both a routine and a repeat sample and either result indicates the presence of fecal coliform or E. coli, the Drinking Water Program must be notified immediately. Such presence is a violation that may pose an acute risk to public health and necessitates a boil-water notice.

Total Coliform

All NTNCWSs must monitor total coliform bacteria, the presence of which indicates possible problems in the treatment processes or distribution and storage systems. The number of samples required is based on system size (*see* **Table 5**).

Public water systems that detect total coliform bacteria must test for fecal coliform or *E. coli,* take immediate repeat samples, and conduct an investigation to determine the cause and remedy the situation. For a brief overview, see *Total Coliform Rule: A Quick Reference Guide* (EPA 816-01-035) in Part IV and on the reference CD. NOTE: Colorado has an additional requirement that systems conduct an investigation for each total coliform–positive routine sample. A total coliform monitoring flowchart is also provided in **Figure 5**.

The MCL for total coliform is based on the presence or absence of total coliform in a sample (**Table 6**). System operators must determine compliance with the MCL for total coliform each month in which monitoring is required (Art. 5, Sect. 5.7). A total coliform MCL violation must be reported to the state by no later than the end of the business day, and the public must be notified of the violation.

MCL violations are determined when any of the following situations occur (Art. 5, Sect. 5.7(a)–(b)):

- Any fecal coliform–positive or *E. coli*–positive routine sample is followed by a total coliform–positive sample (acute MCL violation).
- Any repeat sample is fecal coliform–positive or *E. coli*–positive (acute MCL violation).
- More than 1 routine or repeat sample per month is total coliform–positive for a system collecting fewer than 40 samples per month.
- More than 5 percent of the routine and repeat samples in a month are total coliform–positive in systems collecting at least 40 samples per month.

Failure to comply with the monitoring requirements is a violation and must be reported to the state within 10 days of discovery, and the public must be notified of the violation.

An acute MCL violation requires immediate action and occurs when (1) any repeat sample is fecal or E. coli*–positive or (2) any fecal or* E. coli*–positive routine sample is followed by a positive total coliform repeat sample.*

Routine Monitoring

Systems must collect total coliform samples at sites representative of water throughout the distribution system according to a written sampling plan. These plans are subject to state review and revision (Art. 5, Sect. 5.1.1(a)). Systems must collect routine samples at regular time intervals throughout the month.

The monitoring frequency is based on the population served, as shown in **Table 5** (Art. 5, Table 5-1).

Repeat Monitoring

If a routine sample is total coliform–positive, the system must collect a set of repeat samples within 24 hours of learning of the positive result.

Table 5
Total Coliform Monitoring Frequencies for Surface Water NTNCWSs (Art. 5, Table 5-1)[1]

Population Served	Samples per Month
<1,000	1
1,001–2,500	2
2,501–3,300	3
3,301–4,100	4
4,101–4,900	5
4,901–5,800	6
5,801–6,700	7
6,701–7,600	8
7,601–8,500	9
8,501–12,900	10
12,901–17,200	15
17,201–21,500	20
21,501–25,000	25

1. Systems serving more than 25,000 people should review Article 5, Table 5-1, for monitoring requirements.

- A system that collects 1 routine sample per month or fewer must collect at least 4 repeat samples for each total coliform–positive sample found.
- A system that collects more than 1 routine sample per month must collect at least 3 repeat samples for each total coliform–positive sample found.

Routine monitoring for chlorine and chloramine residuals is conducted at the same location and same time as routine total coliform sampling. Routine monitoring for systems using chlorine dioxide is conducted daily at the entrance to the distribution system.

If a system has a logistical problem in collecting a repeat sample within 24 hours that is beyond its control, it may request an extension from the state. If the system believes it qualifies for an extension, it must notify the state no later than 24 hours after the system is notified of a positive result (Art. 5, Sect. 5.1.2(a)). If an extension is granted, the state will specify the new due date for collecting the repeat samples.

All repeat samples must be collected on the same day at the following locations (*see* **Figure 6**):

- Tap where the original total coliform–positive sample was taken.
- Taps both upstream and downstream within 5 service connections of the original sample site.
- If a fourth sample is required, it may be collected at any location in the system.

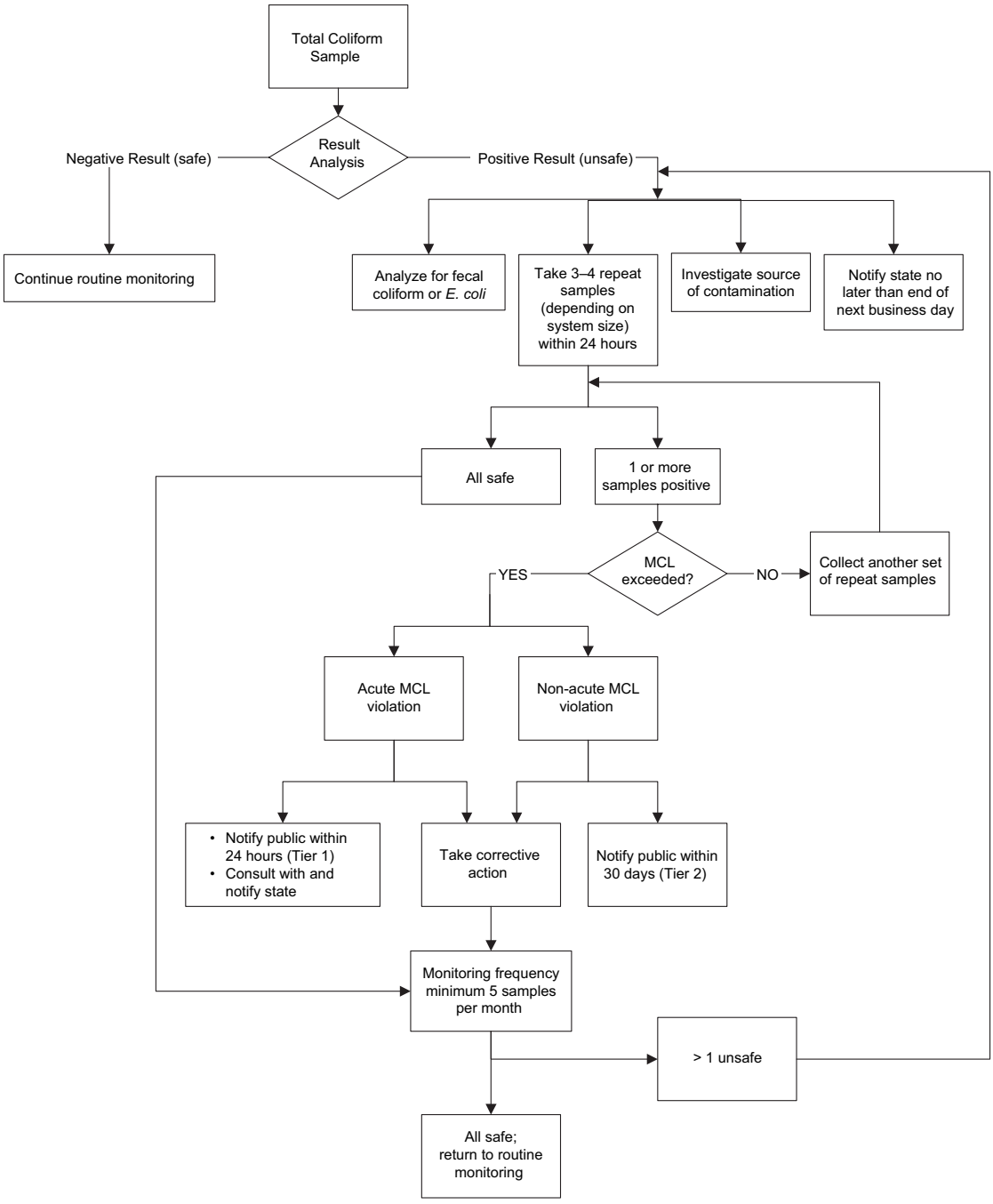


Figure 5. Generalized total coliform monitoring

Table 6
Total Coliform Contaminant Information

Contaminant	MCL (% of positive samples)	Potential Health Effects from Exposure Above the MCL	Common Sources of Contaminant in Drinking Water	Public Health Goal (mg/L)
Total coliforms (including fecal coliform and *E. coli*)	5.0[1]	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present.	Coliforms are naturally present in the environment and in feces; fecal coliforms and *E. coli* come only from human and animal fecal waste.	Zero

1. For a system collecting fewer than 40 samples per month, the MCL is exceeded when more than 1 routine or repeat sample per month is total coliform–positive.

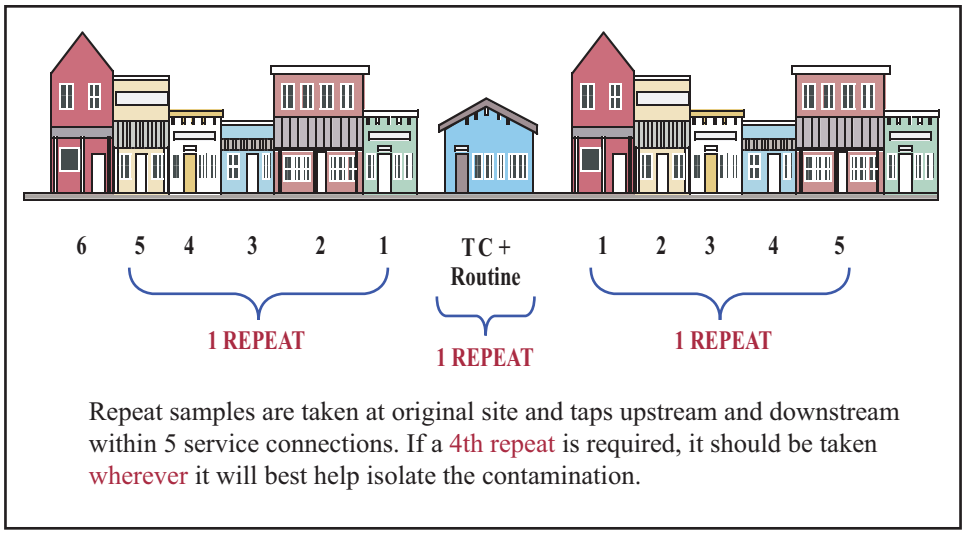


Figure 6. Locations for coliform repeat sampling

If a total coliform–positive sample is at the end of the distribution system or 1 service connection away from the end of the distribution system, the state may waive the requirement to collect at least 1 repeat sample upstream or downstream of the original sampling site and specify more appropriate sampling locations for the repeat sample monitoring (Art. 5, Sect. 5.1.2(c)).

The system must repeat this process until either total coliform is not detected in 1 complete set of repeat samples or the system exceeds the MCL for total coliform and notifies the state. If the system exceeds the MCL, it must continue to monitor at least once a week for the rest of the month or until total coliform is not detected in 2 consecutive samples taken at the original sampling location.

Results of all routine and repeat samples must be included in determining compliance with the MCL for total coliform. Special-purpose samples, such as those taken to check disinfection after pipe replacement or repair, will not be used to determine compliance (Art. 5, Sects. 5.1.2(e), 5.7(d), and 5.1.1(f)).

Any total coliform sample designated as "special purpose" will not be accepted for compliance. The term "special-purpose sample" refers to non-compliance samples (i.e., water that has no chance of actually being consumed, such as the water in disinfected sections of repaired pipes before their flushing and return to service); it does not refer to repeat sampling or any other distribution system sampling to be used for compliance purposes.

Invalidation of Total Coliform–Positive Samples

A total coliform–positive sample may be invalidated by the state if the positive result was caused by improper sample analysis, resulted from a domestic or other non-distribution system plumbing problem, or was caused by a condition that does not reflect the water quality in the distribution system. The specific cause of the positive result and the system's corrective action must be documented in writing. The state may not invalidate a total coliform–positive sample solely on the grounds that all repeat samples are total coliform–negative. If a sample is invalidated, the system must collect another sample from the same location as the original sample within 24 hours (Art. 5, Sect. 5.3).

Investigation of Total Coliform–Positive Samples

After repeat samples are taken, the system must investigate the reason for any total coliform–positive routine samples. The investigation must examine conditions at the sources, treatment facilities, storage sites, and distribution system, and it must also include an evaluation of the potential for unprotected cross-connections. The scope of the investigation may be modified to consider conditions unique to the system's size, sources, and distribution system layout and the location of cross-connection control devices relative to the location of a total coliform–positive sample result (Art. 5, Sect. 5.2(a)).

The results of the investigation must be made available when the repeat sample results become available. These results will be used if the system has an acute violation

of the total coliform MCL necessitating consultation with the state to determine the need for a boil-water notice or other public notice requirements (Art. 5, Sect. 5.2(b)).

The water system is required to investigate the reason for every total coliform–positive sample result. This investigation must be documented in the system's records but need not be submitted to the state unless requested.

Routine Monitoring After Positive Samples

If a water system that collects fewer than 5 routine samples per month has at least 1 total coliform–positive sample and the state does not invalidate the sample, then the system must collect at least 5 routine samples during the next month in which the system provides water to the public. The Colorado Department of Public Health and Environment (CDPHE) may waive this requirement if the conditions of Article 5, Section 5.1.2(f)(1) or (2), are met.

Reporting

Results of all routine total coliform samples must be reported within 10 days of the end of the reporting period. Routine samples with the presence of fecal or *E. coli* and MCL violations for coliform must be reported to the state not later than the end of the next business day.

Systems and state-certified laboratories must use the following reporting forms:

- For each sampling point: Reporting Form for Bacteriological Analysis (see page 70)
- Monthly or quarterly summary when all results are negative: Form 1 – Routine Safe Sample Data Summary (see page 71)
- Summary when positive coliforms are detected: Form 2 – Unsafe Routine Sample Data and Repeats (see page 72)

Article 6. Chemical Contaminants

This article addresses a large number of contaminants. It is important to remember that prompt notification to the state is required for MCL exceedances. Equally important is the requirement to take confirmation samples that, depending on the contaminant, may be required within 24 hours after learning of an MCL exceedance.

Systems should make every effort to understand compositing because it can reduce laboratory costs substantially. However, compositing rules vary for different contaminants, and a misunderstanding of these rules can lead to unexpected monitoring violations.

Inorganic Chemicals

NTNCWSs must monitor to ensure that they are in compliance with the MCLs for inorganic chemical (IOC) contaminants in **Table 7** (Art. 2, Sect. 2.2(a)–(b)). Monitoring frequencies are based on a 9-year compliance cycle. The current compliance cycle lasts from January 2002 to December 2010. Each compliance cycle is composed of three 3-year compliance periods (e.g., January 2002–December 2004, January 2005–December 2007, and January 2008–December 2010) (Art. 1, Sect. 1.5.2(11)).

The required monitoring frequency for IOCs varies from quarterly to every 9 years, depending on the contaminant and the contaminant concentrations. Some systems may qualify for a waiver for certain inorganic contaminants. To qualify for a waiver, systems must have a minimum of 3 years of monitoring data with results less than the MCL and submit a request to the state in writing (Art. 6, Sect. 6.1.5(d)).

Figure 7 summarizes the monitoring requirements for IOCs.

Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cyanide, Fluoride, Mercury, Nickel, Selenium, and Thallium

Routine Monitoring

Systems must take samples at every entry point to the distribution system that is representative of a source after treatment. Each system must monitor at the time designated by the state during each compliance period (Art. 6, Sects. 6.1.5(b)(1) and (b)(3)).

All samples for IOCs must be analyzed by a certified laboratory and follow approved sample collection procedures (Art. 10, Sect. 10.2.2(b)).

The state may reduce the total number of samples to be analyzed by allowing the use of compositing (combined samples). Composite samples from a maximum of 5 sample points are allowed in certain cases. See Article 6, Section 6.1.5(b)(4) for more information. Compositing of samples must be done in the laboratory. For systems

Table 7 Inorganic Chemical Contaminant List				
Contaminant	**MCL or TT (mg/L)[1]**	**Potential Health Effects from Exposure Above the MCL**	**Common Sources of Contaminant in Drinking Water**	**Public Health Goal (mg/L)[1]**
Antimony	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	0.006
Arsenic	0.010	Skin damage or problems with circulatory system; possible increased risk of cancer	Erosion of natural deposits; runoff from orchards, runoff from glass and electronics production wastes	0
Asbestos (fibers >10 micrometers)	7 million fibers per liter (MFL)	Increased risk of benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	7 MFL
Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	2
Beryllium	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	0.004
Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	0.005
Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	0.1
Copper	TT[2]; action level = 1.3	Short-term exposure: gastrointestinal distress. Long-term exposure: liver or kidney damage. People with Wilson's disease should consult their doctor if the amount of copper in their water exceeds the action level.	Corrosion of household plumbing systems; erosion of natural deposits	1.3
Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	Discharge from steel or other metal factories; discharge from plastic and fertilizer factories	0.2
Fluoride	N/A[3]	Bone disease (pain and tenderness of the bones); children may get mottled teeth.	Water additive that promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	4.0
Lead	TT[2]; action level = 0.015	Infants and children: delays in physical or mental development; children could show slight deficits in attention span and learning abilities. Adults: kidney problems; high blood pressure.	Corrosion of household plumbing systems; erosion of natural deposits	Zero
Mercury (inorganic)	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and cropland	0.002
Nickel	N/A	Decreased body weight; heart and liver damage; dermatitis	Leaching from natural deposits; discharges from industrial processes.	N/A
Nitrate (measured as nitrogen)	10	Infants below the age of 6 months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	10
Nitrite (measured as nitrogen)	1	Infants below the age of 6 months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	1
Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines	0.05
Thallium	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories	0.0005

1. Units are in milligrams per liter unless otherwise noted.

2. Lead and copper have a treatment technique in place of an MCL. Lead and copper are discussed in Article 8 of this Guide.

3. The fluoride MCL of 4.0 mg/L applies to NTNCWSs only when specified by the state.

NOTE: Detection limits for most inorganic chemical contaminants vary by method.

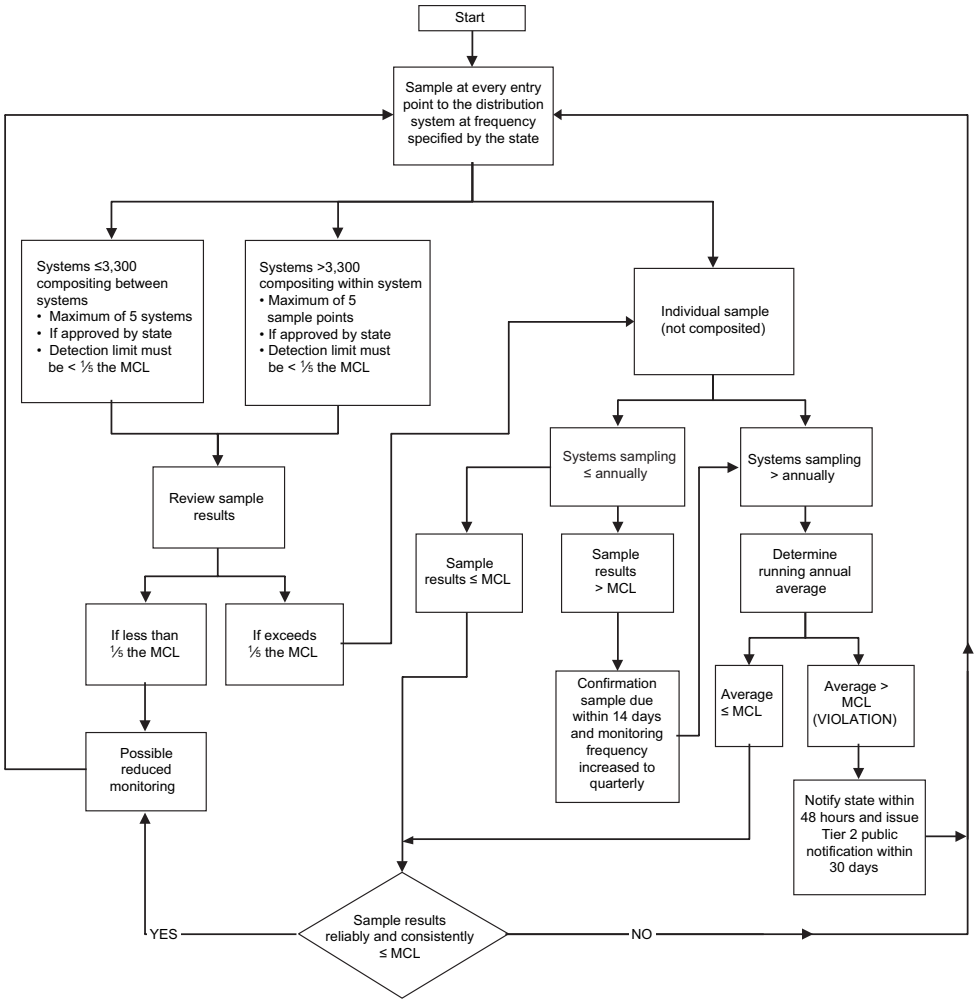


Figure 7. Generalized IOC monitoring

serving more than 3,300 people, the state may allow compositing within a single system (Art. 6, Sect. 6.1.5(b)(4)(ii)). If the concentration in the composite sample is greater than or equal to one-fifth of the MCL for any compound, then a follow-up sample must be taken at each sampling point included in the composite within 14 days.

For systems serving 3,300 or fewer people, the state may allow compositing among different systems provided that the 5-sample limit is maintained.

Systems that exceed an MCL must monitor quarterly beginning in the next quarter after the exceedance occurred. After a violation has been determined (Art. 6, Sect. 6.1.3(a)), the state may decrease the quarterly monitoring requirement if it determines that the system is reliably and consistently below the MCL (Art. 6, Sect. 6.1.5(d)(8)–(9)). The determination will be made after the system takes a minimum of 4 quarterly samples.

Compliance

For systems that monitor more than once a year, compliance with the MCLs for IOCs is determined by a running annual average (RAA) at any sampling point. A system is out of compliance if the average at any sampling point exceeds the MCL. If any 1 sample would cause the RAA to be exceeded, then the system is out of compliance immediately.

For systems that monitor annually or less frequently, compliance is based on the average of the initial sample and any state-required confirmation samples. The system is out of compliance if the average of the initial sample and confirmation samples exceed the MCL.

If any system fails to collect the required number of samples, compliance (average concentration) will be based on the total number of samples collected (Art. 6, Sect. 6.1.3(a)).

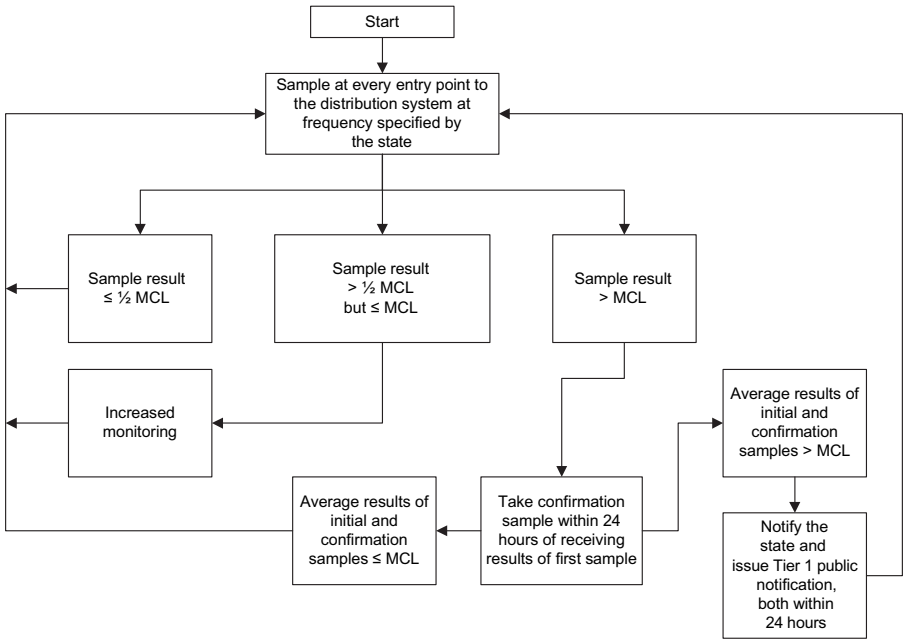


Figure 8. Generalized nitrate/nitrite monitoring

Reporting

Results must be reported within 10 days after the results of the analysis are received or within 10 days after the end of the compliance period, whichever is sooner.

If the MCL is exceeded, the system must report to the state within 48 hours after receiving the monitoring results.

Systems and state-certified laboratories must use the Reporting Form for Inorganic Contaminants Analyses for reporting all IOCs other than nitrate and nitrite (on reference CD).

Nitrate and Nitrite

Nitrate

NTNCWSs using surface water must monitor nitrate quarterly. **Figure 8** summarizes the nitrate monitoring requirements. The state may allow a system to reduce the sampling frequency to annually after 4 consecutive quarterly samples are less than 5 mg/L. Systems that have monitored quarterly in the past but currently monitor annually must sample during the quarter that previously yielded the highest result (Art. 6, Sect. 6.1.5(e)).

Although the MCL for nitrate is 10 mg/L, nitrate levels up to 20 mg/L for non-community water systems may be allowed by the state under certain circumstances. Such systems must demonstrate that water will not be available to children younger than 6 months, public notification requirements are being met, local and state public health authorities are notified, and no adverse health effects will result (Art. 6, Sect. 6.1.1(c)).

Nitrite

All systems must monitor to determine compliance with the nitrite MCL. **Figure 8** summarizes the nitrite monitoring requirements. After the initial sample, systems that have a nitrite concentration of less than 0.5 mg/L must monitor once during each 9-year compliance cycle, or more often if required by the state. Systems must monitor quarterly for at least 1 year after any sample in which the concentration is 0.5 mg/L or higher. The state may allow a system to reduce the sampling frequency to annually after determining the system is reliably and consistently below the MCL. Systems that monitor annually must take each subsequent sample during the quarters that previously resulted in the highest analytical result (Art. 6, Sect. 6.1.5(f)).

Confirmation Samples

Where nitrate or nitrite sampling results exceed the MCL, the system must take a confirmation sample within 24 hours of learning the results of the first sample. Systems unable to comply with the 24-hour

sampling requirement must immediately notify the people they serve according to the requirements for Tier 1 notification. These systems must then take a confirmation sample within 2 weeks of learning the results of the first sample (Art. 6, Sect. 6.1.5(g)(2)).

Compliance

Compliance with the MCLs for nitrate and nitrite is determined based on 1 sample if the levels of these contaminants are below the MCLs. If the level of nitrate or nitrite exceeds the MCL in the initial sample, a confirmation sample is required, and compliance is determined based on the average of the initial and confirmation samples. If the average exceeds the MCL, the system is out of compliance and must notify the public according to Tier 1 requirements (Art. 6, Sect. 6.1.3(a)(3)).

Reporting

Results must be reported within 10 days after the results of the analysis are received or within 10 days after the end of the compliance period, whichever is sooner. If the MCL is exceeded, the system must notify the state as soon as possible and within 24 hours of receiving the analysis results. If the system is unable to take a confirmation sample within 24 hours, the system must notify the public in accordance with Tier 1 requirements.

Systems and state-certified laboratories must use the Reporting Form for Nitrate or Nitrite as Nitrogen Analyses (on reference CD).

Asbestos

There is a statewide vulnerability waiver for asbestos for all public water systems. If additional asbestos sampling is required, it will be noted in the annual required monitoring schedule provided to water systems by the Drinking Water Program.

Synthetic Organic Chemicals

NTNCWSs must monitor for synthetic organic chemicals (SOCs) to ensure that they are in compliance with the MCLs in **Table 8**. Monitoring frequencies are based on three 3-year compliance periods (e.g., January 2002–December 2004, January 2005–December 2007, and January 2008–December 2010) (Art. 1, Sect. 1.5.2(11)).

Monitoring Requirements

Figure 9 summarizes the monitoring requirements for SOCs. Systems must take samples at every entry point to the distribution system that is representative of a source after treatment. Each time it monitors, a system must sample at the same point unless another point is more representative of each source or treatment plant. If a system uses more than 1 source and the sources are combined before distribution, the system must sample during normal operating conditions (i.e., when water is representative of all sources being used) (Art. 6, Sect. 6.2.6(a)(1) and (a)(3)).

The state may reduce the total number of samples a system must analyze by allowing the use of compositing (combining samples). Composite samples from a maximum of 5 sampling points are allowed in certain cases. Compositing of samples must be done in the laboratory (Art. 6, Sect. 6.2.5(a)(10)).

For systems serving 3,300 or fewer people, the state may permit compositing among different systems, provided the 5-sample limit is maintained (Art. 6, Sect. 6.2.6(a)(10)(iii)). If the concentration in the composite sample is greater than or equal to one-fifth of the MCL for any compound, then a follow-up sample must be taken within 14 days at each sampling point included in the composite.

Undetected Contaminants Systems that serve 3,300 or fewer people and do not detect a contaminant during the initial compliance period may sample once at each entry point during each compliance period (1 sample every 3 years). Systems that serve more than 3,300 people may reduce the sampling frequency to 2 consecutive quarterly samples per entry point during each repeat compliance period (2 consecutive quarterly samples every 3 years). Each system must monitor at the time designated by the state within each compliance period. Systems may continue to monitor at these frequencies as long as they do not detect a contaminant (Art. 6, Sects. 6.2.3(e), 6.2.6(a)(4)(ii)–(iii), and 6.2.6(a)(5)).

Detected Contaminants If any system detects an SOC listed in **Table 8**, the system must monitor quarterly at each sampling point at which the contaminant was found. Systems that monitor annually must monitor during the quarter that yielded the highest result during quarterly monitoring (Art. 6, Sect. 6.2.6(a)(7)(i)–(iv)).

Table 8 Synthetic Organic Chemical Contaminant List					
Contaminant	**MCL (mg/L)**	**Potential Health Effects from Exposure Above the MCL**	**Common Sources of Contaminant in Drinking Water**	**Public Health Goal (mg/L)**	**Detection Level (mg/L)**
Alachlor	0.002	Eye, liver, kidney, or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	Zero	0.0002
Atrazine	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	0.003	0.0001
Benzo(a)pyrene (polycyclic aromatic hydrocarbons)	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	Zero	0.00002
Carbofuran	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	0.04	0.0009
Chlordane	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	Zero	0.0002
2,4-D	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	0.07	0.0001
Dalapon	0.2	Minor kidney changes	Runoff from herbicide used on rights of way	0.2	0.001
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	Zero	0.00002
Di(2-ethylhexyl) adipate	0.4	Weight loss, liver problems, or possible reproductive difficulties	Discharge from chemical factories	0.4	0.0006
Di(2-ethylhexyl) phthalate	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	Zero	0.0006
Dinoseb	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	0.007	0.0002
Dioxin (2,3,7,8-TCDD)	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories	Zero	0.000000005
Diquat	0.02	Cataracts	Runoff from herbicide use	0.02	0.0004
Endothall	0.1	Stomach and intestinal problems	Runoff from herbicide use	0.1	0.009
Endrin	0.002	Liver problems	Residue of banned insecticide	0.002	0.00001

Table 8 (continued) Synthetic Organic Chemical Contaminant List					
Contaminant	**MCL (mg/L)**	**Potential Health Effects from Exposure Above the MCL**	**Common Sources of Contaminant in Drinking Water**	**Public Health Goal (mg/L)**	**Detection Level (mg/L)**
Ethylene dibromide	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	Zero	0.00001
Glyphosate	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	0.7	0.006
Heptachlor	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	Zero	0.00004
Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	Zero	0.00002
Hexachlorobenzene	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	Zero	0.0001
Hexachlorocyclopentadiene	0.05	Kidney or stomach problems	Discharge from chemical factories	0.05	0.0001
Lindane	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens	0.0002	0.00002
Methoxychlor	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	0.04	0.0001
Oxamyl (Vydate)	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	0.2	0.002
Pentachlorophenol	0.001	Liver or kidney problems; increased risk of cancer	Discharge from wood-preserving factories	Zero	0.00004
Picloram	0.5	Liver problems	Herbicide runoff	0.5	0.0001
Polychlorinated biphenyls (PCBs)	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals	Zero	0.0001
Simazine	0.004	Problems with blood	Herbicide runoff	0.004	0.00007
Toxaphene	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	Zero	0.001
2,4,5-TP (Silvex)	0.05	Liver problems	Residue of banned herbicide	0.05	0.0002

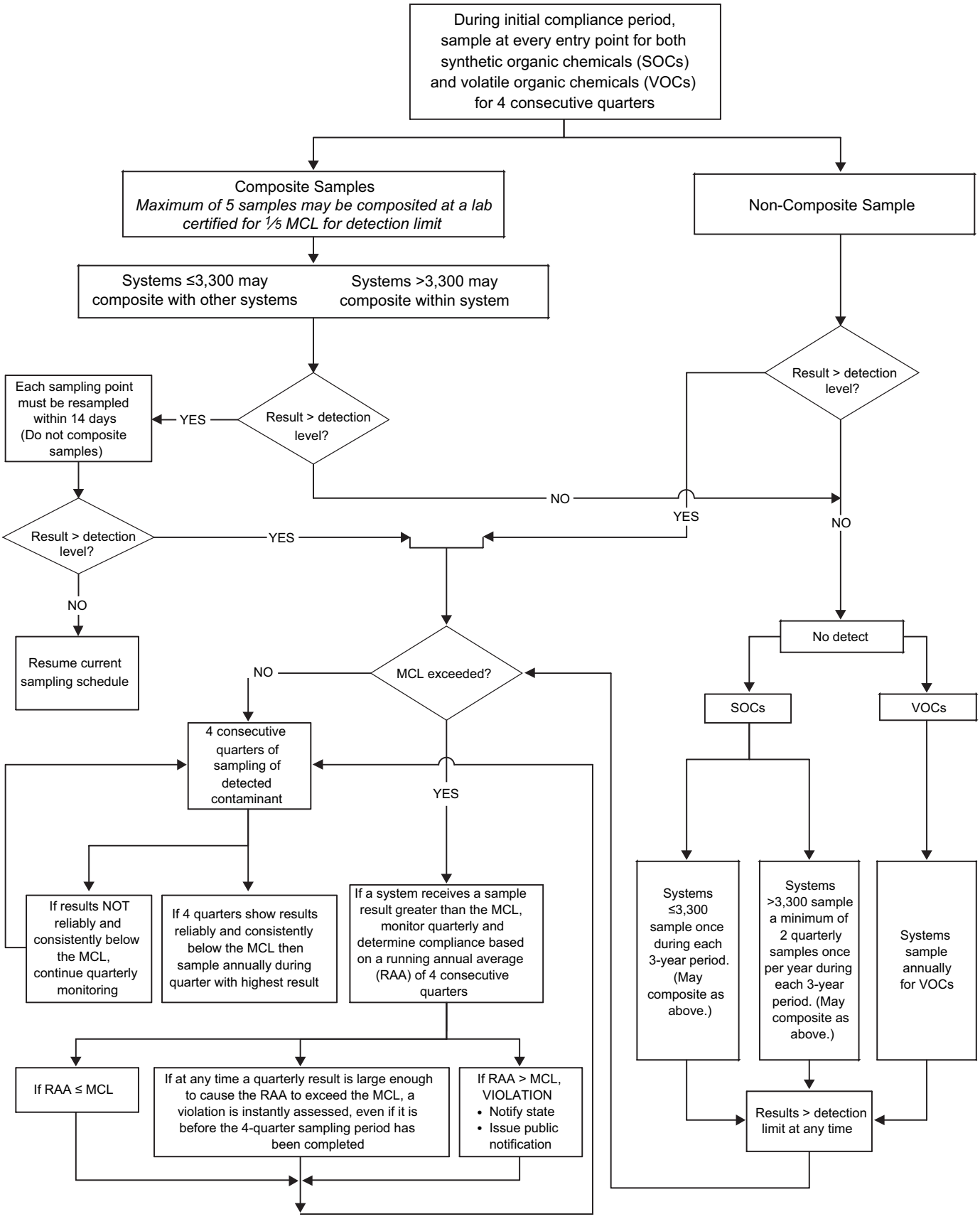


Figure 9. Generalized monitoring for SOCs and VOCs

Aldicarb, aldicarb sulfone, and aldicarb sulfoxide are currently under "administrative stay" as a result of litigation. They are therefore treated as unregulated contaminants until further notice. If a system detects heptachlor or heptachlor epoxide, the system must subsequently monitor for both contaminants (Art. 6, Sect. 6.2.6(a)(7)(v)).

Systems that violate an MCL for SOCs must monitor quarterly. After 4 quarterly samples show that the system is in compliance, and after the state determines the system is consistently below the MCL, the system may monitor annually (Art. 6, Sect. 6.2.6(a)(8)).

Compliance

Compliance is based on the analytical results obtained at each sampling point. If 1 sampling point is in violation of an MCL, the system is in violation of the MCL (Art. 6, Sect. 6.2.3(b)).

For systems monitoring more than once a year, compliance is determined by RAA at each sampling point. If the average exceeds the MCL, the system is in violation. However, if any single sample result would cause the RAA to exceed the MCL, the system is out of compliance with the MCL immediately (Art. 6, Sect. 6.2.3(b)(1)).

If a system fails to collect the required number of samples, compliance is based on the total number of samples collected. If a sample result is less than the detection limit, the sample is assigned a concentration of zero for purposes of calculating the RAA (Art. 6, Sect. 6.2.3(b)(4)–(5)).

The running annual average is calculated by averaging the concentrations of samples from a given sampling point from the last 4 quarters. The average must be recomputed every quarter. For example, if a sample is taken in the first quarter, use the last 3 quarters of the previous year to calculate the average. For an example, see Figure 11 on page 48.

Reporting

Results must be reported within 10 days after the results of the analysis are received or within 10 days after the end of the compliance period, whichever is sooner.

If the MCL is exceeded, the system must report to the state within 48 hours after receiving the results of monitoring and provide public notification.

Systems and state-certified laboratories must report regulated and unregulated SOCs on the Reporting Form for Organic Contaminants Analyses (on reference CD).

Volatile Organic Chemicals

Systems must monitor for volatile organic chemicals (VOCs) to ensure that they are in compliance with the MCLs in **Table 9**. Monitoring frequencies are based on three 3-year compliance periods (e.g., January 2002–December 2004, January 2005–December 2007, January 2008–December 2010) (Art. 1, Sect. 1.5.2(11)).

Monitoring Requirements

Systems must monitor for VOCs quarterly, annually, or at a frequency set by the state, based on previous monitoring results and whether a waiver has been obtained. At this time, the state does not have an approved organics monitoring waiver program for surface water systems. States may increase required monitoring where necessary to detect variations in the system (Art. 6, Sect. 6.2.5(a)(16)). VOC monitoring requirements are summarized in **Figure 9**.

Systems must take 1 sample at every entry point to the distribution system that is representative of each source after treatment. Systems must always sample at the same points unless another point is more representative of each source or treatment plant in the distribution system. If the system draws water from more than 1 source and the sources are combined before distribution, the system must sample during normal operating conditions (i.e., when water representative of all sources is being used) (Art. 6, Sect. 6.2.5(a)(1), (a)(3)).

The state may reduce the total number of samples a system must analyze by allowing the use of compositing (combining samples). Composite samples from a maximum of 5 sampling points are allowed in certain cases. Compositing of samples must be done in the laboratory. See Article 6, Section 6.2.5(a)(14), or consult the state. For systems serving 3,300 or fewer people, the state may permit compositing among different systems, provided the 5-sample limit is maintained (Art. 6, Sect. 6.2.5(a)(14)(ii)(C)).

Table 9 Volatile Organic Chemical Contaminant List				
Contaminant	**MCL (mg/L)**	**Potential Health Effects from Exposure Above the MCL**	**Common Sources of Contaminant in Drinking Water**	**Public Health Goal (mg/L)**
Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	Zero
Carbon tetrachloride	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	Zero
Chlorobenzene	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	0.1
o-Dichlorobenzene	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	0.6
p-Dichlorobenzene	0.075	Anemia; liver, kidney, or spleen damage; changes in blood	Discharge from industrial chemical factories	0.075
1,2-Dichloroethane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	Zero
1,1-Dichloroethylene	0.007	Liver problems	Discharge from industrial chemical factories	0.007
cis-1,2-Dichloroethylene	0.07	Liver problems	Discharge from industrial chemical factories	0.07
trans-1,2-Dichloroethylene	0.1	Liver problems	Discharge from industrial chemical factories	0.1
Dichloromethane	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories	Zero
1,2-Dichloropropane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	Zero
Ethylbenzene	0.7	Liver or kidneys problems	Discharge from petroleum refineries	0.7
Styrene	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	0.1
Tetrachloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	Zero
Toluene	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	1
1,2,4-Trichlorobenzene	0.07	Changes in adrenal glands	Discharge from textile finishing factories	0.07
1,1,1-Trichloroethane	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	0.20
1,1,2-Trichloroethane	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	0.003
Trichloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	Zero
Vinyl chloride	0.002	Increased risk of cancer	Leaching from polyvinyl chloride (PVC) pipes; discharge from plastic factories	Zero
Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	10
NOTE: The detection limit for all volatile organic chemical contaminants is 0.5 parts per billion.				

Undetected Contaminants Each surface water system that does not detect a VOC (defined as a conentration greater that 0.0005 mg/L) may apply to the state for a monitoring waiver after completing initial monitoring (Art. 6, Sect. 6.2.5(a)(5) and (a)(10)). Systems must complete a vulnerability assessment during each 3-year compliance period to remain eligible for a waiver. Each system receiving a waiver shall sample at the frequency specified by the state (Art. 6, Sect. 6.2.5(a)(10)).

Detected Contaminants If a contaminant listed in **Table 9** is detected at a level exceeding 0.0005 mg/L in any sample, then the system must monitor quarterly at each sampling point where the contaminant was detected. The state may decrease the quarterly monitoring requirement to annual monitoring if it determines that the system is reliably below the MCL. Systems that monitor annually must monitor in the quarter that yielded the highest result during quarterly monitoring (Art. 6, Sect. 6.2.5(a)(11)(i)–(iii)).

Systems that detect trichloroethylene, tetrachloroethylene, 1,2-dichloroethane, 1,1,1-trichloroethane, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, or 1,1-dichloroethylene must monitor quarterly for vinyl chloride at each sampling point where they are detected. If the system does not detect vinyl chloride, the state

may reduce the frequency to 1 sample during each 3-year compliance period.

Systems that violate the VOC MCLs in **Table 9** must monitor quarterly. After 4 consecutive quarterly samples that show the system is in compliance and after the state determines that the system is reliably below the MCL, the system may monitor annually. The state may require a confirmation sample for positive or negative results. If a confirmation sample is required by the state, the result must be averaged with the first sampling result, and the average is used for compliance determination. The state has the discretion to delete results of obvious sampling errors from this calculation (Art. 6, Sect. 6.2.5(a)(12)–(13)).

Compliance

Compliance with the MCLs is based on monitoring results at each sampling point. If 1 sampling point is in violation of an MCL, the system is in violation of the MCL (Art. 6, Sect. 6.2.3(a)).

For systems monitoring more than once a year, compliance with the MCL is determined by an RAA at each sampling point.

Systems monitoring annually or less frequently and whose sample result exceeds the MCL must begin quarterly sampling. The system is not in violation of the MCL until it has completed 1 year of quarterly sampling and the RAA of the quarterly samples exceeds the MCL. However, if an individual sample result would cause the RAA to exceed the MCL, the system is immediately out of compliance (Art. 6, Sect. 6.2.3(a)(1)–(3)).

If a system fails to collect the required number of samples, compliance is based on the total number of samples collected. If a sample result is less than the detection limit, the sample is assigned a concentration of zero for the purpose of calculating the RAA (Art. 6, Sect. 6.2.3(a)(4)–(5)).

Reporting

Results must be reported within 10 days after the results of the analysis are received or within 10 days after the end of the compliance period, whichever is sooner.

If the MCL is exceeded, the system must report to the state within 48 hours after receiving the results of monitoring and provide public notification.

Systems and state-certified laboratories must report regulated and unregulated VOCs on the Reporting Form for Organic Contaminants Analyses (on reference CD).

Treatment Technique for Control of Acrylamide and Epichlorohydrin

When acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level must not exceed the following levels (Art. 6, Sect. 6.2.2(a)–(b)):

- Acrylamide = 0.05 percent dosed at 1 part per million (ppm) (or equivalent).
- Epichlorohydrin = 0.01 percent dosed at 20 ppm (or equivalent).

Each system must certify to the state annually in writing (using third-party or manufacturer's certification) that the dose and monomer levels for acrylamide and epichlorohydrin are not exceeded.

Article 7. Filtration, Disinfection, and Disinfection Byproducts

This article addresses the need to protect drinking water from certain microbiological contaminants such as Cryptosporidium*,* Giardia*, bacteria, and viruses. Disinfection methods commonly used to inactivate certain micro-organisms may react with organic constituents found in raw water (byproduct precursors) and produce undesirable disinfection byproducts (DBPs). In order to produce consistently safe drinking water, a system must optimize its treatment processes to provide adequate microbiological removal using filtration or inactivation using disinfection while minimizing the formation of harmful DBPs. This may require the removal of DBP precursors. For a brief overview of the disinfection and surface water treatment rules, see the quick reference guides in Part IV.*

To be in compliance, systems must meet required turbidity levels and demonstrate 2-log removal or inactivation of Cryptosporidium*, 3-log removal or inactivation of* Giardia*, and 4-log removal or inactivation of viruses using specified treatment techniques (TTs). Well-run filtration plants are accorded credit for* Giardia *and* Cryptosporidium *removal efficiency in accordance with EPA guidance.*

Surface water systems that monitor DBPs annually must do so in the month of August unless the system has water temperature records showing warmer average water

Table 10 Microbiological Contaminant List[1] (Art. 7, Sects. 7.1.1(a), 7.2.1(a), and 7.3.1(a))			
Contaminant	**Public Health Goal (mg/L)**	**Potential Health Effects from Exposure Above the Public Health Goal**	**Common Sources of Contaminant in Drinking Water**
Cryptosporidium	Zero	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste
Giardia lamblia	Zero	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste
Heterotrophic plate count (HPC)	N/A	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that is naturally present in the environment
Legionella	Zero	Legionnaires' disease, a type of pneumonia	Found naturally in water; multiplies in heating systems
Viruses (enteric)	Zero	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste
1. Because these micro-organisms are difficult to detect in water, treatment techniques are required in place of MCLs.			

temperatures for a different month. Numerous reporting forms may be necessary for reporting the monitoring results. These are included on the accompanying reference CD; however, the most recent versions are best obtained through the Drinking Water Program Web site or by calling 303-692-3500.

Because of the complexity of the rules discussed in this article, several tools have been included on the accompanying reference CD to assist systems in developing disinfection profiles and benchmarks.

All NTNCWSs using surface water (including GWUDI) must disinfect and filter their water. They must also develop a disinfection profile (with some exceptions). Turbidity limits vary depending on the population served by the system and the type of filtration used.

Because some micro-organisms are difficult to detect in water, TT requirements are used in place of MCLs for *Giardia,* viruses, *Legionella,* heterotrophic plate count (HPC) bacteria, turbidity, and *Cryptosporidium*. **Table 10** summarizes the requirements for microbiological contaminants.

In addition to the TT requirements, a system may be required to develop a disinfection profile, as described under "Disinfection Profiling and Benchmarking." The information from the disinfection profile is used to establish a benchmark for inactivation or removal and to develop optimization methods to improve inactivation or removal of microbiological contaminants. Guidance on developing disinfection profiles is provided on the accompanying reference CD.

CDPHE is currently evaluating new EPA requirements under the Long Term 2 Enhanced Surface Water Treatment Rule and Stage 2 of the Disinfectants and Disinfection Byproducts Rule. Changes in the Colorado rules are expected in 2008.

Disinfection

All NTNCWSs using surface water or GWUDI must provide disinfection. Once a ground water source has been determined to be GWUDI, it must provide disinfection described in this section beginning 60 days after the system is reclassified. Failure to meet any disinfection requirement is a TT violation (Art. 7, Sect. 7.1.2).

Disinfection treatment must be sufficient to ensure that the total treatment process (removal and inactivation) of that system achieves at least 99.9 percent (3-log) inactivation of *G. lamblia* cysts and 99.99 percent (4-log) inactivation of viruses every day the system serves water to the public (Art. 7, Sect. 7.1.2(c)(1)).

The residual disinfectant concentration in the water entering the distribution system cannot be less than 0.2 mg/L for more than 4 hours. In addition, the residual disinfectant concentration in the distribution system, measured as total chlorine, combined chlorine, or chlorine dioxide, cannot be undetectable in more than 5 percent of the samples each month for any 2 consecutive months that the system serves water to the public. Water in the distribution system with HPC less than or equal

to 500/mL is deemed to have a detectable disinfectant residual (Art. 7, Sect. 7.1.2(c)(2)–(3)).

If the residual disinfectant concentration entering the distribution system falls below 0.2 mg/L, contact the state as soon as possible, but no later than the end of the next business day. ***Contact the state whether or not the residual has been restored.*** *Within the distribution system, residual concentration cannot be undetectable in more than 5 percent of the samples.*

Systems must continuously monitor the residual disinfectant concentration of the water entering the distribution system. If there is a failure in the continuous monitoring equipment, systems must take grab samples every 4 hours, in lieu of continuous monitoring, but for no more than 5 working days (Art. 7, Sect. 7.1.4(a)(2)). Systems serving 3,300 or fewer people may, on an ongoing basis, take grab samples instead of continuously monitoring. See **Table 11** for the required grab sample frequency. If more than 1 sample per day is required, each sample must be taken at a different time (Art. 7, Sect. 7.1.4(a)(2)).

Within the distribution system, systems must measure the residual disinfectant concentration when and where total coliform samples are taken (*see* Art. 7, Sect. 7.1.4(c)(3)(i)).

Disinfection Profiling and Benchmarking

A disinfection profile is a graph of daily or weekly *Giardia* or virus log inactivation values plotted over time (**Figure 10**). The disinfection profiles can be used to establish benchmarks that identify the lowest level of inactivation achieved over the given monitoring period. The benchmark level of disinfection is a level that should not be reduced as a means of achieving DBP MCL levels without consulting the Drinking Water Program.

Disinfection profiling and benchmarking requirements apply to all NTNCWSs using surface water. The state may waive profiling and benchmarking for systems if they meet certain requirements for trihalomethanes (THMs) and haloacetic acids (HAAs). Existing systems should have already collected profiling data (Art. 7, Sect. 7.2.).

Systems serving 10,000 or more people must determine their total inactivation ratio (CT) daily for a period of 1 year. Systems serving fewer than 10,000 people must make this calculation weekly. CT must be determined during peak hourly flow using the ratio $CT_{calc}/CT_{99.9}$ (Art. 7, Sects. 7.2.2(a)(3) and 7.3.2(e)):

- CT_{calc} is the CT based on the actual residual concentration and contact time.
- $CT_{99.9}$ is the CT listed in Article 10, Section 10.6, for water of a certain pH and temperature.

Table 11
Entry Point Residual Disinfectant Concentration Grab Samples for Systems Serving 3,300 or Fewer People (Art. 7, Sect. 7.1.4(a)(2))

System Size by Population	Samples per Day
500	1
501–1,000	2
1,001–2,500	3
2,501–3,300	4

To determine $CT_{99.9}$, systems must monitor the following:

- Temperature of disinfected water at each residual disinfectant sampling point;
- pH of disinfected water at each residual disinfectant sampling point if the system uses chlorine;
- Disinfectant contact time (T); and
- Residual disinfectant concentration (C) before or at the first customer and before each additional point of disinfection.

If the system applies disinfectant at only 1 point, it must determine 1 inactivation ratio ($CT_{calc}/CT_{99.9}$) before or at the first customer. If the system applies disinfectant at more than 1 point before the first customer, it must determine the CT value of each disinfection segment immediately before the next point of disinfectant application or, for the final segment, before or at the first customer.

Systems that use chloramines, chlorine dioxide, or ozone for primary disinfection must also calculate inactivation for viruses using a method approved by the state (Art. 7, Sects. 7.2.2(a)(4) and 7.3.2(f)).

A tool is included on the accompanying reference CD to aid systems in calculating values used to graph their own profiles, and a sample calculation is provided in an example in Part III.

Before changing the point of disinfection, the disinfectant itself, or the disinfection process, systems must consult with the state and calculate a disinfection

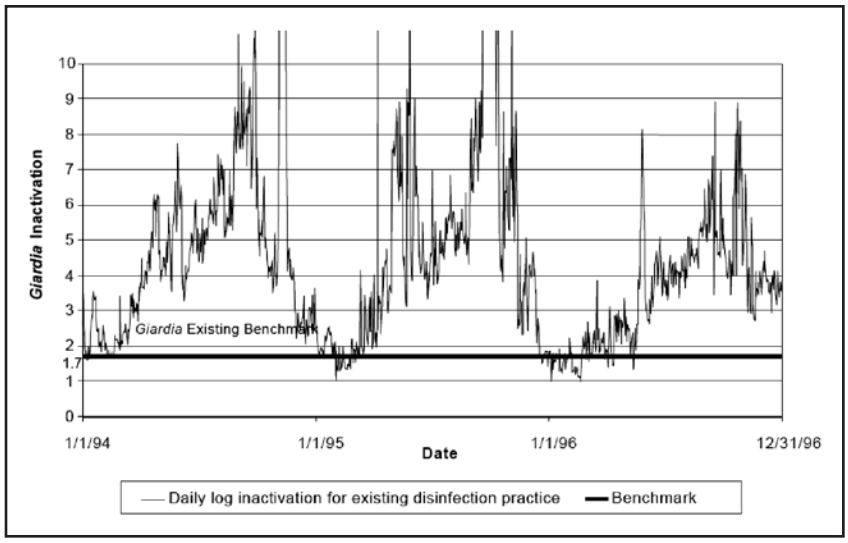


Figure 10. Example disinfection profile

benchmark based on their disinfection profiles (Art. 7, Sects. 7.2.2(b)(4) and 7.3.3(c)).

Disinfection Reporting

Disinfection data must be reported to the state within 10 days after the end of each month in which the system serves water to the public (Art. 7, Sect. 7.1.5(a)(2)).

If the residual disinfectant concentration falls below 0.2 mg/L for more than 4 hours, contact the state as soon as possible, but no later than the end of the next business day. Systems must contact the state whether or not the residual has been restored.

Systems must maintain profiling data for review during sanitary surveys (Art. 7, Sects. 7.2.2(a)(5) and 7.3.2(g)).

Filtration

Compliance with the filtration requirements is demonstrated by meeting both limits on turbidity and the 2-log, 3-log, and 4-log removal and inactivation requirements for *Cryptosporidium*, *Giardia,* and viruses, respectively. Turbidity limits vary depending on the type of filtration in place. The limits for a system's filtered water turbidity are described in **Table 12**.

Turbidity Monitoring Requirements

All systems that use filtration must monitor the combined filter effluent turbidity. Systems using conventional or direct filtration must conduct individual filter monitoring. Monitoring and reporting requirements for individual filter effluent differ slightly for systems of different sizes.

Combined Filter Effluent

Systems must measure the turbidity of their filtered water (the combined filter effluent) at least every 4 hours in which the system serves water to the public. A system may substitute continuous monitoring for grab sample monitoring if it regularly validates its measurement using a protocol approved by the state. If the state permits, systems serving up to 500 people, or using slow sand filtration or alternative filtration, may reduce sampling for filtered water turbidity to once per day (Art. 7, Sect. 7.1.4(a)(1)).

Individual Filter Effluent

In addition to monitoring combined filter effluent, systems that provide conventional or direct filtration must continuously monitor turbidity (every 15 minutes) for each individual filter. If there is a failure in the continuous turbidity monitoring equipment, the system must conduct grab sampling every 4 hours until the continuous monitoring equipment is repaired. Systems serving fewer than 10,000 people may use grab sampling for up to 14 days. Systems serving 10,000 or more people may use grab sampling for up to 5 days (Art. 7, Sects. 7.2.4 and 7.3.5(a)–(b)). Exceedance of maximum turbidity on 2 consecutive readings must be reported to the state (Art. 7, Table 7-6.).

Table 12 Turbidity Limits		
System Type	**95th Percentile (must be less than this value in 95% of the daily samples in any month)**	**Maximum Turbidity (must not exceed)**
Conventional or direct filtration	0.3 NTU	1 NTU
Membrane filtration	0.3 NTU	1 NTU
Cartridge filtration	1 NTU	5 NTU
Bag filtration	1 NTU	5 NTU
Slow sand or diatomaceous earth filtration	1 NTU	5 NTU

Table 13 Individual Filter Turbidity Requirements for Systems Serving Fewer Than 10,000 People[1, 2] (Art. 7, Table 7-6)	
If . . .	**The system must . . .**
(1) The turbidity exceeds 1.0 NTU in 2 consecutive recordings 15 minutes apart	Report to the state by the 10th day of the next month the filter numbers, dates of exceedance, turbidity values at time of exceedance, and cause of exceedance, if known.
(2) The exceedance in (1) occurs at the same filter for 3 months in a row	Conduct a self-assessment of the filter within 14 days, unless the evaluation specified in (3) is required. Self-assessment includes assessment of filter performance, development of a filter profile, identification of factors limiting filter performance, assessment of possible corrections, and preparation of a report.
(3) The turbidity exceeds 2.0 NTU in 2 consecutive recordings 15 minutes apart at the same filter for 2 months in a row	Arrange to have a comprehensive performance evaluation conducted by the state or a third party approved by the state within 60 days. Some exceptions are possible. The evaluation must be submitted to the state within 120 days after the exceedance that triggered the evaluation.
1. If a system conducts continuous monitoring of combined filter effluent rather than individual filters (as permitted for systems with only 1 or 2 filters), the requirements apply to turbidity exceedances in the combined effluent and to all filters. 2. Systems using lime softening may apply for alternative turbidity exceedance levels.	

Systems that serve fewer than 10,000 people and that have only 1 or 2 filters may conduct continuous monitoring of combined filter effluent instead of individual filter monitoring (Art. 7, Sect. 7.3.5(c)).

Compliance

Systems that serve fewer than 10,000 people and that exceed certain turbidity levels in individual filters twice in 15 minutes must meet additional requirements, as described in **Table 13**.

For systems that serve 10,000 or more people, the requirements differ. Systems that exceed certain turbidity levels in individual filters twice in 15 minutes must meet additional requirements (*see* **Table 14**) (Art. 7, Sect. 7.2.4).

Filtration Reporting

Data on turbidity in combined filter effluent must be reported within 10 days after the end of each month in which the system serves water to the public. Data must include the total number of turbidity measurements recorded during the month and the number and percentage of samples meeting turbidity limits. Systems must also report the date and value of any exceedances of the maximum turbidity limit (Art. 7, Sects. 7.1.5(a)(1), 7.2.5(a), and 7.3.6).

Systems monitoring individual filter turbidity must report every month in which they have monitored. They do not have to provide specific results unless there is an exceedance. In the event of an exceedance, systems must submit a filter profile or report the obvious reason for exceedance. Systems must keep results of individual filter monitoring for at least 3 years (Art. 7, Sects. 7.2 and 7.3).

Systems must use the following reporting forms:

- Monthly Report for Individual Filter Turbidity Monitoring (page 77)
- Conventional or Direct Filtration – Monthly Data Sheet (page 76)

Table 14 Individual Filter Turbidity Requirements for Systems Serving 10,000 or More People[1] (Art. 7, Sect. 7.2.4)	
If . . .	**The system must . . .**
(1) The turbidity exceeds 1.0 NTU in 2 consecutive recordings 15 minutes apart	Report to the state by the 10th day of the next month the filter numbers, dates of exceedance, turbidity values at time of exceedance, and cause of exceedance, if known. If cause is unknown, produce filter profile within 7 days.
(2) The turbidity exceeds 0.5 NTU in 2 consecutive recordings 15 minutes apart at the end of the first 4 hours of filter operation after filter has been backwashed or taken offline	Report to the state by the 10th day of the next month the filter numbers, dates of exceedance, turbidity values at time of exceedance, and cause of exceedance, if known. If cause is unknown, produce filter profile within 7 days.
(3) The exceedance in (1) occurs at the same filter for 3 months	In addition to reporting required in (1), conduct a self-assessment of the filter within 14 days, unless the evaluation specified in (4) is required. Self-assessment includes assessment of filter performance, development of a filter profile, identification of factors limiting filter performance, assessment of possible corrections, and preparation of a report.
(4) The turbidity exceeds 2.0 NTU in 2 consecutive recordings 15 minutes apart at the same filter for 2 months in a row	In addition to reporting required in (1), arrange to have a comprehensive performance evaluation conducted by the state or a third party approved by the state within 30 days. Some exceptions are possible. The evaluation must be submitted to the state within 90 days after the exceedance that triggered the evaluation.
1. Systems using lime softening may apply for alternative turbidity exceedance levels.	

- Conventional or Direct Filtration – Monthly Summary Sheet (page 75)
- Membrane Filtration – Monthly Data Sheet (on reference CD)
- Membrane Filtration – Monthly Summary Sheet (on reference CD)
- Slow Sand, Diatomaceous Earth and Other Filtration – Data Sheet (on reference CD)
- Slow Sand, Diatomaceous Earth and Other Filtration – Monthly Summary Sheet (on reference CD)

Reporting Timeframes After a Violation

Systems must also notify the state within indicated timeframes if the following violations or situations occur (Art. 7, Sects. 7.1.5(a)(3) and 7.2.5(c)):

- For waterborne disease outbreaks potentially associated with the system, as soon as possible but by the end of the next business day.
- If turbidity in the combined filter effluent exceeds 5 nephelometric turbidity units (NTU) for systems subject to a maximum turbidity limit of 5 NTU, as soon as practical but no later than 24 hours after the exceedance is known.
- If turbidity in the combined filter effluent exceeds 1 NTU for systems subject to a maximum turbidity limit of 1 NTU, as soon as possible but by the end of the next business day.
- If residual falls below 0.2 mg/L in water entering the distribution system, as soon as possible but by the end of the next business day. The system must also inform the state whether the residual was restored to at least 0.2 mg/L within 4 hours.

Disinfection Byproducts and Disinfectant Residuals

NTNCWSs must meet MCLs for DBPs and maximum residual disinfectant levels (MRDLs). MRDLs are similar to MCLs but apply to disinfectants added in the treatment process. If a system uses conventional filtration, it must also meet TT requirements for DBP precursors by reducing the amount of total organic carbon (TOC) in treated water.

All surface water and GWUDI systems subject to DBP and disinfectant requirements must comply with the MCLs for total trihalomethanes (TTHM) and a group of 5 haloacetic acids (HAA5). TTHM includes chloroform, dibromochloromethane, dichlorobromomethane, and bromoform. HAA5 includes trichloroacetic acid, dichloroacetic acid, monochloroacetic acid, dibromoacetic acid, and monobromoacetic acid (**Table 15**). In addition, systems that use chlorine dioxide as a disinfectant must monitor for chlorite, and systems that treat with ozone must monitor for bromate (Art. 7, Sect. 7.5.1(b)(1)).

Each system is required to develop, submit, and implement a monitoring plan for DBPs and disinfectants. Failure to monitor in accordance with the plan is a monitoring violation (Art. 7, Sect. 7.5.3(f)).

Table 15 Disinfection Byproduct Contaminant List				
Contaminant	**MCL (mg/L)**	**Potential Health Effects from Exposure Above the MCL**	**Common Sources of Contaminant in Drinking Water**	**Public Health Goal (mg/L)**
Bromate	0.010	Increased risk of cancer	Byproduct of drinking water disinfection	Zero
Chlorite	1.0	Anemia; nervous system effects in infants and young children	Byproduct of drinking water disinfection	0.8
Haloacetic acids (HAA5)	0.060	Increased risk of cancer	Byproduct of drinking water disinfection	N/A[1]
Total trihalomethanes (TTHM)	0.080	Liver, kidney, or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	N/A[1]

1. Although there is no collective maximum contaminant level goal (MCLG) for this contaminant group, there are individual MCLGs for some of the individual contaminants:
   - Haloacetic acids: dichloroacetic acid (zero), trichloroacetic acid (0.3 mg/L)
   - Trihalomethanes: bromodichloromethane (zero), bromoform (zero), dibromochloromethane (0.06 mg/L)

If a system is approved for monitoring as a consecutive system (a system that buys its water from another system) or is providing water to a consecutive system, under the provisions of Article 1, Sections 1.9–1.10, the sampling plan must reflect the entire distribution system (Art. 7, Sect. 7.5.3(f)(3)).

TTHM and HAA5

Routine Monitoring Systems must monitor for TTHM and HAA5 at the frequency and locations indicated in **Table 16**. If the state approves, systems using GWUDI as a source may consider multiple wells drawing water from a single aquifer to be 1 treatment plant for the purpose of determining the number of samples required (Art. 7, Sect. 7.5.3(b)(1)(i) and (a)(2)).

TTHM and HAA5 samples must be taken at a location representing the maximum residence time in the distribution system for systems serving less than 10,000 people.

Samples must be taken at locations representing maximum (and in systems serving 10,000 or more people, the average) residence time in the distribution system. Maximum residence time is a point in the distribution system where the treated water has been in the system for the longest or maximum time, as measured by water transport time (Art. 1, Sect. 1.5.2). Average residence time is a point in the distribution system where treated water has been in the system for approximately half of its longest or maximum time, as measured by water transport time (Art. 1, Sect. 1.5.2).

Reduced Monitoring Systems may request reduced monitoring (*see* **Table 17** and Art. 7, Sect. 7.5) from the state after 1 year of monitoring if these conditions are met:

- TTHM annual average is less than or equal to 0.040 mg/L;
- HAA5 annual average is less than or equal to 0.030 mg/L; and
- Annual average source water TOC is less than or equal to 4.0 mg/L.

NOTE: Systems serving fewer than 500 people may not reduce monitoring (Art. 7, Table 7-11).

Calculating Compliance with TTHM and HAA5 MCLs Compliance with the TTHM and HAA5 MCLs is based on the RAA, which is the average of the current quarter's averaged data plus the average of the last 3 quarters). **Figure 11** provides an example for calculating an RAA.

Systems taking more than 1 sample per quarter must compute the RAA based on all samples collected by the system (Art. 7, Sect. 7.5.4(b)(1)(i)). An example for determining an RAA using monthly averages is given in **Figure 11**.

For systems taking 1 sample per quarter, the RAA is simply the quarter's sample concentration averaged with the prior 3 quarters.

For systems monitoring annually, systems are in compliance if the sample taken that year does not exceed the MCL (Art. 7, Sect. 7.5.4(b)(1)(ii)).

A violation will occur if these conditions exist:

- The RAA of results from 4 quarters exceeds the MCL.

Table 16 Routine Monitoring Frequency for TTHM and HAA5 (Art. 7, Table 7-10)		
Population Served	**Minimum Monitoring Frequency**	**Sample Location in the Distribution System**
10,000 or more people	4 samples per quarter per treatment plant	For at least 25% of samples each quarter, maximum residence time. For remaining samples, at least average residence time. Such locations must be representative of the entire distribution system.[1]
500–9,999 people	1 sample per quarter per treatment plant	Maximum residence time.[1]
Fewer than 500 people	1 sample per year per treatment plant[2] during month of warmest water temperature	Maximum residence time.[1]

1. If a system samples more frequently than required, at least 25% of all samples collected each quarter must be taken at maximum residence time locations. The remaining samples must be taken at locations representative of average residence time.
2. If the sample concentration (or average of sample concentrations) exceeds the MCL, the system must increase monitoring as described in Article 7, Section 7.5.4(b)(1)(ii).

Table 17 Reduced Monitoring Frequency for TTHM and HAA5		
If you are a . . .	**You may reduce monitoring if you have monitored at least 1 year and have a . . .**	**To this level**
System serving 10,000 or more people that has a source water annual average TOC level, before any treatment of ≤4.0 mg/L	TTHM annual average of ≤0.040 mg/L and HAA5 annual average of ≤0.030 mg/L	1 sample per treatment plant per quarter at distribution system location reflecting maximum residence time.
System serving 100 to 9,999 people with a source water annual average TOC level, before any treatment of ≤4.0 mg/L	TTHM annual average of ≤0.040 mg/L and HAA5 annual average of ≤0.030 mg/L	1 sample per treatment plant per year at distribution system location reflecting maximum residence time during month of warmest water temperature. Note: Any system serving fewer than 500 people may not reduce its monitoring to less than 1 sample per treatment plant per year.

- For systems monitoring less frequently than quarterly, the average of samples taken that year exceeds the MCL (Art. 7, Sect. 7.5.4(b)(1)(ii)).
- A system fails to complete 4 consecutive quarters of monitoring (Art. 7, Sect. 7.5.4(b)(1)(v)).

Chlorite

The MCL for chlorite is 1.0 mg/L. NTNCWSs using chlorine dioxide for disinfection or oxidation must monitor for chlorite (Art. 7, Sect. 7.5.3(b)(2)). Routine monitoring for chlorite consists of 2 requirements:

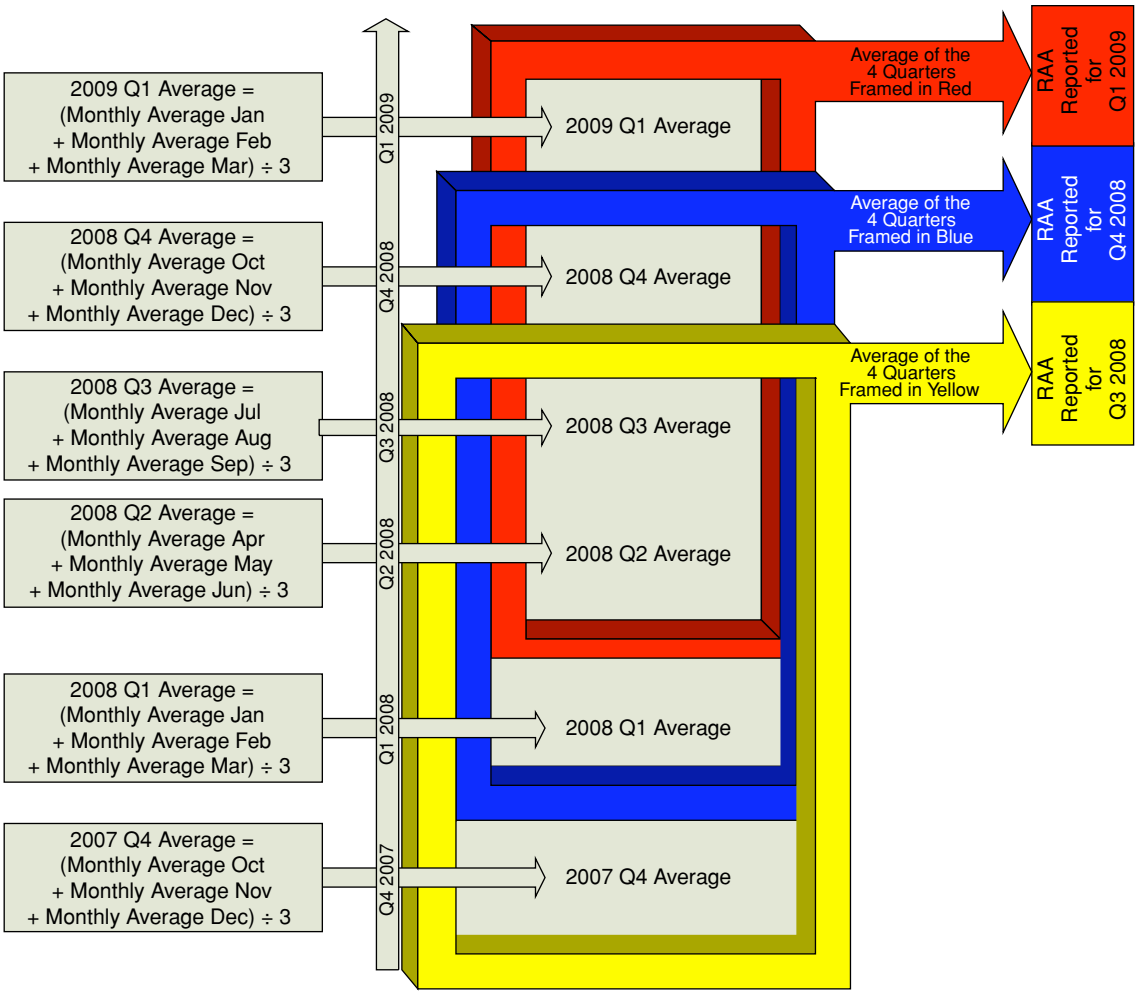
- Daily samples: Systems must take daily samples at the entrance to the distribution system (Art. 7, Sect. 7.5.3(b)(2)(i)(A)). If any daily sample exceeds the 1.0 mg/L MCL for chlorite, the system must take 3 additional samples in the distribution system the next day (Art. 7, Sect. 7.5.3(b)(2)(ii)). Daily chlorite monitoring at the entrance to the distribution system may not be reduced.
- Monthly distribution monitoring: All systems monitoring for chlorite must also take a 3-sample set in the distribution system each month. The system must take 1 sample at each of the following locations: near the first customer, at a location representative of average residence time, and at a location reflecting maximum residence time in the distribution system (Art. 7, Sect. 7.5.3(b)(2)(i)(B)). Monthly chlorite monitoring in the distribution system may be reduced to quarterly (Art. 7, Sect. 7.5.3(b)(2)(iii)(B)).

Compliance with the chlorite MCL is based on the average of a monthly 3-sample set taken in the distribution system. If the average of any 3-sample set exceeds the MCL, the system is in violation of the MCL and must notify the public.

Bromate

The MCL for bromate is 0.010 mg/L. NTNCWSs that use ozone for disinfection or oxidation must take 1 routine bromate sample per month for each treatment plant using ozone. Systems must take samples at the entrance to the distribution system while the ozonation system is operating under normal conditions (Art. 7, Sect. 7.5.3(b)(3)(i)).

Systems may reduce bromate monitoring from monthly to quarterly if they demonstrate that the average source



Sample Calculation			
RAA Reported for Quarter 1 2009			
2008 Quarter 2 Average	1.0		
2008 Quarter 3 Average	1.5		RAA = Sum of 4 quarters ÷ 4
2008 Quarter 4 Average	1.5		RAA = 5.0 ÷ 4 = 1.25
2009 Quarter 1 Average	1.0		
Sum of all four quarters	5.0		

Figure 11. Sample calculation of an RAA

water bromide concentration is less than 0.05 mg/L, based on 1 year of monthly bromide measurements. If at any time the RAA source water bromide concentration is greater than or equal to 0.05 mg/L, the system must resume routine monitoring for bromate (Art. 7, Sect. 7.5.3(b)(3)(ii); Art. 10, Sect. 10.7.4(b)).

Compliance with the 0.010 mg/L MCL for bromate is based on an RAA, computed quarterly (Art. 7, Sect. 7.5.4(b)(2)). If an RAA exceeds the MCL, the system is in violation of the MCL and must notify the public and meet the reporting requirements. If a system fails to complete 12 consecutive months of monitoring, compliance is based on the average of available data (Art. 7, Sect. 7.5.4(b)(2)).

Reporting

Systems required to sample quarterly or more frequently must report to the state within 10 days after the end of each quarter in which samples were collected, notwithstanding the general reporting provisions. Systems required to sample less frequently than quarterly must report to the state within 10 days after the end of each monitoring period in which samples were collected (Art. 7, Sect. 7.5.5(a)).

Table 18 Disinfectant Contaminant List				
Contaminant	**MRDL (mg/L)**	**Potential Health Effects from Exposure Above the MRDL**	**Common Sources of Contaminant in Drinking Water**	**Public Health Goal (mg/L)**
Chloramines (as Cl_2)	4.0	Eye and nose irritation; stomach discomfort, anemia	Water additive used to control microbes	MRDLG[1] = 4
Chlorine (as Cl_2)	4.0	Eye and nose irritation; stomach discomfort	Water additive used to control microbes	MRDLG = 4
Chlorine dioxide (as ClO_2)	0.8	Anemia; nervous system effects in infants and young children	Water additive used to control microbes	MRDLG = 0.8
1. MRDLG = maximum residual disinfectant level goal.				

Systems must use the appropriate forms:

- DBP Form 3 – TTHM and HAA5 Quarterly Report Worksheet **(**page 82**)**
- DBP Form 4 – Reporting Form for Running Annual Average for TTHMs and HAA5s **(**page 84**)**
- DBP Form 6 – Quarterly Reporting Form for the Running Annual Average for Bromate (on reference CD)
- DBP Form 7 – Quarterly Report for Daily, Monthly and Additional Chlorite Monitoring (on reference CD)

Maximum Residual Disinfectant Levels

The MRDLs for regulated disinfectants are shown in **Table 18** (Art. 2, Sect. 2.5).

Notwithstanding the MRDLs in **Table 18**, systems may temporarily increase residual levels of chlorine or chloramines (but not chlorine dioxide) in the distribution system to protect public health, such as to address distribution line breaks or cross-connection events (Art. 7, Sect. 7.5.1(d)).

Chlorine and Chloramines

NTNCWSs using surface water that use chlorine or chloramines must measure the residual disinfectant level in the distribution system at the same points in the distribution system and at the same frequencies total coliforms are sampled. Monitoring for chlorine and chloramines may not be reduced (Art. 7, Sect. 7.5.3(c)(1)).

Compliance with chlorine and chloramines MRDLs is based on the RAA (Art. 7, Sect. 7.5.4(c)(1)(i)).

If the RAA exceeds the MRDL, the system is in violation of the MRDL and must notify the public (Art. 7, Sect. 7.5.4(c)(1)(i)).

In cases where systems switch between chlorine and chloramines for residual disinfection during the year, compliance with MRDLs must be determined by including all monitoring results of both chlorine and chloramines monitoring to calculate the RAA (Art. 7, Sect. 7.5.4(c)(1)(ii)).

If chlorine dioxide or chloramines are used to maintain a residual in the distribution system, or if chlorine is used to maintain a residual and there are no disinfection addition points after the entrance to the distribution system (i.e., no booster chlorination), the system must take 3 samples as close to the first customer as possible, at intervals of at least 6 hours.

If chlorine is used to maintain a residual and there is booster chlorination, the system must take 1 sample at each of the following locations: as close to the first customer as possible, at a location representative of average residence time, and as close to the end of the distribution system as possible (reflecting maximum residence time in the distribution system) (Art. 7, Sect. 7.5.3(c)(2)(ii)).

Reporting

Systems must use the following reporting forms:

- MRDL Form 1 – Chlorine and Chloramines, Maximum Residual Disinfectant Level Monthly Worksheet **(**page 86**)**
- MRDL Form 2 – Quarterly Reporting Form for Chlorine and Chloramines Maximum Residual Disinfectant Level Running Annual Average (page 88)

Chlorine Dioxide

NTNCWSs that use chlorine dioxide for disinfection or oxidation must take routine daily samples at the entrance to the distribution system. This monitoring may not be reduced (Art. 7, Sect. 7.5.3(c)(2)).

For any daily sample that exceeds the value of the MRDL, systems must take 3 samples in the distribution

system the next day in addition to the sample required at the entrance to the distribution system (Art. 7, Sect. 7.5.3(c)(2)(ii)).

There are 2 types of MRDL violations for chlorine dioxide: acute and non-acute. Compliance is based on the results of samples taken over consecutive days.

- Acute Violation: If any daily sample taken at the entrance to the distribution system exceeds the MRDL, and if the next day any of the 3 samples taken in the distribution system exceeds the MRDL, the system is in violation of the MRDL. The system must take immediate corrective action and must notify the state and public with a Tier 1 notice. Failure to take samples in the distribution system the day after an exceedance of the chlorine dioxide MRDL at the entrance to the distribution system will also be considered an acute MRDL violation (Art. 7, Sect. 7.5.4(c)(2)(i)).
- Non-Acute Violation: If any 2 consecutive daily samples taken at the entrance to the distribution system exceed the MRDL but all distribution system samples are below the MRDL, the system is in violation of the MRDL. The system must take corrective action to lower the level of chlorine dioxide below the MRDL and must notify the public with a Tier 2 notice. Failure to monitor at the entrance to the distribution system the day after an exceedance of the chlorine dioxide MRDL at the entrance to the distribution system is also considered a non-acute MRDL violation (Art. 7, Sect. 7.5.4(c)(2)(ii)).

Systems must use MRDL Form 3 – Quarterly Report for Daily and Monthly Chlorine Dioxide (on reference CD).

Compliance with TTs for DBP Precursors

Systems that use conventional filtration must demonstrate TOC removal and use enhanced coagulation or enhanced softening to remove TOC from their water unless they meet alternative compliance criteria (Art. 7, Sect. 7.5.6(a)). The best way to prevent the formation of DBPs is to remove DBP precursors from the water before disinfectant is added. TOC is used as an indicator for DBP precursors.

Monitoring for DBP Precursors (TOC)

Systems that use conventional filtration treatment must take 1 paired TOC sample and 1 source water alkalinity sample per plant per month (Art. 7, Sect. 7.5.3(d)(1)). A paired TOC sample consists of the following:

- One treated water TOC sample taken at the point where combined filter effluent turbidity is monitored; and
- One source water TOC sample taken before any treatment at the same time as monitoring.

Samples should be taken at the same time and at a time representative of normal operating conditions and influent water quality.

Compliance for DBP precursors is based on the percentage of TOC removed between the points where source water TOC and treated water TOC are measured.

Alternative Compliance Criteria

If sufficient historical data exist, some systems may elect to change the criteria used to achieve compliance. Furthermore, these eligible systems may change the criteria in each reporting period. Surface water systems that use conventional filtration treatment and that can comply with 1 of the following alternative compliance criteria do not have to implement enhanced coagulation or softening and do not have to meet TOC removal requirements (Art. 7, Sect. 7.5.6(a)):

- The surface water TOC is less than 2.0 mg/L, calculated quarterly as an RAA;
- The treated water TOC is less than 2.0 mg/L, calculated quarterly as an RAA;
- The surface water TOC is less than 4.0 mg/L, calculated quarterly as an RAA, surface water alkalinity is greater than 60 mg/L, and TTHM and HAA5 RAAs are no higher than 0.040 mg/L and 0.030 mg/L, respectively;
- TTHM and HAA5 RAAs are no higher than 0.040 mg/L and 0.030 mg/L, respectively, and the system uses only chlorine;
- The surface water specific ultraviolet absorption (SUVA) measured monthly is less than 2.0 L/mg-m, calculated quarterly as an RAA; or
- The system's finished water SUVA measured monthly is less than 2.0 L/mg-m, calculated quarterly as an RAA.

In addition to these criteria, systems practicing enhanced softening may use 1 of the alternative compliance criteria found in Article 7, Section 7.5.6(a)(3) in lieu of complying with the removal requirements.

Systems must use the following forms:

- DBP Precursor Form 2 – Alternative Compliance Criteria for Conventional Filtration Treatment Plants (page 92)
- DBP Precursor Form 3 – Additional Alternative Compliance Criteria for Conventional Filtration Treatment Plants Practicing Softening (on reference CD)

Enhanced Coagulation and Enhanced Softening Performance Requirements

Systems that do not meet the alternative criteria are required to achieve the TOC removal specified in **Table 19** (also called Step 1 removal). Step 1 removal involves implementation of enhanced coagulation or enhanced softening. Enhanced coagulation is defined as the addition of sufficient coagulant for improved removal of DBP precursors by conventional filtration treatment. Enhanced softening is the improved removal of DBP precursors by precipitative softening (Art. 7, Sect. 7.5.6(b)(1)).

Enhanced coagulation systems that cannot meet the TOC removal requirements in **Table 19** must ask the state to approve alternative minimum TOC removal (Step 2) requirements. Step 2 requires a system to conduct bench- or pilot-scale testing to determine the removal that can be achieved at that system. Systems must apply to the state for approval for Step 2 within 3 months of failure to achieve Step 1 removals (Art. 7, Sect. 7.5.6(b)(3)).

Enhanced softening systems that are unable to achieve the removal required in the right-most column of **Table 19** may instead implement softening that meets the alternative compliance criteria for treated water alkalinity and removal of magnesium hardness.

Systems must use DBP Precursor Form 4 – Actual Removal Ratios for Enhanced Coagulation and Softening Treatment Plants (page 94).

Article 8. Lead and Copper Monitoring and Compliance

Lead and copper violations are often caused by improper selection of sampling sites, sampling technique, or determination of the 90th percentile. The "Sample Site Selection" and "Sample Collection Methods" subsections should clarify these requirements. It should be noted that many or all of the samples may be collected by the consumers themselves; therefore, the system must provide adequate instruction to residents at these sample sites. A quick reference guide is provided on page 135 of Part IV, and additional guidance on site selection and sampling is available on the reference CD.

Table 19
Step 1 Removal of TOC for Surface Water Systems Using Conventional Treatment (Art. 7, Table 7-15)

Source Water TOC (mg/L)	Source Water Alkalinity (mg/L as $CaCO_3$)		
	0–60	60–120	>120
	Required TOC Removal (%)		
>2.0–4.0	35.0	25.0	15.0
>4.0–8.0	45.0	35.0	25.0
>8.0	50.0	40.0	30.0

General Requirements

All NTNCWSs are subject to provisions of Article 8. The Lead and Copper Rule is different from most rules because it focuses on changes in water quality in the distribution system and the consumer's home. The requirements focus on reducing corrosion, the process that dissolves or leaches lead and copper from distribution systems and home plumbing into the water.

Systems must monitor for lead and copper at customer taps. A system is considered to have optimal corrosion control if it completes an initial phase of monitoring consisting of 2 consecutive 6-month periods of sampling with no more than 10 percent of it collection sites having concentrations above action levels.

Systems exceeding the action level for lead or copper must also monitor their source water for lead and copper and must monitor certain water quality parameters at customer taps and at entry points to the distribution system. Any system that exceeds the lead or copper action level must take these actions:

- Implement corrosion control and, if applicable, source water treatment;
- Meet the public education requirements for lead action level exceedance; and
- Complete lead service line replacement if the system still exceeds action levels after corrosion control and source water treatment are implemented.

Systems must report to the state any required information and must keep records of all sampling data and analyses, reports, evaluations, state determinations, and any other required information for no fewer than 12 years (Art. 8, Sects. 8.1(g) and 8.11).

Systems deemed to have optimized corrosion control must notify the CDPHE in writing of any treatment changes or the addition of a new source (Art. 8, Sect. 8.2(b)(3)(iii)).

Lead and Copper Action Levels

The TT requirements for lead and copper are triggered when systems exceed the lead or copper action level during tap water monitoring. Action levels are defined as follows:

- The *lead action level* is exceeded if more than 10 percent of tap water samples collected in any monitoring period have lead concentrations greater than 0.015 mg/L (i.e., if the 90th percentile lead level is greater than 0.015 mg/L) (Art. 8, Sect. 8.1(a)(1)).
- The *copper action level* is exceeded if more than 10 percent of tap water samples collected in any monitoring period have copper concentrations greater than 1.3 mg/L (i.e., if the 90th percentile copper level is greater than 1.3 mg/L) (Art. 8, Sect. 8.1(a)(2)).

Monitoring Requirements

Figure 12 summarizes the monitoring requirements for lead and copper. A new system begins its lead and copper monitoring with an initial phase and then may reduce monitoring if it does not exceed the action level or fail to monitor at any point in time. The monitoring schedule for a system follows this general flow:

1. Initial or follow-up monitoring: 2 consecutive 6-month sampling periods
2. Reduced monitoring: 3 consecutive years of annual sampling
3. Ultimate reduced monitoring: once every 3 years

Initial Tap Sampling

All systems must monitor during each 6-month monitoring period until the system either (Art. 8, Sect. 8.7(d)(1)(ii))

- Exceeds the lead or copper action level and is therefore required to implement corrosion control treatment; or
- Meets the lead and copper action levels during 2 consecutive 6-month monitoring periods, in which case the system may reduce monitoring.

Results must be reported using the Sample Results and Collection Method Certification form, provided on page 96 of Part III.

Number of Required Tap Sampling Sites

Unless a system is permitted to reduce monitoring (*see* "Reduced Monitoring" subsection), it must monitor for lead and copper at the number of sites specified in **Table 20**, based on population. Systems must collect 1 sample from each site during each required monitoring period (Art. 8, Sect. 8.7(c)).

Any system serving a population of 3,300 or fewer people may apply to the state to reduce monitoring for lead and copper to once every 9 years (i.e., a "full waiver") if it meets all of the materials and monitoring criteria specified in the following paragraphs. Any system serving 3,300 or fewer people that meets the following criteria only for lead or only for copper may apply to reduce tap water monitoring for that contaminant only (i.e., a "partial waiver") (Art. 8, Sect. 8.7(g)).

Sample Site Selection

Each water system must complete a materials evaluation of its distribution system to identify a pool of sampling sites for tap sampling.

The pool must be large enough to ensure that the system can collect the required number of lead and copper tap samples. Sampling sites may not include faucets that have point-of-use or point-of-entry treatment devices (Art. 8, Sect. 8.7(a)(1)).

The sampling sites must be in buildings that contain copper pipes with lead solder installed after 1982, that contain lead pipes, or that are served by a lead service line. If a system does not have enough sites meeting these criteria, the system must complete its sampling pool with sites that contain copper pipes and lead solder installed before 1983. If additional sites are needed, the system must use representative sites throughout the distribution system, where plumbing materials used are commonly found at other sites served by the system. (Art. 8, Sect. 8.7(a)(7)).

Any water system whose distribution system contains lead service lines must take 50 percent of its samples each monitoring period from sites that contain lead pipes or copper pipes with lead solder and 50 percent of the samples from sites served by a lead service line. A water system that cannot locate enough sampling sites served by lead service lines must collect first-draw samples

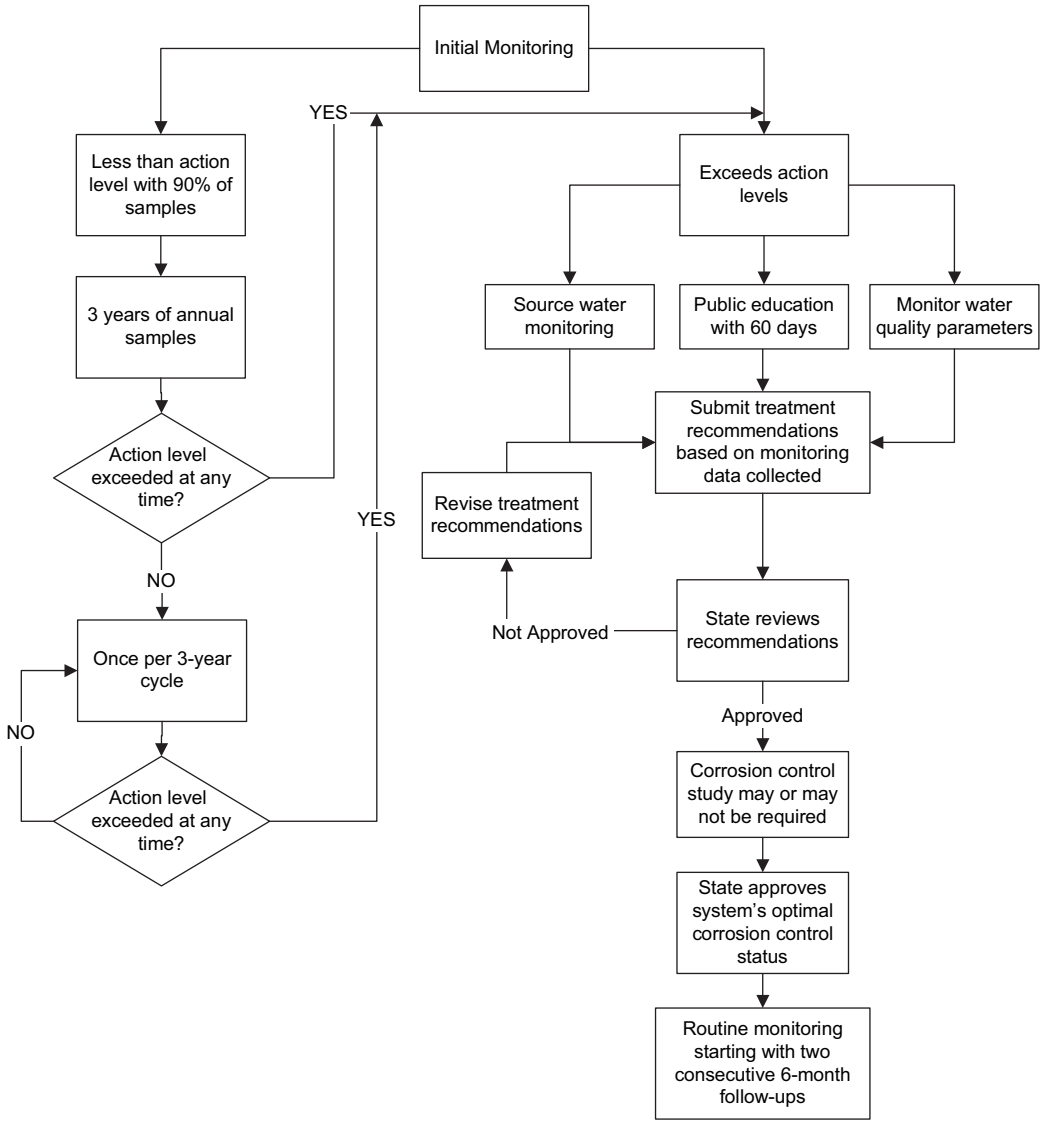


Figure 12. Generalized lead and copper monitoring

Table 20 Lead and Copper Tap Sampling Sites for Standard Monitoring (Art. 8, Sect. 8.7(c))	
System Size (Population Served)	**No. of Sites**
>100,000	100
10,001–100,000	60
3,301–10,000	40
501–3,300	20
101–500	10
≤100	5

from all known sites served by such lines (Art. 8, Sect. 8.7(a)(8)).

Systems must use the following forms:

- Sampling Pool for Lead and Copper Tap Water Samples **(page 97)**
- Homeowner Certification and Instructions for Tap Sample Collection **(page 98)**
- Lead and Copper Sampling Site Change Form (on reference CD)

Sample Collection Methods

All tap samples for lead and copper must be first-draw samples. An NTNCWS which does not have enough taps that can supply first-draw samples may apply in writing to the state for permission to substitute non–first-draw samples. Such systems must collect as many first-draw samples as possible from appropriate taps and identify sampling times and locations that would likely result in the longest standing time for the remaining sites (Art. 8, Sect. 8.7(b)(1) and (b)(5)).

Each first-draw tap sample must be 1 L in volume and must have stood motionless in the plumbing system for at least 6 hours. First-draw samples from residential housing must be collected from the cold water kitchen tap or bathroom sink tap. Non–first-draw samples, where allowed, and samples from non-residential buildings must be collected at an interior tap typically used for consumption (Art. 8, Sect. 8.7(b)(2)).

First-draw samples may be collected by the system. The system may also allow residents to collect samples (*see* Art. 8, Sect. 8.7(b)(2) for more information). First-draw samples may be acidified up to 14 days after the sample is collected. After acidification, the sample must stand in its original container for the time specified in the approved EPA method before it is analyzed (Art. 8, Sect. 8.7(b)(2)).

Systems must collect each first-draw tap sample from the sampling site used during the previous monitoring period.

Each service line sample must be 1 L in volume, must have stood motionless in the lead service line for at least 6 hours, and be collected in a manner that ensures water from the service line is collected. (Art. 8, Sect. 8.7(b)(3)).

Reduced Monitoring

Systems that meet the lead and copper action levels for 2 consecutive 6-month monitoring periods may reduce the number of samples to those shown in **Table 21** and may reduce the sampling frequency to once a year (Art. 8, Sect. 8.7(d)(4)(i) and (iii)).

Systems may further reduce monitoring to once every 3 years after meeting the lead and copper action levels during 3 consecutive years of monitoring (Art. 8, Sect. 8.7(d)(4)(i) and (iii)).

Table 21
Lead and Copper Tap Sampling Sites for Reduced Monitoring (Art. 8, Sect. 8.7(c))

System Size (Population Served)	No. of Sites
>100,000	50
10,001–100,000	30
3,301–10,000	20
501–3,300	10
101–500	5
≤100	5

Systems Exceeding Action Levels

Any public water system that exceeds lead and copper action levels must

- Perform source water monitoring;
- Monitor for water quality parameters;
- Evaluate and implement corrosion control; and
- Conduct public education;

Source Water Monitoring

Any system that exceeds the lead or copper action level at the tap must collect 1 source water sample from each entry point to the distribution system within 6 months after the exceedance, as described in the following paragraph (Art. 8, Sect. 8.9(a)(1) and (b)).

Systems must take 1 sample at every entry point to the distribution system that is representative of each well or source after treatment. If a system uses more than 1 source and the sources are combined before distribution, the system must sample during periods of normal operating conditions, when water is representative of all sources being used (Art. 8, Sect. 8.9(a)(1)).

The state may reduce the total number of samples that must be analyzed by allowing the use of compositing. Compositing of samples must be done by certified laboratory personnel (*see* Art. 8, Sect. 8.9(a)(iv)).

If a system exceeds the maximum permissible source water levels established by the state under Article 8, Section 8.4(b)(4), the state may require that an additional sample be collected (Art. 8, Sect. 8.9(a)(2)).

Water Quality Parameters

All systems that exceed the lead or copper action level must monitor the following water quality parameters in addition to lead and copper:

- pH;
- Alkalinity;
- Orthophosphate, when an inhibitor containing a phosphate compound is used;
- Silica, when an inhibitor containing a silicate compound is used;
- Calcium;
- Conductivity; and
- Water temperature

Water quality parameters must be measured at customer taps and at each entry point to the distribution system. Systems must monitor during the same 6-month monitoring period during which the action level is exceeded.

During each required monitoring period, systems must collect 2 tap samples at each site for water quality parameters. The number of samples required can be found in **Table 22**, based on system size (Art. 8, Sect. 8.8(a)(2)(i)).

Tap samples must be representative of water quality throughout the distribution system, taking into account the number served, sources of water, treatment methods, and seasonal variability. Tap samples for water quality parameters do not have to be taken at taps used for lead and copper sampling (Art. 8, Sect. 8.8(a)(1)(i)).

In addition, during each monitoring period in which a system exceeds the lead or copper action level, it must collect 1 or 2 samples for each applicable water quality parameter at each entry point (Art. 8, Sect. 8.8(a)(1)(ii) and (a)(2)(ii)).

Systems must use the form Water Quality Parameter Sample Results (on reference CD).

Corrosion Control Studies

The state may require systems that exceed the lead or copper action level to perform corrosion control studies to identify optimal corrosion control treatment. (See "General Requirements" at the beginning of this section regarding deadlines for performing studies.) Corrosion control studies shall evaluate the following treatments (Art. 8, Sect. 8.3(c)(1)):

- Alkalinity and pH adjustment;
- Calcium hardness adjustment; and
- Addition of a phosphate- or silicate-based corrosion inhibitor at a concentration sufficient to maintain an effective residual concentration in all test tap samples.

The system must evaluate each corrosion control treatment using pipe rig and loop tests, metal coupon tests, partial-system tests, or analyses of treatments at other water systems of similar size, water chemistry, and distribution system configuration (Art. 8, Sect. 8.3(c)(2)).

The system must evaluate the effect of the chemicals used for corrosion control treatment on other water quality treatment processes. The system must identify all chemical or physical constraints that limit or prohibit the use of a particular corrosion control treatment (Art. 8, Sect. 8.3(c)(4)–(5)).

Based on the results of the corrosion control studies, the system must recommend a treatment option that would provide it with optimal corrosion control treatment.

Table 22
Water Quality Parameter Sampling Sites
(Art. 8, Sect. 8.8(a)(2)(i))

System Size (Population Served)	No. of Sites
>100,000	25
10,001–100,000	10
3,301–10,000	3
501–3,300	2
101–500	1
≤100	1

The system must submit to the state a rationale for its choice, along with all supporting data and any additional information requested by the state (Art. 8, Sect. 8.3(c)(6) and 8.3(d)).

Each system must install and operate the optimal corrosion control treatment designated by the state. Once installation is complete, the system must submit a letter certifying that treatment has been installed (Art. 8, Sects. 8.3(e)–(g) and 8.10(c)(4)).

Systems that fail to meet the lead action level in tap samples after installing corrosion control or source water treatment must replace lead service lines. If a system is in violation for failure to install source water or corrosion control treatment, the state may still require the system to begin lead service line replacement (Art. 8, Sect. 8.5(a)).

Monitoring After Installation of Corrosion Control and Source Water Treatment

Any system that installs optimal corrosion control treatment must monitor lead, copper, and water quality parameters during 2 consecutive 6-month monitoring periods after optimal corrosion control treatment has been installed or after optimal water quality parameter values have been set (Art. 8, Sect. 8.8(c)–(d)). After these 2 periods, the state will specify values for water quality parameters. Systems must monitor for lead and copper every 6 months after the state sets the values, unless the system is eligible for reduced monitoring (Art. 8, Sect. 8.7(d)(2)(i) and (d)(3)).

Summary of Corrosion Control Requirements and Deadlines

Any system serving a population of up to 50,000 people that is required to install corrosion control after exceeding the lead or copper action level may cease

implementing treatment whenever they meet both action levels during 2 consecutive monitoring periods prior to completing the specified treatment steps. If a system later exceeds the lead or copper action level, the system must pick up where it left off in installing treatment (Art. 8, Sect. 8.2(c)).

Systems required to install corrosion control treatment must complete the following treatment steps by the indicated time periods (Art. 8, Sect. 8.2(d)):

1. A system must recommend optimal corrosion control treatment within 6 months after it exceeds an action level.
2. The state shall specify optimal corrosion control treatment within the following timeframes after the action level is exceeded, unless the state requires the system to perform corrosion control studies:
   - Within 12 months after a system exceeds the lead or copper action level, the state may require the system to perform corrosion control studies.
   - If the system has performed corrosion control studies, the state must designate optimal corrosion control treatment within 6 months after the studies are complete.
3. The system must install optimal corrosion control treatment within 24 months after the state designates such treatment.
4. The system must complete follow-up sampling for lead, copper, and in some cases water quality parameters within 36 months after the state designates optimal corrosion control treatment.
5. The state must review the system's installation of treatment and designate optimal water quality control parameters within 6 months after the system completes follow-up sampling.
6. The system must comply with the state-designated optimal water quality parameters and continue to conduct lead and copper tap sampling and water quality parameter monitoring (as required).

Public Education and Supplemental Monitoring Requirements

A water system that exceeds the lead action level in tap water samples must deliver public education materials as described in this section.

Content of Public Education Materials NTNCWSs must include the required text in all printed materials they distribute through their lead public education programs. Any additional information presented by a system must be consistent with the requirements and must be understandable to the general public (Art. 8, Sect. 8.6(a)(1)).

In addition, NTNCWSs must include the required text in any public service announcements (Art. 8, Sect. 8.6(b)).

Delivery of a Public Education Program In communities where a significant proportion of the population speaks a language other than English, public education materials shall be communicated in the appropriate languages (Art. 8, Sect. 8.6(c)(1)).

Within 60 days after exceeding the lead action level, systems must deliver the public education materials on lead in drinking water as follows (Art. 8, Sect. 8.6(c)(2)). Systems must

- Post informational posters in a public place or common area in each building served by the system; and
- Distribute brochures to each individual served by the system.

NTNCWSs must repeat the delivery tasks above every 12 months as long as they exceed the lead action level (Art. 8, Sect. 8.6(c)(3)).

A water system may halt its public education program if it has met the lead action level during the most recent 6-month monitoring period. The system must resume public education if it subsequently exceeds the action level (Art. 8, Sect. 8.6(c)(6)).

Article 9. Consumer Notification

Consumer notification is one of the final barriers to unsafe drinking water. Proper notice provides consumers with information about how to protect their health while the water system resolves the problem that necessitated the notification. It also provides consumers with valuable information about how the issue will be fixed and in what timeframe. System operators and owners should familiarize themselves with the tiered categories of violations and the notification requirements for each. Standard language is required and provided in this section, and public notification templates are available for the more common violations.

General Public Notification Requirements

Public notification is required for all violations of Colorado Primary Drinking Water Regulations and for other situations described in this Guide. The term "Colorado Primary Drinking Water Regulations

Table 23 Definition of Public Notice Tiers (Art. 9, Table 9-3)	
Tier 1	Required for CPDWR violations and situations with significant potential to have serious adverse effects on human health as a result of short-term exposure.
Tier 2	Required for all other CPDWR violations and situations with potential to have serious adverse effects on human health.
Tier 3	Required for all other CPDWR violations and situations not included in Tier 1 and Tier 2.

violations" is used to include violations of MCLs, MRDLs, TTs, monitoring requirements, and testing procedures. For a general overview, see "The Public Notification Rule: A Quick Reference Guide" on page 137 in Part IV.

Public notice requirements are divided into 3 tiers based on the seriousness of the violation or situation and of any potential adverse health effects. Requirements for each violation or situation are determined by its assigned tier. **Table 23** provides the definition of each tier. Lists of tier assignments for specific violations or situations are found on page 102 (Art. 9, Sect. 9.2.1(b)). Each water system must provide public notice to people served by the system. Systems that provide water to other public drinking water systems (i.e., consecutive systems) are required to give public notice to the owner or operator of the consecutive system. A copy of the notice and a certificate of delivery must be sent to the state within 10 days after completion (Art. 9, Sect. 9.2.1(c)(3)).

If a system has a violation in a portion of the distribution system that is physically or hydraulically isolated from other parts of the distribution system, the state may allow the system to limit distribution of the public notice to only those served by the portion of the system that is not in compliance. This permission must be granted in writing by the state (Art. 9, Sect. 9.2.1(c)(2)).

For all public notice tiers, systems must provide the initial notice and any repeat notices in a form and manner reasonably calculated to reach the people served. The notice must meet the following requirements, unless directed otherwise by the state in writing:

- Mail or other direct delivery to each customer receiving a bill and to other service connections to which water is delivered; and
- Any other method reasonably calculated to reach other people, regularly served by the system, if they would not normally be reached by the previous method.

Table 24 Violations and Other Situations Requiring Tier 1 Public Notice (Art. 9, Table 9-4)	
(1)	Violation of the MCL for total coliforms when fecal coliform or *E. coli* is present in the distribution system or when the system fails to test for fecal coliforms or *E. coli* when any repeat sample tests positive for coliform (*see* Art. 5, Sects. 5.4(c) and 5.7(b)).
(2)	Violation of the MCL for nitrate or nitrite or when the system fails to take a confirmation sample within 24 hours of learning that the first sample exceeded the nitrate or nitrite MCL (*see* Art. 2, Sect. 2.2(b) and Art. 6, Sect. 6.1.5(g)(2)).
(3)	Violation of the MRDL for chlorine dioxide when 1 or more samples taken in the distribution system the day following an exceedance of the MRDL at the entrance of the distribution system exceed the MRDL or when the system does not take the required samples in the distribution system (*see* Art. 2, Sect. 2.5(a) and Art. 7, Sect. 7.5.4(c)(2)(i)).
(4)	Occurrence of a waterborne disease outbreak or other waterborne emergency (e.g., failure of water treatment processes, a natural disaster that disrupts the water supply or distribution system, a chemical spill or sewage spill).
(5)	Violation of the TT requirement where a system exceeds the limit on turbidity for combined filter effluent for a single sample, where the state determines after consultation that a Tier 1 notice is required, or where consultation does not take place within 24 hours after the system learns of the violation (*see* Art. 2, Sect. 2.8, and Art. 7, Sects. 7.1.3(f)(2), (g)(2), (h)(2); 7.2.3(a)(2), (b)(1), (c); and 7.3.4(b)(2), (c)(2)).
(6)	Other violations or situations that could cause serious health effects due to short-term exposure, as determined by the state in its regulations or on a case-by-case basis.

Systems must certify to the state that they have provided publication notification using the following forms:

- Tier 1 Certificate of Delivery Form (page 99)
- Tier 2 Certificate of Delivery Form (page 100)
- Tier 3 Certificate of Delivery Form (page 101)

Tier 1 Public Notification

Table 24 lists violation categories and situations requiring a Tier 1 public notice. Tier assignments for specific violations or situations are found on page 102 (Art. 9, Sect. 9.2.2(a)).

To complete a Tier 1 public notice, the system must

- Provide public notice as soon as practical but no later than 24 hours after learning of the violation, using at least 1 of the forms of direct delivery listed earlier;
- Initiate consultation with the state as soon as practical, but no later than 24 hours after learning of the violation or situation, to determine additional public notice requirements; and

Table 25 Violations and Other Situations Requiring a Tier 2 Public Notice (Art. 9, Table 9-5)	
(1)	All violations of the MCL, MRDL, and treatment technique requirements, except where a Tier 1 notice is required under Art. 9, Sect. 9.2.2(a) (see "Tier 1 Public Notification" section in this Guide) or where the state determines that a Tier 1 notice is required.
(2)	Violations of the monitoring and testing procedure requirements, where the state determines that Tier 2 rather than Tier 3 public notice is required, taking into account potential health impacts and persistence of the violation.
(3)	Failure to comply with the terms and conditions of any variance or exemption in place.

- Comply with additional notification requirements (including repeat notices or direction on posted notices) set during consultation (Art. 9, Sect. 9.2.2(b)).

For Tier 1 notification, the state has forms and templates available for use (on the reference CD):

- Boil-water advisory for *E. coli* or fecal bacteria
- Boil-water advisory for *E. coli* or fecal bacteria in Spanish
- Boil-water advisory for waterborne disease outbreak
- Bottled water advisory
- Bottled water advisory in Spanish
- Delayed repeats after *E. coli*- or fecal-positive sample
- Problem corrected template
- Turbidity MCL public notice advisory for conventional, direct, or membrane filtration plants
- Turbidity MCL public notice advisory for slow sand, diatomaceous earth, bag, or cartridge filtration plants

Tier 2 Public Notification

Table 25 lists the violation categories and other situations requiring a Tier 2 public notice. Tier 2 assignments for specific violations or situations are identified on page 102 (Art. 9, Sect. 9.2.3(a)).

Systems must provide public notice as soon as practical, but no later than 30 days after learning of a violation. On a case-by-case basis, the state may allow additional time for the initial notice (up to 3 months from the date on which the system operator learns of the violation). Extensions are not allowed for unresolved violations. Extensions must be provided in writing by the state (Art. 9, Sect. 9.2.3(b)(1)).

)Table 26 Violations and Other Situations Requiring a Tier 3 Public Notice (Art. 9, Table 9-6)	
(1)	Monitoring violations under the CPDWR, except where a Tier 1 notice is required under Art. 9, Sect. 9.2.2(a) (*see* "Tier 1 Public Notification" earlier in this Guide) or where the state determines that a Tier 2 notice is required.
(2)	Failure to comply with a testing procedure established in the CPDWR, except where a Tier 1 notice is required under Art. 9, Sect. 9.2.2(a) (*see* "Tier 1 Public Notification" earlier in this Guide) or where the state determines that a Tier 2 notice is required.
(3)	Operation under a variance or an exemption granted under Art. 4.
(4)	Availability of monitoring results for unregulated contaminants sampled as required by Art. 6, Sect. 6.4.
(5)	Exceedance of the secondary MCL of 2.0 mg/L for fluoride (*see* Art. 3, Table 3-1).

The water system must repeat the notice every 3 months as long as the violation or situation persists, unless the state determines that a different repeat notice frequency is warranted. Under no circumstance may the repeat notice be given less frequently than once per year.

Instructions for Tier 2 notification are provided on the reference CD.

Tier 3 Public Notification

Table 26 lists the violation categories and other situations requiring a Tier 3 public notice. Tier assignments for specific violations or situations are identified on page 102 (Art. 9, Sect. 9.2.4(a)).

Systems must provide public notice no later than 1 year after learning of a violation or situation or beginning operation under a variance or exemption. After the initial notice, the system must repeat the notice annually for as long as the violation, variance, exemption, or other situation persists (Art. 9, Sect. 9.2.4(b)(1)).

Instead of individual Tier 3 public notices, a system may use an annual report detailing all violations and situations that occurred in the previous 12 months, as long as the timing requirements are met (Art. 9, Sect. 9.2.4(b)(2)).

Special Types of Notices

Notice to New Billing Units or New Customers
NTNCWSs must continuously post the public notice in conspicuous locations to inform new consumers of

any continuing violation, the existence of a variance or exemption, or other ongoing situations requiring public notice for as long as the violation, variance, exemption, or other situation persists (Art. 9, Sect. 9.2.6(b)).

Availability of Unregulated Contaminant Monitoring Results If required to monitor under Article 6, Section 6.4, the system must notify people served of the availability of the results of such sampling no later than 12 months after the results are known (Article 9, Section 9.2.7).

Special Notice for Exceeding the SMCL for Fluoride NTNCWSs that exceed the fluoride SMCL of 2.0 mg/L but do not exceed the MCL of 4.0 mg/L must provide public notice to persons served as soon as practical, but no later than 12 months from the day the system learns of the exceedance. Specific requirements for this type of notice can be found in Article 9, Section 9.2.8.

Variance or Exemption Notice If a public water system has been granted a variance or an exemption, the system must provide public notice no later than 12 months after receiving such allowance. Specific requirements for this type of public notice can be found in Article 9, Section 9.2.5(b).

Special Notice for Nitrate A special notice is required for nitrate exceedances above the MCL. Systems must provide continuous posting of such notice when nitrate levels exceed 10 mg/L and the notice must include the potential health effects of exposure, according to Tier 1 requirements (Art. 9, Sect. 9.2.9).

Content and Format of Public Notices

The CPDWR require specific content for public notices, including multi-lingual requirements and standard (mandatory) language requirements.

Elements of Public Notices

The following 10 elements are required in public notices:

- Description of the violation or situation, including the contaminants of concern and contaminant level, as applicable;
- When the violation or situation occurred;
- Potential adverse health effects, including the standard language found on page 107 or that provided under "Standard Language" later in this section for monitoring violations, as applicable;
- Population at risk, including particularly vulnerable subpopulations;
- Whether alternative water supplies should be used;
- Actions consumers should take, including when they should seek medical help, if known;
- Actions the system is taking to correct the violation or situation;
- When the water system is expected to return to compliance or resolve the situation;
- The name, business address, and phone number of the water system owner, operator, or designee of the public water system as a source of additional information about the notice; and
- A statement to encourage the notice recipient to distribute the notice to others, using the following standard language: "Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (e.g., people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or by mail."

Each required public notice must comply with multilingual requirements (Art. 9, Sect. 9.2.5(c)(2)). For systems serving a large proportion of non–English-speaking consumers, as determined by the state or known to the water system, public notice must contain information in the appropriate languages regarding the importance of the notice or a telephone number or address that people can use to request assistance in the appropriate language or to obtain a translated copy of the notice.

Format Requirements

Each required public notice (Art. 9, Sect. 9.2.5(c)(1)) must

- Be prominently displayed when printed or posted;
- Not contain overly technical language or very small print;
- Not be formatted in a way that defeats the purpose of the notice; and
- Not contain language that nullifies the purpose of the notice.

Standard Language

Public water systems must include the following standard language in their public notices (Art. 9, Sect. 9.2.5(d)):

- Standard health effects language for MCL or MRDL violations, TT violations, and violations of the condition of a variance or exemption (*see* page 107). Notices for violations of a condition of a variance or exemption must contain the health effects language for the contaminant in question.
- Standard language for monitoring and testing procedure violations:

  We are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. During [compliance period], we "did not monitor or test" or "did not complete all monitoring or testing" for [contaminant(s)], and therefore cannot be sure of the quality of your drinking water during that time.

Instructions for Tier 3 notification are provided on the reference CD.

Article 10. Analytical Requirements and Laboratory Certification

The state provides a list of certified laboratories on the CDPHE Web site. Although listed, some labs may lack the ability to analyze composited samples. Check with the laboratories before submitting composited samples.

The regulations discussed in this guidance require the use of approved analytical methods. References to analytical methods approved for monitoring requirements can be found in the CPDWR. A water system must obtain written permission from the state and the EPA Administrator before using an alternative method for any contaminant (Art. 10, Sect. 10.10.1).

Unless otherwise stated in Article 10, compliance samples for Articles 5 through 8 must be analyzed by a state-certified laboratory. Exceptions to this are measurements for alkalinity, calcium, conductivity, disinfectant residual, orthophosphate, pH, silica, temperature, and turbidity, which may be performed by an operator certified in accordance with the Operator Certification Program (Regulation 100) (Art. 10, Sect. 10.10).

Article 11. Sanitary Surveys

Sanitary surveys are one of the most important barriers to health risks available to public water systems. A sanitary survey helps systems minimize public health threats and potential violations by identifying existing or potential sanitary risks. Additional guidance on the surveys is included in Part III.

Surface water NTNCWSs must have sanitary surveys at least every 5 years. The state will review the results of each survey to determine whether the existing monitoring frequency is adequate and whether the system must undertake additional measures. Sanitary surveys must be performed by the state or an agent approved by the state. The water system is responsible for ensuring that the survey takes place (Art. 11, Sect. 11.2).

For more information on sanitary surveys, refer to the document on pages 117–126 of Part III and to materials provided on the reference CD.

Article 12. Hazardous Cross-Connections

Uncontrolled cross-connections can lead to contamination in the distribution system. An aggressive prevention program is essential for protecting public health.

A cross-connection is any connection or structural arrangement between a potable water system and any other water source or system through which non-potable water can flow into the drinking water system. Potentially unsafe water could be drawn or pumped into the system by way of a cross-connection, thus contaminating it. Examples of cross-connections include these situations:

- Improperly connected dishwater;
- Unprotected underground sprinkler system; and
- Unprotected hose hanging in a chemical dilution or human-waste holding tank.

The existence of a cross-connection does not always result in backflow, but where a cross-connection exists, the potential for backflow is always present if either of the following exists:

- The water system is operating at a lower pressure than the non-potable system (e.g., sink, tank); or
- There is negative pressure in the water system that siphons non-potable material into the potable system.

The owner or operator must have a program in place to identify and eliminate unprotected cross-connections. Such a program should address the ability to identify cross-connections, require the installation

of containment devices where cross-connections exist, and provide for annual testing and maintenance by a Certified Cross-Connection Control Technician. Maintenance records must be retained by the water system for 3 years, and they must be available for inspection by WQCD personnel. During sanitary surveys, inspectors will examine the documentation to determine whether the system is implementing an adequate cross-connection control program.

More information on cross-connections may be found on the accompanying reference CD or by visiting the WQCD Web site.

Part III. Management and Administration Tools

Additional tools are included on the reference CD.

Article 1: General Requirements

Article 5: Microbiological Contaminants

Article 7: Filtration, Disinfection, and Disinfection Byproducts

Technical, Managerial, Financial Capacity Assessment Checklist

Technical Capacity

Is your water system following the Water Quality Monitoring schedule issued by the WQCD?	☐ Yes	☐ No
Is written documentation of the system's water rights available?	☐ Yes	☐ No
Has a five-year projection of the total annual system water needs been prepared, including domestic, commercial, and industrial uses?	☐ Yes	☐ No
Is the operator in charge certified at or above the facility's classification?	☐ Yes	☐ No
Is a staffing plan available that describes how the operator in responsible charge ensures that a qualified individual is making any critical adjustments within the treatment system?	☐ Yes	☐ No
Does the water system have a training program for water system operators that enables them to achieve recertification?	☐ Yes	☐ No
Is a written emergency operations plan available onsite?	☐ Yes	☐ No
Have water system operators and other personnel been trained to respond to emergencies, including potential breaches of security?	☐ Yes	☐ No
Has the water system identified potential sources of contamination and/or taken appropriate action based on the Source Water Assessment findings?	☐ Yes	☐ No

Managerial Capacity

Is the water system legal ownership clearly documented with name, mailing address, and telephone number?	☐ Yes	☐ No
For very small systems, is a description of operator and managerial responsibilities available?	☐ Yes	☐ No
Is there a recordkeeping system for all monitoring records?	☐ Yes	☐ No
Is the recordkeeping system for operating records appropriate for the complexity of the water system?	☐ Yes	☐ No
Is there a recordkeeping system for maintenance records?	☐ Yes	☐ No
Does the maintenance program cover source water(s), treatment plant(s), storage tanks, and distribution system(s)?	☐ Yes	☐ No
Are maintenance records adequate to keep equipment warranties from being voided?	☐ Yes	☐ No
Is there a recordkeeping system for financial records?	☐ Yes	☐ No
Are a map and facility description available?	☐ Yes	☐ No
Are "as-built" drawings available and maintained?	☐ Yes	☐ No
Is an O&M manual for the entire facility available and maintained?	☐ Yes	☐ No
Does the system have an active program for cross-connection control?	☐ Yes	☐ No
Are written cross-connection control policies and procedures available?	☐ Yes	☐ No
Does the water system track customer questions and complaints, as well as the system's responses?	☐ Yes	☐ No

Financial Capacity

Are all drinking water expenses budgeted for the water system?	☐ Yes	☐ No
Is there at least a 3-month operations and maintenance reserve for contingencies?	☐ Yes	☐ No
Does the water system maintain general liability insurance?	☐ Yes	☐ No
Does liability insurance include coverage for consumers suffering from illness related to your system's water?	☐ Yes	☐ No

Operator Certification General Information

General Requirement

Ground water transient non-community water systems are required to be under the supervision of a certified Operator in Responsible Charge (ORC) in both treatment and distribution. In general, this requirement may be satisfied by an operator certified in any combination of treatment and distribution certifications listed below. **Transient non-community public water systems that draw water from ground water sources not under the influence of surface water, serve less than 100 individuals per day, and utilize treatment consisting only of non-gaseous chlorine disinfection shall be classified as Transient Non-Community Water Systems. Operators of such systems may be certified as "Transient Non-Community Water System Operators" (Level T operators).**

Types of Certification

- Treatment – levels A, B, C, D, and T
- Distribution – levels 3, 2, and 1
- Combined treatment and distribution – SWS (small water system - equivalent to level D treatment and level 1 distribution)

Reporting Requirement

All systems subject to the ORC requirement must keep a current ORC reporting form on file with the Water Quality Control Division. Forms are available at www.cdphe.state.co.us/op/ocb under "Reporting Requirements" or by contacting the Facility-Operator Program.

Certification Examinations

	Spring	Fall	May	November
Application Deadline	Dec. 1st	June 1st	Feb. 15th	Aug. 15th
Exam Date	January-April	August-October	May	November
Treatment	X	X		
Small Water System	X	X		
Distribution			X	X
Examination Fees due with application	$50			
Certification Fees (after passing exam)	$50			
Renewal period	3 Years			
Approved Exam Training Opportunities	www.ocpoweb.com			
Application Forms & Experience Requirements	www.geteams.com/cecti.htm		www.geteams.com/cd.htm	
	www.cdphe.state.co.us.op.ocb			

Operator Duties

- Control the processing of raw, treated, and finished water
- Prepare and control chemical addition for water
- Observe and respond to variations in operating conditions
- Interpret instrument readings and adjust
- Operate valves, gates, and pumps
- Maintain logs and records
- Collect and/or analyze process control samples
- Inspect and test new, modified, or repaired facilities prior to placing them in service
- Implement preventative maintenance programs for facilities
- Comply with laws, regulations, and reporting requirements
- Provide current contact information to Operators Certification Board

Owner Duties

- Ensure the facility is operated by an ORC with appropriate certifications
- Ensure all process control and system integrity decisions about water quality or quantity affecting public health or the environment are made by an ORC
- Ensure a certified operator is available on-site or in contact as needed to initiate appropriate actions in a timely manner for each operating shift
- Keep a current ORC Reporting Form on file with the Water Quality Control Division

Contacts

Water Quality Control Division – Facility-Operator Program
4300 Cherry Creek Drive South – B2
Denver, Colorado 80246-1530
Betsy Beaver

303-692-3503 (phone); 303-782-0390 (fax)
betsy.beaver@state.co.us

Operator Certification Program Office (OCPO)
3401 Quebec Street #4050
Denver, Colorado 80207
Teresa Tezak

303-394-8994 (phone); 303-394-3450 (fax)

Colorado Department
of Public Health
and Environment

COLORADO WATER QUALITY CONTROL DIVISION

FACILITY-OPERATOR PROGRAM
4300 Cherry Creek Drive South – B2
Denver, Colorado 80246-1530
Web Site for Program Information: www.cdphe.state.co.us/op/ocb/ocbhom.asp

OPERATOR IN RESPONSIBLE CHARGE REPORT

Update this form as necessary

Office use: db _____

***Return Form To*:** Betsy Beaver, WQCD
4300 Cherry Creek Drive South - B2
Denver, CO 80246-1530
Telephone: 303-692-3503/ 303-782-0390 (fax)

USE A SEPARATE FORM FOR EACH FACILITY OR SYSTEM – PLEASE PRINT

Check all that apply	Water Treatment	Water Distribution	Wastewater Treatment	Wastewater Collection

Classification(s) of System: _____ **(see Regulation 100, sections 100.4-100.8)**

PWSID# _____ **and/or Discharge Permit #:** _____

System Name: _____ **Name of Person Reporting:**
System Contact Person: _____ _____
System Address: _____ **Position:** _____
_____ **Signature:** _____
System Telephone: _____ **Date:** _____
System e-mail: _____

Operator in Responsible Charge (1): **Operator ID#:** _____
Name: _____ **Cert #:** _____ **Type & Level:** _____ **Exp.Date:** _____
Address: _____ **Cert #:** _____ **Type & Level:** _____ **Exp.Date:** _____
_____ **Cert #:** _____ **Type & Level:** _____ **Exp.Date:** _____
_____ **Cert #:** _____ **Type & Level:** _____ **Exp.Date:** _____
Telephone: _____ **Operator (1) Signature:** _____
e-mail: _____ **Date:** _____

Operator in Responsible Charge (2): **Operator ID#:** _____
Name: _____ **Cert #:** _____ **Type & Level:** _____ **Exp.Date:** _____
Address: _____ **Cert #:** _____ **Type & Level:** _____ **Exp.Date:** _____
_____ **Cert #:** _____ **Type & Level:** _____ **Exp.Date:** _____
_____ **Cert #:** _____ **Type & Level:** _____ **Exp.Date:** _____
Telephone: _____ **e-mail:** _____

DRINKING WATER SECURITY CHECKLIST Colorado Dept. of Public Health & Environment Water Quality Control Division (12/1/2005) **Please mark Y (Yes) or N (No) for each system component.**		Treatment	Distribution/ Storage	COMMENTS
Personnel	1. Do employees wear photo-ID badges when on duty?			
	2. Is staff trained in security procedures?			
	3. Are access codes/keys strictly controlled and periodically changed?			
	4. Are periodic background checks performed for utility staff/contractors?			
Operational Security	1. Is an Emergency Response Plan with updated contacts in place?			
	2. Are personnel aware that all tampering events must be reported to the Colorado Dept. of Public Health & Environment by 10am the following day?			
	3. Is area periodically patrolled?			
	4. Are patrols/inspections varied both in frequency and by personnel?			
	5. Is there a visitor/contractor policy?			
Physical Security	1. Is warning signage in place? (e.g., "NO TRESPASSING," "AUTHORIZED PERSONNEL ONLY")			
	2. Is perimeter fenced and gated?			
	3. Are access roads gated and locked?			
	4. Is perimeter fence clearly visible and free from brush, trash, other barriers?			
	5. Does site have appropriate exterior lighting?			
	6. Are vents adequately secured and/or filtered?			
	7. Are there tamper-proof locks, caps, and covers on valve boxes, vaults, hatches, and fire hydrants?			
	8. Is a backup or uninterruptible power supply available for emergency lighting, alarms, monitors, and computers?			
	9. Are buildings secure and locked, including pump houses and other structures?			
	10. Are alarms monitored?			
Biological/ Chemical	1. Is direct access to wells or treated water protected, including vents or other access routes?			
	2. Are HVAC ventilation shafts secure?			
	3. Are deliveries inspected and monitored?		n/a	
	4. Are employees trained to handle and secure hazardous chemicals using appropriate PPE and MSDS guidelines?		n/a	
Cyber/ Comm.	1. Are cyber/SCADA security measures in place/monitored? (e.g.firewalls/anti-virus programs/password protection/internet & intranet protocols)			
	2. Are communications redundant? (radio, cell phone, telephone)			

Security Resources

CDPHE 24-Hour Hotline: 1-877-518-5608
Reporting hotline for spills or security incidents

WQCD website: http://www.cdphe.state.co.us/wq/Drinking_Water/Emergency_Response.htm
- Emergency Response Forms & Checklists – useful forms to guide water systems through emergency situations
- EPA's Response Protocol Toolbox and Guidelines
- Interim Voluntary Guidelines for Designing an Online Contaminant Monitoring System
- Interim Voluntary Security Guidance For Wastewater/Stormwater Utilities
- Interim Voluntary Security Guidance For Water Utilities

American Society of Civil Engineers (ASCE): The Water Infrastructure Security Enhancements (WISE) Training CD contains security guidance documents for water and wastewater, MS PowerPoint presentations, trainer's guide, quizzes, and exams. The CD may be requested free of charge by sending your name, address, and affiliation to wise@asce.org.

EPA Water Security website: http://www.epa.gov/safewater/watersecurity
EPA's portal to water security resources
- Vulnerability Assessment Tools (VSAT, SEMS)
- Response Protocol Toolbox
- Emergency Planning Guidance
- Security Enhancements/Research
- Security Product Guides

Colorado Drinking Water Security Listserve: http://mailman.listserve.com/listmanager/listinfo/codwsecurity
This listserve was developed by the Water Quality Control Division to provide security information, including training opportunities, to drinking water systems of Colorado. It is a members-only listserve intended exclusively for drinking water systems, and new members must be approved by the administrator. Sensitive information presented on this listserve should not be copied or distributed to others.

Colorado Drinking Water Security Discussion Listserve: http://mailman.listserve.com/listmanager/listinfo/colodwsecuritydiscussion
Members of the Colorado Drinking Water Security listserve are encouraged to use this moderated listserve as a forum in which to discuss drinking water security issues with other water systems.

AWWA website: http://www.awwa.org/advocacy/learn/security
Water security contacts and resources

Water ISAC: http://www.waterisac.org
Comprehensive subscription resource for up-to-date security information

Water Security Channel: www.watersc.org
Free e-mail notification of up-to-date security alerts and information

Colorado Department of Public Health and Environment

Colorado Department of Public Health and Environment
Compliance Assurance & Data Management Unit

REPORTING FORM FOR BACTERIOLOGICAL ANALYSIS

SAMPLER: FILL OUT ONE FORM - FOR EACH INDIVIDUAL SAMPLING POINT

PWSID #: CO0_____ COUNTY:_____ DATE COLLECTED: __/_____/_____

SYSTEM/ESTABLISHMENT NAME: _____

SYSTEM MAILING ADDRESS: _____

Street address/PO Box CITY STATE ZIP

CONTACT PERSON:_____ PHONE: (_____)_____

SAMPLE COLLECTED BY: _____ TIME COLLECTED:_____ am/pm

WATER TYPE: RAW (No chlorine or other treatment) ☐ CHLORINATED ☐ OTHER TREATMENT ☐

SAMPLE POINT (Address)	CHLORINE RESIDUAL in mg/L	SAMPLE TYPE
		☐ Routine ☐ Repeat ☐ Special Purpose

For Laboratory Use Only Below This Line

LABORATORY SAMPLE # _____ CLIENT NAME or ID# _____

LABORATORY NAME: _____ LAB PHONE # (____)_____

DATE RECEIVED IN LABORATORY ____/____/____ DATE ANALYZED ____/____/____

COMMENTS: _____

PARAMETER	RESULT	UNITS	ANALYSIS DATE	LABORATORY METHOD
Coliform, TOTAL (Verified)		#/100 mL		
Coliform, FECAL/e. Coli (Verified)		#/100 mL		
Coliform, TOTAL (Absent/Present)				
Coliform, FECAL/e. Coli (Absent/Present)				

LABORATORY: Please call Drinking Water Section with any results other than < 1 or ABSENT.

NT = Not Tested for compound
TNTC = Too Numerous To Count - Please resample
OD = Outdated - Please resample
<1 = Safe valid sample
Present Coliform / e.Coli /Fecal detected

#/100 ml = Number of colonies per 100 ml of sample
CG = Confluent Growth - Please resample
LA = Lab Accident - Please resample
Absent = Coliform / e.Coli /Fecal not detected

_____ ____/____/____

Reviewed & Approved by Title Date

MAIL RESULTS TO: CDPHE, WQCD-CADM-B2, 4300 Cherry Creek Drive South, Denver, CO 80246-1530

Colorado Department of Public Health and Environment
Compliance Assurance & Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530
PHONE: (303) 692-3500
FAX: (303) 782-0390

Colorado Department of Public Health and Environment

Monthly/Quarterly Summary for Bacteriological Water Analysis Reporting
FORM 1—ROUTINE SAFE SAMPLE DATA

COUNTY	MONTH	YEAR	SYSTEM TYPE
			☐ COMMUNITY ☐ NON-COMMUNITY

YOU MAY ENTER MULTIPLE **SAFE** SAMPLES FOR THE SAME SYSTEM ON ONE LINE
NOTE: Any Total Coliform Present results and their repeats must be reported on FORM 2 ONLY

PWSID #	NAME of WATER SYSTEM	Sample Collection Date	Number of Samples Collected	Total Coliform: Absent=A	CHLORINE RESIDUAL in mg/L	ANY ADDITIONAL COMMENTS
CO0						
CO0						
CO0						
CO0						
CO0						
CO0						
CO0						
CO0						
CO0						
CO0						

NAME OF LABORATORY: _____ LABORATORY PHONE NUMBER: _____

_____ ____/____/____
Reviewed & Approved by Title Date

Colorado Department of Public Health and Environment
Compliance Assurance & Data Management Unit

4300 Cherry Creek Drive South, Denver, CO 80246-1530
PHONE: (303) 692-3500
FAX: (303) 782-0390

Colorado Department of Public Health and Environment

Summary for Bacteriological Water Analysis Reporting
FORM 2—UNSAFE ROUTINE SAMPLE DATA AND REPEATS

COUNTY	MONTH	YEAR	SYSTEM TYPE
			☐ COMMUNITY ☐ NON-COMMUNITY

SYSTEM NAME: _____ PWSID: CO0 _____

SAMPLE TYPE	Sample Collection Date	Verified total Coliform Present=P	Verified fecal/E. coli Coliform: Present=P Absent=A	CHLORINE RESIDUAL in mg/L	NOTIFIED STATE		ANY ADDITIONAL COMMENTS
					CONTACT NAME	DATE/ TIME	
☐ ROUTINE							
☐ UPSTREAM ☐ REPEAT							
☐ DOWNSTREAM ☐ REPEAT							
☐ ORIGINAL ☐ REPEAT							
☐ OTHER ☐ REPEAT							

NAME OF LABORATORY: _____ LABORATORY PHONE NUMBER: _____

_____ / / _____

Reviewed & Approved by Title Date

Calculating Log Inactivation for a Conventional Filtration Plant

The treatment sequence diagram below shows the process for calculating log inactivation for a conventional filtration plant. The process Is divided into three segments that correspond to three periods following disinfectant dosing. For this example, it is assumed that the system has gathered pertinent water quality parameters and has calculated contact time, T_{10}, for each treatment step.

The log inactivation calculation for Segment 1 is provided below. Observe from the diagram that the concentration of chlorine measured at the end of Segment 1 was 0.23 mg/L.

CT_{actual} = (residual disinfection concentration) x (sum of T_{10} for each unit process)
= (0.23 mg/L of chlorine) x (39 + 0.32 + 9.1 + 243 minutes)
= **67.03 mg-min/L**

To determine 3-log inactivation of *Giardia*, or $CT_{3\text{-log, }Giardia}$, for the water quality parameters in Segment 1, use Table A for 5°C (rounding 6.1° to the nearest 5°), pH 8.0, and residual concentration ≤ 0.4.

Table A. Required CT Values for 3-log Inactivation of *Giardia* Cysts by Free Chlorine

Chlorine Concentration (mg/L)	Temperature = 5°C, pH ≤ 6.0	pH 6.5	pH 7.0	pH 7.5	pH 8.0	pH 8.5	pH 9.0
≤ 0.4	97	117	139	166	198	236	279
0.6	100	120	143	171	204	244	291
0.8	103	122	146	175	210	252	301
1	105	125	149	179	216	260	312

$CT_{3\text{-log, }Giardia}$ = 198 mg-min/L

Next, determine the 4-log inactivation of viruses, or $CT_{4\text{-log, virus}}$ from Table B. *Since the temperature of 6.1°C is not covered in the CT table, use the next lower temperature, 6°C.*

Table B. Required CT Values for 4-Log Inactivation of Viruses by Free Chlorine, pH 6.0-9.0

Temperature C	(mg-min/L)
5	8
6	7.6
7	7.2

$CT_{4\text{-log, virus}}$ = 7.6 mg-min/L

Now determine estimated log inactivation of *Giardia* and viruses for Segment 1:

Estimated Log Inactivation of *Giardia* for Segment 1	**Estimated Log Inactivation of Viruses for Segment 1**
= 3.0 x (CT_{actual} / $CT_{3\text{-log, }Giardia}$)	= 4.0 x (CT_{actual} / $CT_{4\text{-log, virus}}$)
= 3.0 x (67.03 / 198)	= 4.0 x (67.03 / 7.6)
= 1.02	**= 35.3**

For total plant log inactivation, repeat these calculations for Segments 2 and 3 and add to the Segment 1 log inactivation.

Calculations for Total Plant Inactivation

	Log Inactivation for Giardia	Log Inactivation for Viruses
Segment 1	1.02	35.3
Segment 2	0.65	30.0
Segment 3	0.22	0.34
Total Plant Inactivation	***Giardia*** **1.89**	***Viruses*** **65.64**

TREATMENT SEQUENCE

	Cl_2 Dose	Segment 1				← *Total Time, Segment 1*	Residual Sampling Point 1	Cl_2 Dose	Segment 2		← *Total Time, Segment 2*	Residual Sampling Point 2	NH_4 Dose	Segment 3	← *Total Time, Segment 3*	Residual Sampling Point 3	To Distribution→
Treatment Step		Raw Water Transfer Line→	Rapid Mix →	Flocculation →	Sedimentation				Filtration	Finished Water Transfer Line				Clear Wells			
Volume (gallons)		416,374	34,468	969,408	5,180,947				130,870	138,983				2,511,545			
Peak Hourly Flow (gpm)		10,651	10,651	10,651	10,651				10,651	10,651				10,651			
Theoretical Detention Time (min) = *Volume/Peak Hourly Flow*		39.1	3.2	91.0	486				12.3	13.0				236			
Baffling Factor		1.0	0.10	0.10	0.50				0.70	1.0				0.3			
Baffling Condition		Plug Flow	Very Poor	Very Poor	Average				Superior	Plug Flow				Poor			
T_{10} (min) = *Theoretical Detention Time x Baffling Condition/Factor*		39.1	0.32	9.1	243	*292*			8.6	13	*22*			71	*71*		
Disinfectant Residual (mg/L), measured							0.23					2.63				2.23	***Total Plant CT Value***
CT_{Actual} (mg/L), calculated		67.3 *(Total Time Segment 1 x Residual Sampling Point 1)*					+		56.8 *(Total Time Segment 2 x Residual Sampling Point 2)*			+		158.3 *(Total Time Segment 3 x Residual Sampling Point 3)*		=	***282.1***
pH, measured		8							7.6					7.6			***Total Plant Log Inactivation for Giardia***
Temp (∞C) measured		6.1							6.1					6.1			
$CT_{3,\ Giardia,}$ from EPA Tables		198							224.8					2130			
Log Inactivation *(Giardia)*, see example		1.02					+		0.65			+		0.22		=	***1.89***
$CT_{4,\ Virus,}$ from EPA Tables		7.6							7.6					1889			***Total Plant Log Inactivation for Viruses***
Log Inactivation (Viruses), see example		35.3					+		30			+		0.34		=	***65.6***

For complete information, see EPA's guidance document, *Disinfection Profiling and Benchmarking*, included on the reference CD.

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

MONTHLY OPERATIONAL REPORT – Summary Sheet

CONVENTIONAL OR DIRECT FILTRATION

Month _____ Year _____

I. DEMOGRAPHICS SECTION PWSID#: _____

System Name: _____ Plant ID #: _____

Plant Address: _____ _____ _____

Street *City* *Zip*

County: _____ Population Served: _____

Responsible Party: _____

** I certify that the information sumitted in this form was obtained by myself or by other individuals under my direction or supervision and that the information, to the best of my knowledge and belief, is true, accurate and complete.**

II. TURBIDITY SECTION (Conventional or Direct Filtration)

☐ Check if Plant is Off the Entire Month

	NO. OF SAMPLES	% OF TOTAL SAMPLES
A. TOTAL NUMBER OF TURBIDITY ANALYSES PERFORMED		
B. NUMBER OF TURBIDITY ANALYSIS ≤0.3 NTU		
B. NUMBER OF TURBIDITY ANALYSIS >1 NTU		

HIGHEST TURBIDITY READING OF THE MONTH _____

D. INDIVIDUAL TURBIDITY CHECKLIST (For Direct or Conventional Only)

1. IS TURBIDITY FROM EACH INDIVIDUAL FILTER RECORDED EVERY 15 MINUTES? ☐ YES ☐ NO

2. DID ANY SINGLE FILTER EXCEED 2.0 NTU IN 2 CONSECUTIVE 15 MINUTE PERIODS?

☐ NO, Go to Question 3.

☐ YES, What date was the Filter Profile completed? _____

DID THIS SAME FILTER EXCEED 2.0 NTU IN 2 CONSECUTIVE 15 MIN. PERIODS DURING THE LAST MONTH?

☐ NO, Go to Question 3.

☐ YES, Schedule Comprehensive Performance Evaluation (CPE) with 30 Days.

3. DID ANY SINGLE FILTER EXCEED 1.0 NTU IN 2 CONSECUTIVE 15 MINUTE PERIODS?

☐ NO, Go to Question 4.

☐ YES, What date was the Filter Profile completed? _____

DID THIS SAME FILTER EXCEED 1.0 NTU IN 2 CONSECUTIVE 15 MIN. PERIODS DURING THE LAST 2 MONTHS?

☐ NO, Go to Question 4.

☐ YES, What date was the Filter Self-assessment completed? _____

4. DID ANY SINGLE FILTER EXCEED 0.5 NTU IN 2 CONSECUTIVE 15 MINUTE PERIODS AT THE END OF 4 HRS OF OPERATION?

☐ NO, You are finished with the checklist.

☐ YES, What date was the Filter Profile complete _____

**** NOTE: If any of the above questions are checked "YES", you must complete IESWTR Form 2 and submit to WQCD along with this form ****

III. CHLORINATION SECTION ☐ FREE ☐ TOTAL

A. NO. CHLORINE RESIDUAL SAMPLES <0.2 MG/L:	
B. NO. OF CHLORINE RESIDUAL SAMPLES TAKEN FROM DIST. SYSTEM:	
C. NO. IN DISTRIBUTION SYSTEM WHERE NO CHLORINE WAS DETECTED:	
D. % OF SAMPLES WHERE NO CHLORINE WAS DETECTED:	

WAS % IN "D" >5%% IN THE PREVIOUS MONTH: ☐ YES ☐ NO

***** NOTE: If answer to above question is "YES" and percentage for current month is also > 5%, this is a Treatment Technique (TT) violation*****

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
MONTHLY OPERATIONAL REPORT - Data Sheet
CONVENTIONAL OR DIRECT FILTRATION

Required Number of Turbidity Readings Per Day: ____ **PWSID #:** _____

DAY	TURBIDITY (NTU) ☐ Continuous Sampling ☐ Grab Sampling								RESIDUAL DISINFECTANT (mg/L) ☐ Continuous Sampling ☐ Grab Sampling							12. COMMENTS
	12 to 4	4 to 8	8 to 12	12 to 4	4 to 8	8 to 12	HIGHEST TURBIDITY READING	TIME TURBIDITY READ	ENTRY POINT TO DISTRIBUTION 12 to 4	4 to 8	8 to 2	12 to 4	4 to 8	8 to 12	LOWEST RESIDUAL READING	
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
31																

****If at **Any Time** the combined filter effluent turbidity exceeds 1 NTU (>1.49), the state must be notified as soon as possible, but not later than the end of the next business day .****

Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

Monthly Report for Individual Filter Turbidity Monitoring

PWSID Number: 0
System Name/Treatment Plant: Type the system or plant name

Individual Filter Calibrated: Date of filter calibration **Date: (Year/Month) Report Year/Month**

Day	List all filters* that exceeded turbidity levels of 0.5 NTU after 4 hrs., 1.0 NTU, and 2.0 NTU in 2 consecutive Individual Filter readings taken 15 minutes apart	If 1.0 NTU ** was exceeded, was a filter profile complete within 7 days?	If 0.5 NTU ** was exceeded 4 hours after a backwash or filter startup, was a filter profile completed within 7 days?	If 1.0 NTU *** was exceeded in the same filter 3 months in a row, was a self-assessment completed within 14 days?	If 2.0 NTU *** was exceed in the same filter 2 months in a row, was a 3rd part CPE arranged within 30 days &completed and submitted within 90 days?
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					

* For each filter, attach information identifying the turbidity readings (taken every 15 minutes) that caused the exceedance(s).
** If the individual filter exceedance was caused by obvious reason (e.g., valve malfunction, etc.) submit a written explanation describing the situation that caused the turbidity exceedance in lieu of the filter profile.
*** If a public water system has reported an obvious reason for an exceedance in columns 3 & 4, it does not count as one of the consecutive months.

IESWTR Form 2
January 25, 2002

Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

DBP Form 1 - Total Trihalomethane Analysis Laboratory Report Form

Section I (to be completed by the Public Water Systems only)		Section II (to be completed by Laboratories only)	
Public Water System Information		**Laboratory Information**	
PWSID #			
System Name:		Laboratory Name	
Address:		Contact Person:	Phone #:
Contact Person:	Phone #:	Comments:	
System Authorized Signature, Title, Date		Laboratory Authorized Signature, Title, Date	

PWS to complete first 3 columns			Laboratories to complete columns 4-6 and 8-11							
Sample Date	**Collector**	**Sample Location Designation #**	**Date Lab Received**	**Date Lab Analyzed**	**Laboratory Sample ID #**	**Analyte**	**Analytical Method**	**µg/L Blank Result**	**µg/L Lab MDL**	**µg/L Result**
						Chloroform				
						Bromoform				
						Bromodichloromethane				
						Dibromochloromethane				
						TTHMs				
Sample Date	**Collector**	**Sample Location Designation #**	**Date Lab Received**	**Date Lab Analyzed**	**Laboratory Sample ID #**	**Analyte**	**Analytical Method**	**µg/L Blank Result**	**µg/L Lab MDL**	**µg/L Result**
						Chloroform				
						Bromoform				
						Bromodichloromethane				
						Dibromochloromethane				
						TTHMs				
Sample Date	**Collector**	**Sample Location Designation #**	**Date Lab Received**	**Date Lab Analyzed**	**Laboratory Sample ID #**	**Analyte**	**Analytical Method**	**µg/L Blank Result**	**µg/L Lab MDL**	**µg/L Result**
						Chloroform				
						Bromoform				
						Bromodichloromethane				
						Dibromochloromethane				
						TTHMs				
Sample Date	**Collector**	**Sample Location Designation #**	**Date Lab Received**	**Date Lab Analyzed**	**Laboratory Sample ID #**	**Analyte**	**Analytical Method**	**µg/L Blank Result**	**µg/L Lab MDL**	**µg/L Result**
						Chloroform				
						Bromoform				
						Bromodichloromethane				
						Dibromochloromethane				
						TTHMs				

Instructions on Reverse

DBP Form 1 – Version 2
July 9, 2002

Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

INSTRUCTIONS FOR COMPLETING

Total Trihalomethane Analysis Laboratory Report Form

Section I – To be Completed by the Public Water System Submitting the Samples to the Laboratory

1. PWSID #: Enter the Public Water System (PWS) Identification number assigned by CDPHE/WQCD.
2. System Name: Enter system legal name provided to CDPHE/WQCD when PWSID assigned.
3. Address: The PWS mailing address.
4. Contact Person: The person at the public water system who would be able to answer questions about these samples.
5. Phone: The phone number of the contact person.
6. Authorized Signature: The person that signs the form must be the legal owner or authorized representative of the legal owner. This signature certifies that the information submitted is correct and consistent with the written monitoring plan. Include title and date authorized.

Section II - To be Completed by the Laboratory Reporting the Results

7. Laboratory Name: The name of the laboratory conducting the analyses.
8. Laboratory Contact: The name of the person at the laboratory that would be able to answer questions about these samples.
9. Laboratory Phone Number: The laboratory contact's phone number.
10. Laboratory Comments: Any relative comments with regards to the samples.
11. Authorized Signature: The person that signs the form must be the laboratory authorized representative. Include title and date signed.

Abbreviations

NT:	Not Tested
B:	The analyte is found in the associated blank as well as in the sample.
µg/L:	Micrograms per Liter
MCL:	Maximum Contaminant Level
BDL:	Compound was analyzed, but the result was below the laboratory MDL
Lab MDL:	Laboratory Method Detection Limit
J:	Indicates the presence of a compound that meets the identification criteria, but the result is less than the practical quantitation limit (PQL) and greater than the Laboratory Method Detection Level (MDL). (Above the Lab MDL, but below the PQL.)

Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

DBP Form 2 - Haloacetic Acid (HAA5) Analysis Laboratory Report Form

Section I (to be completed by the Public Water Systems only)		Section II (to be completed by Laboratories only)	
Public Water System Information		**Laboratory Information**	
PWSID #			
System Name:		Laboratory Name	
Address:		Contact Person:	Phone #:
Contact Person:	Phone #:	Comments:	
System Authorized Signature Title Date		Laboratory Authorized Signature Title Date	

PWS to complete first 3 columns			Laboratory to complete columns 4-6 and 8-11							
Sample Date	**Collector**	**Sample Location Designation #**	**Date Lab Received**	**Date Lab Analyzed**	**Laboratory ID #**	**Analyte**	**Analytical Method**	**µg/L Blank Result**	**µg/L Lab MDL**	**µg/L Result**
						Monochlo.Acid				
						Monobro. Acid				
						Dichlor. Acid				
						Trichlor. Acid				
						Dibromo. Acid				
						Total HAA5s				
Sample Date	**Collector**	**Sample Location Designation #**	**Date Lab Received**	**Date Lab Analyzed**	**Laboratory ID #**	**Analyte**	**Analytical Method**	**µg/L Blank Result**	**µg/L Lab MDL**	**µg/L Result**
						Monochlo.Acid				
						Monobro. Acid				
						Dichlor. Acid				
						Trichlor. Acid				
						Dibromo. Acid				
						Total HAA5s				
Sample Date	**Collector**	**Sample Location Designation #**	**Date Lab Received**	**Date Lab Analyzed**	**Laboratory ID #**	**Analyte**	**Analytical Method**	**µg/L Blank Result**	**µg/L Lab MDL**	**µg/L Result**
						Monochlo.Acid				
						Monobro. Acid				
						Dichlor. Acid				
						Trichlor. Acid				
						Dibromo. Acid				
						Total HAA5s				
Sample Date	**Collector**	**Sample Location Designation #**	**Date Lab Received**	**Date Lab Analyzed**	**Laboratory ID #**	**Analyte**	**Analytical Method**	**µg/L Blank Result**	**µg/L Lab MDL**	**µg/L Result**
						Monochlo.Acid				
						Monobro. Acid				
						Dichlor. Acid				
						Trichlor. Acid				
						Dibromo. Acid				
						Total HAA5s				

Instructions on Reverse

DBP Form 2 – Version 2
July 9, 2002

INSTRUCTIONS FOR COMPLETING
HAA5 Analysis Laboratory Report Form

Section I - Completed by the Public Water System Submitting the Samples to the Laboratory

1. PWSID #: Enter the Public Water System (PWS) Identification number assigned by CDPHE/WQCD.
2. System Name: Enter system legal name provided to CDPHE/WQCD when PWSID assigned.
3. Address: The PWS mailing address.
4. Contact Person: The person at the public water system who would be able to answer questions about these samples.
5. Phone: The phone number of the contact person.
6. Authorized Signature: The person that signs the form must be the legal owner or authorized representative of the legal owner. This signature certifies that the information submitted is correct and consistent with the written monitoring plan. Include title and date authorized.
7. PWS's: Complete first three (3) columns.

Section II - To be Completed by the Laboratory Reporting the Results

8. Laboratory Name: The name of the laboratory conducting the analyses.
9. Laboratory Contact: The name of the person at the laboratory that would be able to answer questions about these samples.
10. Laboratory Phone Number: The laboratory contact's phone number.
11. Laboratory Comments: Any relative comments with regards to the samples.
12. Authorized Signature: The person that signs the form must be the laboratory authorized representative. Include title and date signed.
13. Laboratory: Complete columns 4-6 and 8-11.

Abbreviations

NT:	Not Tested
B:	The analyte is found in the associated blank as well as in the sample.
µg/L:	Micrograms per Liter
MCL:	Maximum Contaminant Level
BDL:	Compound was analyzed, but the result was below the laboratory MDL
Lab MDL:	Laboratory Method Detection Limit
J:	Indicates the presence of a compound that meets the identification criteria, but the result is less than the practical quantitation limit (PQL) and greater than the Laboratory Method Detection Level (MDL). (Above the Lab MDL, but below the PQL.)

Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

DBP Form 3
TTHM and HAA5 Quarterly Report Worksheet

PWSID #: _____ **SYSTEM NAME:** _____

REPORT DATE: _____ **Year: [20__ __]**

Check One: ☐ 1st Quarter ☐ 2nd Quarter ☐ 3rd Quarter ☐ 4th Quarter

A	B	C	D	E	F	G	H	I	J	K	L
Day	First Month	TTHM (µg/L)	HAA5 (µg/L)	Day	Second Month	TTHM (µg/L)	HAA5 (µg/L)	Day	Third Month	TTHM (µg/L)	HAA5 (µg/L)
Total											
Monthly Average											

Instructions on Reverse

Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

INSTRUCTIONS FOR COMPLETING TTHM and HAA5 Quarterly Report Worksheet

This worksheet is provided to assist a public water system in calculating the average of all TTHM samples taken during the month when more than one sample is taken. The monthly average at the bottom of columns C, G, and K are entered into the TTHM portion of Column B of DBP Form 4. The monthly averages at the bottom of column D, H and L are entered into the HAA5 portion of Column B of DBP Form 4. The quarterly averages in the very last row on this form (DBP Form 3) are transferred to the appropriate row of Column C of DBP Form 4, where the results from the last four consecutive quarters are averaged and reported as the RAA on the last row in Column D.

1. PWSID #: enter the Public Water System (PWS) Identification Number.
2. System Name: enter system legal name provided to CDPHE when PWSID assigned.
3. Report Date: enter the date that the final report is prepared.
4. Year: Enter the last two (2) digits of the year that corresponds to the last day of the reporting period.
5. Check One: Check the box for the appropriate quarter of the year: 1st Quarter – January, February, March; 2nd Quarter – April, May, June; 3rd Quarter – July, August, September; 4th Quarter – October, November, December
6. Columns A, E & I: report the appropriate day of the month on which the samples were taken.
7. Columns B, F & J: report the appropriate month of the quarter from which the samples were taken.
8. Columns C, G & K: record the total TTHM results from the last column of DBP Form 1
9. Columns D, H & L: record the total HAA5 results from the last column of DBP Form 2
10. Total: Add the results recorded in each column and record results here.
11. Monthly Average: Divide the result from the total above by the total number of samples obtained during that month. Record the results in the appropriate month under TTHM or HAA5 in Column B of DBP Form 4.
12. Attach a copy of the laboratory reporting forms (DBP Forms 1 & 2) from only the **most recent quarter**.

Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

DBP Form 4
Reporting Form for Running Annual Average (RAA) for Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAA5s)

PWSID #: _____ **SYSTEM NAME:** _____

DATE: _____ **PREPARED BY:** _____

AUTHORIZED SIGNATURE: _____ **TITLE:** _____

POPULATION SERVED: _____

Water Source Type: **Ground water** ☐ **Surface water** ☐ **Both** ☐

Number of Treatment Plants: _____

Total # of samples taken this quarter: **Month 1:** _____ **Month 2:** _____ **Month 3:** _____

If sampling is done yearly, the total # of samples taken during the year: _____

Violation?: ☐

Check One: ☐ **1st Quarter** (Due by April 10th) ☐ **2nd Quarter** (Due by July 10th) ☐ **3rd Quarter** (Due by Oct. 10th) ☐ **4th Quarter** (Due by Jan.10th)

	Column A	Column B Monthly Data*		Column C Quarterly Average		Column D Running Annual Average	
Month	Year	Total TTHMs µg/L	Total HAA5s µg/L	Total TTHMs µg/L	Total HAA5s µg/L	Total TTHMs µg/L	Total HAA5s µg/L
January	20__ __						
February	20__ __						
March	20__ __						
April	20__ __						
May	20__ __						
June	20__ __						
July	20__ __						
August	20__ __						
September	20__ __						
October	20__ __						
November	20__ __						
December	20__ __						
					Running Annual Average =		

ATTACH LABORATORY REPORT FORMS **(DBP Form 1 and 2 –Version 2, dated July 9, 2002)**
Laboratory raw data results must be maintained for a minimum of three years
Instructions on Reverse

Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

INSTRUCTIONS FOR COMPLETING

Running Annual Average (RAA) for Total Trihalomethanes (TTHMs) And Haloacetic Acids (HAA5s)

1. PWSID #: Enter the Public Water System (PWS) Identification Number assigned by CDPHE.
2. System Name: Enter system legal name provided to CDPHE when PWSID assigned.
3. Date: Enter the date that the final report is prepared and signed.
4. Prepared by: Print the name of the person completing the form.
5. Authorized Signature: The person that signs the form must be the legal owner or authorized representative of the legal owner. This signature certifies that the information submitted is correct and consistent with the written monitoring plan
6. Title: Title/position of individual signing the document
7. Population Served: Complete population size served by PWS.
8. Water Source Type: Check the box that describes your water source(s).
9. Number of Treatment Plants: Enter the total number of treatment plants.
10. Total # of samples taken this quarter: for systems sampling TTHM and HAA5 quarterly enter the number of samples collected each month of the reporting period.
11. Total # of samples taken during the year: for systems sampling TTHM and HAA5 annually enter the number of samples collected for the reporting year.
12. Violation?: Check only if the system has had a violation during this reporting quarter.
13. Check One: Check the appropriate reporting quarter: Quarter 1 -January, February, and March; Quarter 2 - April, May, and June; Quarter 3 - July, August, and September; Quarter 4 - October, November, and December.

Specific Form Instructions

Fill out the appropriate months.

14. Column A: enter the year for which the reporting month is associated.
15. Column B: enter quarterly average of TTHM and HAA5 results for each month (Data from DBP Form 1 and 2 if only one sample is taken each quarter or from DBP Form 3 if multiple samples are taken each quarter).
16. Column C: enter the quarterly average of TTHM and HAA5 results, respectively, for the quarter (sum the monthly averages and divide by the number of months that a monthly average was used in the sum).
17. Column D: enter the running annual average (RAA) for TTHM and HAA5 concentrations. Determine the RAA by summing the quarterly average in column 3 and dividing by the number of quarters in column 3 that had entries used to calculate the sum.

Subpart H - Instructions for Different Populations

18. Surface and GWUDISW serving > 10,000 population: Minimum of 4 samples per plant per quarter. Complete Column A, Column B Monthly Data for TTHM and HAA5. Complete Column C quarterly data at end of each quarter – March, June, September and December for TTHM and HAA5. Complete Column D Running Annual Average at bottom of page for both TTHM and HAA5.
19. Surface and GWUDISW serving 500-9,999 population: Minimum of 1 sample per plant per quarter for RAA. Complete Column A, Column B Monthly Data for TTHM and HAA5. Complete Column C quarterly data at end of each quarter – March, June, September and December for TTHM and HAA5. Complete Column D Running Annual Average at bottom of page for both TTHM and HAA5.
20. Surface and GWUDISW <500 population: Minimum of 1 sample per plant per year in August. Complete August Column A & B for TTHM and HAA5, September quarter Column C, and Running Annual Average Column D, for TTHM and HAA5.
21. Ground water serving > 10,000 population: Minimum of 1 sample per plant per quarter for RAA. Complete three designated months, example Jan, Apr, Jul and Oct Columns A & B TTHM and HAA5 data. Then complete Column C quarterly average data for each quarter. Finally, complete Running Annual Average in Column D for both TTHM and HAA5.
22. Ground water serving < 10,000 population: Minimum of 1 sample per plant per year in August. Complete August Column A & B TTHM and HAA5, September quarter Column C, and Running Annual Average Column D, for TTHM and HAA5.

Colorado Department of Public Health and Environment
Water Quality Control Division, Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South – Denver, CO 80246-1530

MRDL Form 1
Chlorine and Chloramines, Maximum Residual Disinfectant Level (MRDL) Monthly Worksheet

PWSID #: _____ SYSTEM NAME: _____ DATE: _____
Month: _____ Year: 20 __ __

Column A	Column B	Column C	Column D	Column E	Column F	Column G
Sample Event #	**Location ID #**	**Level Recorded ROUTINE TC Sample-- Chlorine/Chloramine (mg/L)**	**Level Recorded REPEAT TC Sample-- Chlorine/Chloramine (mg/L)**	**Level Recorded INCREASED ROUTINE TC Sample- Chlorine/ Chloramine (mg/L)**	**Level Recorded OTHER Compliance Sample-- Chlorine/ Chloramine (mg/L)**	**Repeat any entry in Columns C, D, E, or F in this column (mg/L) (there should be only one sample per row)**
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
Add all the numbers in column G and enter the sum here →→						
Calculate the average of all residual levels for the month by dividing the sum of column G by the total number of samples taken during the month. Enter this average into Column A of MRDL Form 2 for the appropriate month.						

Instructions on Reverse

Colorado Department of Public Health and Environment
Water Quality Control Division, Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South – Denver, CO 80246-1530

INSTRUCTIONS FOR COMPLETING

Chlorine and Chloramines, Maximum Residual Disinfectant Level (MRDL) Monthly Worksheet

1. PWSID #: Enter the Public Water System (PWS) ID number assigned by CDPHE/WQCD.
2. System Name: Enter system name provided to CDPHE/WQCD when PWSID assigned.
3. Date: Enter the date that the final report is prepared and signed.
4. Month: Enter the reporting month.
5. Year: Enter the last 2 digits of the reporting year.

FORM SPECIFICS

This worksheet is provided to assist public water systems in calculating the average of all chlorine or chloramine residual levels recorded during the month. Disinfectant residuals must be determined each time a routine, repeat, or increased routine total coliform sample is collected. Any additional disinfectant residual monitoring results obtained by the system must also be recorded and used to calculate compliance. Each row is to contain only one residual level which is to be associated with the appropriate heading: routine, repeat, increased routine or other compliance disinfectant residual level sample(s). Systems required by regulations to collect more than 10 samples per month may modify the form to disregard the column headings or use a spreadsheet to calculate monthly averages as long as all disinfectant residuals taken each month are recorded and used in the computation and reporting of the monthly average disinfectant level.

6. Column A: is used to indicate the number of sample events taken since the beginning of the reporting month. For example: if a PWS samples four times during the month for chlorine residual in the distribution system (in accordance with its written sampling plan) it would enter the results in rows 1-4. . The number in Column A of the last row with an entry, is the number to be used in the denominator to calculate the average concentration from all sample locations. The numbers in this column do not correlate to the days of the month.
7. Column B: enter the location identifier, which should depict the location where each residual measurement was obtained.
8. Column C: enter the Chlorine/Chloramine residual in mg/L, measured at the time each “routine” Total Coliform (TC) sample was collected.
9. Column D: enter the Chlorine/Chloramine residual measured in mg/L, at the time each “repeat” Total Coliform (TC) sample was collected.
10. Column E: enter the Chlorine/Chloramine residual measured in mg/L, at the time each “increased routine” Total Coliform (TC) sample was collected.
11. Column F: enter the Chlorine/Chloramine residual measured in mg/L, at the time “other” residual determinations samples were made in the distribution system, not associated with minimum required TC monitoring, but included in the public water system monitoring plan.
12. Column G: enter the value of the disinfectant residual entered in any one of Columns C, D, E, or F.
13. Calculate the monthly average for chlorine/chloramine MRDL. This is the Sum of the values in Column G divided by the total number of entries in Column A.
14. Transfer monthly average as calculated above to Column A of MRDL Form 2 for the appropriate month.

Colorado Department of Public Health and Environment – Water Quality Control Division
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MRDL Form 2
Quarterly Reporting Form for Chlorine and Chloramines Maximum Residual Disinfectant Level Running Annual Average (RAA)

PWSID #: _____ **SYSTEM NAME:** _____ **DATE:** _____

PREPARED BY: _____ **TITLE:** _____

AUTHORIZED SIGNATURE: _____ **TITLE:** _____

POPULATION SERVED: _____ **VIOLATION?:** ☐

Number of Samples Taken: Month 1: _____ **Month 2:** _____ **Month 3:** _____

		Column A	Column B	Column C
Month	**Year**	**Monthly Average** Chlorine or Chloramines (mg/L)	**Quarterly Average** Chlorine or Chloramines (mg/L)	**Running Annual Average** Chlorine or Chloramines (mg/L)
January	20___ ___			
February	20___ ___			
March	20___ ___		Q1 =	
April	20___ ___			
May	20___ ___			
June	20___ ___		Q2 =	
July	20___ ___			
August	20___ ___			
September	20___ ___		Q3 =	
October	20___ ___			
November	20___ ___			
December	20___ ___		Q4 =	
			Running Annual Average =	

LABORATORY REPORTING FORMS MUST BE AVAILABLE UPON REQUEST

Instructions on Reverse

Colorado Department of Public Health and Environment – Water Quality Control Division
Drinking Water Program – Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

INSTRUCTIONS FOR COMPLETING
Quarterly Report for Chlorine and Chloramines Maximum Residual Disinfection Level Running Annual Average (RAA)

1. PWSID #: Enter the Public Water System (PWS) Identification Number assigned by CDPHE.
2. System Name: Enter system legal name provided to CDPHE when PWSID assigned.
3. Date: Enter the date that the final report is prepared and signed.
4. Prepared by: Print the name of the person completing the form.
5. Authorized Signature: The person that signs the form must be the legal owner or authorized representative of the legal owner. This signature certifies that the information submitted is correct and consistent with the written monitoring plan.
6. Title: Title of the legal owner or authorized representative of the legal owner.
7. Fill out: population size served by system.
8. Violation: check if system is reporting a violation.
9. Total Number of Samples Taken: Enter the total number of samples for chlorine and chloramines for each month of the reporting quarter.

SPECIFIC FORM INSTRUCTIONS

10. Year: Enter the reporting year.
11. Column A: Enter the average of all chlorine/chloramines residual levels for each month. Refer to MRDL Form 1, MRDL monthly worksheet.
12. Column B: For the current quarterly reporting period, enter into the Q1, Q2, Q3, or Q4 box the average monthly chlorine or chloramine residual for the months associated with the reporting quarter. For example, in Q1, sum the average chlorine or chloramine concentration reported for Jan, Feb and March, divide the sum by 3 and enter the result in the Q1 box. Enter the average of the 3 corresponding month's chlorine/chloramines residual levels.
13. Column C: Calculate the RAA (Running Annual Average) of the chlorine/chloramines residual levels for the four most recent quarters and enter the result in the last row of Column C titled: Running Annual Average.

Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

DBP Precursor Form 1

Disinfection Byproduct Precursors Laboratory Report to Public Water Systems

Section I (to be completed by the Public Water Systems only)	Section II (to be completed by Laboratories only)
Public Water System Information	**Laboratory Information**
PWSID #	
System Name:	Laboratory Name
Address:	Contact Person: Phone #:
Contact Person: Phone #:	Comments:
System Authorized Signature Title Date	Laboratory Authorized Signature Title Date

PWS complete columns 2-4				Laboratory complete columns 5-12						
Analysis	**Sample Date**	**Collector**	**Sample Locale ID**	**Date Lab Received**	**Date Lab Analyzed**	**Laboratory Sample ID**	**Analytical Method**	**Lab MDL (abs., or mg/L)**	**Blank Results (abs., or mg/L)**	**Sample Result (abs., or mg/L)**
R Total Alkalinity (mg/L as CaCO3)										
T Total Alkalinity ((mg/L as CaCO3)										
R TOC (mg/L)										
T TOC (mg/L)										
R DOC (mg/L)										
T DOC (mg/L)										
R UV-254 (abs.)										
T UV-254 (abs.)										
R Mg Hardness (mg/L as $CaCO_3$)										
T Mg Hardness (as mg/L $CaCO_3$)										
R Total Alkalinity (mg/L as CaCO3)										
T Total Alkalinity (as mg/L CaCO3)										
R TOC (mg/L)										
T TOC (mg/L)										
R DOC (mg/L)										
T DOC (mg/L)										
R UV-254 (abs.)										
T UV-254 (abs.)										
R Mg Hardness (mg/L as $CaCO_3$)										
T Mg Hardness (mg/L as $CaCO_3$)										

Instructions on Reverse

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Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

INSTRUCTIONS FOR COMPLETING

Laboratory Report to Public Water System Disinfectant By-Product Precursor
Softening Alternative Compliance Parameters

Section I – To be Completed by the Public Water System Submitting the Samples to the Laboratory

Public water systems must take at least one sample per month as required by State and EPA regulations.

1. PWSID #: Enter the Public Water System (PWS) Identification number assigned by CDPHE.
2. System Name: Enter system legal name provided to CDPHE when PWSID assigned.
3. Address: The water system's mailing address.
4. Contact Person: The person at the public water system who would be able to answer questions about these samples.
5. Phone: The phone number of the contact person.
6. Authorized Signature: The person that signs the form must be the legal owner or authorized representative of the legal owner. This signature certifies that the information submitted is correct and consistent with the written monitoring plan. Include the title and date signed.

Section II - To be Completed by the Laboratory that is Reporting Results

7. Laboratory Name: The name of the laboratory conducting the analyses.
8. Laboratory Contact: The name of the person at the laboratory that would be able to answer questions about these samples.
9. Laboratory Phone Number: The laboratory contact's phone number.
10. Laboratory Comments: Any relative comments with regards to the samples or their analysis.
11. Authorized Signature: The person that signs the form must be the laboratory authorized representative. Include title and date signed.

Abbreviations

R:	Raw water sample (i.e., R Total Alkalinity = Raw Water Total Alkalinity)
T:	Treated or Finished water sample (i.e., T TOC = Treated or Finished Water TOC)
Abs.:	Absorption
NT:	Not Tested
B:	The analyte is found in the associated blank as well as in the sample.
µg/L:	Micrograms per Liter
mg/L:	Milligrams per Liter
MCL:	Maximum Contaminant Level
BDL:	Compound was analyzed, but the result was below the laboratory MDL
Lab MDL:	Laboratory Method Detection Limit
J:	Indicates the presence of a compound that meets the identification criteria, but the result is less than the practical quantitation limit (PQL) and greater than the Laboratory Method Detection Level (MDL). (Above the Lab MDL, but below the PQL.)

Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

DBP Precursor Form 2
Alternative Compliance Criteria for Conventional Filtration Treatment Plants

PWSID #: _____ **SYSTEM NAME:** _____ **DATE:** _____

TREATMENT PLANT NAME: _____ **TREATMENT PLANT ID #:** _____

AUTHORIZED SIGNATURE: _____ **TITLE:** _____

PREPARED BY: _____ **TITLE:** _____ **PHONE NUMBER:** _____

Check One: ☐ 1st Quarter (Due by April 10th) ☐ 2nd Quarter (Due by July 10th) ☐ 3rd Quarter (Due by Oct. 10th) ☐ 4th Quarter (Due by Jan.10th) **YEAR: 20 __ __**

System Uses Only Chlorine for Primary Disinfection and Residual Maintenance: Yes ☐ No ☐ **VIOLATION?: ☐**

CRITERIA USED: ☐ (i) ☐ (ii) ☐ (iii) ☐ (iv) ☐ (v) ☐ (vi)

Month	Year	Column A Source Water Alkalinity (mg/L)		Column B Source Water TOC (mg/L)		Column C Treated TOC (mg/L)		Column D Source SUVA (Source UV-254/ Source DOC)		Column E Finished SUVA (Finished UV-254/ Finished DOC)		Column F Distribution System TTHM (mg/L)		Column G Distribution System HAA5 (mg/L)	
January	20__ __														
February	20__ __														
March	20__ __		Q1=		Q1=		Q1=		Q1=		Q1=		Q1=		Q1=
April	20__ __														
May	20__ __														
June	20__ __		Q2=		Q2=		Q2=		Q2=		Q2=		Q2=		Q2=
July	20__ __														
August	20__ __														
September	20__ __		Q3=		Q3=		Q3=		Q3=		Q3=		Q3=		Q3=
October	20__ __														
November	20__ __														
December	20__ __		Q4=		Q4=		Q4=		Q4=		Q4=		Q4=		Q4=
		RAA=		RAA=		RAA=		RAA=		RAA=		RAA=		RAA=	

Instructions on Reverse

Colorado Department of Public Health and Environment -Water Quality Control Division
Drinking Water Program - Compliance Assurance and Data Management Unit
4300 Cherry Creek Drive South, Denver, CO 80246-1530

INSTRUCTIONS FOR COMPLETING DBP Precursor Form 2

1. PWSID #: Enter the Public Water System (PWS) ID number assigned by CDPHE.
2. System Name: Enter system legal name provided to CDPHE when PWSID assigned.
3. Date: Enter the date that the final report is prepared and signed.
4. Treatment Plant: Enter the name of the treatment plant from which these results are associated. Be sure name is consistent with treatment plant name in the monitoring plan.
5. Treatment Plant ID#: The treatment plant identification number.
6. Authorized Signature: The person that signs the form must be the legal owner or authorized representative of the legal owner. This signature certifies that the information submitted is correct and consistent with the written monitoring plan.
   Title: The title of the owner or authorized representative of the legal owner.
7. Prepared by: **Print** the name of the person completing the form.
8. Title: The title of the person completing this form.
9. Phone Number: complete phone number of person completing this form.
10. Check the quarter that this report covers. Quarter 1-January, February, and March; Quarter 2-April, May, and June; Quarter 3-July, August, and September; and Quarter 4-October, November, and December.
11. Year: Enter the last 2 digits of the year for the reporting quarter.
12. Check: Yes, if your system uses ONLY chlorine for both primary and secondary disinfection. No, if your system uses any other disinfectant for either primary or secondary disinfection. If a system answers 'No' to this question, they are not eligible to check Alternative Compliance Criteria (iv).
13. Violation: check if there was a violation during the reporting quarter.
14. Criteria Used: Check the appropriate alternative compliance criteria that the system will be using for compliance during the most recent quarter and complete the appropriate columns as listed in ()**:**
    (i) The system's source water TOC level is less than 2.0 mg/L, calculated quarterly as a running annual average (Complete Columns A, B & C):
    (ii) The system's treated water TOC level is less than 2.0 mg/L, calculated quarterly as a running annual average (Complete Columns A, B, & C):
    (iii) The system meets all 3 of the following criteria (Complete Columns A, B, C, F & G):
        a. The system's source water TOC level is less than 4.0 mg/L, calculated quarterly as a running annual average
        b. The system's source water alkalinity is greater than 60 mg/L (as $CaCO_3$), calculated quarterly as a running annual average; and
        c. The system's TTHM and HAA5 running annual averages are no greater than 0.040 mg/L and 0.030 mg/L, respectively.
    (iv) The TTHM and HAA5 running annual averages are no greater than 0.040 mg/L and 0.030 mg/L, respectively, and the system uses only chlorine for primary disinfection and maintenance of a residual in the distribution system (Complete Columns A, B, C, F & G):
    (v) The system's source water SUVA, prior to any treatment and measured monthly is less than or equal to 2.0 L/mg-m, calculated quarterly as a running annual average (Complete Columns A, B, C &D):
    (vi) The system's finished water SUVA, measured monthly, is less than or equal to 2.0 L/mg-m, calculated quarterly as a running annual average (Complete Columns A, B, C & E).

Complete the appropriate reporting columns, as listed above, for each Alternative Compliance Criteria as follows:
(Note: All systems must complete Columns A, B, and C, regardless of which Alternative Compliance Criteria they use to demonstrate compliance

15. **Column A:** Enter the value that represents the source water alkalinity in mg/L (as CaCO3). If more than one monthly analysis is performed, report the average for the month consistent with the schedule provided in the system's monitoring plan. At the end of each three-month period, calculate the quarterly average of the monthly values and report them in the unshaded area next to the appropriate Quarter (Q1, Q2, Q3, or Q4). At the end of each quarter, calculate the running annual average (RAA) of the previous 4 quarters and report the result at the bottom of the form in the row labeled "RAA".
16. **Column B**: Enter value that represents the source water TOC in mg/L. If more than one monthly analysis is performed, report the average for the month consistent with the schedule provided in the system's monitoring plan. At the end of each three-month period, calculate the quarterly average of the monthly values and report them in the unshaded area next to the appropriate Quarter (Q1, Q2, Q3, or Q4). At the end of each quarter, calculate the running annual average (RAA) of the previous 4 quarters and report the result at the bottom of the form in the row labeled "RAA".
17. **Column C:** Enter the value that represents the finished water TOC in mg/L. If more than one monthly analysis is performed, report the average for the month consistent with the schedule provided in the system's monitoring plan. At the end of each three-month period, calculate the quarterly average of the monthly values and report them in the unshaded area next to the appropriate Quarter (Q1, Q2, Q3, or Q4). At the end of each quarter, calculate the running annual average (RAA) of the previous 4 quarters and report the result at the bottom of the form in the row labeled "RAA".
18. **Column D:** enter the value that represents the source water SUVA (in L/mg·m). If more than one…etc. Same as A,B,C above).
19. **Column E:** Enter the value that represents the finished water SUVA (in L/mg-m). If more that one…etc.
20. **Columns F &G:** Enter in Columns F and G the value that represents distribution system TTHM and HAA5 concentrations respectively. If more than one…etc.

NOTE: Systems do not need to calculate the Running Annual Average (RAA) for source water alkalinity, source water TOC or finished water TOC unless it is required under the appropriate alternative compliance criteria (ACC). (i.e., a system using ACC - (v) would need to report the values of the source water alkalinity, source water TOC and finished water TOC, but would not need to calculate their quarterly averages or their RAAs.

Colorado Department of Public Health and Environment -Water Quality Control Division
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4300 Cherry Creek Drive South, Denver, CO 80246-1530

DBP Precursor Form 4
ACTUAL REMOVAL RATIOS for Enhanced Coagulation and Softening Treatment Plants

PWSID #: _____ **SYSTEM NAME:** _____ **DATE:** _____

TREATMENT PLANT NAME: _____ **TREATMENT PLANT ID #:** _____

AUTHORIZED SIGNATURE: _____ **SIGNATORY'S TITLE:** _____

PREPARED BY: _____ **PREPARER'S TITLE:** _____ **PHONE NUMBER:** _____

Check One: ☐ 1st Quarter (Due by April 10th) ☐ 2nd Quarter (Due by July 10th) ☐ 3rd Quarter (Due by Oct. 10th) ☐ 4th Quarter (Due by Jan. 10th) **YEAR: 20 __ __** **VIOLATION?:** ☐

Month of Quarter	A Source Water Alk. (mg/L)	B Source Water TOC (mg/l)	C Source SUVA	D Treated Alkalinity (mg/L)	E Treated TOC (mg/l)	F Treated SUVA	G Magnesium Hardness Removed (mg/L as $CaCO_3$)	H Actual % TOC Removed	I Required % TOC Removed	J TOC Removal Ratio	K Eligible for Compliance Substitution?	L Compliance Factor	M Calculation of Running Annual Average of TOC using Monthly Compliance Factors
1													January:
													February:
													March:
													April:
													May:
								Monthly AVERAGE				M1=	June:
2													July:
													August:
													September:
													October:
													November:
								Monthly AVERAGE				M2=	December:
3													RAA:
								Monthly AVERAGE				M3=	

Instructions on Reverse

Instructions For

*Disinfection ByProduct Precursor Removal Compliance Reporting **ACTUAL REMOVAL RATIOS** for Enhanced Coagulation and Softening Treatment Plants*

1. PWSID#: Enter the Public Water System (PWS) ID number assigned by CDPHE.
2. System Name: Enter the system legal name provided to CDPHE when PWSID assigned.
3. Date: Enter the date that the final report is prepared and signed.
4. Treatment Plant: Enter the name of the treatment plant from which these results are associated. Be sure name is consistent with treatment plant name in the monitoring plan.
5. Treatment Plant ID#: The treatment plant identification number.
6. Authorized Signature: The person that signs the form must be the legal owner or authorized representative of the legal owner. This signature certifies that the information submitted is correct and consistent with the written monitoring plan.
7. Signatory Title: The title of the owner or authorized representative of the legal owner.
8. Prepared by: **Print** the name of the person completing this form.
9. Preparer's Title: The title of the person completing this form.
10. Phone Number: Complete phone number of person preparing this form.
11. Check: the quarter that this report covers. Quarter 1 –January, February, and March; Quarter 2-April, May, and June; Quarter 3-July, August, and September; and Quarter 4-October, November, and December.
12. Year: Enter the last 2 digits of the year for the reporting quarter.
13. Violation: If the Calculated Running Annual Average of TOC removal % is less than 1.00, check box.

All Systems must complete Columns A, B, and E.

14. **Column A:** Enter the measured value for the source water alkalinity in mg/L (as $CaCO_3$) for each paired sampling event.
15. **Column B:** Enter the measured value for the source water TOC in mg/L for each paired sampling event.
16. **Column C:** For systems that monitor source water SUVA to be able to assign a removal ratio, enter the measured value of the source water SUVA. This sample must be collected at the same time as the source alkalinity and associated paired TOC samples.
17. **Column D:** This column will only be used for softening systems. Softening systems that monitor treated water alkalinity to be able to assign a removal ratio, enter the measured value of the treated water alkalinity. This sample must be collected at the same time as the source alkalinity and associated paired TOC samples.
18. **Column E:** Enter the measured value for the treated water TOC in mg/L for each paired sampling event.
19. **Column F:** For systems that monitor treated water alkalinity to be able to assign a removal ratio, enter the measured value of the treated water alkalinity. This sample must be collected at the same time as the source alkalinity and associated paired TOC samples.
20. **Column G:** For softening systems that monitor magnesium hardness removed to be able to assign a removal ratio, enter the measured value of the magnesium hardness removed in mg/L as $CaCO_3$. This sample must be collected at the same time as the source alkalinity and associated paired TOC samples.
21. **Column H:** Enter the actual % of TOC removed using the results of the paired source and treated water TOC as entered in columns B and E for each paired sampling event, equal to (1- (treated water TOC/source water TOC)) x 100. **Note: This calculation could result in a negative number in instances where the treated water TOC sample result is higher than the source water TOC sample result.**
22. **Column I:** Enter the required TOC percent removal as determined by using the results of source water alkalinity and TOC using the 3 x 3 Table of 40CFR141.135(b)(2).
23. **Column J:** Enter the TOC removal ratio determined by dividing the actual percentage of TOC removed (Column H) by the required TOC removal percentage (Column I). **Note: This calculation would also result in a negative number if the value recorded in Column H were negative. If the calculation results in a negative number, the system must record the negative number as the actual removal ratio in this Column.**
24. **Column K:** If the value entered in Column J is less than 1.00, the system did not remove sufficient TOC. However, the system may assign a removal ratio of 1.0 for an individual sampling event if, for that sampling event, the system can demonstrate through monitoring results that the system was eligible for a compliance substitution (See 40CFR141.135(c)(2). If the system can demonstrate that it meets one or more of these criteria, enter "yes" in column K. If the system cannot demonstrate that it met the criteria to allow it to assign a removal ratio of 1.0, enter "no" in Column K and enter into Column L the actual removal ratio calculated in Column J.
25. **Column L:** Enter either the actual removal ratio from Column J or assign a removal ratio of 1.0 if the system was eligible to enter "yes" in Column K. If a system was eligible to enter "yes" in Column K, they do not have to assign a removal ratio of 1.0 if the actual removal ratio in Column J was greater than 1.00. In the event that the treatment plant takes more than one sample per month, average the compliance factors obtained for each paired sampling event for the month and enter this value in the monthly average row and in Column M for the month for which the monitoring was performed. In any month that the treatment plant does not operate, enter "PO" in lieu of a compliance factor.
26. **Column M:** At the end of each quarter, calculate the running annual average of TOC removed using the monthly compliance factors determined as described in the above paragraphs for the previous 12 consecutive months. In the event that "PO" is entered for any monthly compliance ratio, disregard the associated month and calculate the running annual average over the previous 12 consecutive months using only the months where a compliance factor was determined. For example, if the plant operated for any 10 of the last 12 most recent consecutive months, add the compliance factors for the 10 months that the plant was in operation and divide the result by 10. This is the running annual average. If the running annual average of actual TOC percent removal as determined above is less than 1.0, the system is not in compliance and must check the violation box at the top of this form.

Colorado Department
of Public Health
and Environment

Sample Results and Collection Method Certification

RESULTS OF LEAD AND COPPER TAP WATER MONITORING:
(A copy of the lab report must be attached to this form.)

PWSID No. and System Name_____

# of samples required _____ 90th Percentile Pb: _____ mg/l
# of samples submitted_____ 90th Percentile Cu: _____mg/l

CERTIFICATION OF SAMPLE COLLECTION:

I certify that:

Each first draw tap water sample for lead and copper is one liter in volume and, to the best of my knowledge, has stood motionless in the plumbing for at least six hours.

Each first draw sample collected from a single family residence has been collected from the cold water kitchen tap or bathroom sink tap.

Each first draw sample collected from a non-residential building has been collected at an interior cold-water tap from which water is typically drawn for consumption.

If a resident volunteered to collect a tap water sample from his or her home, I certify that they have been properly instructed in the proper methods for collecting lead and copper samples. I do not challenge the accuracy of those sampling results. Enclosed is a copy of the material distributed to the residents explaining the proper collection methods.

I do not challenge the accuracy of these sampling results.

No changes to the sampling sites were made. If changes were made to sampling sites a Change of Sampling Site form is attached hereto.

AUTHORIZED SIGNATURE:

_____

Print Name:_____

_____ _____
Title Date

Colorado Department of Public Health and Environment

Sampling Pool for Lead and Copper Tap Water Samples

PWSID #CO0_____ System Name:_____
Mailing Address: _____
Telephone No.: _____
Monitoring Period: June 1,_____ to September 30_____
Number of Sampling Sites Required _____
Page 1 of _____

No.	Address	Plumbing Install Date	Plumbing materials	Bldg. Type	Lead Service Line?	Tier Level 1,2,3	New Site?

Building Codes:
SFR = Single Family Residence,
SFS2 = Single Family Structure Bldg used for business
MFR = Multi-Family Residence (>20% exist in system)
MFR2 = Multi-Family Residence
B = Building

Plumbing Codes:
CPLS = Copper Pipes with Lead Solder
CP = Copper Pipes without Lead Solder
NonCP = Non-Copper Pipes
LP = Lead Pipes

Complete this form and submit it with the laboratory results to:
Colorado Department of Public Health and Environment
WQCD-CMDM-B2, ATTN: CADM
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

Colorado Department of Public Health and Environment

Homeowner Certification and Instructions for Tap Sample Collection

These samples are being collected to determine the lead and copper levels in your tap water. This sampling effort is required by the U.S. Environmental Protection Agency and your state, and is being accomplished through the cooperation of homeowners and residents.

A sample is to be collected after water has been sitting in the pipes for an extended period of time (i.e., no water use during this period). Due to this requirement, either early mornings or evenings upon returning from work are the best times for collecting samples. The collection procedure is described in more detail below.

1. Prior arrangements will be made with the customer to coordinate the sample collection event. Dates will be set for sample kit delivery and pick up by the water department staff.
2. A minimum 6-hour period during which there is no water use throughout the house must be achieved prior to sampling. The water department recommends that either early mornings or evenings upon returning home are the best sampling times to ensure that the necessary stagnant water conditions exist.
3. A kitchen or bathroom cold-water faucet is to be used for sampling. Place the sample bottle (open) below the faucet and gently open the cold water tap. Fill the sample bottle to the line marked "1000 ml" and turn off the water.
4. Tightly cap the sample bottle and place in the sample kit provided. Please review the sample kit label at this time to ensure that all information contained on the label is correct.
5. IF ANY PLUMBING REPAIRS OR REPLACMENT HAS BEEN DONE IN THE HOME SINCE THE PREVIOUS SAMPLING EVENT, NOTE THIS INFORMATIN ON THIS FORM BELOW.
6. Place the sample kit and the completed certification form below outside of the residence in the location of the kit's delivery so that department staff may pick up the sample kit.
7. Results from this monitoring effort will be provided to participating customers when reports are generated for the State unless excessive lead and or copper levels are found. In those cases, immediate notification will be provided (usually 10 working days from the time of sample collection).

Call _____ at _____ if you have any questions regarding these instructions.

Certification of Resident Sampling Form:

TO BE COMPLETED BY RESIDENT	
Water was last used:	Time:
Sample was collected:	Time:
I have read the above directions and have taken a tap sample in accordance with these directions. _____ Signature _____ Date	
Additional Comments or Notations:	

Colorado Department of Public Health and Environment

Tier 1
Drinking Water Public Notification Certificate of Delivery Form

System Name: _____

PWSID CO0_____

Reason for Notice: (description of violation or situation) _____

Date of Violation Letter or Date of Public Notice Requirement Letter: _____

I hereby affirm that Public Notification for the violation or situation identified above has been provided to consumers and any consecutive water systems in accordance with the delivery, content, and format requirements of the *Colorado Primary Drinking Water Regulations*, section 9.2. I affirm that future requirements for notifying new billing units will be met. I also understand that this notice may need to be repeated in accordance with section 9.2 and I must submit this form again with each repeated notice.

The system consulted with: _____(name) at CDPHE-WQCD, Date:_____

Public Notice Distributed on: (date) _____

Check all distribution methods used to reach all consumers:

- ☐ Direct delivery method (hand delivery) – required for community water systems
- ☐ Continuously posted: (list locations) _____
- ☐ Television, Radio, and/or Newspaper: _____
- ☐ Emergency-911 system message
- ☐ Delivery of multiple copies to hospitals, apartment buildings, schools, or other community centers
- ☐ E-mail
- ☐ Other method approved by CDPHE: _____

List all consecutive water systems (water systems that purchase water from your system) that notice was delivered to:

_____

_____

_____

_____ _____

Signature of owner or owner's legal representative Date Signed

_____

Printed name of owner or owner's legal representative

Phone number: _____

Mailing Address: _____

Attach copies of each public notice and send to:

CDPHE-WQCD
ATTN: CADM-Public Notification Or Fax to: (303) 758-1398
4300 Cherry Creek Drive South
Denver, CO 80246-1530

Colorado Department of Public Health and Environment

Tier 2
Drinking Water Public Notification Certificate of Delivery Form

System Name: _____

PWSID CO0_____

Reason for Notice: (description of violation or situation) _____

Date of Violation Letter: _____

I hereby affirm that Public Notification for the violation or situation identified above has been provided to consumers and any consecutive water systems in accordance with the delivery, content, and format requirements of the *Colorado Primary Drinking Water Regulations*, section 9.2. I affirm that future requirements for notifying new billing units will be met. I also understand that this notice may need to be repeated in accordance with section 9.2 and I must submit this form again with each repeated notice.

Public Notice Distributed on: (date) _____

Check all distribution methods used to reach all consumers:

- ☐ Direct delivery method (includes hand delivery and U.S. mail) – required for community water systems
- ☐ Continuously posted: (list locations) _____
- ☐ Television, Radio, and/or Newspaper: _____
- ☐ Delivery of multiple copies to hospitals, apartment buildings, schools, or other community centers
- ☐ E-mail
- ☐ Other method approved by CDPHE: _____

List all consecutive water systems (water systems that purchase water from your system) that notice was delivered to:

_____

_____

_____

_____ _____

Signature of owner or owner's legal representative Date Signed

_____

Printed name of owner or owner's legal representative

Phone number: _____

Mailing Address: _____

Attach copies of each public notice and send to:

CDPHE-WQCD
ATTN: CADM-Public Notification Or Fax to: (303) 758-1398
4300 Cherry Creek Drive South
Denver, CO 80246-1530

Colorado Department of Public Health and Environment

Tier 3
Drinking Water Public Notification Certificate of Delivery Form

System Name: _____

PWSID CO0_____

Reason for Notice: (description of violation or situation) _____

Date of Violation Letter: _____

I hereby affirm that Public Notification for the violation or situation identified above has been provided to consumers and any consecutive water systems in accordance with the delivery, content, and format requirements of the *Colorado Primary Drinking Water Regulations*, section 9.2. I affirm that future requirements for notifying new billing units will be met. I also understand that this notice may need to be repeated in accordance with section 9.2 and I must submit this form again with each repeated notice.

Public Notice Distributed on: (date) _____

Check all distribution methods used to reach all consumers:

- ☐ Direct delivery method (includes hand delivery and U.S. mail)
- ☐ Continuously posted: (list locations) _____
- ☐ Television, Radio, and/or Newspaper: _____
- ☐ Delivery of multiple copies to hospitals, apartment buildings, schools, or other community centers
- ☐ E-mail
- ☐ Included in Consumer Confidence Report – applies to community water systems only
- ☐ Other method approved by CDPHE: _____

List all consecutive water systems (water systems that purchase water from your system) that notice was delivered to:

_____

_____

_____

_____ _____

Signature of owner or owner's legal representative Date Signed

_____

Printed name of owner or owner's legal representative

Phone number: _____

Mailing Address: _____

Attach copies of each public notice and send to:

CDPHE-WQCD
ATTN: CADM-Public Notification
4300 Cherry Creek Drive South
Denver, CO 80246-1530

Or Fax to: (303) 758-1398

CPDWR Violations and Other Situations Requiring Public Notice[1]

Contaminant	MCL/MRDL/TT Violations		Monitoring and Testing Procedure Violations	
	Tier	Citation	Tier	Citation
I. Violations of Colorado Primary Drinking Water Regulations (CPDWR):[2]				
A. Microbiological Contaminants				
1. Total coliform	2	2.3	3	5.1.1-5.1.4
2. Fecal coliform/*E. coli*	1	2.3	1[3], 3	5.1.4
3. Turbidity (for TT violations resulting from a single exceedance of maximum allowable turbidity level)	2,1[4]	2.8, 7.1.3(f)(2), 7.1.3(g)(2), 7.1.3(h)(2); 7.2.3(a)(2), 7.2.3(b)(1), 7.2.3(c); and 7.3.4(b)(2), 7.3.4(c)(2))	3	7.1.4, 7.2.4, 7.3.5, 10.5.1
4. Filtration and disinfection violations, other than violations resulting from single exceedance of max. allowable turbidity level	2	2.8, 7.1.2-7.1.3, 7.2.3, 7.3.4	3	7.1.4, 7.2.4, 7.3.5, 10.5.1
5. Disinfection profiling	N/A	N/A	3	7.2.2, 7.3.2-7.3.3
6. Filter Backwash Recycling Rule violations	2	7.4.3	N/A	N/A
B. Inorganic Chemicals (IOCs)				
1. Antimony	2	2.2	3	6.1.5
2. Arsenic	2	2.2[5]	3	6.1.5
3. Asbestos (fibers > 10 µm)	2	2.2	3	6.1.5
4. Barium	2	2.2	3	6.1.5
5. Beryllium	2	2.2	3	6.1.5
6. Cadmium	2	2.2	3	6.1.5
7. Chromium (total)	2	2.2	3	6.1.5
8. Cyanide	2	2.2	3	6.1.5
9. Fluoride	2	2.2	3	6.15
10. Mercury (inorganic)	2	2.2	3	6.1.5
11. Nitrate	1	2.2	1[6],3	6.1.5
12. Nitrite	1	2.2	1[6], 3	6.1.5
13. Selenium	2	2.2	3	6.1.5

Contaminant	MCL/MRDL/TT Violations		Monitoring and Testing Procedure Violations	
	Tier	Citation	Tier	Citation
14. Thallium	2	2.2	3	6.1.5
C. Lead and Copper Rule (Action Level for lead is 0.015 mg/L, for copper is 1.3 mg/L)				
1. Lead and Copper Rule (TT)	2	8.2–8.6	3	8.7, 8.8, 8.9
D. Synthetic Organic Chemicals (SOCs)				
1. 2,4–D	2	2.1 (b)	3	6.2.6
2. 2,4,5–TP (Silvex)	2	2.1 (b)	3	6.2.6
3. Alachlor	2	2.1 (b)	3	6.2.6
4. Atrazine	2	2.1 (b)	3	6.2.6
5. Benzo(a)pyrene (PAHs)	2	2.1 (b)	3	6.2.6
6. Carbofuran	2	2.1 (b)	3	6.2.6
7. Chlordane	2	2.1 (b)	3	6.2.6
8. Dalapon	2	2.1 (b)	3	6.2.6
9. Di (2-ethylhexyl) adipate	2	2.1 (b)	3	6.2.6
10. Di (2-ethylhexyl) phthalate	2	2.1 (b)	3	6.2.6
11. Dibromochloropropane	2	2.1 (b)	3	6.2.6
12. Dinoseb	2	2.1 (b)	3	6.2.6
13. Dioxin (2,3,7,8-TCDD)	2	2.1 (b)	3	6.2.6
14. Diquat	2	2.1 (b)	3	6.2.6
15. Endothall	2	2.1 (b)	3	6.2.6
16. Endrin	2	2.1 (b)	3	6.2.6
17. Ethylene dibromide	2	2.1 (b)	3	6.2.6
18. Glyphosate	2	2.1 (b)	3	6.2.6
19. Heptachlor	2	2.1 (b)	3	6.2.6
20. Heptachlor epoxide	2	2.1 (b)	3	6.2.6
21. Hexachlorobenzene	2	2.1 (b)	3	6.2.6
22. Hexachlorocyclopentadiene	2	2.1 (b)	3	6.2.6
23. Lindane	2	2.1 (b)	3	6.2.6
24. Methoxychlor	2	2.1 (b)	3	6.2.6
25. Oxamyl (Vydate)	2	2.1 (b)	3	6.2.6
26. Pentachlorophenol	2	2.1 (b)	3	6.2.6
27. Picloram	2	2.1 (b)	3	6.2.6
28. Polychlorinated biphenyls (PCBs)	2	2.1 (b)	3	6.2.6
29. Simazine	2	2.1 (b)	3	6.2.6
30. Toxaphene	2	2.1 (b)	3	6.2.6
E. Volatile Organic Chemicals (VOCs)				
1. Benzene	2	2.1 (a)	3	6.2.5
2. Carbon tetrachloride	2	2.1 (a)	3	6.2.5

Contaminant	MCL/MRDL/TT Violations		Monitoring and Testing Procedure Violations	
	Tier	Citation	Tier	Citation
3. Chlorobenzene (monochlorobenzene)	2	2.1 (a)	3	6.2.5
4. o-Dichlorobenzene	2	2.1 (a)	3	6.2.5
5. p-Dichlorobenzene	2	2.1 (a)	3	6.2.5
6. 1,2-Dichlorobenzene	2	2.1 (a)	3	6.2.5
7. 1,1-Dichloroethylene	2	2.1 (a)	3	6.2.5
8. cis-1,2-Dichloroethylene	2	2.1 (a)	3	6.2.5
9. trans-1,2-Dichloroehtylene	2	2.1 (a)	3	6.2.5
10. Dichloromethane	2	2.1 (a)	3	6.2.5
11. 1,2-Dichloropropane	2	2.1 (a)	3	6.2.5
12. Ethylbenzene	2	2.1 (a)	3	6.2.5
13. Styrene	2	2.1 (a)	3	6.2.5
14. Tetrachloroethylene	2	2.1 (a)	3	6.2.5
15. Toluene	2	2.1 (a)	3	6.2.5
16. 1,2,4-Trichlorobenzene	2	2.1 (a)	3	6.2.5
17. 1,1,1-Trichloroethane	2	2.1 (a)	3	6.2.5
18. 1,1,2-Trichloroethane	2	2.1 (a)	3	6.2.5
19. Trichloroethylene	2	2.1 (a)	3	6.2.5
20. Vinyl chloride	2	2.1 (a)	3	6.2.5
21. Xylenes (total)	2	2.1 (a)	3	6.2.5
F. Disinfection Byproducts (DBPs) and Disinfectant Residuals				
1. Total trihalomethanes (TTHM)	2	2.4	3	7.5.3(a), 7.5.3(b)(1)
2. Haloacetic acids (HAA5)	2	2.4	3	7.5.3(a), 7.5.3(b)(1)
3. Bromate	2	2.4	3	7.5.3(a), 7.5.3(b)(3)
4. Chlorite	2	2.4	3	7.5.3(a), 7.5.3(b)(2)
5. Chlorine (MRDL)	2	2.5	3	7.5.3(a), 7.5.3(c)(1)
6. Chloramine (MRDL)	2	2.5	3	7.5.3(a), 7.5.3(c)(1)
7. Chlorine dioxide (MRDL), where any 2 consecutive daily samples at entrance to distribution system only are above MRDL	2	2.5	2[7], 3	7.5.3(a), 7.5.3(c)(2)
8. Chlorine dioxide (MRDL) where sample(s) in distribution system the next day are also above MRDL	1[8]	2.5	1	7.5.3(a), 7.5.3(c)(2)
9. Development of monitoring plan	N/A	N/A	3	7.5.3(f)

Contaminant	MCL/MRDL/TT Violations		Monitoring and Testing Procedure Violations	
	Tier	**Citation**	**Tier**	**Citation**
10. DBP precursor removal	2	2.10	3	7.5.3(a), (d)
G. Radionuclides				
1. Beta particle/photon activity	2	2.6	3	6.3.3
2.Gross alpha particle activity	2	2.6	3	6.3.2
3. Combined radium (radium-226 and radium-228	2	2.6	3	6.3.2
4. Uranium	2	2.6	3	6.3.2
H. Other Treatment Techniques				
1. Acrylamide (TT)	2	2.9	N/A	N/A
2. Epichlorohydrin (TT)	2	2.9	N/A	N/A
II. Public Notification for Variances and Exemptions				
A. Operation under a variance or exemption	3	4.8(f)[9]	N/A	N/A
B. Violation of conditions of a variance or exemption	2	4.8(f)[10]	N/A	N/A
III. Other Situations Requiring Public Notification				
A. Waterborne disease outbreak	1	1.5.2	N/A	N/A
B. Other waterborne emergency[11]	1	N/A	N/A	N/A
C. Availability of results of unregulated contaminant monitoring	3	6.4	N/A	N/A

Contaminant	MCL/MRDL/TT Violations		Monitoring and Testing Procedure Violations	
	Tier	**Citation**	**Tier**	**Citation**
D. Exceedance of fluoride secondary maximum contaminant level	3	3.2	N/A	N/A
E. Other situations as determined by the state	1,2,3[12]	N/A	N/A	N/A

[1]Violations and other situations not listed in this table (e.g., reporting violations, failure to prepare Consumer Confidence Reports) do not require notice, unless otherwise determined by the state. The state may also require a more stringent public notice tier (e.g., Tier 1 instead of Tier 2 or Tier 2 instead of Tier 3) for specific violations and situations listed in the table above.

[2]The term AViolations of Colorado Primary Drinking Water Regulations (CPDWR)@ includes violations of MCL, MRDL, treatment technique, monitoring, and testing procedure requirements.

[3]Failure to test for fecal coliform or *E. coli* is a Tier 1 violation if testing is not done after any repeat sample tests positive for coliform. All other total coliform monitoring and testing procedure violations are Tier 3.

[4]Systems with TT violations involving a single exceedance of a maximum turbidity limit under Art. 2, Section 2.8 (the rightmost column of Table 2-9) or the Article 7 citations in the table above are required to consult with the state within 24 hours of learning of the violation. Based on this consultation, the state may decide to elevate the violation to Tier 1. If a system is unable to make contact with the state in the 24-hour period, the violation is automatically elevated to Tier 1.

[5]The arsenic MCL will change from 0.05 to 0.01 mg/L January 23, 2006.

[6]Failure to take a confirmation sample within 24 hours for nitrate or nitrite after an initial sample exceeds the MCL is a Tier 1 violation. Other monitoring violations for nitrate and nitrite are Tier 3.

[7]Failure to monitor for chlorine dioxide at the entrance to the distribution system the day after exceeding the MRDL at the entrance to the distribution system is a Tier 2 violation.

[8]If any daily sample taken at the entrance to the distribution system exceeds the MRDL for chlorine dioxide and one or more samples taken in the distribution system the next day exceed the MRDL, Tier 1 notification is required. Failure to take the required samples in the distribution system after the MRDL is exceeded at the entry point also triggers Tier 1 notification.

[9]Section 4.8(f) requires final compliance with MCLs or TTs.

[10]Article 4 specifies the items and schedule milestones that must be included in a variance or exemption for small systems.

[11]Other waterborne emergencies require a Tier 1 public notice under section 9.2.2(a) for situations that do not meet the definition of a waterborne disease outbreak given in section 1.5.2, but that still have the potential to cause serious health effects as a result of short-term exposure. These could include outbreaks not related to treatment deficiencies, as well as situations that could cause outbreaks, such as failures or significant interruption in water treatment processes, natural disasters that disrupt the water supply or distribution system, chemical spills, or sewage spills.

[12]The state may place other situations in any tier believed appropriate, based on threat to public health.

Health Effects Language for Public Notification and Consumer Confidence Reports

Contaminant	MCL (mg/L)	Standard Health Effects Language
A. Microbiological Contaminants		
1a. Total coliform	See footnote 1	Coliforms are bacteria that are naturally present in the environment and are used as an indicator that other, potentially harmful, bacteria may be present. Coliforms were found in more samples than allowed and this was a warning of potential problems.
1b. Fecal coliform/*E. coli*	0	Fecal coliforms and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.
2a. Turbidity	TT[2]	Turbidity has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.
2b. Filtration and disinfection requirements (*Giardia lamblia*, viruses, heterotrophic plate count bacteria, *Legionella*, *Cryptosporidium*)	TT[3]	Inadequately treated water may contain disease-causing organisms. These organisms include bacteria, viruses, and parasites, which can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.
B. Inorganic Chemicals (IOCs)		
1. Antimony	0.006	Some people who drink water that contains antimony well in excess of the MCL over many years could experience increases in blood cholesterol and decreases in blood sugar.
2. Arsenic[4]	0.010	Some people who drink water that contains arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.
3. Asbestos (10 □m)	7 MFL[5]	Some people who drink water that contains asbestos in excess of the MCL over many years may have an increased risk of developing benign intestinal polyps.
4. Barium	2	Some people who drink water that contains barium in excess of the MCL over many years could experience and increase in their blood pressure.
5. Beryllium	0.004	Some people who drink water that contains beryllium well in excess of the MCL over many years could develop intestinal lesions.

Contaminant	MCL (mg/L)	Standard Health Effects Language
6. Cadmium	0.005	Some people who drink water that contains cadmium in excess of the MCL over many years could experience kidney damage.
7. Chromium (total)	0.1	Some people who drink water that contains chromium well in excess of the MCL over many years could experience allergic dermatitis.
8. Cyanide	0.2	Some people who drink water that contains cyanide well in excess of the MCL over many years could experience nerve damage or problems with their thyroid.
9a. Fluoride	2.0 (SMCL)[6]	This is an alert about your drinking water and a cosmetic dental problem that might affect children under nine years of age. At low levels, fluoride can help prevent cavities, but children drinking water containing more than 2 milligrams per liter (mg/L) of fluoride may develop cosmetic discoloration of their permanent teeth (dental fluorosis). The drinking water provided by your community water system [name] has a fluoride concentration of [insert value] mg/L. Dental fluorosis, in its moderate or severe forms, may result in a brown staining and/or pitting of the permanent teeth. This problem occurs only in developing teeth, before they erupt from the gums. Children under nine years of age should be provided with alternative sources of drinking water or water that has been treated to remove the fluoride to avoid the possibility of staining and pitting of their permanent teeth. You may also want to contact your dentist about proper use by young children of fluoride-containing products. Older children and adults may safely drink the water. Drinking water containing more than 4 mg/L of fluoride (the Colorado Department of Public Health and Environment's drinking water standard) can increase your risk of developing bone disease. Your drinking water does not contain more than 4 mg/L of fluoride, but we're required to notify you when we discover that the fluoride levels in your drinking water exceed 2 mg/L because of this cosmetic dental problem. For more information, please call [name of water system contact] of [name of community water system] at [phone number]. Some home water treatment units are also available to remove fluoride from drinking water. To learn more about available home water treatment units, you may call NSF International at 1-877-8-NSF-HELP."

Contaminant	MCL (mg/L)	Standard Health Effects Language
9b. Fluoride	4.0	Some people who drink water containing fluoride in excess of the MCL over many years could get bone disease, including pain and tenderness of the bones. Fluoride in drinking water at half the MCL or more may cause mottling of children's teeth, usually in children less than nine years old. Mottling, also known as dental fluorosis, may include brown staining and/ or pitting of the teeth, and occurs only in developing teeth before they erupt from the gums.
10. Mercury (inorganic)	0.002	Some people who drink water that contains inorganic mercury well in excess of the MCL over many years could experience kidney damage.
11. Nitrate	10	Infants below the age of 6 months who drink water that contains nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome.
12. Nitrite	1	Infants below the age of 6 months who drink water that contains nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome.
13. Selenium	0.05	Selenium is an essential nutrient. However, some people who drink water that contains selenium in excess of the MCL over many years could experience hair or fingernail losses, numbness in fingers or toes, or problems with their circulation.
14. Thallium	0.002	Some people who drink water that contains thallium in excess of the MCL over many years could experience hair loss, changes in their blood, or problems with their kidneys, intestines or liver.
C. Lead and Copper Rule		
1. Lead	TT[7]	Infants and children who drink water that contains lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.
2. Copper	TT[8]	Copper is an essential nutrient, but some people who drink water that contains copper in excess of the action level over a relatively short amount of time could experience gastrointestinal distress. Some people who drink water that contains copper in excess of the action level over many years could suffer liver or kidney damage. People with Wilson's Disease should consult their personal doctor.

Contaminant	MCL (mg/L)	Standard Health Effects Language
D. Synthetic Organic Chemicals (SOCs)		
1. 2,4-D	0.07	Some people who drink water that contains the weed killer 2,4-D well in excess of the MCL over many years could experience problems with their kidneys, liver, or adrenal glands.
2. 2,4,5BTP (Silvex)	0.05	Some people who drink water that contains silvex in excess of the MCL over many years could experience liver problems.
3. Alachlor	0.002	Some people who drink water that contains alachlor in excess of the MCL over many years could have problems with their eyes, liver, kidneys, or spleen, or experience anemia, and may have an increased risk of getting cancer.
4. Atrazine	0.003	Some people who drink water that contains atrazine well in excess of the MCL over many years could experience problems with their cardiovascular system or reproductive difficulties.
5. Benzo(a)pyrene (PAHs)	0.0002	Some people who drink water that contains benzo(a)pyrene in excess of the MCL over many years could experience reproductive difficulties and may have an increased risk of getting cancer.
6. Carbofuran	0.04	Some people who drink water that contains carbofuran in excess of the MCL over many years could experience problems with their blood, or nervous or reproductive systems.
7. Chlordane	0.002	Some people who drink water that contains chlordane in excess of the MCL over many years could experience problems with their liver or nervous system, and may have an increased risk of getting cancer.
8. Dalapon	0.2	Some people who drink water that contains dalapon well in excess of the MCL over many years could experience minor kidney changes.
9. Di (2-ethylhexyl) adipate	0.4	Some people who drink water that contains di (2-ethylhexyl) adipate well in excess of the MCL over many years could experience general toxic effects such as weight loss, liver enlargement or possible reproductive difficulties.
10. Di (2-ethylhexyl) phthalate	0.006	Some people who drink water that contains di (2-ethylhexyl) phthalate well in excess of the MCL over many years may have problems with their liver, or experience reproductive difficulties, and may have an increased risk of getting cancer.
11. Dibromochloropropane (DBCP)	0.0002	Some people who drink water that contains DBCP in excess of the MCL over many years could experience reproductive difficulties and may have an increased risk of getting cancer.
12. Dinoseb	0.007	Some people who drink water that contains dinoseb well in excess of the MCL over many years could experience reproductive difficulties.

Contaminant	MCL (mg/L)	Standard Health Effects Language
13. Dioxin (2,3,7,8-TCDD)	$3x10^{-8}$	Some people who drink water that contains dioxin in excess of the MCL over many years could experience reproductive difficulties and may have an increased risk of getting cancer.
14. Diquat	0.02	Some people who drink water that contains diquat in excess of the MCL over many years could get cataracts.
15. Endothall	0.1	Some people who drink water that contains endothall in excess of the MCL over many years could experience problems with their stomach or intestines.
16. Endrin	0.002	Some people who drink water that contains endrin in excess of the MCL over many years could experience liver problems.
17. Ethylene dibromide	0.00005	Some people who drink water that contains ethylene dibromide in excess of the MCL over many years could experience problems with their liver, stomach, reproductive system, or kidneys, and may have an increased risk of getting cancer.
18. Glyphosate	0.7	Some people who drink water that contains glyphosate in excess of the MCL over many years could experience problems with their kidneys or reproductive difficulties.
19. Heptachlor	0.0004	Some people who drink water that contains heptachlor in excess of the MCL over many years could experience liver damage and may have an increased risk of getting cancer.
20. Heptachlor epoxide	0.0002	Some people who drink water that contains heptachlor epoxide in excess of the MCL over many years could experience liver damage, and may have an increased risk of getting cancer.
21. Hexachlorobenzene	0.001	Some people who drink water that contains hexachlorobenzene in excess of the MCL over many years could experience problems with their liver or kidneys, or adverse reproductive effects, and may have an increased risk of getting cancer.
22. Hexachlorocyclopentadiene	0.05	Some people who drink water that contains hexachlorocyclopentadiene well in excess of the MCL over many years could experience problems with their kidneys or stomach.
23. Lindane	0.0002	Some people who drink water that contains lindane in excess of the MCL over many years could experience problems with their kidneys or liver.
24. Methoxychlor	0.04	Some people who drink water that contains methoxychlor in excess of the MCL over many years could experience reproductive difficulties.
25. Oxamyl (Vydate)	0.2	Some people who drink water that contains oxamyl in excess of the MCL over many years could experience slight nervous system effects.

Contaminant	MCL (mg/L)	Standard Health Effects Language
26. Pentachlorophenol	0.001	Some people who drink water that contains pentachlorophenol in excess of the MCL over many years could experience problems with their liver or kidneys and may have an increased risk of getting cancer.
27. Picloram	0.5	Some people who drink water that contains picloram in excess of the MCL over many years could experience problems with their liver.
28. Polychlorinated biphenyls (PCBs)	0.0005	Some people who drink water that contains PCBs in excess of the MCL over many years could experience changes in their skin, problems with their thymus gland, immune deficiencies, or reproductive or nervous system difficulties, and may have an increased risk of getting cancer.
29. Simazine	0.004	Some people who drink water that contains simazine in excess of the MCL over many years could experience problems with their blood.
30. Toxaphene	0.003	Some people who drink water that contains toxaphene in excess of the MCL over many years could have problems with their kidneys, liver, or thyroid, and may have an increased risk of getting cancer.
E. Volatile Organic Chemicals (VOCs)		
1. Benzene	0.005	Some people who drink water that contains benzene in excess of the MCL over many years could experience anemia or a decrease in blood platelets and may have an increased risk of getting cancer.
2. Carbon tetrachloride	0.005	Some people who drink water that contains carbon tetrachloride in excess of the MCL over many years could experience problems with their liver and may have an increased risk of getting cancer.
3. Chlorobenzene (monochloro-benzene)	0.1	Some people who drink water that contains chlorobenzene in excess of the MCL over many years could experience problems with their liver or kidneys.
4. o-Dichlorobenzene	0.6	Some people who drink water that contains o-dichlorobenzene well in excess of the MCL over many years could experience problems with their liver, kidneys, or circulatory system.
5. p-Dichlorobenzene	0.075	Some people who drink water that contains p-dichlorobenzene in excess of the MCL over many years could experience anemia; damage to their liver, kidneys, or spleen; or changes in their blood.
6. 1,2-Dichloroethane	0.005	Some people who drink water that contains 1,2-dichloroethane in excess of the MCL over many years may have an increased risk of getting cancer.
7. 1,1-Dichloroethylene	0.007	Some people who drink water that contains 1,1-dichloroethylene in excess of the MCL over many years could experience problems with their liver.

Contaminant	MCL (mg/L)	Standard Health Effects Language
8. *cis*-1,2-Dichloroethylene	0.07	Some people who drink water that contains cis-1,2-dichloroethylene in excess of the MCL over many years could experience problems with their liver.
9. *trans*-1,2-Dichloroethylene	0.1	Some people who drink water that contains trans-1,2-dichloroethylene well in excess of the MCL over many years could experience problems with their liver.
10. Dichloromethane	0.005	Some people who drink water that contains dichloromethane in excess of the MCL over many years could have liver problems and may have an increased risk of getting cancer.
11. 1,2-Dichloropropane	0.005	Some people who drink water that contains 1,2-dichloropropane in excess of the MCL over many years may have an increased risk of getting cancer.
12. Ethylbenzene	0.7	Some people who drink water that contains ethylbenzene well in excess of the MCL over many years could experience problems with their liver or kidneys.
13. Styrene	0.1	Some people who drink water that contains styrene well in excess of the MCL over many years could have problems with their liver, kidneys, or circulatory system.
14. Tetrachloroethylene	0.005	Some people who drink water that contains tetrachloroethylene in excess of the MCL over many years could have problems with their liver and may have an increased risk of getting cancer.
15. Toluene	1	Some people who drink water that contains toluene well in excess of the MCL over many years could have problems with their nervous system, kidneys, or liver.
16. 1,2,4-Trichlorobenzene	0.07	Some people who drink water that contains 1,2,4-trichlorobenzene well in excess of the MCL over many years could experience changes in their adrenal glands.
17. 1,1,1-Trichloroethane	0.2	Some people who drink water that contains 1,1,1-trichloroethane in excess of the MCL over many years could experience problems with their liver, nervous system, or circulatory system.
18. 1,1,2-Trichloroethane	0.005	Some people who drink water that contains 1,1,2-Trichloroethane well in excess of the MCL over many years could have problems with their liver, kidneys, or immune system.
19. Trichloroethylene	0.005	Some people who drink water that contains trichloroethylene in excess of the MCL over many years could experience problems with their liver and may have an increased risk of getting cancer.
20. Vinyl chloride	0.002	Some people who drink water that contains vinyl chloride in excess of the MCL over many years may have an increased risk of getting cancer.

Contaminant	MCL (mg/L)	Standard Health Effects Language
21. Xylenes (total)	10	Some people who drink water that contains xylenes in excess of the MCL over many years could experience damage to their nervous system.
F. Disinfection Byproducts (DBPs) and Disinfectant Residuals		
1. Total trihalomethanes (TTHM)	0.080[9]	Some people who drink water that contains trihalomethanes in excess of the MCL over many years may experience problems with their liver, kidneys, or central nervous system and may have an increased risk of getting cancer.
2. Haloacetic acids (HAA5)	0.060[10]	Some people who drink water that contains haloacetic acids in excess of the MCL over many years may have an increased risk of getting cancer.
3. Bromate	0.010	Some people who drink water that contains bromate in excess of the MCL over many years may have an increased risk of getting cancer.
4. Chlorite	1.0	Some infants and young children who drink water that contains chlorite in excess of the MCL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water that contains chlorite in excess of the MCL. Some people may experience anemia.
5. Chlorine	4.0 (MRDL)	Some people who use water that contains chlorine well in excess of the MRDL could experience irritating effects to their eyes and nose. Some people who drink water that contains chloramines well in excess of the MRDL could experience stomach discomfort or anemia.
6. Chloramines	4.0 (MRDL)	Some people who use water that contains chloramines well in excess of the MRDL could experience irritating effects to their eyes and nose. Some people who drink water that contains chloramines well in excess of the MRDL could experience stomach discomfort or anemia.
7a. Chlorine dioxide, where any 2 consecutive daily samples taken at the entrance to the distribution system are above the MRDL.	0.8 (MRDL)	Some infants and young children who drink water that contains chlorine dioxide in excess of the MRDL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water that contains chlorine dioxide in excess of the MRDL. Some people may experience anemia. *Add for public notification only:* The chlorine dioxide violations reported today are the result of exceedances at the treatment facility only, not within the distribution system, which delivers water to consumers. Continued compliance with chlorine dioxide levels within the distribution system minimizes the potential risk of these violations to consumers.

Contaminant	MCL (mg/L)	Standard Health Effects Language
7b. Chlorine dioxide, where one or more distribution system samples are above the MRDL.	0.8 (MRDL)	Some infants and young children who drink water that contains chlorine dioxide in excess of the MRDL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water that contains chlorine dioxide in excess of the MRDL. Some people may experience anemia. *Add for public notification only:* The chlorine dioxide violations reported today include exceedances of the state standard within the distribution system, which delivers water to consumers. Violations of the chlorine dioxide standard within the distribution system may harm human health based on short-term exposures. Certain groups, including fetuses, infants, and young children, may be especially susceptible to nervous system effects from excessive chlorine dioxide exposure.
8. TOC (Total organic carbon) (DBP precursor)	TT	Total organic carbon (TOC) has no health effects. However, total organic carbon provides a medium for the formation of disinfection byproducts. These byproducts include trihalomethanes (THMs) and haloacetic acids (HAAs). Drinking water containing these by-products in excess of the MCL may lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an increased risk of getting cancer.
G. Radionuclides		
Beta/photon emitters	4 (mrem/yr)[11]	Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta particle and photon radioactivity in excess of the MCL over many years may have an increased risk of getting cancer.
Gross alpha particle activity	15 (pCi/L)[12]	Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of getting cancer.
Combined radium (radium-226 and radium-228)	5 (pCi/L)	Some people who drink water containing radium-226 or -228 in excess of the MCL over many years may have an increased risk of getting cancer.
Uranium	30 (:g/L)[13]	Some people who drink water containing uranium in excess of the MCL over many years may have an increased risk of getting cancer and kidney toxicity.

Contaminant	MCL (mg/L)	Standard Health Effects Language
H. Other Treatment Techniques		
1. Acrylamide	TT	Some people who drink water that contains high levels of acrylamide over a long period of time could have problems with their nervous system or blood and may have an increased risk of getting cancer.
2. Epichlorohydrin	TT	Some people who drink water that contains high levels of epichlorohydrin over a long period of time could experience stomach problems and may have an increased risk of getting cancer.

[1]For water systems analyzing at least 40 samples per month, no more than 5.0 percent of the monthly samples may be positive for total coliforms. For systems analyzing fewer than 40 samples per month, no more than one sample per month may be positive for total coliforms.

[2] Language for turbidity may be used for any TT violation involving turbidity.

[3] This language must be used for filtration and disinfection TT violations, except that TT violations involving turbidity may use language for turbidity instead.

[4]This arsenic MCL is effective January 23, 2006. Until then, the MCL is 0.05 mg/L.

[5]Million fibers per liter

[6]This language must be used for a notice of exceedance of the secondary maximum contaminant level (SMCL) of 2.0 mg/L for fluoride. Systems that exceed the MCL (4.0 mg/L) should not use this language; they should use the language for fluoride MCL violations.

[7]Action Level = 0.015 mg/L

[8]Action Level = 1.3 mg/L

[9]The MCL for total trihalomethanes is the sum of the concentrations of the individual trihalomethanes.

[10]The MCL for haloacetic acids is the sum of the concentrations of the individual haloacetic acids.

[11]Millirems per year

[12]Picocuries per liter

[13]Micrograms per liter

Sanitary Survey Checklist

Is Your System Ready for a Sanitary Survey?

The Colorado Department of Public Health and Environment, Drinking Water Program (DW Program) is responsible for conducting sanitary surveys of public water systems. A sanitary survey is one of our most important functions because it allows the DW Program to identify potential problems before they can cause a water system to deliver unsafe water or fall out of compliance with the regulations. These valuable surveys can be time consuming for all, so water system representatives are encouraged to prepare in advance for their survey. This document summarizes the parts of the sanitary survey and provides a list of topics that are likely to be reviewed, although not every topic may be reviewed on each survey. Water system representatives are encouraged to review this information so they can have materials and staff available when the survey begins which can save time for everyone. More importantly, preparation may help water system staff to discover and remedy potential problems even before they are identified by the DW Water Program reviewer.

The sanitary survey includes a review of eight major elements and associated areas of potential concern and possible review topics as summarized below. Additional summary information on sanitary surveys conducted by the Colorado Drinking Water Program is provided in the Power Point presentation that follows. Detailed information on Sanitary Surveys is provided in the EPA Guidance Manual for Conducting Sanitary Surveys of Public Water Systems; Surface Water and Ground Water Under the Direct Influence (GWUDI), EPA 815-R-99-106, April 1999 available on the EPA Web page at: http://www.epa.gov/safewater/mdbp/pdf/sansurv/sansurv.pdf

MAJOR ELEMENT	POTENTIAL AREAS OF CONCERN	POSSIBLE REVIEW TOPICS
Monitoring, Reporting and Data Verification	Samples collected are representative of water supplied to consumers Sampling plan covers all required aspects	Existence and completeness of monitoring plan
System Management and Operation	Ability of water system to produce safe drinking water under all conditions	Cross Connection Control Emergency Response Plan Vulnerability Assessment and Emergency Response Plan General Operation and Maintenance Plan Organizational Management Plan
Operator Certification	Water System treatment and distribution facilities under the control of properly qualified individuals	➢ ORC Designated ➢ ORC and Distribution System Operator Certified at Proper Level Pursuant to Regulation 100

MAJOR ELEMENT	POTENTIAL AREAS OF CONCERN	POSSIBLE REVIEW TOPICS
Source	Protection from contamination Adequate storage (even during a drought)	➢ Quality ➢ Quantity ➢ Reliability ➢ Vulnerability
Treatment	Approved design Effective multiple barriers Chemical Impurities and Leaching of Coatings Appropriate controls	➢ Capacity at Current Production Rates ➢ Operational Practices ➢ Process Monitoring ➢ ANSI/NSF Certified ➢ Chemical addition practices ➢ Equipment condition
Distribution System	Sanitary risks associated with new construction Sanitary risks associated with repair procedures Corrosion and Byproducts formation Sanitary risks from cross connections	➢ Sampling plans that are representative of the entire system; ➢ Field sampling measurements (chlorine residual and pressure)
		➢ Water line repair practices ➢ System flushing procedures ➢ Cross connection control program ➢ Water loss control program ➢ Distribution system maps ➢ Properly certified distribution system operators
Finished Water Storage	Inadequate pressure to prevent infiltration into system Sanitary risks from unauthorized entry Excessive detention time/turnover	➢ Capacity ➢ Maintenance including vent and overflow screens ➢ Security for entry and ladders
Pumping	Adequate pressure	➢ Screening ➢ Cross Connections ➢ Back up capacity and power

What Is a Sanitary Survey?

An on-site review of the water source, facilities, equipment, operation, and maintenance of a public water system for the purpose of evaluating the adequacy of the facilities for producing and distributing safe drinking water.

From Where Does the Need for a Sanitary Survey Come?

- Safe Drinking Water Act passed by US Congress in 1974
- Requires the EPA to set regulations regarding drinking water (National Primary Drinking Water Regulations)
- States given primacy by adopting regulations that are no less stringent than EPA's
- Colorado adopted regulations—published as the Colorado Primary Drinking Water Regulations (CPDWR)
- Amendments in 1986 and 1996 change how Sanitary Surveys are conducted

The Eight Elements of a Sanitary Survey

1. Monitoring, Reporting and Data Verification
2. System Management and Operations
3. Operator Compliance
4. Source
5. Treatment
6. Distribution System
7. Finished Water Storage
8. Booster Pumping Stations

Primary Objectives

1. Ensure compliance with treatment objectives and design criteria
2. Offer a second point of view on safety and security
3. Answer technical questions and share ideas on how similar communities are addressing similar issues

Types of Findings

1. Significant deficiency—immediate potential to affect human health
2. Minor deficiency—no immediate affect or risk to human health
3. Observations/recommendations/ requirements—items to improve system operations and maintenance (could lead to a deficiency if not addressed)

1. Monitoring and Reporting Data Verification

- Monitoring Plan
- Bacteriological Sampling Plan
- Disinfection Profile
- Disinfectant/Disinfection By-products
- Lead and Copper Monitoring
- Chemical Monitoring Plan

Monitoring Plan

- Required by CPDWR 1.12
- System Summary
- Water Source Details
- Water Treatment Details
- Distribution System Details
- Individual Rule Sampling/Monitoring Plans

Monitoring Plan (continued)

- Drinking Water Templates and Forms web page: http://www.cdphe.state.co.us/wq/drinkingwater/PublicWaterSystemReportingForms.html
- Monitoring Plan Template (MS Word format): http://www.cdphe.state.co.us/wq/drinkingwater/WordDocs/Monitoring_Plan_Template.doc
- Review CPDWR 1.12

Bacteriological Sampling Plan

- Required by CPDWR Article 5
- Map of the water distribution system
- Locations of sampling sites
- Number and frequency of routine coliform samples
- Procedure for collecting repeat samples
- List of laboratories used
- Sample conditions

Bacteriological Sampling Plan (continued)

(Generic System) Bacteriological Sampling Schedule

(Please complete table per your system's information)

Site #*	Sample Month	Site Location	Sample Point Description**	Upstream Sample Site*	Downstream Sample Site*
1	Jan., May, Sep.	344 Main St.	Bathroom sink	270 Main St.	520 Main St.
2	Feb., June, Oct.	2nd and Grant	Outside faucet tap	1st and Grant	3rd and Grant
3	Mar., July, Nov.	End of Iowa Street	Park yard hydrant	Iowa and Main	Line flushing hydrant
4	Apr., Aug., Dec.	8000 W. Crestline #625	Janitor's sink at center of complex	#114 men's bathroom sink	#835 men's bathroom sink

* Site #s are identified on System Distribution Map.

** Must be non-swivel, non-treaded tap; remove aerator, and, if outside, sanitize tap

* Upstream and downstream sample sites must have a "Sample Point Description"

Samples must be preserved in an iced cooler and delivered to the lab within 24 hours

Preferred Lab: _____

Address: _____

Phone: _____

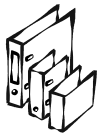
Alternate Lab: _____ at phone number _____

Samples can be shipped via UPS (phone #) or FedEx (phone #)

Note: Sampling frequency is determined based on population. The population numbers and the system sampling plan must be reviewed annually or at any time that major changes occur in the system.

(PLEASE SEE HANDOUT)

2. System Management and Operations



- Cross Connection Control Program
- Emergency Response Plan
- Vulnerability Assessment (pop. >3,300)
- General Operation and Maintenance Plan
- Organizational Management Plan

Cross Connection Control Program

- Required by CPDWR Article 12
- Identification of Potential Cross-Connections and Hazard Level Determination
- Public Education
- Installation of Devices
- Annual Testing
- Record Keeping
- List of Backflow Prevention Installations

Cross Connection Control Program (continued)

POTENTIAL CROSS-CONNECTIONS SAMPLE LIST

The water supplier must conduct a systematic survey of all facilities connected to the water distribution system. The survey can then be used to determine the degree of hazard posed by each facility connected to the water distribution system and the appropriate backflow prevention device to be installed at the service connection.

"Information in this manual, combined with interviews with facility managers, will help the water supplier to determine the degrees of hazard. Facilities presenting health hazards to the water distribution system will require containment assemblies. Those cross-connections viewed as the most severe hazards will have the highest action priority for correction."

Source: Colorado Cross-Connection Control Manual, March 2000, pages 11-12

System Survey Conducted By: _____ Date:_____

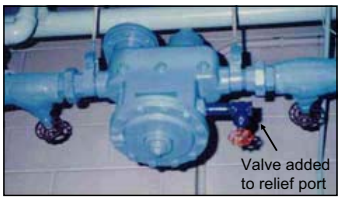
Potential Cross-Connection[1]	Street Address of Potential Cross-Connection	Degree of Hazard[2]	Device Required	Backflow Prevention Assembly (Type & Model No.)	Annual Test Date
Elementary school fire sprinkler system	2468 Onyourway Place	L	Double Check		
Photo developer	1001 Panoramic Views Drive	H	Reduced Pressure		
Car wash	424 Cleaner Way	H	Reduced Pressure		
Apartment building boiler system	3000 More People Road	H	Reduced Pressure		
Irrigation sprinkler system	586 Park Side Drive	H	Vacuum Breaker or Reduced Pressure		
Ice cream dipper well	123 Frosty Street	H	Air Gap		
Construction site	8531 Expansion Place	L or H	Double Check or Reduced Pressure		
Residential hose bibs	101 Anywhere Way	H	Hose Bib Vacuum Breaker		

[1] – Potential Cross-Connections must be evaluated annually
[2] – Degree of Hazard: High = H (Contamination or Health Hazard); Low = L (Pollution Hazard)

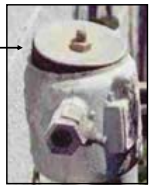
(PLEASE SEE HANDOUT)

Just a matter of time!

Submerged outlets



PVB with bolted in rubber plug



Source of Pictures: American Backflow Prevention Association; http://www.abpa.org/bb/viewtopic.php?t=100

Emergency Response Plan

- Procedure or plan of action in an emergency event
- Include contacts of appropriate people to notify in an emergency event
- Contacts must include the state's 24-hour Environmental Release/Incident Report Line ***1-877-518-5608***
- Most importantly, action or plan to notify your consumers in an emergency event

Emergency Response Plan (continued)

- Should include a list of possible emergency scenarios and specific actions
  - Water line breaks
  - Large pressure losses
  - Critical equipment failure
  - Operator error
  - Security breach
  - Hazardous chemical leaks

Emergency Response Plan (continued)

- Questions to consider with water line breaks/pressure losses
- Does the WQCD need to be contacted?
  - If the system pressure drops below 20 psi or
  - If there is the potential to discharge to waters of the state
- The answer is yes
- Contact 1-877-518-5608 and the DE

Emergency Response Plan (continued)

- Questions to consider with water line breaks/pressure losses
  - How large of an area is affected?
    - Is the area isolated?
    - How is it isolated?
    - Are the isolation valves leaking?
  - How and when did you become aware of this situation?
  - How much water was lost?

Emergency Response Plan (continued)

- Questions to consider with water line breaks/ pressure losses (continued)
  - To where did the water flow? Is there still a chlorine residual in the water?
    - If it is contained, dechlorination in a contained area/pond may be needed.
    - If it flowed to a storm sewer, then the discharge of storm sewer needs to be checked for chlorine residual and neutralized as needed.
    - If it flowed to a surface water, the system must check for fish kills and other environmental impacts and look to see if there is a location to dechlorinate the flows.

Emergency Response Plan (continued)

- Questions to consider with water line breaks/ pressure losses (continued)
  - Did the line break drain your storage tanks?
  - Do you know how much water can be lost before your system reaches a critical low pressure?
  - Did your system lose pressure anywhere in the area of the line break or elsewhere such as an area of higher elevation?

Emergency Response Plan (continued)

- Questions to consider with water line breaks/ pressure losses (continued)
  - Do you have any critical areas that may lose pressure if the repair is not made by some determined or undetermined time?
  - Are there industrial or commercial service connections within the affected area?

Emergency Response Plan (continued)

- Questions to consider with water line breaks/ pressure losses (continued)
  - What potential cross connections are in the area of the line break?
    - What are the cross connections?
    - Are backflow prevention devices installed?
    - Are the backflow prevention devices maintained per CPDWRs?

Emergency Response Plan (continued)

- Questions to consider with water line breaks/ pressure losses (continued)
  - If the pipe break requires a complete pipe replacement or system pressure drops below 20 psi, the system must have a procedure to disinfect the pipe line and issue a local boil/bottle water advisory until a flushing and disinfection can be completed (sometimes confirmed by coliform sampling results)

Emergency Response Plan (continued)

- Questions to consider with water line breaks/ pressure losses (continued)
  - What are the procedures for disinfecting and flushing the affected area?
    - How are repaired pipes super chlorinated?
    - How are affected pipes flushed?
    - How are disinfectant residuals measured?
    - What are the procedures to inform customers of the problems and advised to flush their home lines?

Operation and Maintenance Plan

- Needs to include well defined procedures
- Include checks and procedures from frequent (hourly) to infrequent (yearly)
- Essential and functional procedures
  - Visual checks and inspections
  - Test equipment calibration
  - Equipment operation
  - Data collection
  - Computer operation (PLCs and backups)
  - Cleaning (equipment, water lines, storage tanks)
  - Flushing & valve exercising program
  - Preventive maintenance program

3. Operator Compliance

- Operator in responsible charge (ORC) holds the appropriate level certifications for:
  - Water treatment
  - Distribution operations
- Certifications are current
- Additional operators

4. Source

- All sources are identified and cross-checked with state database
- Source is protected or controlled
- Source Water Protection Plan

- Surface water intake review
- Well construction and condition
- Identify sources of contamination

Source (continued)

Example of a properly protected wellhead.

Source (continued)

Example of an unprotected wellhead.

Source (continued)

Another example of an unprotected wellhead.

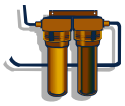
Source (continued)

Example of a well house and a surface water intake.

5. Treatment

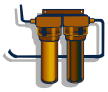
- Defined as all processes associated with production of potable drinking water
- Inspect treatment processes
  - Chemical processes
  - Feed pumps
  - Mixers
  - Turbidity meters
  - Treatment equipment and loading rates

Treatment (continued)



- Effective multiple barrier approach (eliminate or mitigate contaminants entering distribution system)
  - Filtration
  - Additional methods of contaminant removal
  - Disinfectant / disinfection contact time
  - Chemicals and equipment must have proper ANSI/NSF approvals

Treatment (continued)



ANSI/NSF Certified Testing Labs:

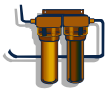
1) CSA International – Toronto, Canada
   http://directories.csainternational.org/directorymain.asp?txtDir=DIR004&Submit=Search&txtCustomer=&txtProvState=&txtCountry=&txtFile=&txtMajorClass=&txtMinorClass=&txtClassDesc=&txtKeyword=filter
2) International Association of Plumbing and Mechanical Officials Research and Testing – Ontario, CA:
   http://www.iapmo.org/
3) NSF International – Ann Arbor, MI:
   http://www.nsf.org/business/search_listings/#mname
4) Underwriters Labs (UL) – Northbrook, IL:
   http://www.ul.com/water/prodcert/waterqry.html
5) Water Quality Association (Gold Seal Program) – Lisle, IL:
   http://www.wqa.org/

Treatment (continued)

Applicable Drinking Water ANSI/NSF Standards:

ANSI/NSF Standard	Description of the Standard
14	Plastics piping system components and related materials
42	Drinking water treatment units – aesthetic effects
44	Residential cation exchange water softeners
53	Drinking water treatment units – health effects
55	Ultraviolet microbiological water treatment systems
58	Reverse osmosis drinking water treatment system
60	Drinking water treatment chemicals – health effects
61	Drinking water system components – health effects
50	*Circulation system components and related materials for swimming pools, spas/hot tubs*

Treatment (continued)



ANSI/NSF Certification Example:

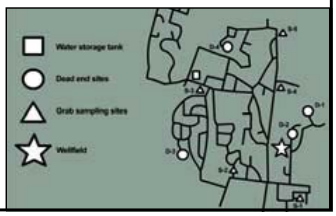
- LMI (Liquid Metronics Inc. [Milton Roy]) metering pumps and solution tanks are not ANSI/NSF certified under Std 61 for Drinking Water System Components – health effects
- Standard trash cans are not approved
- Stenner, chemical pumps are certified under Standard 61. (must check that exact pump's certifications)
- All chemical storage tanks need to have ANSI/NSF 61

Treatment (continued)

- Review bench sheets and online/bench monitoring
- Review changes since last sanitary survey

6. Distribution System

- Review system mapping
  - Water line sizes
  - Age of water lines
  - Looping / dead end issues
  - Valving
- Verify disinfectant residuals
- Flushing



7. Finished Water Storage

- Review all storage of potable water
- Security
- Inspect integrity, screening, etc.

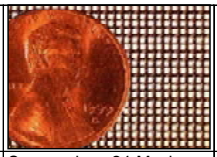
Finished water storage (continued)

Finished water storage (continued)

1) All screens must be 24-mesh or smaller for all vents. This screen is closer to the size of chicken wire.
2) Overflow pipe must terminate 12–24 inches from the ground.

Finished water storage (continued)

Example of screen mesh sizes:

		
Screen size: 10-Mesh (10 squares per inch)	Screen size: 24-Mesh (24 squares per inch) All open-air openings must be this size or smaller per the design criteria	Screen size: 60-Mesh (60 squares per inch)

Finished water storage (continued)

Finished water storage (continued)

Finished water storage (continued)

8. Booster Pumping Stations

- Review all booster stations
- Inspect integrity, screening, etc.

Conclusion to Sanitary Survey

- Present and review findings of sanitary survey to ORC and other representatives
  - – Deficiencies discussed (significant or minor)
    - • Systems required to respond to letter within 45 days
    - • System may have to correct problems immediately
  - – Recommendations discussed
    - • Response may not be required
    - • To assist the system with O&M, monitoring, reporting, etc.
- Discuss other issues or follow up items
- Findings to be sent in letter to owner and ORC of the system

Preparing for Sanitary Survey

- Review previous sanitary survey report
- Review past deficiencies and recommendations
- Have all records/certifications available
  - – Water quality
  - – Bench and operational log sheets
  - – Bacteriological sampling
  - – Cross-connection control program
  - – Monitoring plans
  - – Operator certifications
- Make sure all areas of the system are accessible
- Make sure that any backwash discharge permits are available. ("9th" point of sanitary survey)

Part IV. EPA Quick Reference Guides

United States Environmental Protection Agency
Office of Water (4606)
EPA 816-F-01-035
November 2001
www.epa.gov/safewater

Total Coliform Rule: A Quick Reference Guide

Overview of the Rule

Title	**Total Coliform Rule (TCR) 54 FR 27544-27568, June 29, 1989, Vol. 54, No. 124[1]**
Purpose	**Improve public health protection by reducing fecal pathogens to minimal levels through control of total coliform bacteria, including fecal coliforms and *Escherichia coli (E. coli).***
General Description	**Establishes a maximum contaminant level (MCL) based on the presence or absence of total coliforms, modifies monitoring requirements including testing for fecal coliforms or *E. coli,* requires use of a sample siting plan, and also requires sanitary surveys for systems collecting fewer than five samples per month.**
Utilities Covered	**The TCR applies to all public water systems.**

Public Health Benefits

Implementation of the TCR has resulted in . . .	**► Reduction in risk of illness from disease causing organisms associated with sewage or animal wastes. Disease symptoms may include diarrhea, cramps, nausea, and possibly jaundice, and associated headaches and fatigue.**

What are the Major Provisions?

ROUTINE Sampling Requirements

- **Total coliform samples must be collected at sites which are representative of water quality throughout the distribution system according to a written sample siting plan subject to state review and revision.**
- **Samples must be collected at regular time intervals throughout the month except groundwater systems serving 4,900 persons or fewer may collect them on the same day.**
- **Monthly sampling requirements are based on population served (see table on next page for the minimum sampling frequency).**
- **A reduced monitoring frequency may be available for systems serving 1,000 persons or fewer and using only ground water if a sanitary survey within the past 5 years shows the system is free of sanitary defects (the frequency may be no less than 1 sample/quarter for community and 1 sample/year for non-community systems).**
- **Each total coliform-positive routine sample must be tested for the presence of fecal coliforms or *E. coli.***
- **If any routine sample is total coliform-positive, repeat samples are required.**

REPEAT Sampling Requirements

- **Within 24 hours of learning of a total coliform-positive ROUTINE sample result, at least 3 REPEAT samples must be collected and analyzed for total coliforms:**
  - **One REPEAT sample must be collected from the same tap as the original sample.**
  - **One REPEAT sample must be collected within five service connections upstream.**
  - **One REPEAT sample must be collected within five service connections downstream.**
  - **Systems that collect 1 ROUTINE sample per month or fewer must collect a 4th REPEAT sample.**
- **If any REPEAT sample is total coliform-positive:**
  - **The system must analyze that total coliform-positive culture for fecal coliforms or *E.coli.***
  - **The system must collect another set of REPEAT samples, as before, unless the MCL has been violated and the system has notified the state.**

Additional ROUTINE Sample Requirements

- **A positive ROUTINE or REPEAT total coliform result requires a minimum of five ROUTINE samples be collected the following month the system provides water to the public unless waived by the state.**

[1] The June 1989 Rule was revised as follows: Corrections and Technical Amendments, 6/19/90 and Partial Stay of Certain Provisions (Variance Criteria) 56 FR 1556-1557, Vol 56, No 10.

Note: The TCR is currently undergoing the 6 year review process and may be subject to change.

For additional information on the TCR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater/mdbp/mdbp.html; or contact your state drinking water representative.

[2] The revised Public Notification Rule will extend the period allowed for public notice of monthly violations to 30 days and shorten the period for acute violations to 24 hours. These revisions are effective for all systems by May 6, 2002 and are detailed in 40 CFR Subpart Q.

Public Water System ROUTINE Monitoring Frequencies

Population	Minimum Samples/ Month	Population	Minimum Samples/ Month	Population	Minimum Samples/ Month
25-1,000*	1	21,501-25,000	25	450,001-600,000	210
1,001-2,500	2	25,001-33,000	30	600,001-780,000	240
2,501-3,300	3	33,001-41,000	40	780,001-970,000	270
3,301-4,100	4	41,001-50,000	50	970,001-1,230,000	300
4,101-4,900	5	50,001-59,000	60	1,230,001-1,520,000	330
4,901-5,800	6	59,001-70,000	70	1,520,001-1,850,000	360
5,801-6,700	7	70,001-83,000	80	1,850,001-2,270,000	390
6,701-7,600	8	83,001-96,000	90	2,270,001-3,020,000	420
7,601-8,500	9	96,001-130,000	100	3,020,001-3,960,000	450
8,501-12,900	10	130,001-220,000	120	• 3,960,001	480
12,901-17,200	15	220,001-320,000	150		
17,201-21,500	20	320,001-450,000	180		

*Includes PWSs which have at least 15 service connections, but serve <25 people.

What are the Other Provisions?

Systems collecting fewer than 5 ROUTINE samples per month . . .	Must have a sanitary survey every 5 years (or every 10 years if it is a non-community water system using protected and disinfected ground water).**
Systems using surface water or ground water under the direct influence of surface water (GWUDI) and meeting filtration avoidance criteria . . .	Must collect and have analyzed one coliform sample each day the turbidity of the source water exceeds 1 NTU. This sample must be collected from a tap near the first service connection.

** As per the IESWTR, states must conduct sanitary surveys for community surface water and GWUDI systems in this category every 3 years (unless reduced by the state based on outstanding performance).

How is Compliance Determined?

- Compliance is based on the presence or absence of total coliforms.
- Compliance is determined each calendar month the system serves water to the public (or each calendar month that sampling occurs for systems on reduced monitoring).
- The results of ROUTINE and REPEAT samples are used to calculate compliance.

A Monthly MCL Violation is Triggered if:

A system collecting fewer than 40 samples per month . . .	Has greater than 1 ROUTINE/REPEAT sample per month which is total coliform-positive.
A system collecting at least 40 samples per month . . .	Has greater than 5.0 percent of the ROUTINE/REPEAT samples in a month total coliform-positive.

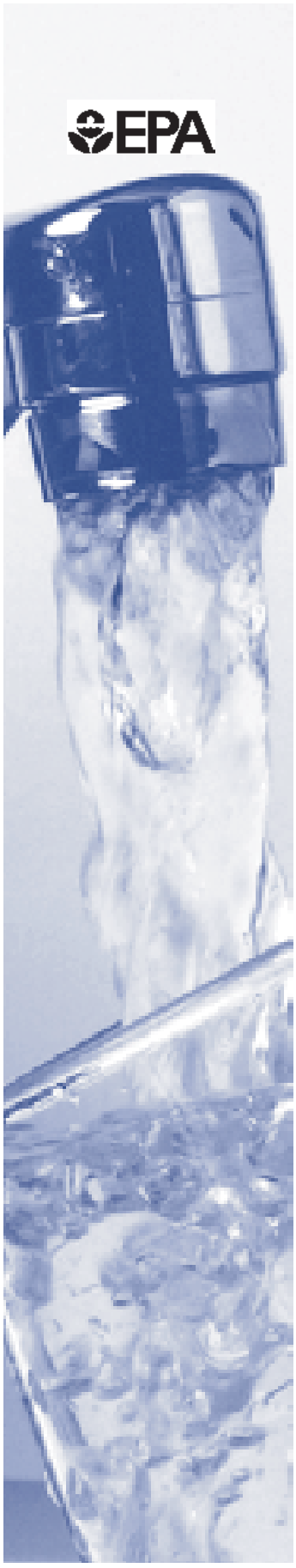
An Acute MCL Violation is Triggered if:

Any public water system . . .	Has any fecal coliform- or *E. coli*-positive REPEAT sample *or* has a fecal coliform- or *E. coli*-positive ROUTINE sample followed by a total coliform-positive REPEAT sample.

What are the Public Notification and Reporting Requirements?

For a Monthly MCL Violation	▶ The violation must be reported to the state no later than the end of the next business day after the system learns of the violation. ▶ The public must be notified within 14 days.[2]
For an Acute MCL Violation	▶ The violation must be reported to the state no later than the end of the next business day after the system learns of the violation. ▶ The public must be notified within 72 hours.[2]
Systems with ROUTINE or REPEAT samples that are fecal coliform- or *E. coli*-positive . . .	Must notify the state by the end of the day they are notified of the result or by the end of the next business day if the state office is already closed.

United States Environmental Protection Agency
Office of Water (4606)
EPA 816-F-01-011
May 2001
www.epa.gov/safewater



Interim Enhanced Surface Water Treatment Rule: A Quick Reference Guide

Overview of the Rule

Title	Interim Enhanced Surface Water Treatment Rule (IESWTR) 63 FR 69478 - 69521, December 16, 1998, Vol. 63, No. 241 Revisions to the Interim Enhanced Surface Water Treatment Rule (IESWTR), the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR), and Revisions to State Primacy Requirements to Implement the Safe Drinking Water Act (SDWA) Amendments 66 FR 3770, January 16, 2001, Vol 66, No. 29
Purpose	Improve public health control of microbial contaminants, particularly *Cryptosporidium*. Prevent significant increases in microbial risk that might otherwise occur when systems implement the Stage 1 Disinfectants and Disinfection Byproducts Rule.
General Description	Builds upon treatment technique approach and requirements of the 1989 Surface Water Treatment Rule. Relies on existing technologies currently in use at water treatment plants.
Utilities Covered	Sanitary survey requirements apply to all public water systems using surface water or ground water under the direct influence of surface water, regardless of size. All remaining requirements apply to public water systems that use surface water or ground water under the direct influence of surface water and serve 10,000 or more people.

Major Provisions

Regulated Contaminants

Cryptosporidium	► Maximum contaminant level goal (MCLG) of zero. ► 99 percent (2-log) physical removal for systems that filter. ► Include in watershed control program for unfiltered systems.
Turbidity Performance Standards	Conventional and direct filtration combined filter effluent: ► ≤ 0.3 nephelometric turbidity units (NTU) in at least 95 percent of measurements taken each month. ► Maximum level of 1 NTU.

Turbidity Monitoring Requirements (Conventional and Direct Filtration)

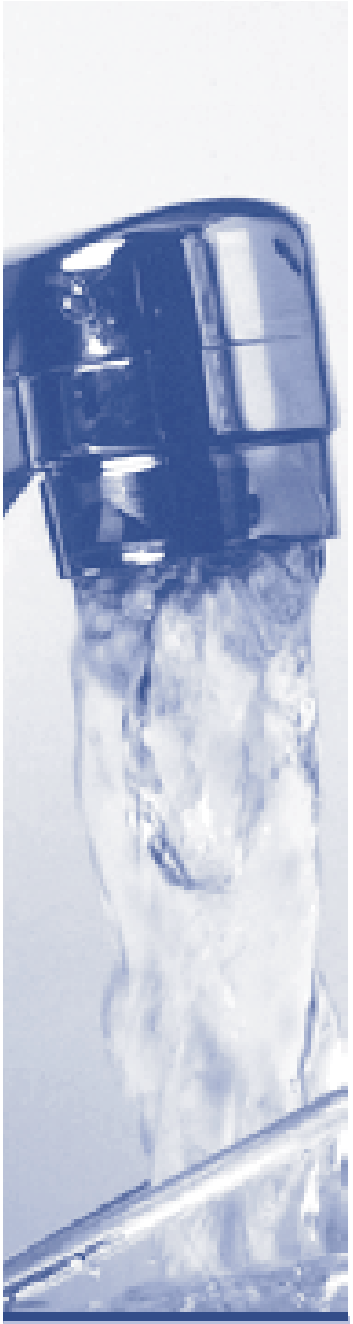
Combined Filter Effluent	► Performed every 4 hours to ensure compliance with turbidity performance standards.
Individual Filter Effluent	► Performed continuously (every 15 minutes) to assist treatment plant operators in understanding and assessing filter performance.

Additional Requirements

► Disinfection profiling and benchmarking.

► Construction of new uncovered finished water storage facilities prohibited.

► Sanitary surveys, conducted by the state, for all surface water and ground water under the direct influence of surface water systems regardless of size (every 3 years for community water systems and every 5 years for noncommunity water systems).



For additional information on the IESWTR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater; or contact your State drinking water representative.

Additional material is available at www.epa.gov/safewater/mdbp/implement.html.

Profiling and Benchmarking

Public water systems must evaluate impacts on microbial risk before changing disinfection practices to ensure adequate protection is maintained. The three major steps are:

- **Determine if a public water system needs to profile based on TTHM and HAA5 levels (applicability monitoring)**
- **Develop a disinfection profile that reflects daily *Giardia lamblia* inactivation for at least a year (systems using ozone or chloramines must also calculate inactivation of viruses)**
- **Calculate a disinfection benchmark (lowest monthly inactivation) based on the profile and consult with the state prior to making a significant change to disinfection practices**

Critical Deadlines and Requirements

For Drinking Water Systems

February 16, 1999	Construction of uncovered finished water reservoirs is prohibited.
March 1999	Public water systems lacking ICR or other occurrence data begin 4 quarters of applicability monitoring for TTHM and HAA5 to determine if disinfection profiling is necessary.
April 16, 1999	Systems that have 4 consecutive quarters of HAA5 occurrence data that meet the TTHM monitoring requirements must submit data to the state to determine if disinfection profiling is necessary.
December 31, 1999	Public water systems with ICR data must submit it to states to determine if disinfection profiling is necessary.
April 1, 2000	Public water systems must begin developing a disinfection profile if their annual average (based on 4 quarters of data) for TTHM is greater than or equal to 0.064 mg/L or HAA5 is greater than or equal to 0.048 mg/L.
March 31, 2001	Disinfection profile must be complete.
January 1, 2002	Surface water systems or ground water under the direct influence of surface water systems serving 10,000 or more people must comply with all IESWTR provisions (e.g., turbidity standards, individual filter monitoring).

For States

December 16, 2000	States submit IESWTR primacy revision applications to EPA (triggers interim primacy).
January 2002	States begin first round of sanitary surveys.
December 16, 2002	Primacy extension deadline - all states with an extension must submit primacy revision applications to EPA.
December 2004	States must complete first round of sanitary surveys for community water systems.
December 2006	States must complete first round of sanitary surveys for noncommunity water systems.

Public Health Benefits

Implementation of the IESWTR will result in . . .	▶ Increased protection against gastrointestinal illnesses from *Cryptosporidium* and other pathogens through improvements in filtration. ▶ Reduced likelihood of endemic illness from *Cryptosporidium* by 110,000 to 463,000 cases annually. ▶ Reduced likelihood of outbreaks of cryptosporidiosis.
Estimated impacts of the IESWTR include . . .	▶ National total annualized cost: $307 million ▶ 92 percent of households will incur an increase of less than $1 per month. ▶ Less than 1 percent of households will incur an increase of more than $5 per month (about $8 per month).

United States Environmental Protection Agency
Office of Water (4606)
EPA 816-F-01-010
May 2001
www.epa.gov/safewater

Stage 1 Disinfectants and Disinfection Byproducts Rule: A Quick Reference Guide

Overview of the Rule

Title	Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) 63 FR 69390 - 69476, December 16, 1998, Vol. 63, No. 241 Revisions to the Interim Enhanced Surface Water Treatment Rule (IESWTR), the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR), and Revisions to State Primacy Requirements to Implement the Safe Drinking Water Act (SDWA) Amendments 66 FR 3770, January 16, 2001, Vol 66, No. 29
Purpose	Improve public health protection by reducing exposure to disinfection byproducts. Some disinfectants and disinfection byproducts (DBPs) have been shown to cause cancer and reproductive effects in lab animals and suggested bladder cancer and reproductive effects in humans.
General Description	The Stage 1 DBPR is the first of a staged set of rules that will reduce the allowable levels of DBPs in drinking water. The new rule establishes seven new standards and a treatment technique of enhanced coagulation or enhanced softening to further reduce DBP exposure. The rule is designed to limit capital investments and avoid major shifts in disinfection technologies until additional information is available on the occurrence and health effects of DBPs.
Utilities Covered	The Stage 1 DBPR applies to all sizes of community water systems and nontransient noncommunity water systems that add a disinfectant to the drinking water during any part of the treatment process and transient noncommunity water systems that use chlorine dioxide.

Public Health Benefits

Implementation of the Stage 1 DBPR will result in . . .	▶ As many as 140 million people receiving increased protection from DBPs. ▶ 24 percent average reduction nationally in trihalomethane levels. ▶ Reduction in exposure to the major DBPs from use of ozone (DBP = bromate) and
Estimated impacts of the Stage 1 DBPR include . . .	▶ National capital costs: $2.3 billion National total annualized costs to utilities: $684 million ▶ 95 percent of households will incur an increase of less than $1 per month. ▶ 4 percent of households will incur an increase of $1-10 per month. ▶ <1 percent of households will incur an increase of $10-33 per month.

Critical Deadlines and Requirements

For Drinking Water Systems

January 1, 2002	Surface water systems and ground water systems under the direct influence of surface water serving ≥ 10,000 people must comply with the Stage 1 DBPR requirements.
January 1, 2004	Surface water systems and ground water systems under the direct influence of surface water serving < 10,000, and all ground water systems must comply with the Stage 1 DBPR requirements.

For States

December 16, 2000	States submit Stage 1 DBPR primacy revision applications to EPA (triggers interim primacy).
December 16, 2002	Primacy extension deadline - all states with an extension must submit primacy revision applications to EPA.

For additional information on the Stage 1 DBPR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater; or contact your State drinking water representative.

Additional material is available at www.epa.gov/safewater/mdbp/implement.html.

Regulated Contaminants/Disinfectants

Regulated Contaminants	MCL (mg/L)	MCLG (mg/L)	Regulated Disinfectants	MRDL* (mg/L)	MRDLG* (mg/L)
Total Trihalomethanes (TTHM)	0.080		Chlorine	4.0 as Cl_2	4
Chloroform		-			
Bromodichloromethane		zero			
Dibromochloromethane		0.06			
Bromoform		zero			
Five Haloacetic Acids (HAA5)	0.060		Chloramines	4.0 as Cl_2	4
Monochloroacetic acid		-	Chlorine dioxide	0.8	0.8
Dichloroacetic acid		zero			
Trichloroacetic acid		0.3			
Bromoacetic acid		-			
Dibromoacetic acid		-			
Bromate (plants that use ozone)	0.010	zero	*Stage 1 DBPR includes maximum residual disinfectant levels (MRDLs) and maximum residual disinfectant level goals (MRDLGs) which are similar to MCLs and MCLGs, but for disinfectants.		
Chlorite (plants that use chlorine dioxide)	1.0	0.8			

Treatment Technique

Enhanced coagulation/enhanced softening to improve removal of DBP precursors (See Step 1 TOC Table) for systems using conventional filtration treatment.

Step 1 TOC Table - Required % Removal of TOC

Source Water TOC (mg/L)	Source Water Alkalinity, mg/L as $CaCO_3$		
	0-60	> 60-120	> 120
> 2.0 to 4.0	35.0%	25.0%	15.0%
> 4.0 to 8.0	45.0%	35.0%	25.0%
> 8.0	50.0%	40.0%	30.0%

[1] Systems meeting at least one of the alternative compliance criteria in the rule are not required to meet the removals in this table.

[2] Systems practicing softening must meet the TOC removal requirements in the last column to the right

Routine Monitoring Requirements

	Coverage	Monitoring Frequency	Compliance
TTHM/HAA5	Surface and ground water under the direct influence of surface water serving ≥ 10,000	4/plant/quarter	Running annual average
	Surface and ground water under the direct influence of surface water serving 500 - 9,999	1/plant/quarter	Running annual average
	Surface and ground water under the direct influence of surface water serving < 500	1/plant/year in month of warmest water temperature**	Running annual average of increased monitoring
	Ground water serving ≥ 10,000	1/plant/quarter	Running annual average
	Ground water serving < 10,000	1/plant/year in month of warmest water temperature**	Running annual average of increased monitoring
Bromate	Ozone plants	Monthly	Running annual average
Chlorite	Chlorine dioxide plants	Daily at entrance to distribution system; monthly in distribution system	Daily/follow-up monitoring
Chlorine dioxide	Chlorine dioxide plants	Daily at entrance to distribution system	Daily/follow-up monitoring
Chlorine/Chloramines	All systems	Same location and frequency as TCR sampling	Running annual average
DBP precursors	Conventional filtration	Monthly for total organic carbon and alkalinity	Running annual average

** System must increase monitoring to 1 sample per plant per quarter if an MCL is exceeded.

EPA
United States
Environmental Protection
Agency

Lead and Copper Rule: A Quick Reference Guide

Overview of the Rule

Title	**Lead and Copper Rule (LCR)[1], 56 FR 26460 - 26564, June 7, 1991**
Purpose	**Protect public health by minimizing lead (Pb) and copper (Cu) levels in drinking water, primarily by reducing water corrosivity. Pb and Cu enter drinking water mainly from corrosion of Pb and Cu containing plumbing materials.**
General Description	**Establishes action level (AL) of 0.015 mg/L for Pb and 1.3 mg/L for Cu based on 90th percentile level of tap water samples. An AL exceedance is not a violation but can trigger other requirements that include water quality parameter (WQP) monitoring, corrosion control treatment (CCT), source water monitoring/treatment, public education, and lead service line replacement (LSLR).**
Utilities Covered	**All community water systems (CWSs) and non-transient, non-community water systems (NTNCWSs) are subject to the LCR requirements.**

Public Health Benefits

Implementation of the LCR has resulted in . . .	▸ **Reduction in risk of exposure to Pb that can cause damage to brain, red blood cells, and kidneys, especially for young children and pregnant women.** ▸ **Reduction in risk of exposure to Cu that can cause stomach and intestinal distress, liver or kidney damage, and complications of Wilson's disease in genetically predisposed people.**

Lead and Copper Tap Sampling Requirements

- **First draw samples must be collected by all CWSs & NTNCWSs at cold water taps in homes/buildings that are at high risk of Pb/Cu contamination as identified in 40 CFR 141.86(a).**
- **Number of sample sites is based on system size (see Table 1).**
- **Systems must conduct monitoring every 6 months unless they qualify for reduced monitoring (see Table 2).**

Table 1: Pb and Cu Tap and WQP Tap Monitoring

Size Category	System Size	Number of Pb/Cu Tap Sample Sites		Number of WQP Tap Sampling Sites	
		Standard	Reduced	Standard	Reduced
Large	> 100K	100	50	25	10
	50,001-100K	60	30	10	7
Medium	10,001 - 50K	60	30	10	7
	3,301 - 10K	40	20	3	3
Small	501 - 3,300	20	10	2	2
	101 - 500	10	5	1	1
	≤ 100	5	5	1	1

Table 2: Criteria for Reduced Pb/Cu Tap Monitoring[a]

Can Monitor . . .	*If the System . . .*
Annually	1. Serves ≤ 50,000 and is ≤ both ALs for 2 consecutive 6-month monitoring periods; ***or***
	2. Meets Optimal Water Quality Parameter (OWQP) specifications for 2 consecutive 6-month monitoring periods.
Triennially	1. Serves ≤ 50,000 and is ≤ both ALs for 3 consecutive years of monitoring; ***or***
	2. Meets OWQP specifications for 3 consecutive years of monitoring; ***or***
	3. Has 90th percentile Pb levels ≤ 0.005 mg/L & 90th percentile Cu level ≤ 0.65 mg/L for 2 consecutive 6-month periods (*i.e*, accelerated reduced Pb/Cu tap monitoring), ***or***
	4. Meets the 40 CFR 141.81(b)(3) criteria.
Once every 9 years	Serves ≤ 3,300 and meets monitoring waiver criteria found at 40 CFR 141.86(g).

[a] Samples are collected at reduced number of sites (see Table 1 above).

Treatment Technique and Sampling Requirements

CORROSION CONTROL TREATMENT INSTALLATION: All large systems (except systems that meet the requirements of 40 CFR 141.81(b)(2) or (3)) must install CCT. Medium and small systems that exceed either AL must install CCT.

WATER QUALITY PARAMETER MONITORING: All large systems are required to do WQP monitoring. Medium and small systems that exceed either AL are required to do WQP monitoring.

[1]The June 1991 LCR was revised with the following Technical Amendments: 56 FR 32112, July 15, 1991; 57 FR 28785, June 29, 1992; 59 FR 33860, June 30, 1994; and the LCR Minor Revisions 65 FR 1950, January 12, 2000.

For additional information on the LCR, call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater/lcrmr/implement.html; or contact your State drinking water representative.

Treatment Technique and Sampling Requirements if the AL is Exceeded

1 Water Quality Parameter (WQP) Monitoring

- All systems serving > 50,000 people, and those systems serving ≤ 50,000 people if 90th percentile tap level > either AL, must take WQP samples during the same monitoring periods as Pb/Cu tap sample.
- Used to determine water corrosivity, and if needed, to help identify type of CCT to be installed and how CCT should be operated (*i.e.*, establishes OWQP levels).
- WQPs include: pH, alkalinity, calcium, conductivity (initial WQP monitoring only), orthophosphate (if phosphate-based inhibitor is used); silica (if silicate-based inhibitor is used), and temperature (initial WQP monitoring only).
- Samples are collected within distribution system (*i.e.*, WQP tap samples), with number of sites based on system size (see Table 1), and at each entry point to distribution system (EPTDS).
- Systems installing CCT, must conduct follow-up monitoring for 2 consecutive 6-month periods – WQP tap monitoring is conducted semi-annually; EPTDS monitoring increases to every two weeks.
- After follow-up monitoring, State sets ranges of values for the OWQPs.
- Reduced WQP tap monitoring is available for systems in compliance with OWQPs; *Reduced monitoring does not apply to EPTDS monitoring.*
- For systems ≤ 50,000, WQP monitoring is not required whenever 90th percentile tap levels are ≤ both ALs.

2 Public Education (PE)

- Only required if Pb AL is exceeded *(no public education is required if only Cu AL exceeded)*.
- Informs Public Water System's (PWS) customers about health effects, sources, and what can be done to reduce exposure.
- Includes billing inserts sent directly to customers, pamphlets or brochures distributed to hospitals & other locations that provide services to pregnant woman & children, and for some CWSs, newspaper notices and public service announcements (PSAs) submitted to TV/radio stations.
- System must begin delivering materials within 60 days of Pb AL exceedance and continue every 6 months for PSAs and annually for all other forms of delivery for as long as it exceeds Pb AL.
- Different delivery methods and mandatory language for CWSs & NTNCWSs.
- Can discontinue delivery whenever ≤ Pb AL; but must recommence if Pb AL subsequently exceeded.
- PE requirements are in addition to the Public Notification required in 40 CFR Subpart Q.

3 Source Water Monitoring and Treatment

- All systems that exceed Pb or Cu AL must collect source water samples to determine contribution from source water to total tap water Pb/Cu levels and make a source water treatment (SOWT) recommendation within 6 months of the exceedance.
- One set of samples at each EPTDS is due within 6 months of first AL exceedance.
- If State requires SOWT; system has 24 months to install SOWT.
- After follow-up Pb/Cu tap and EPTDS monitoring, State sets maximum permissible levels for Pb & Cu in source.

4 Corrosion Control Treatment

- Required for all large systems (except systems that meet the requirements of 40 CFR 141.81(b)(2) or (b)(3)) and medium/small systems that exceed either AL. The system shall recommend optimal CCT within 6 months.
- Corrosion control study required for large systems.
- If State requires study for medium or small systems, it must be completed within 18 months.
- Once State determines type of CCT to be installed, PWS has 24 months to install CCT.
- Systems installing CCT must conduct 2 consecutive 6-months of follow-up monitoring.
- After follow-up Pb/Cu tap & WQP monitoring, State sets OWQPs.
- Small & medium systems can stop CCT steps if ≤ both ALs for 2 consecutive 6-month monitoring periods.

If the system continues to exceed the AL after installing CCT and/or SOWT...

5 Lead Service Line (LSL) Monitoring

- Two types of sampling associated with LSL replacement (LSLR):
  - *Optional* - Monitoring from LSL to determine need to replace line. If all Pb samples from line ≤ 0.015 mg/L then LSL does not need to be replaced and counts as replaced line.
  - *Required* - Monitoring if entire LSL is ***not*** replaced to determine impact from "partial" LSLR. Sample is collected that is representative of water in service line that is partially replaced.
- Monitoring only applies to system subject to LSLR.

6 Lead Service Line Replacement

- System must replace LSLs that contribute more than 0.015 mg/L to tap water levels.
- Must replace 7% of LSL per year; State can require accelerated schedule.
- If only a portion of a LSL is replaced, PWS must:
  - Notify customers at least 45 days prior to replacement about the potential for increased Pb levels;
  - Collect sample within 72 hours of replacement and mail/post results within 3 days of receipt of results.
- Systems can discontinue LSLR whenever ≤ Pb AL in tap water for 2 consecutive monitoring periods.

Office of Water (4606) EPA 816-F-04-009 www.epa.gov/safewater March 2004

United States Environmental Protection Agency | Office of Water (4606) | EPA 816-F-00-023 May 2000

The Public Notification Rule

A Quick Reference Guide

Highlights

- Revises timing and distribution requirements — notice must be provided within 24 hours (Tier 1, instead of 72 hours), 30 days (Tier 2, instead of 14 days), or one year (Tier 3, instead of 90 days), based on the potential severity of the situation
- Expands list of violations and situations requiring immediate notification and broadens applicability of the public notice to other situations
- Simplifies mandatory health effects language and adds standard language for monitoring violations and for encouraging notice distribution
- Consolidates public notification requirements previously found in other parts of drinking water regulations
- Increases primacy agency flexibility
- Amends Consumer Confidence Report (CCR) regulations to conform to changes made in public notification regulations

Title

Revisions to the Public Notification Regulations for Public Water Systems (40 CFR Part 141, subpart Q), published May 4, 2000 (65 *FR* 25981)

Purpose

To notify the public any time a water system violates national primary drinking water regulations or has other situations posing a risk to public health

Effective Date

Rule is effective **June 5, 2000**
PWSs in jurisdictions directly implemented by EPA must meet these revised requirements **October 31, 2000**
PWSs in primacy states must meet these revised requirements **May 6, 2002** or when the state adopts the revised regulations, whichever is sooner

Applicability

All PWSs violating national primary drinking water regulations, operating under a variance or exemption, or having other situations posing a risk to public health

Timing and Distribution

Notices must be sent within 24 hours, 30 days, or one year depending on the tier to which the violation is assigned (see page 2). The clock for notification starts when the PWS learns of the violation. Notices must be provided to persons served (not just billing customers).

Multilingual Requirements

Where the PWS serves a large proportion of non-English speakers, the PWS must provide information in the appropriate language(s) on the importance of the notice or on how to get assistance or a translated copy

Tier 1 (Immediate Notice, Within 24 Hours)

Notice as soon as practical or within 24 hours via radio, TV, hand delivery, posting, or other method specified by primacy agency, along with other methods if needed to reach persons served. PWSs must also initiate consultation with primacy agency within 24 hours. Primacy agency may establish additional requirements during consultation.

- Fecal coliform violations; failure to test for fecal coliform after initial total coliform sample tests positive
- Nitrate, nitrite, or total nitrate and nitrite MCL violation; failure to take confirmation sample
- Chlorine dioxide MRDL violation in distribution system; failure to take samples in distribution system when required
- Exceedance of maximum allowable turbidity level, if elevated to Tier 1 by primacy agency
- Special notice for non-community water systems (NCWSs) with nitrate exceedances between 10 mg/L and 20 mg/L, where system is allowed to exceed 10 mg/L by primacy agency
- Waterborne disease outbreak or other waterborne emergency
- Other violations or situations determined by the primacy agency

Tier 2 (Notice as Soon as Possible, Within 30 Days)

Notice as soon as practical or within 30 days. Repeat notice every three months until violation is resolved. CWSs: Notice via mail or direct delivery. NCWSs: Notice via posting, direct delivery, or mail. Primacy agencies may permit alternate methods. All PWSs must use additional delivery methods reasonably calculated to reach other consumers not notified by the first method.

- All MCL, MRDL, and treatment technique violations, except where Tier 1 notice is required
- Monitoring violations, if elevated to Tier 2 by primacy agency
- Failure to comply with variance and exemption conditions

*** Turbidity consultation:** Where PWSs have a treatment technique violation resulting from a single exceedance of the maximum allowable turbidity limit or an MCL violation resulting from an exceedance of the two-day turbidity limit, they must consult their primacy agency within 24 hours. Primacy agencies will then determine whether a Tier 1 notice is necessary. If consultation does not occur within 24 hours, violations are automatically elevated to Tier 1.

Tier 3 (Annual Notice)

Notice within 12 months; repeated annually for unresolved violations. Notices for individual violations can be combined into an annual notice (including the CCR, if public notification requirements can still be met). CWSs: Notice via mail or direct delivery. NCWSs: Notice via posting, direct delivery, or mail. Primacy agencies may permit alternate methods. All PWSs must use additional delivery methods reasonably calculated to reach other consumers not notified by the first method.

- Monitoring or testing procedure violations, unless primacy agency elevates to Tier 2
- Operation under a variance and exemption
- Special public notices (fluoride secondary maximum contaminant level (SMCL) exceedance, availability of unregulated contaminant monitoring results)

Requirements for Ongoing Violations

All new billing units and customers must be notified of ongoing violations or situations requiring notice

Relationship to the CCR

Where appropriate, the public notification and CCR requirements are consistent:

- Health effects language for MCL, MRDL, and treatment technique violations are the same
- Multilingual and certification requirements are similar
- CCR may be used for Tier 3 notification, provided public notification timing, content, and delivery requirements are met

Reporting and Record Keeping

- PWSs have ten days to send a certification of compliance and a copy of the completed notice to the primacy agency
- PWS and primacy agency must keep notices on file for three years
- Primacy agencies must report public notification violations to EPA on a quarterly basis

Primacy Requirements

- Primacy agencies must submit complete and final requests for approval of program revisions in order to maintain primacy for public notification
- Primacy agencies have up to 2 years to adopt the new regulations
- Primacy agencies must establish enforceable requirements and procedures if they choose to use any of the flexibilities allowed them in the public notification regulation (e.g., if they allow a PWS to use a different notification method or if they elevate a Tier 2 violation to Tier 1)

Materials Available to Support This Rule

EPA/ASDWA *Public Notification Handbook* provides sample notice templates for water systems and other aids for water systems preparing notices

Primacy Guidance for the Public Notification Rule provides guidance and formats for states preparing primacy program revisions to adopt public notification rule

For More Information

Safe Drinking Water Hotline
1-800-426-4791

Office of Ground Water and Drinking Water Web Site
http://www.epa.gov/safewater/pn.html

Contents of Notice (see sample notice on last page)

Unless otherwise specified in the regulations,* each notice must contain:

1) A description of the violation or situation, including contaminant levels, if applicable
2) When the violation or situation occurred
3) Any potential adverse health effects (using standard health effects language from Appendix B of the public notification rule or the standard monitoring language, see below)
4) The population at risk
5) Whether alternative water supplies should be used
6) What actions consumers should take
7) What the system is doing to correct the violation or situation
8) When the water system expects to return to compliance or resolve the situation
9) The name, business address, and phone number of the water system owner or operator
10) A statement (see below) encouraging distribution of the notice to others, where applicable

** These elements do not apply to notices for fluoride SMCL exceedances, availability of unregulated contaminant monitoring data, and operation under a variance or exemption. Content requirements for these notices are specified in the rule.*

Standard Language:

Standard Monitoring Language: We are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During [period] we [did not monitor or test/did not complete all monitoring or testing] for [contaminant(s)] and therefore cannot be sure of the quality of the drinking water during that time.

Standard Distribution Language: Please share this information with all the people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

Sample Public Notice

DRINKING WATER WARNING

Springfield water has high levels of nitrate

DO NOT GIVE THE WATER TO INFANTS UNDER SIX MONTHS OLD OR USE IT TO MAKE INFANT FORMULA

AVISO
NO USE EL AGUA PARA PREPARAR ALIMENTOS PARA BEBES

Este informe contiene información muy importante sobre su agua potable. Hable con alguien que lo entienda bien o llame al teléfono 555-1200 para hablar en español sobre este aviso.

Water sample results received June 22, 1999 showed nitrate levels of 12 milligrams per liter (mg/l). This is above the nitrate standard, or maximum contaminant level (MCL), of 10 mg/l. Nitrate in drinking water is a serious health concern for infants less than six months old.

What should I do?
DO NOT GIVE THE WATER TO INFANTS. *Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome.* Blue baby syndrome is indicated by blueness of the skin. Symptoms in infants can develop rapidly, with health deteriorating over a period of days. If symptoms occur, seek medical attention immediately.

Water, juice, and formula for children under six months of age should not be prepared with tap water. Bottled water or other water low in nitrates should be used for infants until further notice. Springfield Water Company and the Springfield Health Department are providing free bottled water to families with infants. Water is available between 9 a.m. and 5 p.m. Monday through Friday at the Health Department office at the Town Hall. Water will be provided until the nitrate problem is resolved.

Do not boil the water. Boiling, freezing, filtering, or letting water stand does not reduce the nitrate level. Excessive boiling can make the nitrates more concentrated, because nitrates remain behind when the water evaporates.

Adults and children older than six months can drink the tap water (nitrate is a concern for infants because they can't process nitrates in the same way adults can). However, if you are pregnant or have specific health concerns, you may wish to consult your doctor.

What happened? What is being done?
Nitrate in drinking water can come from natural, industrial, or agricultural sources (including septic systems and run-off). Levels of nitrate in drinking water can vary throughout the year. We'll let you know when the amount of nitrate is again below the limit.

We are investigating water treatment and other options. These may include drilling a new well or mixing the water with low-nitrate water from another source. We anticipate resolving the problem by July 15.

For more information, please contact John Smith of the Springfield Water Company at (602) 555-1212. This notice was prepared and distributed by the Springfield Water Company, 500 Main Street, Springfield.

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

4 - The population at risk

Information for Spanish speakers

2 - When the violation or situation occurred

1 - A description of the violation or situation

3 - Potential health effects

5 - Whether alternate water supplies should be used

6 - Actions consumers should take

7 - What is being done to correct the violation or situation

8 - When the system expects to return to compliance

9 - Name, phone number, and business address for more information

10 - Standard distribution language

Part V. Additional Help

Web Site References

WQCD Web Pages

Colorado Certified Labs
www.cdphe.state.co.us/lr/certification/SDWlist.pdf

Colorado Primary Drinking Water Regulations
www.cdphe.state.co.us/op/regs/waterqualitycontroldivision/100301primarydrinkingwater.pdf

Design Criteria for Potable Water Systems
www.cdphe.state.co.us/op/regs/waterregs/1003p001.pdf

Drinking Water Monitoring Plan Template
www.cdphe.state.co.us/wq/Drinking_Water/pdf/ReportForms/MonitoringPlanTemplate_April_ 2003.pdf

Excellence Program
www.cdphe.state.co.us/wq/drinkingwater/ExcellenceProgram.html

Operator Certification—Regulation 100
www.cdphe.state.co.us/op/ocb

Security
www.cdphe.state.co.us/wq/drinkingwater/EmergencyResponse.html

Source Water Assessment
www.cdphe.state.co.us/wq/sw/swaphom.html

WQCD Drinking Water Program
www.cdphe.state.co.us/wq/Drinking_Water/Drinking_Water_Program_Home.htm

WQCD Home Page
www.cdphe.state.co.us/wq

WQCD Source Water and Wellhead Protection
www.cdphe.state.co.us/wq/Drinking_Water/Source_Water_Protection.htm

EPA Web Pages

EPA Ground Water and Drinking Water
www.epa.gov/safewater

Public Notification Rule: A Quick Reference Guide
www.epa.gov/safewater/pws/pn/guide.pdf

Security
www.epa.gov/safewater/watersecurity

Total Coliform Rule: A Quick Reference Guide
www.epa.gov/safewater/tcr/pdf/qrg_tcr_v10.pdf

Variances and Exemptions: A Quick Reference Guide
www.epa.gov/safewater/smallsys/pdfs/qrguide_smallsystems_variance-exemptions.pdf

Other Web Pages and Resources

American Water Works Association (AWWA)
www.awwa.org
- AWWA: Disinfection of Pipelines and Storage Facilities Field Guide
- AWWA Manual 56: Fundamentals and Control of Nitrification in Chloraminated Drinking Water Distribution Systems
- AWWA Standard 200-04: Distribution Systems Operation and Management

Colorado Department of Local Affairs (DOLA)
www.dola.state.co.us

Colorado Rural Water Association (CRWA)
www.crwa.net

Rural Community Assistance Program (RCAP)
www.rcap.org

Water Distribution System Operations and Maintenance
A field study training program prepared by California State University, Sacramento, College of Engineering and Computer Science, in cooperation with the National Environmental Training Association for the California Department of Health Services, Sanitary Engineering Branch, and U.S. Environmental Protection Agency, Office of Drinking Water; Kenneth D. Kerri, project director.

Drinking Water Program Services and Organizations

The Drinking Water Program of the Colorado Department of Public Health and Environment (CDPHE) is housed within the Water Quality Control Division (WQCD), which administers 2 major federal statutes as authorized by Colorado law: the Clean Water Act and the Safe Drinking Water Act. The Drinking Water Program provides many services for the professionals operating public water systems and other professionals providing services to these systems, such as consulting engineers, equipment suppliers, and associations. These services are provided through numerous projects and programs of the WQCD.

The sections and units that implement the overall Drinking Water Program and the services provided to external entities by each unit are as follows:

- **Compliance Assurance and Data Management Section**
  This section provides compliance assistance and assurance (enforcement) for all rules of the Colorado Primary Drinking Water Regulations, monitoring schedules, guidance document and reporting form development, and inventory requests.
- **Engineering Section**
  The Engineering Section provides design reviews, monitoring waiver evaluations, sanitary surveys, assistance responding to water treatment or distribution system failures, water quality and safety complaints and inquiries, and revolving loan fund eligibility determinations.
- Outreach and Project Assistance Unit
  - ***Drinking Water Revolving Fund***
    The DWRF provides low-interest loans to governmental agencies for the construction of water projects for public health and compliance purposes. This includes funding for treatment upgrades, distribution line replacement, and treated water storage projects. Funding of dams, reservoirs, water rights acquisition, and projects needed primarily for growth or fire protection are not eligible. Planning and design grants may also be available to eligible entities.
  - ***Drinking Water Grant Program***
    The DWGP provides grants to governmental entities, counties representing unincorporated areas, and not-for-profit public water systems serving populations of not more than 5,000 people. Eligible projects include funding for public health and compliance purposes and may include treatment upgrades, distribution line replacement, and treated water storage projects. Funding of dams, reservoirs, water rights acquisition, and projects needed primarily for growth or fire protection are not eligible. Availability of grant funds is dependent upon appropriations from the state legislature.
  - ***Source Water Assessment and Protection***
    The SWAP Program gives the public information about their untreated drinking water and enables consumers and communities to participate in water quality protection efforts. The program also assists local planning efforts by supplying the lead protection entity with the necessary consulting services and tools to develop a protection plan.
- Special Programs Unit
  - ***Capacity Development***
    This program provides performance evaluations, performance improvement, excellence program, training events, management tools, rate setting tools, and operator certification reimbursement.
  - ***Emergency Response and Security***
    This program provides assistance responding to water treatment or distribution system tampering events, security and emergency response guidance documents, vulnerability assessment and emergency response planning tools, and reporting information and forms.
  - ***Excellence Program***
    The Excellence Program is an initiative sponsored by the Drinking Water Program for the purpose of defining excellence, developing a knowledge base of methods to achieve excellence, and helping systems translate knowledge into excellence to make Colorado's drinking water the best it can be every day.

- Ancillary Programs Sponsored by the Drinking Water Program
  - *CO-STAR:* The Colorado Strategy for Arsenic Removal program was developed to help all Colorado systems meet the new levels by January 23, 2006. The program established partnerships with public water systems and other interested groups (e.g., Colorado Rural Water Association, EPA) and provided technical assistance in 5 phases.
  - *CO-RADS:* The Colorado Radionuclide Abatement and Disposal Strategy is a project designed to help public water systems affected by radionuclides achieve compliance with the drinking water regulations.
  - *CoWARN:* The Colorado Water/Wastewater Agency Response Network is a mutual aid network designed to enable utilities to help each other during emergencies by tapping into available expertise and equipment in the water and wastewater industry.

Glossary and Acronyms

Term	Definition
Action level	The concentration of lead or copper in water, which determines in some cases the treatments a system is required to complete.
ANSI	American National Standards Institute.
Average residence time	A point in the distribution system where treated water has been in the system for approximately half of its longest or maximum time in the system, as measured by water transport time. Sample locations between 25 and 75 percent of the maximum are considered to be representative of average residence time provided that in total, the average of the selected locations is approximately 50 percent of the maximum residence time and takes into account population densities and their locations.
AWWA	American Water Works Association.
BAT	Best available technology.
CCR	Consumer Confidence Report. Annual water quality reports that discuss the quality of water delivered by a system and explain the risks (if any) from exposure to contaminants.
CDPHE	Colorado Department of Public Health and Environment.
CFR	Code of Federal Regulations.
Consecutive system	A public water system that buys or otherwise receives some or all of its finished water from 1 or more wholesale systems for at least 60 days per year. In addition to buying finished water, some consecutive systems operate a treatment plant.
Contact time (T)	The time (T) in minutes that it takes for water to move from the point of disinfectant application to a point before or at the point where residual disinfectant concentration (C) is measured, or the time it takes for water to move from 1 point of residual measurement to another.
Conventional filtration	A series of processes including coagulation, flocculation, sedimentation, and filtration, resulting in substantial particulate removal.
CO-RADS	Colorado Radionuclide Abatement and Disposal Strategy.
CO-STAR	Colorado Strategy for Arsenic Removal.
CoWARN	Colorado Water/Wastewater Agency Response Network.
CPDWR	Colorado Primary Drinking Water Regulations.
CPE	Comprehensive performance evaluation.
Cross-connection	Any unprotected actual or potential connection or structural arrangement between a potable water system and any other source, through which it is possible to introduce into any part of the potable system any substance not meeting the CPDWR.
CT	The product of disinfectant residual concentration (C) and contact time (T).
CWS	Community water system. A public water system that serves at least 15 service connections used by year-round residents or that regularly serves at least 25 year-round residents.
DBP	Disinfection byproduct.
Direct filtration	A series of processes including coagulation and filtration but excluding sedimentation, resulting in substantial particulate removal.
Disinfection profile	A summary of daily *Giardia lamblia* inactivation through the treatment plant. For systems that use chloramines, ozone, or chlorine dioxide for primary disinfection, this also includes a summary of daily virus inactivation through the treatment plant.
Disinfectant residual	The concentration of a disinfectant after a given contact time. Typically used to describe the concentration of a disinfectant in the distribution system.
DOLA	Department of Local Affairs.
Drinking Water Program	The Drinking Water Program of the Colorado Department of Public Health and Environment.
DWGP	Drinking Water Grant Program.
DWRF	Drinking Water Revolving Fund.

Term	Definition
EPA	U.S. Environmental Protection Agency.
Filter profile	A graphic representation of individual filter performance, based on continuous turbidity measurements or total particle counts versus time for an entire filter run, that includes an assessment of filter performance while another filter is being backwashed.
First-draw sample	A 1-liter sample of tap water that has been standing in plumbing pipes at least 6 hours and is collected without flushing the tap. Used for lead and copper sampling.
GWUDI	Ground water under the direct influence of surface water. Any water beneath the surface of the ground with 1 of the following: • Significant occurrence of insects or other macro-organisms, algae, or large-diameter pathogens such as Giardia lamblia or Cryptosporidium; or • Significant and rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH that closely correlate to climatological or surface water conditions. GWUDI sources are classified together with surface water sources and must meet the same requirements as surface water systems.
HAA5	Five haloacetic acids. The sum of concentrations of monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid in milligrams per liter, rounded to 2 significant figures after addition.
HPC	Heterotrophic plate count.
IOC	Inorganic chemical. Includes metals and minerals.
Maximum residence time	A point in the distribution system where the treated water has been in the system for the longest or maximum time, as measured by water transport time. Sample locations between 90 and 100 percent of the maximum are considered to be representative of maximum residence time.
MCL	Maximum contaminant level. The maximum permissible level of a contaminant in water that can be delivered to any user of a public water system. The MCL is set as close to the MCLG as possible, taking into account costs, benefits, and feasible technologies.
MCLG	Maximum contaminant level goal. The level at which no known or anticipated adverse effects occur and that allows for an adequate margin of safety.
MRDL	Maximum residual disinfectant level. Similar to an MCL, it is an enforceable limit on the level of residual disinfectants in a distribution system.
MRDLG	Maximum residual disinfectant level goal. Similar to an MCLG, it is an non-enforceable goal for residual disinfectants in a distribution system.
N/A	Not applicable.
National Primary Drinking Water Regulations (NPDWR)	Federal regulations defined in the Safe Drinking Water Act (Title 40, Code of Federal Regulations, Part 141; 40 CFR 141) that apply to public water systems, specify contaminants that may have health effects, specify maximum contaminant levels or treatment techniques, and contain criteria of compliance. National standards for drinking water.
National Secondary Drinking Water Regulations (NSDWR)	Non-enforceable federal limits for contaminants on the basis of aesthetic impacts (e.g., undesirable taste, odor, or appearance).
NSF	NSF International.
NTU	Nephelometric turbidity unit. A unit for expressing the cloudiness (turbidity) of a sample as measured by a nephelometric turbidimeter.
Optimal corrosion control treatment	Treatment that minimizes lead and copper concentrations at users' taps while ensuring that treatment does not cause the water system to violate any CPDWR.
ORC	Operator in responsible charge. The person designated by the owner of a facility to be the certified operator, who has ultimate responsibility for decisions about daily operations.
POE	Point of entry. A POE treatment device is installed at the service entrance to a home.
Public water system	A system for the provision to the public of water for human consumption, through pipes or conveyances, that has at least 15 service connections or that regularly serves at least 25 people at least 60 days per year.
RAA	Running annual average. Calculated by averaging the concentrations of samples from a given sampling point from the last 4 quarters. The average must be recomputed every quarter.

Term	Definition
Sanitary survey	A systematic on-site examination of the sources, processes, and equipment used by a public water system to produce and distribute safe drinking water.
SDWA	Safe Drinking Water Act. The SDWA is Public Law 93-523, enacted December 16, 1974, which requires the EPA to set national primary drinking water regulations.
SMCL	Secondary maximum contaminant level.
SOC	Synthetic organic chemical. SOCs include pesticides and chemicals used in manufacturing.
Surface water	Any water source that is open to the atmosphere and subject to surface runoff.
SWAP	Source Water Assessment and Protection.
Tamper	To introduce a contaminant into a public water system or into drinking water or to otherwise interfere with drinking water or the operation of a public water system with the intention of harming people or public water systems.
TMF	Technical, managerial, and financial.
TOC	Total organic carbon.
Treatment technique (TT)	An enforceable procedure or level of technological performance that public water systems must follow to ensure control of a contaminant.
TTHM	Total trihalomethanes. The sum of concentrations of chloroform, dibromochloromethane, bromodichloromethane, and bromoform in milligrams per liter, rounded to 2 significant figures.
VOC	Volatile organic chemical. VOCs vaporize at low temperatures. They include mostly industrial and chemical solvents such as benzene and toluene.
Waterborne disease outbreak	Significant occurrence of acute infectious illness, epidemiologically associated with the ingestion of water from a system that is deficient in treatment, as determined by the appropriate local or state agency.
WQCD	Water Quality Control Division at the Colorado Department of Public Health and Environment.

Monitoring Schedule Under Normal Operating Conditions

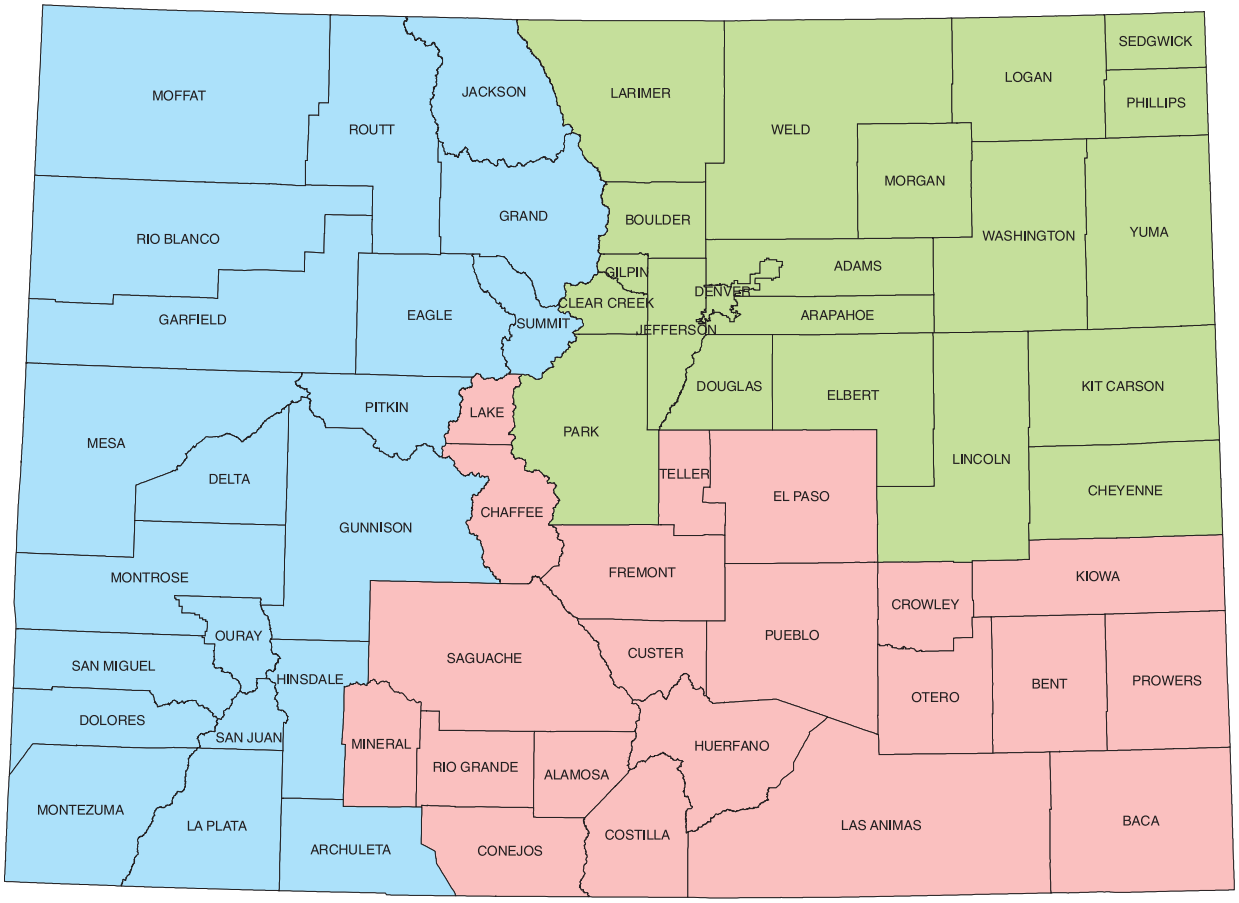
- Frequency may be increased on detection or MCL exceedance.
- Frequency may be decreased with a waiver from the CDPHE.

For utility-specific monitoring requirements, the administrative contact from each utility will receive a letter from the state in November that details the particular system's monitoring requirements for the next year.

Monitoring Schedule Under Normal Operating Conditions for NTNCWS-SW			
Analyte	**Sampling Frequency**	**Sample Locations**	**Page #**
Total coliform	<1,000 people: 1 per month >1,000 people: See Art. 5, Table 5-1, in CPDWR	Representative site in the distribution system. Must be approved in the monitoring plan.	27
Disinfectant residual (in the distribution system)	Taken at same time as coliform sample	Taken at same location as coliform sample	42
Disinfectant residual (leaving the plant)	Continuously monitor <3,300: 1–4 times per day	At the entrance to the distribution system.	42
Disinfectant residual (chlorine dioxide)	Daily	At entrance to distribution system.	49
Turbidity	Continuously or every 4 hours <500: 1 per day	Combined effluent of the filters. After each filter for direct and conventional filtration.	43
IOCs	Specified by the state	At each entry point to the distribution system.	30
– Nitrate	Quarterly	At each entry point to the distribution system.	33
– Nitrite	1 sample per 9-year compliance cycle	At each entry point to the distribution system.	33
– Asbestos	Not required at this time	—	34
VOCs	Specified by the state	At each entry point to the distribution system.	38
SOCs	1 sample every 3 years	At each entry point to the distribution system.	34
DBPs (TTHMs and HAA5)	<500: 1 sample per year 500–9,999: 1 sample per quarter per plant ≥10,000: 4 samples per quarter per plant	At the maximum residence time in the distribution system. ≥10,000: 25% at maximum residence time. Remainder at least the average residence time.	46
Chlorite (chlorine dioxide only)	Daily	At the entrance to the distribution system.	47
Chlorite in the distribution system (chlorine dioxide only)	1 set of 3 samples every month	1. Near the first customer. 2. Average retention time. 3. Maximum residence time.	47
Bromate (ozone only)	1 sample per month	At the entrance to the distribution system.	47
TOC	1 paired sample (source and treated water) per month	Source water. At same point combined filter turbidity is measured.	50
Alkalinity	1 sample per month	Collected at same time as source water TOC.	50
Lead and copper	See Art. 8, Table 8-1, in CPDWR	At customer taps selected to represent the distribution system.	51
Unregulated contaminant monitoring	See 40 CFR 141.40	—	

Contact Information

Water Quality Control Division Regional Offices



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Current contact information for the following Water Quality Control Division staff may be obtained online at www.cdphe.state.co.us/wq/tech/TSUlist.pdf:

- District Engineers
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- Technical Services Unit (TSU) Manager, Supervisors, and Staff
- Watershed Coordinators
- Drinking Water Rules Staff
- Compliance Technicians
- Project Administrators
- Fluoridation Specialist

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