DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Water Quality Control Commission

COLORADO PRIMARY DRINKING WATER REGULATIONS

5 CCR 1003-1

Board of Health

Adopted	02/12/1962		
Amended	10/17/1967		
Amended	11/16/1977		
Amended	07/23/1981	Effective	10/30/1981
Amended	12/21/1988	Effective	01/30/1989
Amended	03/20/1991	Effective	04/30/1991
Amended	07/20/1994	Effective	09/30/1994
Amended	11/16/1994	Effective	01/30/1995
Amended	11/18/1998	Effective	01/30/1999
Amended	03/15/2000	Effective	04/30/2000
Amended	11/14/2001	Effective	12/30/2001
Amended	01/16/2002	Effective	03/02/2002
Amended	07/17/2002	Effective	09/01/2002
Articles 1, 5, 6, 8, 16		Amended	10/16/2002
		Effective	12/30/2002
Article 16, Part of Article 5		Amended	10/16/2002
		Effective	01/23/2004
Part of Article 6		Amended	10/16/2002
		Effective	12/08/2003
Amended	01/15/2003	Effective	01/15/2003
Amended	04/04/2003	Effective	04/04/2003
Amended	05/21/2003	Effective	07/30/2003
Amended	01/24/2004	Effective	03/30/2004
Amended	01/19/2005	Effective	03/30/2005

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Amended	08/13/2007	Effective	09/30/2007
Amended	07/14/2008	Effective	09/30/2008
Amended	10/14/2008	Effective	11/30/2008
Amended	12/08/2008	Effective	01/30/2009
Amended	10/13/2009	Effective	12/01/2009
Amended	08/09/2010	Effective	11/30/2010

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DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Water Quality Control Commission

COLORADO PRIMARY DRINKING WATER REGULATIONS

5 CCR 1003-1

Article 1 General Requirements

1.1 Authority

Sections 24-4-104, 24-4-105, 25-1.5-101, 25-1.5 Part 2, 25-1-108, 25-1-109, 25-1-114, and 25-1-114.1, Colorado Revised Statutes

1.1.1 Purpose

The purpose of the *Colorado Primary Drinking Water Regulations* is to assure the safety of public drinking water supplies, and to enable the State of Colorado to assume responsibility for enforcing the standards established by the federal Safe Drinking Water Act (*Public Law 93-523), as amended.

The Water Quality Control Commission, pursuant to Part 2, Article 1.5 of Title 25, Colorado Revised Statutes, has promulgated the *Colorado Primary Drinking Water Regulations*.

1.2 Applicability

The *Colorado Primary Drinking Water Regulations* shall apply to each public water system, unless the public water system meets all of the following conditions:

(a) Consists only of distribution and storage facilities (and does not have any collection and treatment facilities)

(b) Obtains all of its water from, but is not owned or operated by, a public water system to which such regulations apply

(c) Does not sell water to any person, and

(d) Is not a carrier which conveys passengers in interstate commerce.

1.3 Reserved

1.4 Effective Date

The *Colorado Primary Drinking Water Regulations* shall take effect twenty days after the date of publication thereof in the Colorado Register as finally adopted by the Water Quality Control Commission.

1.5 Definitions of General Applicability

1.5.1 Introduction

Definitions of general applicability to the *Colorado Primary Drinking Water Regulations* promulgated by the Department pursuant to sections 25-1.5-201 through 25-1.5-208, 25-1-108 through 25-1-109, 25-1-114, and 25-1-114.1, Colorado Revised Statutes, are set forth in section 1.5.2 of the *Colorado Primary*

Drinking Water Regulations, and shall be liberally construed to protect the quality of drinking water supplied to the public and the public health.

1.5.2 Definitions

As used in the *Colorado Primary Drinking Water Regulations:*

(1) *4-Log Treatment of Viruses* is achieved by using inactivation and removal, or a Department-approved combination of 4-log virus inactivation and removal.

(2) *Act* means the federal public health service act, as amended by the Safe Drinking Water Act, Public Law 93-523.

(3) *Action level* is the concentration of lead or copper in water specified in section 2.7, which determines, in some cases, the treatment requirements contained in Article 8 that a water system is required to complete.

(4) *Assessment Source Water Monitoring* can be required by the Department and may compliment triggered source water monitoring and targets higher risk groundwater systems (GWS)s by requiring that the GWS take up to 12 monthly source water samples and analyze for one or more of the GWR fecal indicators (E. coli, enterococci, or coliphage).

(5) *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 in the system, as measured by water transport time. With respect to section 7.6, 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 approximate 50 percent of the maximum residence time and take into account population densities and their locations.

(6) *Bag filters* are pressure –driven separation devices that remove particulate matter larger than 1 micrometer using an engineered porous filtration media. They are typically constructed of a non-rigid, fabric filtration media housed in a pressure vessel in which the direction of flow is from the inside of the bag to outside.

(7) *Bank filtration is* a water treatment process that uses a well to recover surface water that has naturally infiltrated into groundwater through a river bed or bank(s). Infiltration is typically enhanced by the hydraulic gradient imposed by a nearby pumping water supply or other well(s).

(8) *Best available technology* or *BAT* means the best technology, treatment techniques, or other means, which the EPA Administrator finds, after examination for efficacy under field conditions and not solely under laboratory conditions, are available (taking cost into consideration). For the purposes of setting maximum contaminant levels (MCLs) for synthetic organic chemical contaminants, any BAT must be at least as effective as granular activated carbon.

(9) *Cartridge filters* are pressure-driven separation devices that remove particulate matter larger than 1 micrometer using an engineered porous filtration media. They are typically constructed as rigid or semi-rigid, self-supporting filter elements housed in pressure vessels in which flow is from the outside of the cartridge to the inside.

(10) *Certified cross-connection control technician* means a person who has responsibility for the testing, operation and maintenance of cross-connection control devices and is certified in accordance with the provisions of Article 12.

(11) *Certified laboratory* means a laboratory certified by the State of Colorado for analysis of drinking water.

(12) *Coagulation* means a process using coagulant chemicals and mixing by which colloidal and suspended materials are destabilized and agglomerated into flocs.

(13) *Combined distribution system* is the interconnected distribution system consisting of the distribution systems of wholesale systems and of the consecutive systems that receive finished water.

(14) *Commencement of construction* means commencement of the physical effort to construct a project, excluding engineering, architectural, legal, fiscal and economic investigations, studies, and completion of plans and specifications, and surveys. Included in such effort, but not by way of limitation, are site clearance, excavation, construction, and the establishment of an office or construction building on site.

(15) *Community water system* means 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.

(16) *Compliance cycle* means the nine-year calendar year cycle during which public water systems must monitor. Each compliance cycle consists of three three-year compliance periods. The first calendar year cycle begins January 1, 1993 and ends December 31, 2001; the second begins January 1, 2002 and ends December 31, 2010; the third begins January 1, 2011 and ends December 31, 2019.

(17) *Compliance gross alpha* means the analytical gross alpha minus radon and uranium, but including radium-226. This value is compared to the gross alpha maximum contaminant level (MCL) to determine compliance.

(18) *Compliance Monitoring* as referenced in Article 13 is required by all groundwater systems (GWSs) that provide at least 4-log treatment of viruses using chemical disinfection, membrane filtration, or a State-approved alternate treatment technology. Disinfectant residual and total coliform monitoring is required to demonstrate treatment effectiveness.

(19) *Compliance period* means a three-year calendar year period within a compliance cycle. Each compliance cycle has three three-year compliance periods. Within the first compliance cycle, the first compliance period ran from January 1, 1993 to December 31, 1995; the second from January 1, 1996 to December 31, 1998; the third from January 1, 1999 to December 31, 2001.

(20) *Comprehensive performance evaluation* (CPE) is a thorough review and analysis of a treatment plant's performance capabilities and associated administrative, operation and maintenance practices. It is conducted to identify factors that may be adversely impacting a plant's capability to achieve compliance and emphasizes approaches that can be implemented without significant capital improvements. For purposes of compliance with Article 7, the comprehensive performance evaluation must consist of at least the following components: Assessment of plant performance; evaluation of major unit processes; identification and prioritization of performance limiting factors; assessment of the applicability of comprehensive technical assistance; and preparation of a CPE report.

(21) *Comprehensive technical assistance* (CTA) means the performance improvement phase that is implemented if the Comprehensive Performance Evaluation (CPE) results indicate improved performance potential. The CTA is a combination of utilizing CPE results as a basis for follow-up, implementing process control priority-setting techniques and maintaining long-term involvement to systematically train staff and administrators.

(22) *Confluent growth*, in the context of bacterial testing, means a continuous bacterial growth covering the entire filtration area of a membrane filter, or a portion thereof, in which bacterial colonies are not discrete.

(23) *Consecutive system* is a public water system that receives some or all of its finished water from one or more wholesale systems. Delivery may be through a direct connection or through the distribution system of one or more consecutive systems.

(24) *Construction* means the erection, building, modification, reconstruction, improvement or expansion of waterworks.

(25) *Contaminant* means any physical, chemical, biological, or radiological substance or matter in water.

(26) *Control device* means any Department-approved cross-connection control device or method installed on service connections to a premises or auxiliary system.

(27) *Conventional filtration treatment* means a series of processes including coagulation, flocculation, sedimentation, and filtration resulting in substantial particulate removal.

(28) *Corrosion inhibitor* means a substance capable of reducing the corrosivity of water toward metal plumbing materials, especially lead and copper, by forming a protective film on the interior surface of those materials.

(29) *Cross-connection* means any unprotected actual or potential connection or structural arrangement between a public or a consumer's potable water system and any other source or system through which it is possible to introduce into any part of the potable system any used water, industrial fluid, gas, or substance not meeting drinking water requirements in these regulations. By-pass arrangements, jumper connections, removable sections, swivel or changeover devices and other temporary or permanent devices through which or because of which "backflow" can or may occur are considered to be cross-connections.

(30) *Cross-connection-controlled* means having an accepted cross-connection control device properly installed and maintained. This device shall continuously provide cross-connection protection commensurate with the degree of hazard.

(31) *CT* or *CTcalc* is the product of "residual disinfectant concentration" (C) in milligrams per liter (mg/L) determined before or at the first customer, and the corresponding "disinfectant contact time" (T) in minutes, i.e., "C" x "T".

(32) *Customer* means, for the purpose of section 9.1, billing units or service connections to which water is delivered by a community water system.

(33) *Department* as used in the *Colorado Primary Drinking Water Regulations*, means the Colorado Department of Public Health and Environment as created by section 25-1-102(1), Colorado Revised Statutes.

(34) *Detected* means, for the purpose of section 9.1, at or above the levels prescribed by Article 10 for inorganic chemical contaminants, volatile organic chemical contaminants, synthetic organic chemical contaminants, disinfection byproducts and for radioactive contaminants.

(35) *Diatomaceous earth filtration* means a process resulting in substantial particulate removal in which (1) a precoat cake of diatomaceous earth filter media is deposited on a support membrane (septum), and (2) while the water is filtered by passing through the cake on the septum, additional

filter media known as body feed is continuously added to the feed water to maintain the permeability of the filter cake.

(36) *Direct filtration* means a series of processes including coagulation and filtration but excluding sedimentation resulting in substantial particulate removal.

(37) *Disinfectant* means any oxidant, including but not limited to chlorine, chlorine dioxide, chloramines, ozone, and ultraviolet light, added to water in any part of the treatment or distribution process, that is intended to kill or inactivate pathogenic microorganisms.

(38) *Disinfectant contact time* ("T" in CT calculations) means the time in minutes that it takes for water to move from the point of disinfectant application or the previous point of disinfectant residual measurement to a point before or at the point where residual disinfectant concentration ("C") is measured. Where only one "C" is measured, "T" is the time in minutes that it takes for water to move from the point of disinfectant application to a point before or at where residual disinfectant concentration ("C") is measured. Where more than one "C" is measured, "T" is (a) for the first measurement of "C", the time in minutes that it takes for water to move from the first or only point of disinfectant application to a point before or at the point where the first "C" is measured and (b) for subsequent measurements of "C", the time in minutes that it takes for water to move from the previous "C" measurement point to the "C" measurement point for which the particular "T" is being calculated.

(39) *Disinfection* means a process that inactivates pathogenic organisms in water by chemical oxidants, ultraviolet light, or equivalent agents.

(40) *Disinfection profile* is 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.

(41) *Domestic or other non-distribution system plumbing problem* means a coliform contamination problem in a public water system with more than one service connection that is limited to the specific service connection from which the coliform-positive sample was taken.

(42) *Dose equivalent* means the product of the absorbed dose from ionizing radiation and such factors as account for differences in biological effectiveness due to the type of radiation and its distribution in the body as specified by the International Commission on Radiological Units and Measurements (ICRU).

(43) *Dual sample set* is a set of two samples collected at the same time and same location, with one sample analyzed for TTHM and the other sample analyzed for HAA5. Dual sample sets are collected for the purposes of conducting an Initial Distribution System Evaluation (IDSE) under section 7.7 and determining compliance with the TTHM and HAA5 MCLs under Section 7.8.

(44) *EPA* means the United States Environmental Protection Agency.

(45) *EPA administrator* means the administrator of the United States Environmental Protection Agency.

(46) *Effective corrosion inhibitor residual*, for the purpose of Article 8 only, means a concentration sufficient to form a passivating film on the interior walls of a pipe.

(47) *Emergency source/connection* means a water facility that is only used as the result of extreme circumstances, and is otherwise kept offline. These facilities may be either connected or disconnected from a treatment plant/distribution system.

(48) *Enhanced coagulation* means the addition of sufficient coagulant for improved removal of disinfection byproduct precursors by conventional filtration treatment.

(49) *Enhanced softening* means the improved removal of disinfection byproduct precursors by precipitative softening.

(50) *Enforcement order* means an order issued for the purpose of notifying a public water system that it is in violation of the *Colorado Primary Drinking Water Regulations*, or for the purpose of requiring a public water system to cease such violations. Enforcement orders may prescribe corrective measures necessary to achieve compliance with the *Colorado Primary Drinking Water Regulations*.

(51) *Exemption* means a form of temporary relief from a maximum contaminant level in finished potable water granted to a public water system pending installation and operation of treatment facilities, acquisition of an alternate source, or completion of improvements in treatment processes to bring the system into compliance with the *Colorado Primary Drinking Water Regulations*.

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

(53) *Filtration* means a process for removing particulate matter from water by passage through porous media.

(54) *Finished water* is water that is introduced into the distribution system of a public water system and is intended for distribution and consumption without further treatment, except as treatment necessary to maintain water quality in the distribution system (e.g., booster disinfection, addition of corrosion control chemicals).

(55) *First customer* means the first potable water service connection downstream of the point where complete water treatment, including disinfection contact time, has occurred. Typically, the first customer is the water treatment plant's domestic water system.

(56) *First draw sample*, as it applies to section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water), means a one-liter sample of tap water that has been standing in plumbing pipes for at least six hours and is collected without flushing the tap.

(57) *Flocculation* means a process to enhance agglomeration or collection of smaller floc particles into larger, more easily settled particles through gentle stirring by hydraulic or mechanical means.

(58) *Flowing stream* is a course of running water flowing in a definite channel.

(59) *GAC10* means granular activated carbon filter beds with an empty-bed contact time of ten minutes based on average daily flow and a carbon reactivation frequency of every 180 days, except that the reactivation frequency for GAC10 used as a best available technology for compliance with Section 7.8 MCLs under Section 2.4 shall be 120 days.

(60) *GAC20* means granular activated carbon filter beds with an empty-bed contact time of 20 minutes based on average daily flow and a carbon reactivation frequency of every 240 days.

(61) *Gross alpha particle activity* means the total radioactivity due to alpha particle emission as inferred from measurements on a dry sample.

(62) *Gross beta particle activity* means the total radioactivity due to beta particle emission as inferred from measurements on a dry sample.

(63) *Groundwater* means any water under the surface of the ground being neither "surface water" nor "groundwater under the direct influence of surface water".

(64) *Groundwater System* (GWS) means a public water system (PWS) that uses groundwater not under the direct influence of surface water as its sole source of water and does not include PWSs that combine all of their groundwater with surface water or groundwater under the direct influence of surface water prior to treatment.

(65) *Groundwater under the direct influence of surface water* (GWUDI) means any water beneath the surface of the ground with:

(i) Significant occurrence of insects or other macro-organisms, algae, or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium*; or

(ii) Significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH, which closely correlate to climatological or surface water conditions.

(66) *Haloacetic acids* (HAA5) means the sum of the concentrations in milligrams per liter of the haloacetic acid compounds (monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid), rounded to two significant figures after addition.

(67) *Halogen* means one of the chemical elements chlorine, bromine or iodine.

(68) *Hydrogeologic Sensitivity Assessment* (HSA) is a determination of whether groundwater systems obtain water from hydrogeologically sensitive settings. Sensitive settings are described as: (1) aquifers that exists in an area with high population densities combined with onsite wastewater treatment systems; (2) aquifers in which viruses may travel faster and further than bacteria (e.g. alluvial or sand aquifers), (3) shallow, unconfined aquifers; (4) aquifers with thin or absent soil cover; (5) areas where wells have previously been identified as having fecal contamination; and (6) sensitive aquifers.

(69) *Inactivation* of pathogens using a chemical disinfectant (for example chorine, chloramine, ozone) is based on the CT concept where C is the measured concentration of the chemical disinfectant residual and T is the contact time between the point of application of the disinfectant and the point where the disinfectant residual is measured. The point where the residual is measured must be before or at the first service connection or customer.

(70) *Initial distribution system evaluation* (IDSE) means a study and analysis of data to determine locations with representative high TTHM and HAA5 concentrations throughout a system's distribution system.

(71) *Initial compliance period* means the first full three-year compliance period which begins at least 18 months after promulgation; except for inorganic, volatile organic and synthetic organic contaminants, initial compliance period means the first full three-year compliance period after promulgation; or the first full three-year compliance period after the effective date of the regulation as stipulated by the rule.

(72) *Integrated system* means two or more public water systems, one of which is a wholesale system, whose distribution systems are physically connected and who have agreed to operate using a common set of standards that the wholesale system establishes for the purposes of maintaining and protecting drinking water quality.

(73) *Lake/reservoir* refers to a natural or man made basin or hollow on the Earth's surface in which water collects or is stored that may or may not have a current or single direction of flow.

(74) *Lead free*, for purposes of Article 8, means:

(i) When used with respect to solders and flux, refers to solders and flux containing not more than 0.2 percent lead

(ii) When used with respect to pipes and pipe fittings, refers to pipes and pipe fittings containing not more than 8.0 percent lead, or

(iii) When used with respect to plumbing fittings and fixtures intended by the manufacturer to dispense water for human ingestion, refers to fittings and fixtures that are in compliance with standards established in accordance with 42 U.S.C. 300g-6(e).

(75) *Lead service line* means a service line made of lead, which connects the water main to the building inlet and any lead pigtail, gooseneck or other fitting, which is connected to such lead line.

(76) *Legionella* means a genus of bacteria, some species of which have caused a type of pneumonia called legionnaires disease.

(77) *Liquids from dewatering processes* means a stream of liquids generated from a unit used to concentrate solids for disposal. Processes may consist of centrifuges, filter presses, belt presses, vacuum filters, monofills, or other sludge concentrating equipment. Such equipment may be used to dewater sludge from treatment units used in recycling processes or sludge from units found in the primary processes.

(78) *Locational running annual average* (LRAA) is the average of sample analytical results for samples taken at a particular monitoring location during the previous four calendar quarters.

(79) *Man-made beta particle and photon emitters* means all radionuclides emitting beta particles and/or photons listed in *Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure*, NBS Handbook 69, except the daughter products of thorium-232, uranium-235 and uranium-238.

(80) *Maximum contaminant level* (MCL) means the maximum permissible level of a contaminant in water, which is delivered to any user of a public water system.

(81) *Maximum contaminant level goal* or *MCLG* means the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety. Maximum contaminant level goals are non-enforceable health goals.

(82) *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. For purposes of section 7.6, sample locations between 90 and 100 percent of the maximum are considered to be representative of maximum residence time.

(83) *Maximum residual disinfectant level* (MRDL) means a level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap without an unacceptable possibility of adverse health effects.

(84) *Maximum residual disinfectant level goal* (MRDLG) means the maximum level of a disinfectant added for water treatment at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety. MRDLGs are non-

enforceable health goals and do not reflect the benefit of the addition of the chemical for control of waterborne microbial contaminants.

(85) *Maximum total trihalomethane potential* (MTP) means the maximum concentration of total trihalomethanes produced in water containing a disinfectant residual after seven days at a temperature of 25°C or above.

(86) *Membrane Filtration* is a pressure or vacuum driven separation process in which particulate matter larger than 1 micrometer is rejected by an engineered barrier, primarily through a size-exclusion mechanism, and which has a measurable removal efficiency of a target organism that can be verified through the application of a direct integrity test. This definition includes the common membrane technologies of microfiltration, ultrafiltration, nanofiltration, and reverse osmosis.

(87) *Membrane module* means the smallest component of a membrane unit in which a specific membrane surface area is housed in a device with a filtrate outlet structure.

(88) *Minimum general sanitary standards* means the minimum standards for the construction and operation of public water systems reasonably consistent with protection of the public health.

(89) *Monitoring plan* as it applies to section 1.12 means the written description of the system detailing all sources capable of being used by the system; a summary of the system's operating characteristics, treatment processes and their associated temporal utilization (e.g., use of peaking facilities, alternative water sources, maintenance schedules that take facilities off line, etc.); a schematic of the facilities and distribution system identifying the location of all sources (including latitude and longitude), treatment processes, entry points to the distribution system, post entry point treatment facilities, storage facilities, treatment and distribution system monitoring points; and a detailed sampling plan to monitor each parameter for which a compliance determination is required. The monitoring plan consists of *PART I – FACILITY INVENTORY* and *PART II - INDIVIDUAL RULE SAMPLING PLANS*.

(90) *Near the first service connection* means at one of the 20 percent of all service connections in the entire system that are nearest the water supply treatment facility, as measured by water transport time within the distribution system.

(91) *New source* means a source not previously utilized by the public water system.

(92) *New waterworks* means:

(i) Any newly constructed public water system, or

(ii) An existing system that becomes, by definition, a public water system by extending its infrastructure through physical expansion by virtue of increasing the number of connections, the number of individuals served, or by extending the number of days of service.

(93) *Non-community water system* means a public water system that is not a community water system. A non-community water system is either a "transient, non-community water system" or a "non-transient, non-community water system."

(94) *Non-transient, non-community water system* means a public water system that is not a community water system and that regularly serves at least 25 of the same persons over six months per year.

(95) *Non-transient population* means 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 a regular opportunity to consume water produced by the system. Regular opportunity is defined as four or more hours per day, for four or more days per week, for six months or more per year.

(96) *Optimal corrosion control treatment,* for the purpose of lead and copper tap monitoring only, means the corrosion control treatment that minimizes the lead and copper concentrations at users' taps while ensuring that the treatment does not cause the water system to violate any provision of the *CPDWR*.

(97) *Performance evaluation sample, also referred to as laboratory proficiency test samples (PTs)* means a reference sample provided to a laboratory for the purpose of demonstrating that the laboratory can successfully analyze the sample within specified limits of performance specified by the agency. The true value of the concentration of the reference material is unknown to the laboratory at the time of the analysis.

(98) *Person* means an individual, corporation, company, association, partnership, municipality, or State, Federal, or tribal agency.

(99) *picoCurie* (pCi) means the quantity of radioactive material producing 2.22 nuclear transformations per minute.

(100) *Plans and Specifications* means the technical design drawings and specifications for waterworks. For new waterworks, this also includes technical, financial and managerial plans.

(101) *Plant intake* refers to the works or structures at the head of a conduit through which water is diverted from a source (e.g., river or lake) into the treatment plant.

(102) *Point of disinfectant application* is the point where the disinfectant is applied and water downstream of that point is not subject to recontamination.

(103) *Point-of-entry treatment device* (POE) is a treatment device applied to the drinking water entering a house or building for the purpose of reducing contaminants in the drinking water distributed throughout the house or building.

(104) *Point-of-use treatment device* (POU) is a treatment device used for the purpose of reducing contaminants in drinking water applied to a single faucet or other point of use (i.e., drinking fountain, ice maker, etc.).

(105) *Population-served* means the average daily population that occurs during the busiest month of the year or regular operating period(s). Population-served is further defined as the sum of resident, non-transient, and transient populations.

(106) *Presedimentation* is a preliminary treatment process used to remove gravel, sand and other particulate material from the source water through settling before the water enters the primary clarification and filtration processes in a treatment plant.

(107) *Public water system* (PWS) means a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year. Such term includes:

(i) Any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system.

(ii) Any collection or pretreatment storage facilities not under such control, which are used primarily in connection with such system.

Such term does not include any "special irrigation district." A public water system is either a "community water system" or a "non-community water system."

(108) *Recycle* means the act of returning recycle streams to a plant's primary treatment process.

(109) *Recycle flows* means any water, solid or semi-solid, generated by a plant's treatment processes, operational processes, and residual treatment processes, that is returned to the plant's primary treatment process. Also referred to as recycle streams.

(110) *Rem* means the unit of dose equivalent from ionizing radiation to the total body or any internal organ or organ system. A "millirem (mrem)" is 1/1000 of a rem.

(111) *Repeat compliance period* means any subsequent three-year monitoring period following the initial compliance period.

(112) *Resident population* means the average number of persons whose primary residence is served by the system. The individual need not live at the residence for 365 days per year for it to be considered his/her primary residence.

(113) *Residual disinfectant concentration* ("C" in CT calculations) means the concentration of disinfectant measured in mg/L in a representative sample of water.

(114) *Sanitary survey* means an onsite review of the water source, facilities, equipment, operation and maintenance of a public water system for the purpose of evaluating the adequacy of such source, facilities, equipment, operation and maintenance for producing and distributing safe drinking water.

(115) *Secondary Maximum Contaminant Levels* (SMCLs) apply to public water systems and which, in the judgment of the EPA Administrator, are requisite to protect the public health. The SMCL means the maximum permissible level of a contaminant in water which is delivered to the ultimate user of a public water system. Contaminants added to the water under circumstances controlled by the user, except those resulting from corrosion of piping and plumbing caused by water quality, are excluded from this definition. The SMCLs are not enforceable, but are intended as guidelines.

(116) *Sedimentation* means a process for removal of solids before filtration by gravity or separation.

(117) *Service connection* means a connection to a system that delivers water by constructed conveyance. The definition does not include connections that deliver water by a constructed conveyance other than a pipe if:

(i) The water is used exclusively for purposes other than residential uses (consisting of drinking, bathing, and cooking, or other similar uses)

(ii) The Department determines that an alternative water source to achieve the equivalent level of public health protection provided by the applicable Colorado primary drinking water regulation is provided for residential or similar uses for drinking and cooking, or

(iii) The Department determines that the water provided for residential or similar uses for drinking, cooking, and bathing is centrally treated or treated at the point of entry by the provider, a pass-through entity, or the user to achieve the equivalent level of protection provided by the applicable *Colorado Primary Drinking Water Regulations*.

(118) *Service line sample,* as it applies to section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water), means a one-liter sample of water that has been standing for at least 6 hours in a service line.

(119) *Significant deficiency* means any situation, practice, or condition in a public water system with respect to design, operation, maintenance, or administration, that the state determines may result in or have the potential to result in production of finished drinking water that poses an unacceptable risk to health and welfare of the public served by the water system. Significant deficiencies include, but are not limited to, defects in design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that the Department determines to be causing, or have potential for causing, the introduction of contamination into the water delivered to consumers.

(120) *Single-family structure,* for the purpose of lead and copper tap monitoring only, means a building constructed as a single-family residence that is currently used as either a residence or a place of business.

(121) *Slow sand filtration* means a process involving passage of raw water through a bed of sand at low velocity (generally less than 0.4 meters per hour (m/h)) resulting in substantial particulate removal by physical and biological mechanisms.

(122) *Small system variance* means variance from the requirement to comply with a maximum contaminant level or treatment technique to systems serving a total population of fewer than 10,000 that qualify under all provisions of section 4.3.

(123) *Source* means the point at which a public water system diverts water from its natural or man-made origin.

(124) *Special irrigation district* means an irrigation district in existence prior to May 18, 1994 that provides primarily agricultural service through a piped water system with only incidental residential or similar use where the system or the residential or similar users of the system comply with the exclusion provisions outlined in the definition of service connections (section 1.5.2(117)(ii)-(iii)).

(125) *Spent filter backwash water* means a stream containing particles that are dislodged from filter media when water is forced back through a filter (backwashed) to clean the filter. Spent filter backwash water contains particles including coagulants, metals, and microbes such as *Cryptosporidium*.

(126) *Standard sample* means the aliquot of finished drinking water that is examined for the presence of coliform bacteria.

(127) *State* means the State of Colorado.

(128) *Supplier of water* means any person who owns or operates a public water system.

(129) *Surface water* means any water source that is open to the atmosphere and subject to surface runoff. Groundwaters found to be under the direct influence of surface water will be classified as surface water.

(130) *SUVA* means specific ultraviolet absorption at 254 nanometers (nm), an indicator of the humic content of water. It is a calculated parameter obtained by dividing a sample's ultraviolet absorption at a wavelength of 254 nm (UV254) (in m^{-1}) by its concentration of dissolved organic carbon (DOC) (in mg/L).

(131) *System with a single service connection* means a system that supplies drinking water to consumers via a single service line.

(132) *Tamper*, as defined in section 25-1-114.1(6), Colorado Revised Statutes, means 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 persons or public water systems. It does not include the standardized accepted treatment procedures performed by a supplier of water in preparing water for human consumption.

(133) *Thickener supernatant* means a stream containing the decant from a sedimentation basin, clarifier or other unit that is used to treat water, solids, or semi-solids from the primary treatment processes. The “clear water” that exits the units after particles have been allowed to settle out is thickener supernatant (or sludge thickener supernatant).

(134) *Too numerous to count* (TNTC) means that the total number of bacterial colonies exceeds 200 on a 47-millimeter (mm) diameter membrane filter used for coliform detection.

(135) *Total organic carbon* (TOC) means a parameter measuring the total amount of carbon in water, present as organic molecules. It is used as a surrogate for disinfection byproduct precursors.

(136) *Total trihalomethanes* (TTHM) means the sum of the concentration in milligrams per liter (mg/L) of the trihalomethane compounds (trichloromethane [chloroform], dibromochloromethane, bromodichloromethane and tribromomethane [bromoform]), rounded to two significant figures.

(137) *Transient, non-community water system* means a non-community water system that does not regularly serve at least twenty-five of the same persons over six months per year.

(138) *Transient population* means the average number of individuals served per day during the year or annual operating period(s), who have an opportunity to consume water from the system, but who do not meet the definition of either residents or non-transient customers.

(139) *Treatment technique requirement* means a requirement of the *Colorado Primary Drinking Water Regulations* that specifies, for a contaminant, a specific treatment technique(s) known to EPA, which leads to a sufficient reduction in the level of such contaminant to comply with the requirements of the *Colorado Primary Drinking Water Regulations*.

(140) *Trihalomethane* (THM) means one of the family of organic compounds, named as derivatives of methane, wherein three of the four hydrogen atoms in methane are each substituted by a halogen atom in the molecular structure.

(141) *Triggered Source Water Monitoring* means the monitoring requirements for a groundwater system (GWS) when a distribution system total coliform sample tests positive.

(142) *Triggered Source Water Monitoring Plan* means a plan that specifies the applicable well(s) for collecting source water samples in the event a groundwater system (GWS) with multiple sources is required to collect a triggered source water sample(s).

(143) *Two-stage lime softening* is a process in which chemical addition and hardness precipitation occur in each of two distinct unit clarification processes in series prior to filtration.

(144) *Uncovered finished water storage facility* means a tank, reservoir, or other facility used to store water that will undergo no further treatment except residual disinfection and that is open to the atmosphere without properly screened vents, screened overflow pipe, or cover.

(145) *Variance* means a form of relief from a maximum contaminant level granted to a public water system. Variances may be granted where characteristics of the system's raw water source preclude compliance by the system with the maximum contaminant levels prescribed by the *Colorado Primary Drinking Water Regulations*, despite application of best available technology, treatment techniques, or other means generally available to said system. In deliberations regarding variance requests, costs shall be taken into consideration.

(146) *Violation* means failure to comply with any provision of the *Colorado Primary Drinking Water Regulations*.

(147) *Virus* means a virus of fecal origin, which is infectious to humans by waterborne transmission.

(148) *Vulnerability-use-waiver* means a waiver issued by the Department to reduce the monitoring requirements for a specific contaminant pursuant to the Department's Monitoring Waiver Program, when the Department has determined that the contaminant was not used (including transport, storage or disposal) in the area of a public water system.

(149) *Waiver* means reduction of a monitoring requirement. A waiver may either eliminate the requirement to monitor for a particular contaminant during a compliance period or reduce the frequency at which the contaminant must be analyzed. There are two types of waivers: (1) a waiver-by-rule and (2) a vulnerability-use-waiver.

(150) W*aiver-by-rule* means a waiver that is issued by the Department pursuant to the Department's Monitoring Waiver Program following a determination that a public water system meets the specific criteria for a reduction of a monitoring requirement contained in the *Colorado Primary Drinking Water Regulations*.

(151) *Waterborne disease outbreak* means the significant occurrence of acute infectious illness, epidemiologically associated with the ingestion of water from a public water system which is deficient in treatment, as determined by the appropriate local or State agency.

(152) *Waterworks* means the facilities that are directly involved in the production, treatment, or distribution of water for public water systems.

(153) *Water Quality Control Commission* means the commission that has been created within the Colorado Department of Public Health and Environment pursuant to section 25-8-201, Colorado Revised Statutes.

(154) *Water Vending and Dispensing Machines* means any device which, upon payment by insertion of a coin, coins, token, or by other means, dispenses water into a container.

(155) *Wholesale system* is a public water system that treats source water as necessary to produce finished water and then delivers some or all of that finished water to another public water system. Delivery may be through a direct connection or through the distribution system of one or more consecutive systems.

1.6 Common Provisions

1.6.1 Monitoring Requirements

The Department may require public water systems to install, maintain, and use instrumentation to monitor and record data. Periodic reports are required to demonstrate compliance with applicable regulations on a continuing basis.

1.6.2 Performance Testing

To establish compliance with the Colorado Primary Drinking Water Regulations, the Department may require public water systems to conduct performance tests and monitoring, as the Department deems necessary to protect the public health. These tests shall be conducted in accordance with methods approved by the Department to demonstrate compliance with the *Colorado Primary Drinking Water Regulations* or terms and conditions of enforcement orders.

1.6.3 Recordkeeping

Each public water system shall retain on the system's premises or at a convenient location near such premises the following records:

(a) Records of microbiological analyses and turbidity analyses made pursuant to Articles 5 and 7 of the *Colorado Primary Drinking Water Regulations* for not less than five years, and records of chemical analyses for not less than ten years. The actual laboratory reports may be kept, or data may be transferred to tabular summaries, provided that the following information is included:

(1) The date, place, and time of sampling, and the name of the person who collected the sample;

(2) Identification of the sample as to whether it was a routine distribution system sample, routine entry-point-to-the-distribution-system sample (EPTDS), confirmation sample, raw or processed water sample or a special purpose sample;

(3) Date of analysis;

(4) Laboratory and person responsible for performing analysis;

(5) The analytical technique/method used, and

(6) The results of the analyses.

(b) For each violation of the Colorado Primary Drinking Water Regulations, the records of action taken by the public water system to correct the violation shall be kept for not less than three years after the date on which the last action was taken with respect to the particular violation involved.

(c) Copies of any written reports, summaries or communications relating to sanitary surveys of the system conducted by the system itself, a private consultant, or a local, state or federal agency shall be kept for not less than ten years after completion of the sanitary survey.

(d) Records concerning a variance or exemption granted to the system shall be kept for not less than five years following the expiration of such variance or exemption.

(e) Copies of public notices and consumer confidence reports issued pursuant to Article 9 and certifications made to the Department must be kept for not less than three years after issuance.

(f) Copies of monitoring plans developed pursuant to this section shall be kept for the same period of time as the records of analyses taken under the plan are required to be kept under paragraph (a) of the section, except as specified elsewhere in this section.

(g) All records pertaining to the operation and water quality of a public water system are public information and shall be made available to the public by the Department, at request, during normal working hours.

(h) Upon request of the Department the public water system shall submit copies of any records required to be maintained for public notification or copies of any documents in existence, which

the Department is entitled to inspect pursuant to the authority of the Colorado Primary Drinking Water Regulations.

(i) In addition to other recordkeeping requirements, systems subject to any of the requirements shown in the first column of the table below, must maintain records as described.

Corresponding requirement	Description of necessary records	Duration of time records must be kept
(1) Individual Filter Turbidity Requirements (section 7.3.5)	Results of individual filter monitoring	At least 3 years.
(2) Disinfection Profiling (section 7.3.2)	Results of Profile (including raw data and analysis)	Indefinitely.
(3) Disinfection Benchmarking (section 7.3.3)	Benchmark (including raw data and analysis)	Indefinitely.

(j) The system must collect and retain on file recycle flow information specified in sections 1.6.3(j)(1) through (6) for review and evaluation by the Department beginning June 8, 2004.

(1) Copy of the recycle notification and information submitted to the Department under section 7.5.2.

(2) List of all recycle flows and the frequency with which they are returned.

(3) Average and maximum backwash flow rate through the filters and the average and maximum duration of the filter backwash process in minutes.

(4) Typical filter run length and a written summary of how filter run length is determined.

(5) The type of treatment provided for the recycle flow.

(6) Data on the physical dimensions of the equalization and/or treatment units, typical and maximum hydraulic loading rates, type of treatment chemicals used and average dose and frequency of use, and frequency at which solids are removed, if applicable.

(k) Systems must keep results from the initial round of source water monitoring under section 7.4.2(a) and the second round of source water monitoring under section 7.4.2(b) until 3 years after bin classification under section 7.4.9 for filtered systems.

(l) Systems must keep any notification to the Department that they will not conduct source water monitoring due to meeting the criteria of section 7.4.2(d) for 3 years.

(m) Systems must keep the results of treatment monitoring associated with microbial toolbox options under sections 7.4.14 through 7.4.18, as applicable, for 3 years.

(n) Systems must retain a complete copy of the IDSE report submitted under section 7.7 for 10 years after the date that the report was submitted. If the Department modifies the section 7.8 monitoring requirements as recommended in the IDSE report or if the Department approves alternative monitoring locations, the system must keep a copy of the Department's notification on file for 10 years after the date of the Department's notification. The system must make the IDSE report and any Department notification available for review by the Department or the public.

1.6.4 Reporting Requirements

(a) Except where a shorter period is specified, the public water system shall report to the state the results of any test measurement or analysis required by the *Colorado Primary Drinking Water Regulations* within (1) the first ten calendar days following the month in which the result is received, or (2) the first ten calendar days following the end of the required monitoring period, as stipulated by the Department, whichever of these is shorter.

(b) Except where a different reporting period is specified, the public water system must report to the Department within 48 hours the failure to comply with any requirement (including failure to comply with monitoring requirements) set forth in the *Colorado Primary Drinking Water Regulations*.

(c) The public water system is not required to report analytical results to the Department in cases where the state laboratory performs the analysis and reports the results to the Department, except in instances that relate to monitoring required under sections 7.6 and 13.2.

(d) The public water system, within ten calendar days of completing the public notification requirements under Article 9 for the initial public notice and for any repeat notices, must submit to the Department a certification that it has fully complied with the public notification regulations. The public water system must include with this certification a representative copy of each notice distributed, published, posted, and/or made available to the persons served by the system and to the media.

1.6.5 Severability Clause

If any regulation, section, subsection, paragraph, or other portion of the *Colorado Primary Drinking Water Regulations* shall for any reason be held inoperative, unconstitutional, void or invalid, the validity of the remaining portions thereof shall not be affected.

1.6.6 Federal Facilities

The Department, notwithstanding any other provisions of the *Colorado Primary Drinking Water Regulations*, shall enforce the *Colorado Primary Drinking Water Regulations* against federal facilities, on federally owned lands within the State, excluding Native American Lands.

1.6.7 Enforcement Provisions

(a) Where a public water system has violated any provision of any article of the *Colorado Primary Drinking Water Regulations*, the Department may issue an enforcement order requiring the public water system to take actions necessary to correct the violation(s). Such orders may require the public water system to design, redesign, install, modify, construct or reconstruct facilities or to take other such corrective action or to demonstrate adequacy of control measures and employ such operational techniques and practices as will eliminate any violations.

(b) The Department may issue an enforcement order on finding significant deviation from plans and specifications or significant inaccuracies in data submitted to the Department on which basis the Department had approved proposed construction or modification of any public water system.

(c) The Department may issue an enforcement order due to the incidence of disease, the source of which is reasonably identified by the Department as originating from consumption of drinking water from a specified public water system.

(d) When the Department determines that contaminants are present in a public water supply and that the presence of these contaminants presents an unreasonable risk to the public health, the utilization of treatment techniques or acquisition of an alternate source may be required by an enforcement order.

(e) When the Department determines that a physical condition, or an operation or maintenance practice poses an unreasonable risk to the public health, the Department may issue an enforcement order.

(f) Violators of the *Colorado Primary Drinking Water Regulations* or of enforcement orders may be subject to civil or criminal actions pursuant to the provisions of Sections 25-1-114 and 25-1-114.1, Colorado Revised Statutes.

(g) A public water system contesting an enforcement order may request a hearing. Requests for such a hearing shall be filed in writing with the Department within 30 days after service of the order. Such requests shall state the grounds upon which the order is contested and state the amount of time the public water system estimates will be required for the hearing. Hearings on enforcement orders shall be held in accordance with applicable provisions of Article 4 of Title 24, Colorado Revised Statutes.

1.6.8 Tampering

The public water system shall notify the Department as soon as possible, but no later than 10 a.m. of the next calendar day following any tampering, suspected tampering or receipt of tampering threat by the system. Written notice must be provided within five calendar days to the Department explaining the circumstances of the occurrence and setting forth the action(s) taken to ensure the ability of the system to provide a safe and reliable supply of drinking water and to prevent any reoccurrence.

1.6.9 Special Monitoring for Construction Materials

(a) A community water system shall identify whether the following construction materials are present in its distribution system and report to the Department the existence of:

(1) Lead from piping, solder, caulking, interior lining of distribution mains, alloys and home plumbing;

(2) Copper from piping and alloys, service lines, and home plumbing;

(3) Galvanized piping, service lines, and home plumbing;

(4) Ferrous piping materials such as cast iron and steel, and/or

(5) Asbestos cement pipe.

(b) In addition, the Department may require identification and reporting of other materials of construction present in distribution systems that may contribute contaminants to the drinking water, such as:

(1) Vinyl-lined asbestos cement pipe; or

(2) Coal tar-lined pipes and tanks.

1.6.10 Use of Point-of-Entry Devices

(a) Public water systems may use point-of-entry devices to comply with maximum contaminant levels only if all the requirements of section 1.6.10 are met.

(b) It is the responsibility of the public water system to operate and maintain the point-of-entry treatment system.

(c) The public water system must develop and obtain Department approval for a monitoring plan before point-of-entry devices are installed. Under the plan approved by the Department, point-of-entry devices must provide health protection equivalent to central water treatment. "Equivalent" means that the water will meet all *Colorado Primary Drinking Water Regulations* and will be of acceptable quality, similar to water distributed by a well-operated central treatment plant. In addition to the VOCs, monitoring must include physical measurements and observations such as total flow treated and mechanical condition of the treatment equipment.

(d) Effective technology must be applied properly, under a plan approved by the Department, and the microbiological safety of the water must be maintained.

(1) The Department requires adequate certification of performance, field testing, and, if not included in the certification process, a rigorous engineering design review of the point-of-entry devices.

(2) The design and application of the point-of-entry devices must consider the tendency for increase in heterotrophic bacteria concentrations in water treated with activated carbon. It may be necessary to use frequent backwashing, post-contactor disinfection, and Heterotrophic Plate Count monitoring to ensure that the microbiological safety of the water is not compromised.

(e) Every building connected to the system must have a point-of-entry device installed, maintained, and adequately monitored to ensure all consumers are protected. The Department must be assured that every building is subject to treatment and monitoring, and that the rights and responsibilities of the public water system customer convey with title upon sale of property.

1.6.11 Use of Bottled Water

Public water systems shall not use bottled water to achieve compliance with an MCL. Bottled water may be used on a temporary basis to avoid unreasonable risk to health.

1.7 Entry and Inspection of Public Water Systems

(a) Upon presentation of proper credentials, authorized representatives of the Department may enter and inspect, at any reasonable time and in a reasonable manner, any establishment, facility, or any other property, premises, or place owned, operated or under the control of a public water system or other person for the purpose of investigating any actual, suspected, or potential violations of any minimum general sanitary standards required by section 25-1.5-202, Colorado Revised Statutes.

(1) Said authorized representatives may obtain samples of drinking water, and

(2) Any sample collected may be used as evidence in an enforcement action; a split or duplicate sample shall be offered to the owner, operator, or person in charge of the premises.

(b) A copy of the results of any analysis of such sample shall be furnished promptly to the owner, operator, or person in charge.

(c) If such entry or inspection is denied or not consented to, the Department is empowered to and shall obtain from the district or county court for the judicial district or county in which such property, premises, or place is located, a warrant to enter and inspect said property, premises, or place. The said district and county courts of the state are empowered to issue such warrants upon a proper showing of the need for such entry and inspection, and a copy of any inspection report shall be provided to the court within a reasonable time after making the inspection.

1.8 Wholesale Systems

Wholesale systems are responsible for meeting all of the applicable provisions of these regulations up to the point where treated drinking water from the wholesale system enters a consecutive system. The wholesale system may, under the provisions of section 1.10, accept responsibility for compliance with regulatory provisions that would otherwise apply to a consecutive system.

1.9 Consecutive Systems

1.9.1 Monitoring and Reporting Requirements

(a) Consecutive systems are subject to the monitoring and reporting provisions of the *Colorado Primary Drinking Water Regulations* unless such consecutive system is a part of an integrated system where the wholesale system has assumed responsibility for compliance with the applicable requirements in accordance with the provisions of section 1.10.

1.9.2 Applicable Maximum Contaminant Levels and Other Requirements

(a) Consecutive systems, unless exempted from the monitoring requirements of section 1.9.1, must meet the maximum contaminant levels (MCLs) and other requirements of the *Colorado Primary Drinking Water Regulations* unless such consecutive system is part of an integrated system where the wholesale system has assumed responsibility for compliance with the MCL or other applicable requirements in accordance with the provisions of section 1.10.

(b) While not a requirement of these regulations, consecutive systems are also subject to the applicable requirements of Regulation 100, the Water and Wastewater Facility Operators Certification Requirements. Where a wholesale system has assumed responsibility for the operation and maintenance of a distribution system for a consecutive system, in accordance with the requirements for an integrated system, the wholesale system becomes the operator in responsible charge of such distribution system and is responsible to meet the applicable requirements of Regulation 100 in lieu of the consecutive system.

1.10 Integrated Systems

(a) Applicability: Only a public water system that receives, through purchase or other means, treated water from one or more wholesale systems and distributes only that water through a distribution system that it owns may be considered for integrated system status. An integrated system may or may not provide additional disinfection; however, it cannot be considered an integrated system if it provides any treatment other than disinfection. If such a public water system is required to meet additional or more stringent monitoring requirements or maximum contaminant levels than its supplier, it cannot be considered an integrated system. A system may be included in an integrated system, as that term is defined at 1.5.2(72), for the purpose of complying with one or more of the regulatory requirements applicable to the system.

(b) An integrated system may be established by the wholesale system in cooperation with the participating consecutive systems, as restricted by 1.10(a), with the approval of the Department. The wholesale system shall establish requirements for consecutive systems that have been accepted into the integrated system and these requirements shall be included in a contract, memorandum of agreement, or other enforceable mechanism. The decision to accept a consecutive system in the integrated system is solely at the discretion of the wholesale system, except where required under Colorado law, and cannot be appealed.

1.10.1 Requirements for Application for Integrated System Approval

1.10 Integrated Systems

Integrated systems may be established for one or more of the requirements listed in section 1.9.1 or 1.9.2 of these regulations. In order to establish an integrated system, an application that includes the following information must be submitted to the Department and approved:

(a) For qualifying consecutive systems and the wholesale system that intend to participate in at least one of the integrated systems: a contact person, address, and phone number for each participating system, and each regulatory requirement for which an integrated system is being created;

(b) The number of persons served by the wholesale system and each qualifying consecutive system and whether the consecutive system is providing further disinfection;

(c) A map showing the wholesale system and each consecutive system including the relevant elements of the distribution system such as meters, lines 16 inches in diameter or larger, pump stations, storage tanks, and finished water reservoirs;

(d) A Sampling Plan for each regulatory provision covered by the integrated system. Each sampling plan shall meet all requirements of the respective provision and shall also identify the responsibilities of each party;

(e) A copy of each agreement between the wholesale system and each qualifying consecutive systems. This shall include the common set of operation and maintenance standards that the wholesale system has established for each regulatory requirement for which an integrated system is being created; and

(f) A statement that clearly assigns legal responsibility to one of the participating systems for compliance with each individual regulatory provision in the integrated system.

1.10.2 Integrated System Approval and Modification

(a) The Department shall have 90 days to notify the applicant of any area where the application for creation of an integrated system is incomplete.

(b) Upon submittal of a complete application for creation or revision of an integrated system, the Department shall have 150 days to approve or deny the request and shall provide a rationale for the action taken. If the Department denies the request for a new or modified integrated system, the applicant may request a hearing to contest the denial. Requests for such a hearing must be filed in writing with the Department within thirty (30) days after service of the statement of denial. Such requests shall state the grounds upon which the denial is being contested and state the amount of time the public water system estimates will be required for the hearing. Hearing on the denial shall be held in accordance with applicable provisions of Article 4 of Title 24, Colorado Revised Statute.

(c) Where a new and proposed qualifying consecutive system is added to an integrated system, 30 days notice shall be provided to the Department. The notice shall be signed by the qualifying consecutive system and the wholesale system. A revised sampling plan and map consistent with the requirements of sections 1.10.1 shall be included. The addition of the new qualifying consecutive system will be automatically approved unless the Department notifies the wholesale system of specific concerns with the revised sampling plan within forty-five (45) days of receipt of the request.

1.10.3 Integrated System Responsibilities

Until an integrated system is created, the consecutive system remains responsible for compliance with all regulatory requirements listed in sections 1.9.1 and 1.9.2.

1.10.4 Removal of a Consecutive System from the Integrated System

A wholesale system may remove a consecutive system from the integrated system provided that the wholesale system has given the consecutive system and the division thirty (30) days notice of the cause for such removal. The Department may, through written notice to the wholesale system within the aforementioned 30-day period, intervene in an attempt to resolve the issue(s) between the two systems. In this case, the period after which the consecutive system may be removed from the integrated system shall be extended from thirty (30) days to ninety (90) days. Where the Department has conducted a sanitary survey of a distribution system for a consecutive system that is part of an integrated system, the division shall notify the wholesale system of any deficiencies, regulatory or otherwise, that are noted in the final report for the sanitary survey.

1.10.5 Separation of a Consecutive System from an Integrated System

Where a consecutive system voluntarily separates from an integrated system, the consecutive system must immediately notify the Department of the date of separation and the regulatory provision(s) for which the consecutive system was included in that integrated system.

1.10.6 Dissolution of an Integrated System

The Department may, after providing thirty (30) days notice to the wholesale system and any affected consecutive systems, revoke the approval of an integrated system for good cause shown. If the Department revokes the approval of an integrated system, the applicant may request a hearing to contest the revocation. Requests for such a hearing must be filed in writing with the Department within 30 days after service of the statement of revocation. Such requests shall state the grounds upon which the revocation is being contested and state the amount of time the public water system estimates will be required for the hearing. The hearing on the revocation shall be held in accordance with applicable provisions of Article 4 of Title 24, Colorado Revised Statute. Upon appeal, the applicant may request the Department to grant a stay until the administrative decision is rendered on the appeal.

1.11 Plans Approval for the Location and the Construction of Waterworks

1.11.1 Introduction

Decisions regarding the review and approval of plans and specifications for new waterworks or improvements or modifications to existing waterworks shall be based upon compliance with design criteria developed by the Department.

Copies of the “State of Colorado Design Criteria for Potable Water Systems”[1-1] are available electronically on the Department’s web site at www.cdphe.state.co.us or by request to 303-692-3500 or a written request may be sent to:

CPDHE-WQCD
ATTN: Technical Services Unit Manager
4300 Cherry Creek Drive South
Denver, CO 80246-1530

1-1 There is a charge for paper copies.

1.11.2 Prior Approval Required

(a) No person shall commence construction of a new community or non-transient, non-community public water system unless such system performs and receives Department approval of a capacity (technical, managerial and financial) assessment conducted in accordance with the criteria of the *New Public Water System Capacity Planning Manual*.

(b) No person shall commence construction of any new waterworks, or make improvements to or modify the treatment process of an existing waterworks, or initiate the use of a new source, until plans and specifications for such construction, improvements, modifications or use have been submitted to, and approved by the Department. A Professional Engineer registered in the State of Colorado shall design all treatment systems serving a community water supply. The Department shall grant such approval when it finds that the proposed facilities are capable of complying, on a continuous basis, with design criteria as stated above, and with all applicable laws, standards, rules and regulations.

1.11.3 Siting Requirements

No waterworks shall be located at a site which:

(a) Is subject to a significant risk from earthquakes, floods, fires or other disasters which could cause a breakdown of the public water system or a portion thereof; or

(b) Except for intake structures, is within the floodplain of a 100-year flood. [1-2] The Department will not seek to override land use decisions affecting public water systems siting which are made at the local government level.

1-2 Records of the 100-year projections are available at the office of the Colorado Water Conservation Board, 1313 Sherman Street, Denver, Colorado 80203

1.11.4 Processing by the Department

(a) The Department shall, within forty-five (45) days after the receipt of a request for approval of the complete set of final plans and specifications, review the documents submitted and, based thereon, shall approve or conditionally approve the plans and specifications in writing, or issue a written denial of approval, stating the reason for any such denial, or submit in writing to the project engineer, a list of items which must be addressed prior to further action regarding review and approval.

(b) Where commencement of construction of the project has not occurred within one year of approval, such approval shall expire. An expired approval may be reinstated by submittal of the former plans and specifications to the Department for review and approval.

1.11.5 Procedures Upon Denial

If the Department denies approval of plans and specifications submitted pursuant to this section 1.11.1 through 1.11.4, or if an applicant refuses to accept any conditions or terms pursuant to which said approval was conditionally granted, which shall constitute a denial, the applicant may request a hearing to contest the denial. Requests for such a hearing must be filed in writing with the Department within thirty (30) days after service of the statement of denial. Such requests shall state the grounds upon which the denial is being contested and state the amount of time the public water system estimates will be required for the hearing. Hearing on the denial shall be held in accordance with applicable provisions of Article 4 of Title 24, Colorado Revised Statutes.

1.12 Monitoring Plan

Each public water system shall develop and implement a monitoring plan. The public water system shall maintain the plan and make it available for inspection by the Department. The monitoring plan shall be designed and implemented to ensure that the water quality monitoring performed by the system is representative of the water distributed to consumers and is consistent with regulatory requirements of the Colorado Primary Drinking Water Regulations.

In accordance with section 1.12.2 each public water system is required to submit one copy of the monitoring plan to:

Colorado Department of Public Health and Environment
Water Quality Control Division
ATTN: Public Water System Monitoring Plan Coordinator
4300 Cherry Creek Drive South
Denver, CO 80246-1530

1.12.1 Monitoring Plan Required Elements

Each public water system's monitoring plan shall include the information specified in Sections 1.12.1(a) - (e), except that, one schematic may be sufficient if that schematic includes all sources, treatment processes and distribution system details as specified in sections 1.12.1(b) – (d).

The monitoring plan consists of five parts:

(a) Part 1 - *System Summary*: Identify the public water system and provide all of the following:

(1) The Colorado public water system identification number (PWSID);

(2) The full name of the legal entity (that is, the owner of the system. For example, the name of a corporation, LLC, partnership, sole proprietor, HOA, etc.);

(3) The legal entity's address;

(4) The name of the legal entity's authorized contact person(s) responsible for the development and implementation of the monitoring plan (if other than the owner);

(5) The telephone number of the legal entity or the legal entity's authorized monitoring plan contact person;

(6) The system's classification (that is, community, non-transient, non-community, or transient, non-community);

(7) The total population-served by the system, by population type (that is, the total of resident, non-transient, and transient consumers);

(8) The physical addresses of all system facilities (including master meters) and the latitude and longitude of all facilities, and

(9) The physical location of all records required by section 1.6.3.

(b) Part 2 - *Water Sources Details*: Identify all water sources capable of being used by the system, (i.e., those connected by conveyances, whether currently producing or not) and a schematic, diagram, or sketch depicting how the flow from each source is connected to the treatment processes and the distribution system.

(c) Part 3 - *Water Treatment Details*: Provide a summary of the system's operating characteristics, including a schematic of all treatment processes and their associated temporal utilization that was assumed in the design of the monitoring plan (e.g., use of peaking facilities, alternative water sources, maintenance schedules that take facilities off line, etc.).

(d) Part 4 - *Distribution System Details*: Provide a schematic of the distribution system identifying:

(1) All entry points to the distribution system;

(2) All post entry point treatment facilities;

(3) All storage facilities and other finished water reservoirs;

(4) All distribution system monitoring points;

(5) Any master meters; and

(6) All pump stations.

(e) Part 5 - *Individual Rule Sampling Plans*: Each sampling plan shall meet all requirements of the respective provision, including:

(1) Frequency and approximate time of collection;

(2) Sample site location identification and associated identification number;

(3) If appropriate, justification for the site selection;

(4) Sample preservation, quality assurance, and quality control procedures, including procedures for equipment calibration;

(5) Analysis procedure (certified laboratory or on-site by a party approved by the Department);

(6) Monitoring results presentation format;

(7) Procedures to assess and report compliance status for MCLs, ALs, MRDLs, TTs and, if applicable, disinfection byproduct precursor removal efficiency;

(8) The rationale used by the system to identify the sampling locations selected to represent the distribution system, and

(9) A process to review and update the selected distribution system sampling locations to account for changes due to growth or other significant changes to the distribution system.

1.12.2 Monitoring Plan Submission Requirements

(a) All Public water systems must submit Sections 1.12.1(a) - (d), which correlates to Parts 1 – 4 of the monitoring plan, to the Department according to the following schedule:

(1) Systems using surface water or groundwater under the direct influence of surface water, serving a population of greater than 10,000 persons - no later than April 10, 2002, or ten (10) calendar days following the end of the first required monitoring quarter thereafter.

(2) All groundwater systems serving a population of greater than 3,300 persons, and all systems using surface water or groundwater under the direct influence of surface water serving a population of greater than 3,300, but less than 10,001 persons and using a disinfectant in their treatment process no later than April 10, 2004, or ten (10) calendar days following the end of the first required monitoring quarter thereafter.

(3) All other community water systems no later than April 10, 2005, or ten (10) calendar days following the end of the first required monitoring quarter thereafter.

(4) All other non-community water systems no later than April 10, 2006, or ten (10) calendar days following the end of the first required monitoring quarter thereafter.

(b) Section 1.12.1(e), which correlates to Part 5 of a public water system's monitoring plan, must be submitted to the Department according to the requirements as may be stipulated in Articles 5, 6, 7 and 8.

1.12.3 Monitoring Plan Revisions

A public water system is required to submit any changes related to the monitoring plan under Sections 1.12.1(a), (b), (c), (d) or (e) to the Department within thirty (30) calendar days following the effective date of the change.

1.13 Guidance Documents and Policy Documents

1.13.1 Guidance Document Availability

(a) The Department has developed guidance documents designed to assist public water systems with understanding the regulations and to explain the specific requirements systems must meet to maintain compliance.

(b) Copies of the available guidance documents may be obtained by requesting them from the Department at:

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

Guidance documents are also available on the Department's Internet web site at the following address: www.cdphe.state.co.us.

1.13.2 Policy Document Availability

(a) The Department has developed a number of internal policy documents designed to address special primacy requirements, which are defined in 40 CFR 142. These documents are developed by the Department in order to maintain primary enforcement responsibility in the State of Colorado and are; therefore, not included in the regulation.

(b) While not regulatory in nature, these policies are public record and copies may be obtained by requesting them from the Department at the address listed in section 1.13.1(b).

1.14 Materials Incorporated by Reference

(a) All materials incorporated by reference in the drinking water regulations include only those volumes or editions cited and not later amendments to or editions of, incorporated material. The incorporated material may be examined at any state publications depository library, the Laboratory Services Division of the Department, or:

Drinking Water Program Manager
Colorado Department of Public Health And Environment
Water Quality Control Division
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530
(303) 692-3500

(b) In instances where material incorporated by reference refers to other sections of the referenced document that conflict with current language of the Colorado Primary Drinking Water Regulations, the current language of the *Colorado Primary Drinking Water Regulations* shall take precedence.

Article 2 MCLs, MCLGs, TTs, ALs, MRDLs, and MRDLGs

Maximum Contaminant Levels (MCLs), Maximum Contaminant Level Goals (MCLGs), Treatment Technique (TT) Requirements, Action Levels (AL), Maximum Residual Disinfectant Levels (MRDLs), and Maximum Residual Disinfectant Level Goals (MRDLGs)

2.1 MCLs and MCLGs for Organic Chemical Contaminants

(a) The following maximum contaminant levels for volatile organic chemical contaminants apply to community and non-transient, non-community water systems.

Table 2-1 MCLs and MCLGs for Volatile Organic Chemical Contaminants

.	CAS No.	Contaminant	MCL (mg/L)	MCLG (mg/L)
(1)	75-01-4	Vinyl chloride	0.002	Zero
(2)	71-43-2	Benzene	0.005	Zero
(3)	56-23-5	Carbon tetrachloride	0.005	Zero
(4)	107-06-2	1,2-Dichloroethane	0.005	Zero
(5)	79-01-6	Trichloroethylene	0.005	Zero
(6)	106-46-7	Para-Dichlorobenzene	0.075	0.075
(7)	75-35-4	1,1-Dichloroethylene	0.007	0.007
(8)	71-55-6	1,1,1-Trichloroethane	0.2	0.20
(9)	156-59-2	cis-1,2 Dichloroethylene	0.07	0.07
(10)	78-87-5	1,2-Dichloropropane	0.005	Zero
(11)	100-41-4	Ethylbenzene	0.7	0.7
(12)	108-90-7	Monochlorobenzene	0.1	0.1
(13)	95-50-1	o-Dichlorobenzene	0.6	0.6
(14)	100-42-5	Styrene	0.1	0.1
(15)	127-18-4	Tetrachloroethylene	0.005	Zero
(16)	108-88-3	Toluene	1	1
(17)	156-60-5	Trans-1,2 Dichloroethylene	0.1	0.1
(18)	1330-20-7	Xylenes (total)	10	10

(19)	75-09-2	Dichloromethane (methylene chloride)	0.005	Zero
(20)	120-82-1	1,2,4-Trichlorobenzene	0.07	0.07
(21)	79-00-5	1,1,2-Trichloroethane	0.005	0.003

(b) The following maximum contaminant levels for synthetic organic chemical contaminants apply to community water systems and non-transient, non-community water systems:

Table 2-2 MCLs and MCLGs for Synthetic Organic Chemical Contaminants

.	**CAS No.**	**Contaminant**	**MCL (mg/L)**	**MCLG (mg/L)**
(1)	15972-60-8	Alachlor	0.002	Zero
(2)	116-06-3	Aldicarb[1]	0.003	0.001
(3)	1646-87-3	Aldicarb sulfoxide	0.004	0.001
(4)	1646-87-4	Aldicarb sulfone	0.002	0.001
(5)	1912-24-9	Atrazine	0.003	0.003
(6)	1563-66-2	Carbofuran	0.04	0.04
(7)	57-74-9	Chlordane	0.002	Zero
(8)	96-12-8	Dibromochloropropane	0.0002	Zero
(9)	94-75-7	2,4-D	0.07	0.07
(10)	106-93-4	Ethylene dibromide	0.00005	Zero
(11)	76-44-8	Heptachlor	0.0004	Zero
(12)	1024-57-3	Heptachlor epoxide	0.0002	Zero
(13)	58-89-9	Lindane	0.0002	0.0002
(14)	72-43-5	Methoxychlor	0.04	0.04
(15)	1336-36-3	Polychlorinated biphenyls	0.0005	Zero
(16)	87-86-5	Pentachlorophenol	0.001	Zero
(17)	8001-35-2	Toxaphene	0.003	Zero
(18)	93-72-1	2,4,5-TP (Silvex)	0.05	0.05
(19)	50-32-8	Benzo[a]pyrene	0.0002	Zero
(20)	75-99-0	Dalapon	0.2	0.2

(21)	103-23-1	Di(2-ethylhexyl)adipate	0.4	0.4
(22)	117-81-7	Di(2-ethylhexyl)phthalate	0.006	Zero
(23)	88-85-7	Dinoseb	0.007	0.007
(24)	85-00-7	Diquat	0.02	0.02
(25)	145-73-3	Endothall	0.1	0.1
(26)	72-20-8	Endrin	0.002	0.002
(27)	1071-53-6	Glyphosate	0.7	0.7
(28)	118-74-1	Hexachlorobenzene	0.001	Zero
(29)	77-47-4	Hexachlorocyclopentadiene	0.05	0.05
(30)	23135-22-0	Oxamyl (Vydate)	0.2	0.2
(31)	1918-02-1	Picloram	0.5	0.5
(32)	122-34-9	Simazine	0.004	0.004
(33)	1746-01-6	2,3,7,8-TCDD (Dioxin)	3×10^{-8}	Zero

1 The Aldicarbs are currently under "administrative stay" as a result of litigation. They are therefore treated as unregulated contaminants until further notice.

2.2 MCLs and MCLGs for Inorganic Chemical Contaminants

(a) The following maximum contaminant levels for inorganic chemical contaminants apply to all community and non-transient, non-community water systems. The fluoride maximum contaminant level (MCL) applies only to community water systems and may be applied to non-community water systems when found by the Department to be necessary to protect the public health. In addition, the maximum contaminant levels for nitrate, nitrite and total nitrate/nitrite also apply to transient, non-community water systems.

Table 2-3 MCLs and MCLGs for Inorganic Chemicals

.	**Contaminant**	**MCL (mg/L)**	**MCLG (mg/L)**
(1)	Antimony	0.006	0.006
(2)	Arsenic	0.010	Zero
(3)	Asbestos	7 Million Fibers/liter (Longer than 10 µm)	7 Million Fibers/liter (Longer than 10 µm)
(4)	Barium	2	2
(5)	Beryllium	0.004	0.004

(6)	Cadmium	0.005	0.005
(7)	Chromium	0.1	0.1
(8)	Cyanide (as free Cyanide)	0.2	0.2
(9)	Fluoride	4.0	4.0
(10)	Mercury	0.002	0.002
(11)	Nitrate	10 (as Nitrogen)	10 (as Nitrogen)
(12)	Nitrite	1 (as Nitrogen)	1 (as Nitrogen)
(13)	Total Nitrate and Nitrite	10 (as Nitrogen)	10 (as Nitrogen)
(14)	Selenium	0.05	0.05
(15)	Thallium	0.002	0.0005

2.3 MCLs, MCLGs and Treatment Technique Requirements for Microbiological Contaminants

The following maximum contaminant levels apply to all public water systems regardless of size or type. The treatment technique (TT) requirements apply to all public water systems that use surface water or groundwater under the direct influence of surface water regardless of system size or type.

Table 2-4 MCLs, MCLGs and TTs for Microbiological Contaminants

	Contaminant	**Number of Samples**	**MCL**	**MCLG**	**TT** ***Requirements***
(1)	Giardia lamblia		N/A	Zero	3-log
(2)	Viruses		N/A	Zero	4-log
(3)	Legionella		N/A	Zero	N/A
(4)	Coliforms (including fecal coliforms and Escherichia coli)			Zero	N/A
	(a) Total Coliforms	System collects 40 or more samples per month	No more than 5.0 percent of the samples collected during a month are total coliform-positive		N/A
		System collects less than 40 samples per month	No more than one sample collected during a month is total coliform-positive		

	(b) Fecal coliform or E. coli repeat sample (following routine total coliform-positive sample) or any total coliform-positive repeat sample following a fecal coliform-positive or E. coli-positive routine sample.		Absent		
(5)	Cryptosporidium[1]		N/A	Zero	2-log

1 The treatment technique requirement for Cryptosporidium will not apply for surface water or groundwater under the direct influence of surface water serving less than 10,000 until January 1, 2005.

2.4 MCLs and MCLGs for Disinfection Byproducts

The following maximum contaminant levels for disinfection byproduct apply to all community and non-transient, non-community water systems.

Table 2-5 MCLs and MCLGs for Disinfection Byproducts

.	**Disinfection Byproduct**	**MCL (mg/L)**	**MCLG (mg/L)**
(1)	Total trihalomethanes (TTHM)	0.080[1]	
(a)	Bromodichloromethane	.	Zero
(b)	Bromoform	.	Zero
(c)	Chloroform	.	0.07
(d)	Dibromochloromethane	.	0.06
(2)	Haloacetic acids (five) (HAA5)	0.060[1]	.
(a)	Bromoacetic acid	.	N/A
(b)	Dibromoacetic acid	.	N/A
(c)	Dichloroacetic acid	.	Zero
(d)	Monochloroacetic acid	.	0.07
(e)	Trichloroacetic acid	.	0.02
(3)	Bromate[2]	0.010	Zero
(4)	Chlorite[3]	1.0	0.8

1 All systems must comply with these MCLs as a RRA until the date specified in section 7.8. After the dates specified in 7.8 systems must comply with these MCLs as a LRRA.

2 The MCL and MCLG for bromate only apply to those systems that use ozone as a disinfectant or oxidant somewhere in their treatment process.

3 The MCL and MCLG for chlorite only apply to those systems that use chlorine dioxide as a disinfectant or oxidant somewhere in the treatment process.

2.5 MRDLs and MRDLGs for Disinfectants

The following maximum residual disinfectant levels for disinfectant residuals apply to all community and non-transient, non-community water systems. In addition, the maximum residual disinfectant level for chlorine dioxide applies to transient, non-community water systems.

Table 2-6 MRDLs and MRDLGs for Disinfectants

.	**Disinfectant Residual**	**MRDL (mg/L)**	**MRDLG (mg/L)**
(1)	Chlorine	4.0 (as Cl_2).	4.0 (as Cl_2).
(2)	Chloramines	4.0 (as Cl_2).	4.0 (as Cl_2).
(3)	Chlorine dioxide[1]	0.8 (as ClO_2)	0.8 (as ClO_2)

1 The MCL and MCLG for chlorine dioxide only apply to those systems that use chlorine dioxide as a disinfectant or oxidant somewhere in the treatment process.

2.6 MCLs and MCLGs for Radionuclides

The following maximum contaminant levels for radionuclides apply to all community water systems.

Table 2-7 MCLs and MCLGs for Radionuclides

.	**Contaminant**	**MCL**	**MCLG**
(1)	Combined radium-226 and radium-228[1]	5 pCi/L	Zero
(2)	Gross alpha particle activity (including radium-226 but, excluding radon and uranium)	15 pCi/L	Zero
(3)	Beta particle and photon radioactivity [2]	4 mrem/yr [3]	Zero
(4)	Uranium	30 µg/L	Zero

1 The combined radium-226 and radium-228 value is determined by the addition of the results of the analysis for radium-226 and the analysis for radium-228.

2 The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water must not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year (mrem/year)

3 Except for the radionuclides listed in Table 6-4 of section 6.3.6, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents must be calculated on the basis of 2 liter per day drinking water intake using the 168 hour data list in “Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure,” NBS (National Bureau of Standards) Handbook 69 as amended August 1963, U.S. Department of Commerce. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 mrem/year.

2.7 Action Levels (ALs) and MCLGs for Lead and Copper

The following action levels for lead and copper apply to all community and non-transient, non-community water systems.

Table 2-8 Action Levels and MCLGs for Lead & Copper

.	**Contaminant**	**AL (mg/L)**	**MCLG (mg/L)**
(1)	Copper	1.3	1.3
(2)	Lead	0.015	Zero

2.8 Filtration (Turbidity) Treatment for Surface Water Systems

The following treatment technique requirements apply to all public water systems that use surface water or groundwater under the direct influence of surface water.

Table 2-9 Required Turbidity Levels

.	**Treatment Technique**	**System Size (in population served)**	**Turbidity Level (NTU)**	.
(1)	Conventional, Direct, or Membrane Filtration	All sizes	less than or equal to (≤) 0.3 NTU in at least 95% of the measurement taken each month	At no time to exceed 1 NTU
(2)	Slow Sand Filtration	All sizes	less than or equal to (≤) 1 NTU in at least 95% of the measurement taken each month	At no time to exceed 5 NTU
(3)	Diatomaceous Earth and Cartridge & Bag Filtration	All sizes	less than or equal to (≤) 1 NTU in at least 95% of the measurement taken each month	At no time to exceed 5 NTU
(4)	Other Filtration Technologies	Less than 10,000	Department approved technology must consistently achieve 99.9% (3-log) removal and/or inactivation of Giardia lamblia cysts, and 99.99% (4-log) removal and/or inactivation of viruses 99% (2-log) removal of Cryptosporidium oocysts	.

(5)	Other Filtration Technologies	greater than or equal to (≥) 10,000	Department approved technology must consistently achieve 99.9% (3-log) removal and/or inactivation of Giardia lamblia cysts, and 99.99% (4-log) removal and/or inactivation of viruses, and 99% (2-log) removal of Cryptosporidium oocysts	.

2.9 Treatment Techniques for Acrylamide and Epichlorohydrin

The following treatment technique requirements for acrylamide and epichlorohydrin apply to all public water systems. When determining compliance, the combination (or product) of dose and monomer level does not exceed the levels specified in Table 2-9.

Table 2-10 Treatment Techniques for Acrylamide and Epichlorohydrin

	Contaminant	**Maximum combination (or product) of dose and monomer level**	**MCLG (mg/L)**
(1)	Acrylamide	0.05% dosed at 1 ppm (or equivalent)	Zero
(2)	Epichlorohydrin	0.01% dosed at 20 ppm (or equivalent)	Zero

2.10 Treatment Technique for Control of Disinfection Byproduct (DBP) Precursors

(a) The table below lists the required TOC removals for surface water systems using conventional filtration based on a system's source water alkalinity and TOC.

Table 2-11 Required Removal of TOC by Enhanced Coagulation and Enhanced Softening for Surface Water Systems Using Conventional Treatment

Source-water TOC (mg/L)	**Source-water alkalinity, mg/L as $CaCO_3$**		
	0-60	>60-120	>120
	TOC Removal (in percentages)		
>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

(b) Systems meeting at least one of the conditions in section 7.6.6(a)(2) are not required to operate with enhanced coagulation.

(c) Softening systems meeting one of the alternative compliance criteria in section 7.6.6(a)(3) are not required to operate with enhanced softening.

(d) Systems practicing softening must meet the TOC removal requirements in the last column on the right in the table above.

(e) Compliance for TOC is based on a removal ratio of the actual amount a public water system removes versus the amount required as indicated in the table above. The compliance calculation can be found in section 7.6.6(c).

(f) The TOC removal ratio must be greater than or equal to 1.00.

Article 3 Secondary Maximum Contaminant Levels

3.1 Introduction

These contaminants in drinking water primarily affect the aesthetic qualities relating to the public acceptance of drinking water. At considerably higher concentrations of these contaminants, health implications may also exist as well as aesthetic degradation. The secondary maximum contaminant levels are not enforceable, but are intended as guidelines.

3.2 Secondary Maximum Contaminant Levels

These levels represent reasonable goals for drinking water quality. The secondary maximum contaminant levels for public water systems are as follows:

Table 3-1 Secondary Maximum Contaminant Levels

.	**Contaminant**	**Level**
1	Aluminum	0.05 to 0.2 mg/L
2	Chloride	250 mg/L
3	Color	15 color units
4	Copper	1.0 mg/L
5	Corrosivity	Non-corrosive
6	Fluoride	2.0 mg/L[1]
7	Foaming agents	0.5 mg/L
8	Iron	0.3 mg/L
9	Manganese	0.05 mg/L
10	Odor	3 threshold odor number
11	pH	6.5-8.5
12	Silver	0.1 mg/L
13	Sulfate	250 mg/L
14	Total dissolved solids (TDS)	500 mg/L

15	Zinc	5 mg/L

1 When the fluoride level exceeds the SMCL of 2.0 mg/L public notification in accordance with Article 9 is required.

3.3 Monitoring

It is recommended that the parameters in these regulations be monitored at intervals no less frequent than the monitoring performed for inorganic chemical contaminants as applicable to community water systems. More frequent monitoring would be appropriate for specific parameters such as pH, color, odor or others under certain circumstances.

3.4 Analytical Methods

Measurement of pH, copper and fluoride to determine compliance under section 3.3 may be conducted with one of the methods in section 10.2.2. Analyses of aluminum, chloride, foaming agents, iron, manganese, odor, silver, sulfate, total dissolved solids (TDS) and zinc to determine secondary contaminant concentrations under section 3.3 may be conducted with the methods in the following table or alternative methods listed in Appendix A to Subpart C of 40 CFR 141. Criteria for analyzing aluminum, copper, iron, manganese, silver and zinc samples with digestion or directly without digestion, and other analytical test procedures are contained in Technical Notes on Drinking Water Methods, EPA-600/R-94-173, October 1994, which is available at NTIS PB95-104766.

Table 3-2 Analytical Methods for Secondary Contaminants

	Contaminant	EPA	ASTM [3]	SM [4] (18th and 19th ed.)	SM [4] (20th ed.)	Other
1	Aluminum	200.7[2]		3120 B	3120 B	
		200.8[2]		3113 B		
		200.9[2]		3111 D		
2	Chloride	300.0[1]	D4327-97	4110 B	4110 B	
				4500-Cl^-D	4500-Cl^- D	
			D512-89B	4500-Cl^-B	4500-Cl^- B	
3	Color			2120 B	2120 B	
4	Foaming Agent			5540 C	5540 C	
5	Iron	200.7[2]		3120 B	3120 B	
		200.9[2]		3111 B		
				3113 B		
6	Manganese	200.7[2]		3120 B	3120 B	
		200.8[2]		3111 B		
		200.9[2]		3113 B		

7	Odor			2150 B	2150 B	
8	Silver	200.7[2]		3120 B	3120 B	I-3720-85 [5]
		200.8[2]		3111 B		
		200.9[2]		3113 B		
9	Sulfate	300.0[1]	D4327-97	4110 B	4110 B	
		375.2[1]		4500-SO_4^{2-} F	4500-SO_4^{2-} F	
				4500-SO_4^{2-} C, D	4500-SO_4^{2-} C, D	
			D516-90	4500-SO_4^{2-} E	4500-SO_4^{2-} E	
10	Total Dissolved Solids			2540 C	2540 C	
11	Zinc	200.7[2]		3120 B	3120 B	
		200.8[2]		3111 B		

The procedures shall be done in accordance with the documents listed below. Copies of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at 800-426-4791. Documents may be inspected at the Office of Federal Register, 800 North Capitol Street, NW, Suite 700, Washington, DC 20408.

1 "Methods for the Determination of Inorganic Substances in Environmental Samples", EPA/600/R-93-100, August 1993. Available at NTIS, PB94-120821.

2 "Methods for the Determination of Metals in Environmental Samples Supplement I", EPA/600/R-94-111, May 1994. Available at NTIS, PB 95-125472.

3 Annual Book of ASTM Standards, 1994, 1996, or 1999, Vols. 11.01 and 11.02, ASTM International; any year containing the cited version of the method may be used. Copies may be obtained from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

4 Standard Methods for the Examination of Water and Wastewater, 18th edition (1992), 19th edition (1995), or 20th edition (1998). American Public Health Association, 1015 Fifteenth Street, NW, Washington, DC 20005. The cited methods published in any of these three editions may be used, except that the versions of 3111 B, 3111 D, and 3113 B in the 20th edition may not be used.

5 Method I-3720-85, Techniques of Water Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A-1, 3rd ed., 1989; Available from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225-0425.

Article 4 Variances and Exemptions

4.1 Introduction

(a) The Department may grant variances or exemptions from certain provisions of the *Colorado Primary Drinking Water Regulations* subject to such terms and conditions as the EPA Administrator shall deem appropriate to protect the public health.

(b) Circumstances under which a variance or exemption may not be granted include:

(1) No variances or exemptions from the MCL for total coliform

(2) No variances from any of the treatment technique requirements for filtration for surface water sources

(3) No exemptions to the disinfection residual requirement at point of entry to the distribution system for systems using surface water.

(c) The effective date has been stayed for the section relating to the total coliform MCL for systems that demonstrate to the Department that the violation of the total coliform MCL is due to a persistent growth of total coliforms in the distribution system rather than fecal or pathogenic contamination, a treatment lapse or deficiency, or a problem in the operation or maintenance of the distribution system.

4.2 Variances

The Department may grant one or more variances from an applicable Colorado primary drinking water regulation to a public water system, which because of characteristics of the raw water sources that are reasonably available to the system cannot meet the requirements respecting the maximum contaminant levels of the *Colorado Primary Drinking Water Regulations*.

(a) A variance may only be issued to a system after the system's application of the best available technology (BATs), treatment techniques, or other means identified by the EPA Administrator and based upon an evaluation satisfactory to the Department that indicates that alternative sources of water are not reasonably available to the system after taking costs into consideration. Before a variance is granted, the Department must find that the variance will not result in an unreasonable risk to health.

(b) The Department shall prescribe at the time the variance is granted, a schedule for:

(1) Compliance (including increments of progress) by the public water system with each contaminant level requirement with respect to which the variance was granted.

(2) Implementation by the public water system of such additional control measures as the Department may require for each contaminant, subject to such contaminant level requirement, during the period ending on the date compliance with such requirement is required. Before a schedule prescribed by the Department pursuant to this subparagraph may take effect, the Department shall provide notice and opportunity for a public hearing on the schedule. A schedule prescribed for a public water system granted a variance shall require compliance by the system with each contaminant level requirement with respect to which the variance was granted as expeditiously as practicable (as the Department may reasonably determine).

(c) The Department may grant to a public water system one or more variances from any provision of the *Colorado Primary Drinking Water Regulations* which requires the use of a specified treatment technique with respect to a contaminant, if the public water system applying for the variance demonstrates to the satisfaction of the Department that such treatment technique is not necessary to protect the health of persons because of the nature of the raw water source of such system. A variance granted shall be conditioned on such monitoring and other requirements as the Department may prescribe.

(d) Before a variance proposed to be granted by the Department under section 4.2(a) or (b) may take effect, the Department shall provide notice and opportunity for public hearing on the proposed variance.

(e) Each public water system's variance granted by the Department shall be conditioned upon compliance by the public water system with the schedule prescribed by the Department.

(f) Any schedule or other requirement, on which a variance granted under this section is conditioned, may be enforced as if such schedule or other requirement was part of a Colorado primary drinking water regulation.

4.3 Small System Variances

(a) The Department may grant a variance under section 4.3 for compliance with a requirement specifying a maximum contaminant level or treatment technique contained in a Colorado primary drinking water regulation to:

(1) Public water systems serving 3,300 or fewer persons.

(2) With the approval of the EPA Administrator, public water systems serving more than 3,300 persons but fewer than 10,000 persons.

(b) A public water system may receive a small system variance under section 4.3(a), if:

(1) A variance technology that is applicable to the size and source water quality conditions of the public water system has been identified by the EPA Administrator,

(2) The public water system installs, operates, and maintains, in accordance with guidance or regulations issued by the EPA Administrator, such treatment technology, treatment technique, or other means, and

(3) The Department determines that the conditions of section 4.3(c) are met.

(c) A small system variance shall be available only to a system:

(1) That cannot afford to comply, in accordance with affordability criteria established by the Department, with a Colorado primary drinking water regulation, including compliance through:

(i) Treatment

(ii) Alternative source of water supply

(iii) Restructuring or consolidation, unless the Department makes a written determination that restructuring or consolidation is not practicable, and

(2) For which the Department determines that the terms of the small system variance ensure adequate protection of human health, considering the quality of the source water for the system and the removal efficiencies and expected useful life of the treatment technology required by the variance.

(d) A small system variance shall not be available for:

(1) Any maximum contaminant level or treatment technique for a contaminant with respect to which a national primary drinking water regulation was promulgated prior to January 1, 1986.

(2) A Colorado primary drinking water regulation for a microbial contaminant (including a bacterium, virus, or other organism) or an indicator or treatment technique for a microbial contaminant.

(e) A small system variance shall require compliance with the conditions of the variance not later than 3 years after the date on which the variance is granted, except that the Department may allow up to 2 additional years to comply with a variance technology, secure an alternative source of water, restructure or consolidate if the Department determines that additional time is necessary for capital improvements, or to allow for financial assistance provided pursuant to a federal or state program.

(f) The Department shall review each small system variance granted under section 4.3 not less often than every 5 years after the compliance date established in the variance to determine whether the system remains eligible for the variance and is conforming to each condition of the variance.

(g) Prior to granting a variance under section 4.3 to a public water system serving more than 3,300 and fewer than 10,000 persons the Department must submit the variance to the EPA Administrator for review and approval. The EPA Administrator must approve or disapprove the variance within 90 days of the day of submittal by the Department. If the EPA Administrator disapproves a variance under this paragraph, the EPA Administrator must notify the Department in writing of the reasons for disapproval. Objections to variances:

(1) By the EPA Administrator: the Administrator may review and object to any variance proposed to be granted by the Department, if the objection is communicated to the Department not later than 90 days after the Department proposes to grant the variance. If the EPA Administrator objects to the granting of a variance, the EPA Administrator shall notify the Department in writing of each basis for the objection and propose a modification to the variance to resolve the concerns of the EPA Administrator. The Department shall make the recommended modification or respond in writing to each objection.

(2) Petition by consumers: not later than 30 days after the Department proposes to grant a variance for a public water system, any person served by the system may petition the EPA Administrator to object to the granting of a variance. The EPA Administrator shall respond to the petition and determine whether to object to the variance under 4.3(f) not later than 60 days after the receipt of the petition.

(h) The Department shall provide for at least one public meeting on a small system variance no later than 15 days after the small system variance is proposed.

4.4 Exemptions

(a) The Department may exempt any public water system from any requirement respecting a maximum contaminant level or any treatment technique requirement, or from both, of an applicable Colorado primary drinking water regulation upon a finding that:

(1) Due to compelling factors (which may include economic factors, including qualification of the public water system as a system serving a disadvantaged community), the public water system is unable to comply with such contaminant level or treatment technique requirement, or to implement measures to develop an alternative source of water supply.

(2) The public water system was in operation on the effective date of such contaminant level or treatment technique requirement, or, for a system that was not in operation by that date, only if no reasonable alternative source of drinking water is available to such new system.

(3) The granting of the exemption will not result in an unreasonable risk to health.

(4) Management or restructuring changes (or both) cannot reasonably be made that will result in compliance with the *Colorado Primary Drinking Water Regulations* or, if compliance cannot be achieved, improve the quality of the drinking water.

(b) If the Department grants a public water system an exemption under section 4.4(a), the Department shall prescribe, at the time the exemption is granted, a schedule for:

(1) Compliance (including increments of progress or measures to develop an alternative source of water supply) by the public water system with each contaminant level requirement or treatment technique requirement with respect to which the exemption was granted, and

(2) Implementation by the public water system of such control measures as the Department may require for each contaminant, subject to such contaminant level requirement or treatment technique requirement, during the period ending on the date compliance with such requirement is required. Before a schedule prescribed by the Department pursuant to this subsection may take effect, the Department shall provide notice and opportunity for a public hearing on the schedule.

(c) A schedule prescribed pursuant to 4.4(b) for a public water system granted an exemption shall require compliance by the system with each contaminant level and treatment technique requirement with respect to which the exemption was granted as expeditiously as practicable (as the Department may reasonably determine), but not later than 3 years after the otherwise applicable compliance date established in the *Colorado Primary Drinking Water Regulations*.

(d) No exemption shall be granted unless the public water system establishes that:

(1) The system cannot meet the standard without capital improvements, which cannot be completed prior to the date established in the *Colorado Primary Drinking Water Regulations*.

(2) In the case of a system which needs financial assistance for necessary improvements, the system has entered into an agreement to obtain such financial assistance or any federal or state program is reasonably likely to be available within the period of the exemption.

(3) The system has entered into an enforceable agreement to become a part of a regional public water system; and the system is taking all practicable steps to meet the standard.

(4) In the case of a system which does not serve more than a population of 3,300 and which needs financial assistance for the necessary improvements, an exemption granted under 4.4(d)(1) or (2) may be renewed for one or more additional 2-year periods, but not to exceed a total of 6 years, if the system establishes that it is taking all practicable steps to meet the requirements of 4.4(d).

(5) A public water system may not receive an exemption under this section if the system was granted a variance under sections 4.2 or 4.3.

(e) Each exemption granted by the Department under 4.4(a) shall be conditioned upon compliance by the public water system with the schedule prescribed by the Department. Any requirement of a schedule on which an exemption is conditioned may be enforced as if such requirement was part of a Colorado primary drinking water regulation.

(f) All exemptions and schedules prescribed by the Department are subject to review by the EPA Administrator.

4.5 Applications for Variances or Exemptions

All applications for variances or exemptions must be submitted in writing to the Department. The application must be complete and signed by the owner or the owner's authorized representative listed with the Department.

(a) The completed and signed application must be submitted to:

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

(b) Requests for variances or exemptions shall be in writing and include the following information:

(1) The nature and duration of the variance or exemption requested;

(2) Relevant analytical results of water quality samples taken from the system, including results of relevant tests conducted pursuant to the requirements of the Colorado Primary Drinking Water Regulations;

(3) The interim measures to be continuously applied during the requested exemption or variance period to adequately protect the health of the persons served by the public water system;

(4) For purposes of an exemption provide an explanation of the compelling factors pursuant to section 4.4, and

(5) For purposes of a variance provide an explanation of the compelling factors pursuant to sections 4.2 or 4.3.

4.6 Disposition of Variances and Exemptions

The Department shall act on any exemption or variance request within 90 days after receipt of a complete application therefore.

(a) If an application submitted to the Department is incomplete, within 20 days of receipt of the application the Department shall advise the applicant in writing of items needed to complete the application.

(b) The Department shall consider written comments and requests for a public meeting regarding the proposed granting of a variance or exemption filed within 30 days after the date the Department provides public notification pursuant to sections 4.2, 4.3, or 4.4.

(c) Within 90 days of receipt of a complete application, the Department shall make an initial determination to approve or deny the application. The procedures set out below in section 4.6(c)(1) through (3) will then follow:

(1) If the Department determines that the application complies with the criteria for a variance or exemption and if there has not been a written request for a public meeting and the EPA Administrator has approved the variance or exemption request (for systems serving more than 3,300 persons), the Department shall issue an order granting the exemption or variance pursuant to section 4.8.

(2) If the Department makes a tentative determination that the application complies with the criteria for a variance or exemption and a written request for a public meeting was submitted to the Department, the following procedure shall be utilized:

(i) The Department shall hold a public meeting in accordance with the procedures set out in section 4.7, and

(A) If there is no compelling evidence to deny the variance or exemption request; and

(B) The EPA Administrator has approved the variance or exemption request (for systems serving more than 3,300 persons);

(ii) The Department shall issue an order granting or denying the variance or exemption.

(3) If the Department makes a tentative determination to deny the application the following procedure shall be utilized:

(i) The Department shall notify the applicant in writing of its tentative determination to deny the application and state the grounds therefore;

(ii) Within 15 days after receipt of such notice the applicant may submit in writing a response of intent to provide additional argument or information to the Department;

(iii) If any person files a written request with the Department to hold a public meeting the Department shall do so, and if there is no compelling evidence to grant the variance or exemption;

(iv) The Department shall issue an order denying the variance or exemption.

4.7 Public Meetings

(a) Within 30 days after the Department has issued public notification required by sections 4.2, 4.3, or 4.4, any person may file a written request for the Department to hold a public meeting concerning such application for a variance or exemption. The Department shall hold a public meeting upon written request or as otherwise required by federal law. Frivolous or insubstantial requests for a public meeting may be denied.

(b) At least 15 days prior to the public meeting the Department shall arrange for publication of notice of that meeting. Notice of public meeting shall include:

(1) Name, address and telephone number of the public water system for which the variance or exemption is sought;

(2) The provision of the drinking water regulations from which a variance or exemption is sought;

(3) The tentative determination of the Department regarding the variance or exemption, and the Department's address and telephone number;

(4) A statement that a copy of the application is available for inspection at the Department during regular business hours, and

(5) The date, time, and location of the public meeting.

(c) A representative of the Department shall preside at the meeting. The Department shall also record the oral statements made at the public meeting. The person conducting a meeting shall have discretion to fix reasonable limits upon the time for oral statements.

(d) At the meeting, any person shall be permitted to submit oral or written statements concerning the variance or exemption application.

(e) The person(s) presiding at the public meeting shall maintain a list consisting of the name, address and telephone number of each person who submits an oral or written statement.

4.8 Final Order to Grant or Deny Variance or Exemption

(a) In determining whether to grant or deny a variance or an exemption, the Department shall consider the following:

(1) The completed application;

(2) Any written comments regarding the application received by the Department within 30 days of public notification pursuant to sections 4.2, 4.3, or 4.4;

(3) If a notice of tentative decision to deny application has been issued, any written response by the applicant to this notice; and

(4) If a public meeting is held regarding the application, any written or oral statements submitted at the public meeting.

(b) The final order of the Department shall either grant or deny the variance or the exemption. Any such order granting the variance or exemption shall include the following information:

(1) The provision of the drinking water regulations from which the variance or exemption is granted;

(2) The duration of the variance or exemption; and

(3) The prescribed schedules pursuant to sections 4.2, 4.3, or 4.4.

(c) The Department may revoke any variance or exemption where the supplier fails to comply with the terms of the order granting the variance or exemption. The Department may summarily revoke variances or exemptions pursuant section 24-4-104, Colorado Revised Statutes, and shall conduct hearings regarding such revocations in accordance with the requirements of section 24-4-105, Colorado Revised Statutes.

(d) A copy of the Department's order shall be mailed to the applicant, all persons who submit written comments in timely fashion, and all persons who submit statements at any public meeting concerning the variance or exemption if such a meeting is held.

(e) The variance or exemption shall become effective 90 days after issuance of the Department's final order. Any person adversely affected or aggrieved by the Department's final order may request an adjudicatory hearing on the order. Such hearing shall be conducted in accordance with the requirements of section 24-4-105, Colorado Revised Statutes. A request for such a hearing shall be filed in writing within 60 days after the effective date of the Department's order granting the variance or exemption, or within 60 days of the service of the order denying the variance or exemption. If a variance or exemption is granted, and a request for a hearing

regarding the variance or exemption is filed in a timely fashion, the variance or exemption shall remain in effect prior to any determination made at such a hearing.

(f) Following the issuance of a variance or exemption the supplier shall issue consumer notifications pursuant to Article 9 of the *Colorado Primary Drinking Water Regulations*.

Article 5 Microbiological Contaminants

5.1 Coliform Sampling

5.1.1 Routine Monitoring

(a) Public water systems must collect total coliform samples at sites, which are representative of water throughout the distribution system according to a written sample-siting plan. These plans are subject to Department review and revision.

(b) Results of all routine total coliform samples must be submitted to the Department for review.

(c) A public water system must collect samples at regular time intervals throughout the month, except that a system which uses only groundwater [except groundwater under the direct influence of surface water, as defined in section 1.5.2(65)], and serves 4,900 persons or fewer, may collect all required samples on a single day if they are taken from different sites.

(d) Community water systems must monitor for total coliforms at a frequency based on the population served by the system, regardless of the type of water source, according to the following table:

Table 5-1 Total Coliform Monitoring Frequency for Community Water Systems

Population Served Per Day	Minimum number of samples per month	Population Served Per Day	Minimum number of samples per month
25 to 1,000[1]	1	59,001 to 70,000	70
1,001 to 2,500	2	70,001 to 83,000	80
2,501 to 3,300	3	83,001 to 96,000	90
3,301 to 4,100	4	96,001 to 130,000	100
4,101 to 4,900	5	130,001 to 220,000	120
4,901 to 5,800	6	220,001 to 320,000	150
5,801 to 6,700	7	320,001 to 450,000	180
6,701 to 7,600	8	450,001 to 600,000	210
7,601 to 8,500	9	600,001 to 780,000	240
8,501 to 12,900	10	780,001 to 970,000	270
12,901 to 17,200	15	970,001 to 1,230,000	300

17,201 to 21,500	20	1,230,001 to 1,520,000	330
21,501 to 25,000	25	1,520,001 to 1,850,000	360
25,001 to 33,000	30	1,850,001 to 2,270,000	390
33,001 to 41,000	40	2,270,001 to 3,020,000	420
41,001 to 50,000	50	3,020,001 to 3,960,000	450
50,001 to 59,000	60	3,960,001 or more	480

1 Includes public water systems which have at least 15 service connections, but serve fewer than 25 persons.

(e) Non-community water systems must monitor for total coliform at frequencies as specified in the following paragraphs (1) – (6):

(1) A non-community water system using only groundwater (except groundwater under the direct influence of surface water, as defined in section 1.5.2(65)) and serving 1,000 persons or fewer must monitor in each calendar quarter that the system provides water to the public.

(2) A non-community water system using only groundwater [except groundwater under the direct influence of surface water, as defined in section 1.5.2(65)] and serving more than 1,000 persons must monitor at the same frequency as a like-sized community water system, as specified in Table 5-1.

(3) A non-community water system using groundwater under the direct influence of surface water, as defined in section 1.5.2(65) must monitor at the same frequency as a like-sized community water system, as specified in Table 5-1. The system must begin monitoring at this frequency beginning with the next monitoring period following written determination that the groundwater is under the direct influence of surface water.

(4) A non-community water system using surface water, in total or in part, must monitor at the same frequency as a like-sized community water system, as specified in Table 5-1, during the period surface water is being used, regardless of the number of persons it serves.

(5) A non-community water system that is not open year around must monitor for total coliforms at least ten days prior to opening for the season.

(6) A non-community water system using hand pumped wells subject to section 13.2(e) must monitor for total coliforms on a monthly basis during any period of operation.

(f) Special purpose samples, such as those taken to determine whether disinfection practices are sufficient following pipe placement, replacement, or repair, shall not be used to determine compliance with the MCL for total coliforms in Table 2-4. Repeat samples taken pursuant to section 5.1.2 are not considered special purpose samples, and must be used to determine compliance with the MCL for total coliforms in Table 2-4.

5.1.2 Repeat Monitoring

(a) If a routine sample is total coliform-positive, the public water system must collect a set of repeat samples within 24 hours of being notified of the positive result. The Department may extend the 24-hour limit on a case-by-case basis if the system has a logistical problem in collecting the

repeat samples within 24 hours that is beyond its control. In the case of an extension, the Department must specify how much time the system has to collect the repeat samples and will notify the system of that time frame by the end of the next business day.

(1) If a system believes they have extenuating circumstances that would qualify them for an extension, the system must notify the Department as soon as practical, but no later than 24 hours of being notified of the positive result.

(b) A system required to collect one routine sample per month or fewer must collect no fewer than four repeat samples for each total coliform-positive sample found. A system required to collect more than one routine sample per month must collect no fewer than three repeat samples for each total coliform-positive sample found.

(c) The system must collect at least one repeat sample from the sampling tap where the original total coliform-positive sample was taken, and at least one repeat sample at a tap within five service connections upstream and at least one repeat sample at a tap within five service connections downstream of the original sampling site. If a total coliform-positive sample is at the end of the distribution system, or one tap away from the end of the distribution system, the Department may waive the requirement to collect at least one repeat sample upstream or downstream of the original sampling site and specify more appropriate sampling locations for the repeat sample monitoring.

(d) The system must collect all repeat samples on the same day, except that the Department may allow a system with a single service connection to collect the required set of repeat samples over a four-day period.

(e) If one or more repeat samples in the set is total coliform-positive, the public water system must collect an additional set of repeat samples in the manner specified in sections 5.1.2(a)-(d). The additional samples must be collected within 24 hours of being notified of the positive result, unless the Department extends the limit as provided in section 5.1.2(a). The system must repeat this process until either total coliforms are not detected in one complete set of repeat samples or the system determines that the maximum contaminant level for total coliforms in Table 2-4 has been exceeded and the system notifies the Department of such non-compliance.

(f) If a system collecting fewer than five routine samples per month has one or more total coliform-positive sample(s) and the Department does not invalidate the sample(s) under section 5.3, it must collect at least five routine samples during the next month the system provides water to the public, except that the Department may waive this requirement if the conditions of section 5.1.2(f) (1) or (2) are met. The Department cannot waive the requirement for a system to collect repeat samples in section 5.1.2(a) – (e).

(1) The Department may waive the requirement to collect five samples the next month the system provides water to the public if the Department, or an agent approved by the Department, performs a site visit before the end of the next month the system provides water to the public. Although a sanitary survey need not be performed, the site visit must be sufficiently detailed to allow the Department to determine whether additional monitoring and/or any corrective action is needed. The Department cannot approve an employee of the system to perform this site visit, even if the employee is an agent approved by the Department to perform sanitary surveys.

(2) The Department may waive the requirement to collect five routine samples the next month the system provides water to the public if the Department has determined why the sample was total coliform-positive and establishes that the system has corrected the problem or will correct the problem before the end of the next month the system serves water to the public. In this case, the Department must document this decision to waive the following month's additional monitoring requirement in writing, have it approved and

signed by the supervisor of the Department official who recommends such a decision, and make this document available to the EPA and public. The written documentation must describe the specific cause of the total coliform-positive sample and what action the system has taken and/or will take to correct this problem. The Department cannot waive the requirement to collect five routine samples the next month the system provides water to the public solely on the grounds that all repeat samples are total coliform-negative. Under this paragraph, a system must still take at least one routine sample before the end of the next month it serves water to the public and use it to determine compliance with the MCL for total coliforms in Table 2-4, unless the Department has determined that the system has corrected the contamination problem before the system took the set of repeat samples required in section 5.1.2(a) – (e), and all repeat samples were total coliform-negative

(g) If a system collects a routine sample, which after analysis is found to be total coliform-positive, but prior to receiving results of that analysis the system collected another routine sample(s) within five adjacent service connections of the initial sample, the system may use the subsequent sample(s) as a repeat sample(s) instead of as a routine sample(s).

(h) Failure to submit the required number of repeat samples is a violation of section 5.1.2 and may subject the system to a Tier 2 public notification requirement per section 9.2.3, Table 9-5, as required by the Department.

(i) Results of all repeat total coliform samples must be submitted to the Department for review.

5.2 Investigation of Total Coliform-Positive Routine Microbiological Sample(s)

(a) After appropriate repeat samples are taken in accordance with section 5.1.2, systems must investigate the reason for any total coliform-positive routine sample(s).

(1) The scope of the investigation required under section 5.2 is to include conditions at the sources, treatment facilities, storage sites and distribution system including an evaluation of the potential for unprotected cross connections.

(2) The scope of the investigation may be modified by the system to take into account conditions unique to the system's size, sources and distribution system layout and cross connection control devices relative to the location of the total coliform-positive sample result(s).

(b) The results of the investigation must be available at the time that repeat sample results become available and will be used by the Department in the event that the system has an acute violation of the total coliform maximum contaminant level requiring consultation with the Department, in accordance with section 9.2.2(b)(2), to determine the efficacy of requiring the public to boil their water or to use alternative sources of water, or other public notice requirements.

5.3 Invalidation of Total Coliform Samples

A total coliform-positive sample invalidated under this section 5.3 does not count towards meeting the minimum monitoring requirements of this Article 5.

(a) The Department may invalidate a total coliform-positive sample only if the conditions of the following paragraphs (1), (2) or (3) are met.

(1) The laboratory establishes that improper sample analysis caused the total coliform-positive result.

(2) The Department, on the basis of the results of repeat samples collected in accordance with sections 5.1.2(a) – (e), determines that the total coliform-positive sample resulted from a domestic or other non-distribution system plumbing problem. The Department cannot invalidate a sample on the basis of repeat sample results unless all repeat sample(s) collected at the same tap as the original total coliform-positive sample are also total coliform-positive, and all repeat samples collected within five service connections of the original tap are total coliform-negative (e.g., the Department cannot invalidate a total coliform-positive sample on the basis of repeat samples if all the repeat samples are total coliform-negative, or if the public water system has only one service connection).

(3) The Department has substantial grounds to believe that a total coliform-positive result is due to a circumstance or condition which does not reflect water quality in the distribution system. In this case, the system must still collect all repeat samples required under section 5.1.2(a) - (e), and use them to determine compliance with the MCL for total coliforms in Table 2-4. To invalidate a total coliform-positive sample under this paragraph, the decision with the rationale for the decision must be documented in writing, and approved and signed by the supervisor of the department official who recommended the decision. The Department must make this document available to EPA and the public. The written documentation must state the specific cause of the total coliform-positive sample, and what action the system has taken, or will take, to correct this problem. The Department may not invalidate a total coliform-positive sample solely on the grounds that all repeat samples are total coliform-negative.

(b) A laboratory must invalidate a total coliform sample (unless total coliforms are detected) if any of the following conditions in paragraphs (1)-(3) are met:

(1) The sample produces a turbid culture in the absence of gas production using an analytical method where gas formation is examined (e. g., the Multiple-Tube Fermentation Technique);

(2) The sample produces a turbid culture in the absence of an acid reaction in the Presence-Absence (P-A) Coliform Test; or

(3) The sample exhibits confluent growth or produces colonies too numerous to count with an analytical method using a membrane filter (e.g., Membrane Filter Technique).

(c) If a laboratory invalidates a sample, the system must collect another sample from the same location as the original sample within 24 hours of being notified of the interference problem and have it analyzed for the presence of total coliforms. The system must continue to re-sample within 24 hours and have the samples analyzed until it obtains a valid result. The Department may waive the 24-hour time limit on a case-by-case basis when the system, for logistical reasons outside the system's control, cannot have the sample collected within 24 hours. In that case, the Department will specify how much time the system has to collect the sample.

5.4 Fecal Coliforms/*Escherichia coli* (*E. coli*) Testing

(a) If any routine or repeat sample is total coliform-positive, the system must have a certified laboratory analyze that total coliform-positive culture medium to determine if fecal coliforms are present, except that the system may test for *E. coli* in lieu of fecal coliforms.

(b) If fecal coliforms or *E. coli* are present, the system must notify the Department as soon as possible but not later than the end of the next business day following the day on which the system was notified of the test result.

(c) The Department has the discretion to allow a public water system, on a case-by-case basis, to forgo fecal coliform or *E. coli* testing on a total coliform-positive sample if that system assumes that the total coliform-positive sample is fecal coliform-positive or *E. coli*-positive. Accordingly, the system must notify the Department as specified in Sections 5.6(a) – (b) and the provisions of section 5.7(b) apply.

5.5 Analytical Requirements

(a) The standard sample volume required for total coliform analysis, regardless of analytical method used, is 100 ml.

(b) Public water systems need only determine the presence or absence of total coliforms; a determination of total coliform density is not required.

(c) When fecal coliform analysis is performed subsequent to a positive total coliform sample, the public water systems need only determine the presence or absence of fecal coliforms; a determination of fecal coliform density is not required.

(d) For the purpose of determining compliance with this Article 5 regarding microbiological contaminants, samples may be considered only if the conditions specified in this section 5.5(d)(1) and (2) are met.

(1) The sample must have been analyzed by a laboratory certified by the Department. A current list of certified laboratories is available upon request from:

Colorado Department of Public Health and Environment
Laboratory Services Division
Laboratory Certification Program
8100 Lowry Boulevard
Denver, CO 80230-6928

Phone: 303-692-3090

or by Internet at the following web address:
www.cdphe.state.co.us/lr/Certification/SDWLIST.pdf

(2) The sample must have been analyzed by a method conducted in accordance with Article 10, section 10.1.

5.6 Response to Violation

(a) A public water system which has exceeded the MCL for total coliforms as listed in Table 2-4 must report the violation to the Department no later than the end of the next business day after it learns of the violation, and notify the public in accordance with Article 9.

(b) A public water system, which has failed to comply with a coliform monitoring requirement, must report the monitoring violation to the Department within ten days after the system discovers the violation, and notify the public in accordance with Article 9.

5.7 Microbiological Contaminant Maximum Contaminant Level (MCL) Determination

(a) The MCL, as listed in Table 2-4, is based on the presence or absence of total coliforms in a sample, rather than coliform density.

(1) For a system that collects at least 40 samples per month, if no more than 5.0 percent of the samples collected during a month are total coliform-positive, the system is in compliance with the MCL for total coliforms.

(2) For a system collecting fewer than 40 samples per month, if no more than one sample collected during a month is total coliform-positive, the system is in compliance with the MCL for total coliforms.

(b) Any fecal coliform-positive repeat sample or E. coli-positive repeat sample, or any total coliform-positive repeat sample following a fecal coliform-positive or E. coli-positive routine sample constitutes a violation of the MCL for total coliforms. For purposes of the public notification requirements in Article 9, this is a violation that may pose an acute risk to health.

(c) A public water system must determine compliance with the MCL, as listed in Table 2-4, for total coliforms for each month in which it is required to monitor for total coliforms.

(d) Results of all routine and repeat samples not invalidated by the Department or the laboratory must be included in determining compliance with the MCL for total coliforms listed in Table 2-4.

5.8 Best Available Technologies (BATs) for Microbiological Contaminants

(a) The EPA Administrator hereby identifies the following as the best technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant level for total coliforms in section 2..3 Table 2-4:

(1) Protection of wells from contamination by coliforms by appropriate placement and construction;

(2) Maintenance of a disinfectant residual throughout the distribution system;

(3) Proper maintenance of the distribution system including appropriate pipe replacement and repair procedures, main flushing programs, proper operation and maintenance of storage tanks and reservoirs, and continual maintenance of positive water pressure in all parts of the distribution system;

(4) Filtration and/or disinfection of surface water, as described in Article 7, or disinfection of groundwater using strong oxidants such as chlorine, chlorine dioxide, or ozone; and

(5) For systems using groundwater, compliance with the requirements of the Departments Wellhead Protection Program, which was developed and implemented under section 1428 of the Safe Drinking Water Act.

Article 6 Chemical Contaminants and Radionuclides

6.1 Inorganic Chemical Contaminants

6.1.1 Applicability

(a) These regulations shall apply to all community and non-transient, non-community water systems in Colorado, except:

(1) The fluoride maximum contaminant level (MCL) applies only to community water systems and may be applied to non-community water systems when found by the Department to be necessary to protect the public health; and

(2) The MCLs for nitrate, nitrite, and total nitrate and nitrite apply to all public water systems.

(b) The maximum contaminant levels for antimony, asbestos, barium, beryllium, cadmium, chromium, cyanide, mercury, selenium, and thallium apply to community water systems and non-transient, non-community water systems.

(c) At the discretion of the Department, nitrate levels not to exceed 20 mg/L may be allowed in a non-community water system if the public water system demonstrates to the satisfaction of the Department that:

(1) Such water will not be available to children under 6 months of age; and

(2) The non-community water system is meeting the public notification requirements under section 9.2.2, including continuous posting of the fact that nitrate levels exceed 10 mg/L and the potential health effects of exposure; and

(3) Local and State public health authorities will be notified annually of nitrate levels that exceed 10 mg/L; and

(4) No adverse health effects shall result.

6.1.2 Reporting requirements

Reporting requirements shall be those in section 1.6.4, unless otherwise noted in section 6.1.

6.1.3 Compliance Determination

(a) Compliance with section 2.2, MCLs and MCLGs for Inorganic Chemical Contaminants, shall be determined based on the analytical result(s) obtained at each sampling point.

(1) For systems which are conducting monitoring at a frequency greater than annual, compliance with the maximum contaminant levels for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium or thallium is determined by a running annual average based on data from the most recent four consecutive quarters at any sampling point. If the running annual average at any sampling point is greater than the MCL, then the system is out of compliance. If any one sample would cause the running annual average to be exceeded, then the system is out of compliance immediately.

(2) For systems which are monitoring annually, or less frequently, the system is out of compliance with the maximum contaminant levels for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium or thallium if the level of a contaminant is greater than the MCL. If confirmation samples are required by the Department the determination of compliance will be based on the annual average of the initial MCL exceedance and any Department-required confirmation samples.

(3) Compliance with the maximum contaminant levels for nitrate and nitrite is determined based on one sample if the levels of these contaminants are below the MCLs. If the levels of nitrate and/or nitrite exceed the MCLs in the initial sample, a confirmation sample is required in accordance with section 6.1.5(g)(2), and compliance shall be determined based on the average of the initial and confirmation samples.

(4) Any sample below the method detection limit shall be calculated at zero for the purpose of determining the annual average. If a system fails to collect the required number of

samples, compliance (average concentration) will be based on the total number of samples collected.

(5) Arsenic sampling results will be reported to the nearest 0.001mg/L.

(b) The provisions of sections 6.1.5(k)(2) and (3) notwithstanding, compliance with the maximum contaminant level for nitrate shall be determined on the basis of the mean of two analyses.

(c) When a level exceeding the maximum contaminant level for nitrate is found, a second analysis shall be initiated within 24 hours, and if the mean of the two analyses exceeds the maximum contaminant level, the supplier of water shall report to the Department pursuant to section 1.6.4 and shall notify the public pursuant to section 9.2.

6.1.4 Best Available Technology (BAT) and Small System Compliance Technology (SSCT)

(a) The EPA Administrator hereby identifies the following as the best technology, treatment technique, or other means available for achieving compliance with the maximum contaminant levels for inorganic contaminants identified in section 2.2, except fluoride:

Table 6-1 BAT for Inorganic Compounds (Listed in section 2.2(2))

Chemical Name	BAT(s)
Antimony	2,7
Arsenic [4]	1, 2, 5, 6, 7, 9, 12 [5]
Asbestos	2,3,8
Barium	5,6,7,9
Beryllium	1,2,5,6,7
Cadmium	2,5,6,7
Chromium	2,5,6 [2],7
Cyanide	5,7,13
Mercury	2 [1],4,6 [1],7 [1]
Nickel	5,6,7
Nitrate	5,7,9
Nitrite	5,7
Selenium	1,2 [3],6,7,9
Thallium	1,5

1 BAT only if influent Hg concentrations < 10µg/1.

2 BAT for Chromium III only.

3 BAT for Selenium IV only.

4 BATs for Arsenic V. Pre-oxidation may be required to convert Arsenic III to Arsenic V.

5 To obtain high removals, iron to arsenic ration must be at least 20:1.

Key to BATS in Table 6-1

1 = Activated Alumina

2 = Coagulation/Filtration (not BAT for systems with < 500 service connections)

3 = Direct and Diatomite Filtration

4 = Granular Activated Carbon

5 = Ion Exchange

6 = Lime Softening (not BAT for systems with < 500 service connections)

7 = Reverse Osmosis

8 = Corrosion Control

9 = Electrodialysis

10 = Chlorine

11 = Ultraviolet

12 = Oxidation/Filtration

13 = Alkaline Chlorination (pH ≥ 8.5)

(b) The EPA Administrator hereby identifies in the following table the affordable technology, treatment technique, or other means available to systems serving 10,000 persons or fewer for achieving compliance with the maximum contaminant level for arsenic:

Table 6-2 Small System Compliance Technologies (SSCTs)[1] for Arsenic[2]

Small system compliance technology	**Affordable for listed small system categories [3]**
Activated Alumina (centralized)	All size categories.
Activated Alumina (Point-of-Use) [4]	All size categories.
Coagulation/Filtration [5]	501–3,300, 3,301–10,000.
Coagulation-assisted Microfiltration	501–3,300, 3,301–10,000.
Electrodialysis reversal [6]	501–3,300, 3,301–10,000.
Enhanced coagulation/filtration	All size categories
Enhanced lime softening (pH> 10.5)	All size categories.

Ion Exchange	All size categories.
Lime Softening [5]	501–3,300, 3,301–10,000.
Oxidation/Filtration [7]	All size categories.
Reverse Osmosis (centralized) [6]	501–3,300, 3,301–10,000.
Reverse Osmosis (Point-of-Use) [4]	All size categories.

1 Section 1412(b)(4)(E)(ii) of SDWA specifies that SSCTs must be affordable and technically feasible for small systems.

2 SSCTs for Arsenic V. Pre-oxidation may be required to convert Arsenic III to Arsenic V.

3 The Act (ibid.) specifies three categories of small systems: (i) those serving 25 or more, but fewer than 501, (ii) those serving more than 500, but fewer than 3,301, and (iii) those serving more than 3,300, but fewer than 10,001.

4 When POU or POE devices are used for compliance, programs to ensure proper long-term operation, maintenance, and monitoring must be provided by the water system to ensure adequate performance.

5 Unlikely to be installed solely for arsenic removal. May require pH adjustment to optimal range if high removals are needed.

6 Technologies reject a large volume of water—may not be appropriate for areas where water quantity may be an issue.

7 To obtain high removals, iron to arsenic ratio must be at least 20:1.

6.1.5 Inorganic Chemical Monitoring

(a) Community and non-transient, non-community water systems shall conduct monitoring to determine compliance with the maximum contaminant levels specified in Table 2-3 in accordance with section 6.1.5. Transient, non-community water systems shall conduct monitoring to determine compliance with the nitrate and nitrite maximum contaminant levels in Table 2-3 in accordance with section 6.1.5.

(b) Monitoring shall be conducted as follows:

(1) Groundwater systems shall take a minimum of one sample at every entry point to the distribution system, which is representative of each well after treatment (hereafter called a sampling point). The system shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

(2) Surface[6-1] water systems shall take a minimum of one sample at every entry point to the distribution system after any application of treatment or in the distribution system at a point, which is representative of each source after treatment (hereafter called a sampling point). The system shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

6-1 For purposes of this section, surface water systems include systems with a combination of surface and ground sources.

(3) If a system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water is representative of all sources being used).

(4) The Department may reduce the total number of samples that must be analyzed by allowing the use of compositing. Composite samples from a maximum of five sampling points are allowed, provided that the detection limit of the method used for analysis is

less than one-fifth (<1/5) of the MCL. Compositing of all samples must be done in the laboratory.

(i) If the concentration in the composite sample is greater than or equal to one-fifth of the MCL of any inorganic chemical, then a follow-up sample must be taken within 14 days at each sampling point included in the composite. These samples must be analyzed for the contaminants that exceeded one-fifth of the MCL in the composite sample.

(ii) If the population served by the system is greater than (>) 3,300 persons, compositing of samples is permitted at sampling points within a single system only. In systems serving less than or equal to (≤) 3,300 persons, compositing of samples is permitted at sampling points among different systems provided the 5-sample limit is maintained.

(iii) If duplicates of the original sample taken from each sampling point used in the composite sample are available, the system may use these instead of re-sampling. The duplicates must be analyzed and the results reported to the Department within 14 days after completing analysis of the composite sample, provided the holding time of the sample is not exceeded.

(5) The frequency of monitoring for asbestos shall be in accordance with section 6.1.5(c); the frequency of monitoring for antimony, arsenic, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium and thallium shall be in accordance with section 6.1.5(d); the frequency of monitoring for nitrate shall be in accordance with section 6.1.5(e); and, the frequency of monitoring for nitrite shall be in accordance with section 6.1.5(f).

(c) **Asbestos:** The frequency of monitoring conducted to determine compliance with the maximum contaminant level for asbestos specified in Table 2-3 shall be conducted as follows:

(1) Each community and non-transient, non-community water system is required to monitor for asbestos during the first three-year compliance period of each nine-year compliance cycle beginning in the compliance period.

(2) The Department may initiate or the system may apply to the Department for a waiver of the monitoring requirements in section 6.1.5(c)(1) if the system is not vulnerable to either asbestos contamination in its source water or due to corrosion of asbestos-cement pipe, or both. If the Department grants the waiver, the system is not required to monitor.

(3) The Department may grant a waiver based on a consideration of the following factors:

(i) Potential asbestos contamination of the water source, and

(ii) The use of asbestos-cement pipe for finished water distribution and the corrosive nature of the water.

(4) A waiver remains in effect until the completion of the three-year compliance period. Systems not receiving a waiver must monitor in accordance with the provisions of section 6.1.5(c)(1).

(5) A system vulnerable to asbestos contamination due solely to corrosion of asbestos-cement pipe shall take one sample at a tap served by asbestos-cement pipe and under conditions where asbestos contamination is most likely to occur.

(6) A system vulnerable to asbestos contamination due solely to source water shall monitor in accordance with the provision of section 6.1.5(b).

(7) A system vulnerable to asbestos contamination due both to its source water supply and corrosion of asbestos-cement pipe shall take one sample at a tap served by asbestos-cement pipe and under conditions where asbestos contamination is most likely to occur.

(8) A system that exceeds the maximum contaminant levels, as determined in section 6.1.3(a), shall monitor quarterly beginning in the next quarter after the violation occurred.

(9) The Department may decrease the quarterly monitoring requirement to the frequency specified in section 6.1.5(c)(1) provided the Department has determined that the system is reliably and consistently below the maximum contaminant level. In no case will the Department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface (or combined surface/ground) water system takes a minimum of four quarterly samples.

(d) **Antimony, arsenic, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium and thallium:** The frequency of monitoring conducted to determine compliance with the maximum contaminant levels in section 2.2 for antimony, arsenic, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium and thallium shall be as follows:

(1) Groundwater systems shall take one sample at each sampling point during each compliance period. Surface water systems (or combined surface/ground) shall take one sample annually at each sampling point.

(2) The system may apply to the Department for a waiver from the monitoring frequencies specified in section 6.1.5(d)(1).

(3) The Department may grant a public water system a waiver for monitoring of cyanide, provided that the Department determines that the system is not vulnerable due to lack of any industrial source of cyanide.

(4) A condition of the waiver shall require that a system shall take a minimum of one sample while the waiver is effective. The term during which the waiver is effective shall not exceed one compliance cycle (i.e., nine years).

(5) The Department may grant a waiver provided surface water systems have monitored annually for at least three years and groundwater systems have conducted a minimum of three rounds of monitoring. Both surface and groundwater systems shall demonstrate that all previous analytical results were less than the maximum contaminant level. Systems that use a new water source are not eligible for a waiver until three rounds of monitoring from the new source have been completed.

(6) In determining the appropriate reduced monitoring frequency, the Department shall consider:

(i) Reported concentrations from all previous monitoring;

(ii) The degree of variation in reported concentrations; and

(iii) Other factors which may affect contaminant concentrations such as changes in groundwater pumping rates, changes in the system's configuration, changes in the system's operating procedures, or changes in stream flows or characteristics.

(7) A decision by the Department to grant a waiver shall be made in writing and shall set forth the basis for the determination. The determination may be initiated by the Department or upon an application by the public water system. The public water system shall specify the basis for its request. The Department shall review and, where appropriate, revise its determination of the appropriate monitoring frequency when the system submits new monitoring data or when other data relevant to the system's appropriate monitoring frequency become available.

(8) Systems that exceed the maximum contaminant levels, as calculated in accordance with section 6.1.3(a), shall monitor quarterly beginning in the next quarter after the violation occurred.

(9) The Department may decrease the quarterly monitoring requirement to the frequencies specified in sections 6.1.5(d)(1) and 6.1.5(d)(2) provided it has determined that the system is reliably and consistently below the maximum contaminant level. In no case will the Department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.

(10) All new systems or systems that use a new source of water must demonstrate compliance with the maximum contaminant levels specified in Table 2-3 within one year of beginning operation. The system must also comply with the initial sampling frequencies specified by the Department to ensure a system can demonstrate compliance with the MCL. Routine and increased monitoring frequencies shall be conducted in accordance with the requirements of this section.

(e) **Nitrate:** All public water systems (community; non-transient non-community; and transient non-community systems) shall monitor to determine compliance with the maximum contaminant level for nitrate in Table 2-3(11).

(1) Community and non-transient, non-community water systems served by groundwater systems shall monitor annually; systems served by surface water shall monitor quarterly.

(2) For community and non-transient, non-community water systems, the repeat monitoring frequency for groundwater systems shall be quarterly for at least one year following any one sample in which the concentration is greater than or equal to (≥) 50 percent of the MCL. The Department may allow a groundwater system to reduce the sampling frequency to annually after four consecutive quarterly samples are reliably and consistently less than the MCL.

(3) For community and non-transient, non-community water systems, the Department may allow a surface water system to reduce the sampling frequency to annually if all analytical results from four consecutive quarters are less than (<) 50 percent of the MCL. A surface water system shall return to quarterly monitoring if any one sample is greater than or equal to (≥) 50 percent of the MCL.

(4) Each transient, non-community water system shall monitor annually.

(5) After the initial round of quarterly sampling is completed, each community and non-transient, non-community system that is monitoring annually shall take subsequent samples during the quarter(s) that previously resulted in the highest analytical result.

(f) **Nitrite:** All public water systems (community; non-transient, non-community; and transient, non-community systems) shall monitor to determine compliance with the maximum contaminant level for nitrite in Table 2-3(12).

(1) After the initial sample, systems where an analytical result for nitrite is less than (<) 50 percent of the MCL shall monitor at least once during each monitoring cycle (i.e. once every nine years), or more frequently as determined by the Department to protect public health.

(2) For community, non-transient, non-community, and transient, non-community water systems, the repeat monitoring frequency for any water system shall be quarterly for at least one year following any one sample in which the concentration is greater than or equal to (≥) 50 percent of the MCL. The Department may allow a system to reduce the sampling frequency to annually after determining the system is reliably and consistently less than the MCL.

(3) Systems that are monitoring annually shall take each subsequent sample during the quarter(s) that previously resulted in the highest analytical result.

(g) Confirmation samples:

(1) Where the results of sampling for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium or thallium indicate an exceedance of the maximum contaminant level, the Department requires one additional sample be collected as soon as possible after the initial sample was taken (but not to exceed two weeks) at the same sampling point.

(2) Where nitrate or nitrite sampling results indicate an exceedance of the maximum contaminant level, the system must take a confirmation sample within 24 hours of the system's receipt of notification of the analytical results of the first sample. Systems unable to comply with the 24-hour sampling requirement must immediately notify persons served by the public water system in accordance with section 9.2 and meet other Tier 1 public notification requirements under Article 9. Systems exercising this option must take and analyze a confirmation sample within two weeks of notification of the analytical results of the first sample.

(3) If the Department-required confirmation sample is taken for any contaminant, then the results of the initial and confirmation sample will be averaged. The resulting average is used to determine the system's compliance in accordance with section 6.1.3(a). The Department has the discretion to invalidate results of sampling or analytic errors.

(h) The Department may require more frequent monitoring than specified in sections 6.1.5(c), (d), (e) and (f) or may require confirmation samples for positive and negative results at its discretion.

(i) Systems may apply to the Department to conduct more frequent monitoring than the minimum monitoring frequencies specified in section 6.1.5.

(j) Each public water system shall monitor at the time designated by the Department during each compliance period.

(k) Requirements for nitrate levels not to exceed 20 mg/L in non-community water systems (section 6.1.1(c)).

(1) Analyses for the purpose of determining compliance with section 6.1.1(c), with respect to nitrate levels not to exceed 20 mg/L in non-community water systems, shall be conducted using the requirements specified in section 6.1.5(k)(1)-(3) as well as the requirements in specified in section 6.1.3(b).

(i) Analyses for all community water systems utilizing surface water sources shall be repeated at yearly intervals.

(ii) Analyses for all community water systems utilizing only groundwater sources shall be repeated at three-year intervals.

(iii) For non-community water systems, whether supplied by surface or ground sources, analyses for nitrate shall be repeated at intervals specified by the Department in the Enforcement Compliance Agreement.

(iv) The Department has the authority to determine compliance or initiate enforcement action based upon analytical results and other information compiled by their sanctioned representatives and agencies.

(2) If the result of an analysis made under section 6.1.5(k)(1) indicates that the level of nitrate listed in section 6.1.1(c) exceeds the maximum contaminant level, the supplier of the water shall report to the Department within 7 days and initiate three additional analyses at the same sampling point within one month.

(3) When the average of four analyses made pursuant to section 6.1.5(k)(2), rounded to the same number of significant figures as the maximum contaminant level for the substance in question, exceeds the maximum contaminant level, the supplier of water shall notify the Department pursuant to section 1.6.4 and give notice to the public pursuant to Article 9. Monitoring after public notification shall be at a frequency designated by the Department and shall continue until the maximum contaminant level has not been exceeded in two successive samples or until a monitoring schedule as a condition to a variance, exemption or enforcement action shall become effective.

6.1.6 Monitoring for Systems Purchasing Water in Addition to Utilizing Water from Other Sources

(a) The Department may modify the monitoring requirements imposed by section 6.1.5 when a public water system purchases treated water from another public water systems, when:

(1) The purchased water enters the distribution system independent of any other water source owned by the system; and

(2) The interconnection of the systems justifies the modification of monitoring requirements.

(b) Any modified monitoring shall be conducted pursuant to a schedule specified by the Department.

6.1.7 Special Monitoring for Sodium

(a) Community public water systems shall collect and analyze one sample per plant at the entry point of the distribution system for the determination of sodium concentration levels; samples must be collected and analyzed annually for systems utilizing surface water sources in whole or in part, and at least every three years for systems utilizing solely groundwater sources. The minimum number of samples required to be taken by the system shall be based on the number of treatment plants used by the system, except that multiple wells drawing raw water from a single aquifer may, with Department approval, be considered one treatment plant for determining the minimum number of samples.

(b) The public water system shall report to the Department the results of the analyses for sodium within the first 10 days of the month following the month in which the sample results were

received or within the first 10 days following the end of the required monitoring period as stipulated by the Department, whichever of these is first.

(c) The public water system shall notify appropriate local and State public health officials of the sodium levels by written notice by direct mail each year. A copy of each notice, required by this section 6.1.7(c), shall be sent to the Department within 10 days of its issuance.

(d) Analyses for sodium shall be conducted as directed in Table 10-5(24).

6.2 Organic Chemical Contaminants

6.2.1 Applicability

Section 6.2 applies to all community and non-transient, non-community water systems in Colorado.

6.2.2 Acrylamide and Epichlorohydrin Certification

(a) Each public water system must certify annually in writing to the Department (using third party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the following levels:

(1) Acrylamide = 0.05% dosed at 1 ppm (or equivalent).

(2) Epichlorohydrin = 0.01% dosed at 20 ppm (or equivalent).

(b) Certifications can rely on manufacturers or third parties, as approved by the Department.

6.2.3 Compliance Determination

(a) **VOC:** Compliance with the volatile organic chemical contaminants MCLs, listed in Table 2-1(1)-(21), shall be determined based on the analytical results obtained at each sampling point. If one sampling point is in violation of an MCL, the system is in violation of the MCL.

(1) For systems monitoring more than once per year, compliance with the MCL is determined by a running annual average at each sampling point.

(2) Systems monitoring annually or less frequently whose sample result exceeds the MCL must begin quarterly sampling. The system will not be considered in violation of the MCL until it has completed one year of quarterly sampling.

(3) If any sample result will cause the running annual average to exceed the MCL at any sampling point, the system is out of compliance with the MCL immediately.

(4) If a system fails to collect the required number of samples, compliance will be based on the total number of samples collected.

(5) If a sample result is less than the detection limit, zero will be used to calculate the annual average.

(b) **SOC:** Compliance with the synthetic organic chemical contaminants MCLs, listed in Table 2-2(1) – (33), shall be determined based on the analytical results obtained at each sampling point. If one sampling point is in violation of an MCL, the system is in violation of the MCL.

(1) For systems monitoring more than once per year, compliance with the MCL is determined by a running annual average at each sampling point.

(2) Systems monitoring annually or less frequently whose sample result exceeds the regulatory detection level as defined in section 10.3.3 must begin quarterly sampling. The system will not be considered in violation of the MCL until it has completed one year of quarterly sampling.

(3) If any sample result will cause the running annual average to exceed the MCL at any sampling point, the system is out of compliance with the MCL immediately.

(4) If a system fails to collect the required number of samples, compliance will be based on the total number of samples collected.

(5) If a sample result is less than the detection limit, zero will be used to calculate the annual average.

(c) All new systems or systems that use a new source of water must demonstrate compliance with the maximum contaminant levels specified in Tables 2-1 and 2-2 within one year of beginning operation. The system must also comply with the initial sampling frequencies specified by the Department to ensure a system can demonstrate compliance with the MCL. Routine and increased monitoring frequencies shall be conducted in accordance with the requirements of sections 6.2.5 for volatile organic Chemical contaminants and 6.2.6 for synthetic organic Chemical contaminants.

(d) The Department has the authority to determine compliance or initiate enforcement action based upon analytical results and other information compiled by their sanctioned representatives and agencies.

(e) Each public water system shall monitor at the time designated by the Department within each compliance period.

6.2.4 Best Available Technology (BAT)

The EPA Administrator, hereby identifies the following, as indicated in the table below, granular activated carbon (GAC), packed tower aeration (PTA), or oxidation (OX) as the best technology treatment technique, or other means available for achieving compliance with the MCL for organic chemical contaminants.

Table 6-3 BAT for Organic Chemical Contaminants Listed in Sections 2.1(a) and (b)

CAS No.	CHEMICAL CONTAMINANTS	GAC	PTA	OX
15972-60-8	Alachlor	X	.	
116-06-3	Aldicarb	X	.	
1646-88-4	Aldicarb sulfone	X	.	
1646-87-3	Aldicarb sulfoxide	X	.	
1912-24-9	Atrazine	X	.	
71-43-2	Benzene	X	X	

CAS No.	CHEMICAL CONTAMINANTS	GAC	PTA	OX
50-32-8	Benzo[a]pyrene	X	.	
1563-66-2	Carbofuran	X	.	
56-23-5	Carbon tetrachloride	X	X	
57-74-9	Chlordane	X	.	
75-99-0	Dalapon	X	.	
94-75-7	2,4-D	X	.	
103-23-1	Di(2-ethylhexyl) adipate	X	X	
117-81-7	Di(2-ethylhexyl) phthalate	X	.	
96-12-8	Dibromochloropropane (DBCP)	X	X	
95-50-1	o-Dichlorobenzene	X	X	
106-46-7	para-Dichlorobenzene	X	X	
107-06-2	1,2-Dichloroethane	X	X	
75-35-4	1,1-Dichloroethylene	X	X	
156-59-2	cis-1,2-DichloroethyleneX	X	X	
156-60-5	trans-1,2-Dichloroethylene	X	X	
75-09-2	Dichloromethane	.	X	
78-87-5	1,2-Dichloropropane	X	X	
88-85-7	Dinoseb	X	.	
85-00-7	Diquat	X	.	
145-73-3	Endothall	X	.	
72-20-8	Endrin	X	.	
100-41-4	Ethylbenzene	X	X	
106-93-4	Ethylene Dibromide (EDB)	X	X	
1071-83-6	Glyphosate	.	.	X
76-44-8	Heptachlor	X	.	

CAS No.	CHEMICAL CONTAMINANTS	GAC	PTA	OX
1024-57-3	Heptachlor epoxide	X	.	
118-74-1	Hexachlorobenzene	X	.	
77-47-3	Hexachlorocyclopentadiene	X	X	
58-89-9	Lindane	X	.	
72-43-5	Methoxychlor	X	.	
108-90-7	Monochlorobenzene	X	X	
23135-22-0	Oxamyl (Vydate)	X	.	.
87-86-5	Pentachlorophenol	X		.
1918-02-1	Picloram	X	.	.
1336-36-3	Polychlorinated biphenyls (PCB)	X	.	.
122-34-9	Simazine	X	.	.
100-42-5	Styrene	X	X	.
1746-01-6	2,3,7,8-TCDD (Dioxin)	X	.	.
127-18-4	Tetrachloroethylene	X	X	.
108-88-3	Toluene	X	X	.
8001-35-2	Toxaphene	X	.	.
93-72-1	2,4,5-TP (Silvex)	X	.	.
120-82-1	1,2,4-TrichlorobenzeneX	X	X	.
71-55-6	1,1,1-Trichloroethane	X	X	.
79-00-5	1,1,2-Trichloroethane	X	X	.
79-01-6	Trichloroethylene	X	X	.
75-01-4	Vinyl chloride	.	X	.
1330-20-7	Xylene	X	X	.

6.2.5 Volatile Organic Chemical Contaminants Monitoring Requirements

(a) Beginning with the initial compliance period, analysis of the contaminants listed in Table 2-1(1) through (21) for the purpose of determining compliance with the maximum contaminant level shall be conducted as follows:

(1) Groundwater systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment (hereafter called a sampling point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source, treatment plant, or within the distribution system.

(2) Surface water systems (or combined surface/ground) shall take a minimum of one sample at points in the distribution system that are representative of each source or at each entry point to the distribution system after treatment (hereafter called a sampling point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source, treatment plant, or within the distribution system.

(3) If the system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water representative of all sources is being used).

(4) Each community and non-transient, non-community water system shall take four consecutive quarterly samples for each contaminant listed in Table 2-1(2) through (21) during each compliance period, beginning in the initial compliance period.

(5) If the initial monitoring for contaminants listed in Table 2-1(1) through (8) and the monitoring for the contaminants listed in Table 2-1(9) through (21) as allowed in section 6.2.5(a)(15) has been completed by December 31, 1992, and the system did not detect any contaminant listed in Table 2-1(1) through (21), then each ground and surface water system shall take one sample annually beginning with the initial compliance period.

(6) After a minimum of three years of annual sampling, the Department may allow groundwater systems with no previous detection of any contaminant listed in Table 2-1 to take one sample during each compliance period.

(7) Each community and non-transient, non-community groundwater system which does not detect a chemical contaminant listed in Table 2-1(a)(1) through (21) may apply to the Department for a waiver from the requirements of sections 6.2.5(a)(5) and 6.2.5(a)(6) after completing the initial monitoring. (For purposes of section 6.2.5, detection is defined as greater than (>) 0.0005 mg/L.) A waiver shall be effective for no more than six years (two compliance periods). The Department may also issue waivers to small systems for the initial round of monitoring for 1,2,4-trichlorobenzene.

(8) The Department may grant a waiver after evaluating the following factor(s):

(i) Knowledge of previous use (including transport, storage, or disposal) of the chemical contaminant within the watershed or zone of influence of the system. If a determination by the Department reveals no previous use of the chemical contaminant within the watershed or zone of influence, a waiver may be granted.

(ii) If previous use of the chemical contaminant is unknown or it has been used previously, then the following factors shall be used to determine whether a waiver is granted.

(A) Previous analytical results.

(B) The proximity of the system to a potential point or non-point source of contamination. Point sources include spills and leaks of chemical

contaminants at or near a water treatment facility or at manufacturing, distribution, or storage facilities, or from hazardous and municipal waste landfills and other waste handling or treatment facilities.

(C) The environmental persistence and transport of the chemical contaminants.

(D) The number of persons served by the public water system and the proximity of a smaller system to a larger system.

(E) How well the water source is protected against contamination, such as whether it is a surface or groundwater system. Groundwater systems must consider factors such as depth of the well, the type of soil, and wellhead protection. Surface water systems must consider watershed protection.

(9) As a condition of the waiver a groundwater system must take one sample at each sampling point during the time the waiver is effective (i.e., one sample during two compliance periods or six years) and update its vulnerability assessment considering the factors listed in section 6.2.5(a)(8). Based on this vulnerability assessment the Department must reconfirm that the system is non-vulnerable. If the Department does not make this reconfirmation within three years of the initial determination, then the waiver is invalidated and the system is required to sample annually as specified in section 6.2.5(a)(5).

(10) Each community and non-transient, non-community surface water system that does not detect a volatile organic chemical contaminant listed in Table 2-1(1)-(21), may apply to the Department for a waiver from the requirements of section 6.2.5(a)(5) after completing the initial monitoring. Composite samples from a maximum of five sampling points are allowed, provided that the detection limit of the method used for analysis is less than one-fifth of the MCL. Systems meeting this criterion must be determined by the Department to be non-vulnerable based on a vulnerability assessment completed during each compliance period. Each system receiving a waiver shall sample at the frequency specified by the Department.

(11) If a volatile organic chemical contaminant listed in Table 2-1(2)-(21) is detected at a level exceeding 0.0005 mg/L in any sample, then:

(i) The system must monitor quarterly at each sampling point that resulted in a detection.

(ii) The Department may decrease the quarterly monitoring requirement specified in section 6.2.5(a)(11)(i) provided it has determined that the system is reliably and consistently below the maximum contaminant level. In no case shall the Department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.

(iii) If the Department determines that the system is reliably and consistently below the MCL, the Department may allow the system to monitor annually. Systems which monitor annually must monitor during the quarter(s) which previously yielded the highest analytical result.

(iv) Systems that have three consecutive annual samples with no detection of a chemical contaminant may apply to the Department for a waiver as specified in section 6.2.5(a)(7).

(v) Groundwater systems which have detected one or more of the following two-carbon organic compounds: trichloroethylene, tetrachloroethylene, 1,2-dichloroethane, 1,1,1-trichloroethane, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, or 1,1-dichloroethylene shall monitor quarterly for vinyl chloride. A vinyl chloride sample shall be taken at each sampling point at which one or more of the two-carbon organic compounds were detected. If the results of the first analysis do not detect vinyl chloride, the Department may reduce the quarterly monitoring frequency of vinyl chloride monitoring to one sample during each compliance period. Surface water systems are required to monitor for vinyl chloride as specified by the Department.

(12) Systems which violate the volatile organic chemical contaminant MCL requirements of Table 2-1(1)-(21), as determined by section 6.2.3(a), must monitor quarterly. After a minimum of four consecutive quarterly samples which show the system is in compliance as specified in section 6.2.3(a) and the Department determines that the system is reliably and consistently below the maximum contaminant level, the system may monitor at the frequency and times specified in section 6.2.5(a)(11)(iii).

(13) The Department may require a confirmation sample for positive or negative results. If a confirmation sample is required by the Department, the result must be averaged with the first sampling result and the average is used for the compliance determination as specified by section 6.2.3(a). The Department has discretion to invalidate results of sampling or analytic errors.

(14) Compositing of Samples:

(i) The Department may reduce the total number of samples a system must analyze by allowing the use of compositing. Composite samples from a maximum of five sampling points are allowed, provided that the detection limit of the method used for analysis is less than one-fifth of the MCL.

(ii) Compositing of samples must be done in the laboratory and analyzed within 14 days of sample collection.

(A) If the concentration in the composite sample is greater than or equal to (≥) 0.0005 mg/L for any volatile organic chemical contaminant listed in Table 2-1, then a follow-up sample must be taken within 14 days at each sampling point included in the composite, and be analyzed for that chemical contaminant.

(B) If duplicates of the original sample taken from each sampling point used in the composite sample are available, the system may use these instead of re-sampling. The duplicates must be analyzed and the results reported to the Department within 14 days after completing analysis of the composite sample, provided the holding time of the sample is not exceeded.

(C) If the population served by the system is greater than (>) 3,300 persons, compositing is only permitted at sampling points within a single system. In systems serving less than or equal to (≤) 3,300 persons, the

compositing is permitted among different systems provided the 5-sample limit is maintained.

(15) The Department may allow the use of monitoring data collected after January 1, 1988, required under section 1445 of the Safe Drinking Water Act for purposes of initial monitoring compliance. If the data are generally consistent with the other requirements of section 6.2.5, the Department may use these data (i.e., a single sample rather than four quarterly samples) to satisfy the initial monitoring requirements of section 6.2.5(a)(4). Systems which use grandfathered samples and did not detect any chemical contaminant listed in Table 2-1(1) through (21) shall begin monitoring annually in accordance with section 6.2.5(a)(5) beginning with the initial compliance period.

(16) States may increase required monitoring where necessary to detect variations within the system.

6.2.6 Synthetic Organic Chemical Contaminant Monitoring Requirements

(a) Analysis of the synthetic organic chemical contaminants, listed in Table 2-2, for the purposes of determining compliance with the maximum contaminant level shall be conducted as follows: [6-2]

6-2 Monitoring for the contaminants aldicarb, aldicarb sulfoxide, and aldicarb sulfone shall be conducted in accordance with §141.40 (Unregulated Contaminant Monitoring Rule).

(1) Groundwater systems shall take a minimum of one sample at every entry point to the distribution system, which is representative of each well after treatment (hereafter called a sampling point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

(2) Surface[6-3] water systems shall take a minimum of one sample at points in the distribution system that are representative of each source or at each entry point to the distribution system after treatment (hereafter called a sampling point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

6-3 For purposes of this paragraph, surface water systems include systems with a combination of surface and ground sources.

(3) If the system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water representative of all sources is being used).

(4) Monitoring frequency:

(i) Each community and non-transient, non-community water system shall take four consecutive quarterly samples for each synthetic organic chemical contaminant, listed in Table 2-2, during each compliance period beginning with the initial compliance period.

(ii) Systems serving more than 3,300 persons that do not detect a chemical contaminant in the initial compliance period may reduce the sampling frequency to a minimum of two quarterly samples in one year during each repeat compliance period.

(iii) Systems serving less than or equal to 3,300 persons which do not detect a chemical contaminant in the initial compliance period may reduce the sampling frequency to a minimum of one sample during each repeat compliance period.

(5) Each community and non-transient water system may apply to the Department for a waiver from the requirement of section 6.2.6(a)(4). A system must reapply for a waiver for each compliance period.

(6) The Department may grant a waiver after evaluating the following factor(s):

(i) Knowledge of previous use (including transport, storage, or disposal) of the chemical contaminant within the watershed or zone of influence of the system. If a determination by the Department reveals no previous use of the chemical contaminant within the watershed or zone of influence, a waiver may be granted.

(ii) If previous use of the chemical contaminant is unknown or it has been used previously, then the following factors shall be used to determine whether a waiver is granted.

(A) Previous analytical results.

(B) The proximity of the system to a potential point or non-point source of contamination. Point sources include spills and leaks of chemical contaminants at or near a water treatment facility or at manufacturing, distribution, or storage facilities, or from hazardous and municipal waste landfills and other waste handling or treatment facilities. Non-point sources include the use of pesticides to control insect and weed pests on agricultural areas, forest lands, home and gardens, and other land application uses.

(C) The environmental persistence and transport of the pesticide or PCBs.

(D) How well the water source is protected against contamination due to such factors as depth of the well and the type of soil and the integrity of the well casing.

(E) Elevated nitrate levels at the water supply source.

(F) Use of PCBs in equipment used in the production, storage, or distribution of water (i.e., PCBs used in pumps, transformers, etc.).

(7) If a synthetic organic chemical contaminant listed in Table 2-2 is detected (as defined by section 10.3.3) in any sample, then:

(i) Each system must monitor quarterly at each sampling point that resulted in a detection.

(ii) The Department may decrease the quarterly monitoring requirement specified in section 6.2.6(a)(7)(i) provided it has determined that the system is reliably and consistently below the maximum contaminant level. In no case will the Department make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.

(iii) After the Department determines the system is reliably and consistently below the maximum contaminant level the Department may allow the system to monitor annually. Systems that monitor annually must monitor during the quarter that previously yielded the highest analytical result.

(iv) Systems that have 3 consecutive annual samples with no detection of a chemical contaminant, may apply to the Department for a waiver as specified in section 6.2.6(a)(6).

(v) If monitoring results in detection of one or more of certain related chemical contaminants (aldicarb, aldicarb sulfone, aldicarb sulfoxide and heptachlor, heptachlor epoxide), then subsequent monitoring shall analyze for all related chemical contaminants.

(8) Systems which violate the synthetic organic chemical contaminant MCL requirements of Table 2-2 as determined by section 6.2.3(b) must monitor quarterly. After a minimum of four quarterly samples show the system is in compliance and the Department determines the system is reliably and consistently below the MCL, as specified in section 6.2.3(b), the system shall monitor at the frequency specified in section 6.2.6(a)(7)(iii).

(9) The Department may require a confirmation sample for positive results and may require a confirmation sample for negative results. If required by the Department, the confirmation sample result must be averaged with the first sampling result and the average used for the compliance determination as specified by section 6.2.3(b). The Department has discretion to invalidate results of sampling or analytic errors.

(10) The Department may reduce the total number of samples a system must analyze by allowing the use of compositing. Composite samples from a maximum of five sampling points are allowed, provided that the detection limit of the method used for analysis is less than one-fifth (< 1/5) of the MCL. Compositing of samples must be done in the laboratory and analyzed within 14 days of sample collection.

(i) If the concentration in the composite sample detects one or more chemical contaminants listed in Table 2-2, then a follow-up sample must be taken within 14 days at each sampling point included in the composite, and be analyzed for that chemical contaminant.

(ii) If duplicates of the original sample taken from each sampling point used in the composite sample are available, the system may use these instead of re-sampling. The duplicates must be analyzed and the results reported to the Department within 14 days after completion of the composite analysis or before the holding time for the initial sample is exceeded whichever is sooner.

(iii) If the population served by the system is greater than (>) 3,300 persons, compositing is only permitted at sampling points within a single system. In systems serving less than or equal to (≤) 3,300 persons, compositing is permitted among different systems provided the 5-sample limit is maintained.

(11) The Department may increase the required monitoring frequency, where necessary, to detect variations within the system (e.g., fluctuations in concentration due to seasonal use, changes in water source).

6.3 Radionuclides

6.3.1 Applicability

Section 6.3 applies to all community public water systems in Colorado.

6.3.2 Monitoring Requirements for Gross Alpha Particle Activity, Radium-226, Radium-228, and Uranium

(a) Community water systems must conduct initial monitoring to determine compliance with the MCLs and MCLGs for Radionuclides, Table 2-7(1), (2), and (4) by December 31, 2007. For the purposes of monitoring for gross alpha particle activity, radium-226, radium-228, and uranium in drinking water, "detection limit" is defined in section 10.4.1(c)(1).

(1) All existing community water systems using groundwater, surface water or systems using both ground and surface water (for the purpose of this section hereafter referred to as systems) must sample at every entry point to the distribution system that is representative of all sources being used (hereafter called a sampling point) under normal operating conditions. The system must take each sample at the same sampling point unless conditions make another sampling point more representative of each source.

(2) All new community water systems or community water systems that use a new source of water must begin to conduct initial monitoring for the new source within the first quarter after initiating use of the source. Community water systems must conduct more frequent monitoring when ordered by the Department in the event of possible contamination or when changes in the distribution system or treatment processes occur which may increase the concentration of radioactivity in finished water.

(b) Systems must conduct initial monitoring for gross alpha particle activity, radium-226, radium-228, and uranium as follows:

(1) Systems without acceptable historical data, as defined below, must collect four consecutive quarterly samples at all sampling points before December 31, 2007.

(2) The Department may allow historical monitoring data collected at a sampling point to satisfy the initial monitoring requirements for that sampling point, for the following situations.

(i) To satisfy initial monitoring requirements, a community water system having only one entry point to the distribution system may use the monitoring data from the last compliance monitoring period that began between June 2000 and December 8, 2003.

(ii) To satisfy initial monitoring requirements, a community water system with multiple entry points and having appropriate historical monitoring data for each entry point to the distribution system may use the monitoring data from the last compliance monitoring period that began between June 2000 and December 8, 2003.

(3) For gross alpha particle activity, uranium, radium-226, and radium-228 monitoring, the Department may waive the final two quarters of initial monitoring for a sampling point if the results of the samples from the previous two quarters are below the detection limit.

(4) If the average of the initial monitoring results for a sampling point is above the MCL, the system must collect and analyze quarterly samples at that sampling point until the system has results from four consecutive quarters that are at or below the MCL, unless the system enters into another schedule as part of a formal compliance agreement with the Department.

(c) The Department may allow community water systems to reduce the future frequency of monitoring from once every three years to once every six or nine years at each sampling point, based on the following criteria.

(1) If the average of the initial monitoring results for each contaminant (i.e., gross alpha particle activity, uranium, radium-226, or radium-228) is below the detection limit specified in section 10.4.1(c)(1), the system must collect and analyze for that contaminant using at least one sample at that sampling point every nine years.

(2) For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is at or above the detection limit but at or below 1/2 the MCL, the system must collect and analyze for that contaminant using at least one sample at that sampling point every six years. For combined radium-226 and radium-228, the analytical results must be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is at or above the detection limit but at or below 1/2 the MCL, the system must collect and analyze for that contaminant using at least one sample at that sampling point every six years.

(3) For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is above 1/2 the MCL but at or below the MCL, the system must collect and analyze at least one sample at that sampling point every three years. For combined radium-226 and radium-228, the analytical results must be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is above 1/2 the MCL but at or below the MCL, the system must collect and analyze at least one sample at that sampling point every three years.

(4) Systems must use the samples collected during the reduced monitoring period to determine the monitoring frequency for subsequent monitoring periods (e.g., if a system's sampling point is on a nine year monitoring period, and the sample result is above 1/2 MCL, then the next monitoring period for that sampling point is three years).

(5) If a system has a monitoring result that exceeds the MCL while on reduced monitoring, the system must collect and analyze quarterly samples at that sampling point until the system has results from four consecutive quarters that are below the MCL, unless the system enters into another schedule as part of a formal compliance agreement with the Department.

(d) COMPOSITING: To fulfill quarterly monitoring requirements for gross alpha particle activity, radium-226, radium-228, or uranium, a system may composite up to four consecutive quarterly samples from a single entry point if analysis is done within a year of the first sample. The Department will treat analytical results from the composited as the average analytical result to determine compliance with the MCLs and the future monitoring frequency. If the analytical result from the composited sample is greater than 1/2 MCL, the Department may direct the system to take additional quarterly samples before allowing the system to sample under a reduced monitoring schedule.

(e) A gross alpha particle activity measurement may be substituted for the required radium-226 measurement provided that the measured gross alpha particle activity does not exceed 5 pCi/L. A gross alpha particle activity measurement may be substituted for the required uranium measurement provided that the measured gross alpha particle activity does not exceed 15 pCi/L. The gross alpha measurement shall have a confidence interval of 95% (1.65σ, where σ is the standard deviation of the net counting rate of the sample) for radium-226 and uranium. When a system uses a gross alpha particle activity measurement in lieu of a radium-226 and/or uranium measurement, the gross alpha particle activity analytical result will be used to determine the future monitoring frequency for radium-226 and/or uranium. If the gross alpha particle activity

result is less than detection, 1/2 the detection limit will be used to determine compliance and the future monitoring frequency.

6.3.3 Monitoring and Compliance Requirements for Beta Particle and Photon Radioactivity

For the purposes of monitoring for beta particle and photon radioactivity in drinking water, "detection limit" is defined in section 10.4.1(c)(2). To determine compliance with the maximum contaminant levels in Table 2-7(3) for beta particle and photon radioactivity, a system must monitor at a frequency as follows:

(a) Community water systems (both surface and groundwater) designated by the Department as vulnerable must sample for beta particle and photon radioactivity. Systems must collect quarterly samples for beta emitters and annual samples for tritium and strontium-90 at each entry point to the distribution system (hereafter called a sampling point), beginning within one quarter after being notified by the Department. Systems already designated by the Department must continue to sample until the Department reviews and either reaffirms or removes the designation.

(1) If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity at a sampling point has a running annual average (computed quarterly) less than or equal to 15 pCi/L (screening level), the Department may reduce the frequency of monitoring at that sampling point to once every 3 years. Systems must collect all samples required in section 6.3.3(a) during the reduced monitoring period.

(2) For systems in the vicinity of a nuclear facility, the Department may allow the community water system to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at the system's entry point(s), where the Department determines if such data is applicable to a particular water system. In the event that there is a release from a nuclear facility, systems that are using surveillance data must begin monitoring at the community water system's entry point(s) in accordance with section 6.3.3(a).

(b) Community water systems (both surface and groundwater) designated by the Department as utilizing waters contaminated by effluents from nuclear facilities must sample for beta particle and photon radioactivity. Systems must collect quarterly samples for beta emitters and iodine-131 and annual samples for tritium and strontium-90 at each entry point to the distribution system (hereafter called a sampling point), beginning within one quarter after being notified by the Department. Systems already designated by the Department as systems using waters contaminated by effluents from nuclear facilities must continue to sample until the Department reviews and either reaffirms or removes the designation.

(1) Quarterly monitoring for gross beta particle activity shall be based on the analysis of monthly samples or the analysis of a composite of three monthly samples. The former is recommended.

(2) For iodine-131, a composite of five consecutive daily samples shall be analyzed once each quarter. As ordered by the Department, more frequent monitoring shall be conducted when iodine-131 is identified in the finished water.

(3) Annual monitoring for strontium-90 and tritium shall be conducted by means of the analysis of a composite of four consecutive quarterly samples or analysis of four quarterly samples. The latter procedure is recommended.

(4) If the gross beta particle activity beta minus the naturally occurring potassium-40 beta particle activity at a sampling point has a running annual average (computed quarterly) less than or equal to 15 pCi/L, the Department may reduce the frequency of monitoring at that sampling point to every 3 years. Systems must collect all samples required in section 6.3.3(b) during the reduced monitoring period.

(5) For systems in the vicinity of a nuclear facility, the Department may allow the community water system to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at the system's entry point(s), where the Department determines if such data is applicable to a particular water system. In the event that there is a release from a nuclear facility, systems that are using surveillance data must begin monitoring at the community water system's entry point(s) in accordance with section 6.3.3(b).

(c) Community water systems designated by the Department to monitor for beta particle and photon radioactivity cannot apply to the Department for a waiver from the monitoring frequencies specified in sections 6.3.3(a) or 6.3.3(b).

(d) Community water systems may analyze for naturally occurring potassium-40 beta particle activity from the same or equivalent sample used for the gross beta particle activity analysis. Systems are allowed to subtract the potassium-40 beta particle activity value from the total gross beta particle activity value to determine if the screening level is exceeded. The potassium-40 beta particle activity must be calculated by multiplying elemental potassium concentrations (in mg/L) by a factor of 0.82.

(e) If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity exceeds the appropriate screening level, an analysis of the sample must be performed to identify the major radioactive constituents present in the sample and the appropriate doses must be calculated and summed to determine compliance with Table 2-7(3), using the formula in section 6.3.6. Doses must also be calculated and combined for measured levels of tritium and strontium to determine compliance.

(f) Systems must monitor monthly at the sampling point(s) that exceed the maximum contaminant level in Table 2-7(3) beginning the month after the exceedance occurs. Systems must continue monthly monitoring until the system has established, by a rolling average of three (3) monthly samples, that the MCL is being met. Systems who establish that the MCL is being met must return to quarterly monitoring until they meet the requirements set forth in section 6.3.3(a)(2) or 6.3.3(b)(1).

6.3.4 General Monitoring and Compliance Requirements for Radionuclides

(a) The Department may require more frequent monitoring than specified in sections 6.3.2 and 6.3.3, or may require confirmation samples at its discretion. The results of the initial and confirmation samples will be averaged for use in compliance determinations.

(b) Each public water system shall monitor at the time designated by the Department during each compliance period.

6.3.5 Compliance Determination

(a) Compliance with MCLs of Table 2-7 will be determined based on the analytical result(s) obtained at each sampling point. If one sampling point is in violation of an MCL, the system is in violation of the MCL.

(1) For systems monitoring more than once per year, compliance with the MCL is determined by a running annual average at each sampling point. If the average of any sampling point is greater than the MCL, then the system is out of compliance with the MCL.

(2) For systems monitoring more than once per year, if any sample result will cause the running average to exceed the MCL at any sample point, the system is out of compliance with the MCL immediately.

(3) Systems must include all samples taken and analyzed under the provisions of this section in determining compliance, even if that number is greater than the minimum required.

(4) If a system does not collect all required samples when compliance is based on a running annual average of quarterly samples, compliance will be based on the running average of the samples collected.

(5) If a sample result is less than the detection limit, zero will be used to calculate the annual average, unless a gross alpha particle activity is being used in lieu of radium-226 and/or uranium. If the gross alpha particle activity result is less than detection, 1/2 the detection limit will be used to calculate the annual average.

(b) The Department may, at its discretion, invalidate results of sampling or analytic errors.

(c) If the MCL for a radionuclide, listed in Table 2-7, is exceeded, the operator of a community water system must give notice to the Department pursuant to section 1.6.4 and to the public as required by Article 9.

(d) To judge compliance with the MCLs listed in Table 2-7, averages of data shall be used and shall be rounded to the same number of significant figures as the maximum contaminant level for the substance in question.

(e) The Department may determine compliance or initiate enforcement action based upon analytical results or other information compiled by Department representatives and agencies.

6.3.6 Calculation of Maximum Contaminant Levels for Beta Particle and Photon Radioactivity

Except for the radionuclides listed in Table 6-4, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents must be calculated on the basis of 2 liter per day drinking water intake using the 168 hour data list in “Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure,” NBS (National Bureau of Standards) Handbook 69 as amended August 1963, U.S. Department of Commerce[6-4]. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 mrem/year.

6-4 Copies of this document are available from the National Technical Information Service, NTIS ADA 280 282, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. The toll-free number is 800-553-6847. Copies may be inspected at EPA’s Drinking Water Docket, 401 M Street, SW, Washington, DC 20460; or at the Office of the Federal Register, 800 North Capitol Street, NW, Suite 700, Washington, DC.

Table 6-4 Average Annual Concentrations Assumed to Produce a Total Body or Organ Dose of 4 mrem/yr

Radionuclide	**Critical Organ**	**picoCurie per liter (pCi/L)**
Tritium	Total body	20,000
Strontium-90	Bone Marrow	8

Best Available Technologies (BATs) and Small Systems Compliance Technologies (SSCTs) for Radionuclides

(a) The EPA Administrator hereby identifies in the following table the best technology available for achieving compliance with the maximum contaminant levels for combined radium-226 and -228, uranium, gross alpha particle activity, and beta particle and photon radioactivity.

Table 6-5 BAT for Combined Radium-226 and Radium-228, Uranium, Gross Alpha Particle Activity, and Beta Particle and Photon Radioactivity

.	**Contaminant**	**BAT**
1	Combined radium-226 and radium-228	Ion exchange, reverse osmosis, lime softening.
2	Uranium	Ion exchange, reverse osmosis, lime softening, coagulation/filtration.
3	Gross alpha particle activity (excluding radon and uranium)	Reverse osmosis.
4	Beta particle and photon radioactivity	Ion exchange, reverse osmosis.

(b) Small systems compliance technologies list for radionuclides.

Table 6-6 List of Small Systems Compliance Technologies for Radionuclides and Limitations to Use

.	**Unit technologies**	**Limitations**	**Operator skill level required[1]**	**Raw water quality range and considerations[1]**
1	Ion exchange (IE)	(a)	Intermediate	All ground waters.
2	Point of use (POU[2]) IE	(b)	Basic	All ground waters.
3	Reverse osmosis (RO)	(c)	Advanced	Surface waters usually require pre-filtration.
4	POU[2] RO	(b)	Basic	Surface waters usually require pre-filtration.
5	Lime softening	(d)	Advanced	All waters.
6	Green sand filtration	(e)	Basic	.
7	Co-precipitation with Barium sulfate	(f)	Intermediate to Advanced	Ground waters with suitable water quality.
8	Electrodialysis/ electrodialysis reversal	.	Basic to Intermediate	All ground waters.
9	Pre-formed hydrous Manganese oxide filtration	(g)	Intermediate	All ground waters.
10	Activated alumina	(a), (h)	Advanced	All ground waters; competing anion concentrations may affect regeneration frequency.
11	Enhanced coagulation/filtration	(i)	Advanced	Can treat a wide range of water qualities.

1 National Research Council (NRC). Safe Water from Every Tap: Improving Water Service to Small Communities. National Academy Press. Washington, D.C. 1997.

2 POU devices are typically installed at the kitchen faucet or other point of end use (i.e. drinking fountain, ice maker, etc.). See the April 21, 2000 NODA for more details.

Limitations of "Unit Technologies" Listed in Table 6-6:

(a) The regeneration solution contains high concentrations of the contaminant ions. Disposal options should be carefully considered before choosing this technology.

(b) When POU devices are used for compliance, programs for long-term operation, maintenance, and monitoring must be provided by water utility to ensure proper performance.

(c) Reject water disposal options should be carefully considered before choosing this technology. See other RO limitations described in the SWTR Compliance Technologies Table.

(d) The combination of variable source water quality and the complexity of the water chemistry involved may make this technology too complex for small surface water systems.

(e) Removal efficiencies can vary depending on water quality.

(f) This technology may be very limited in application to small systems. Since the process requires static mixing, detention basins, and filtration, it is most applicable to systems with sufficiently high sulfate levels that already have a suitable filtration treatment train in place.

(g) This technology is most applicable to small systems that already have filtration in place.

(h) Handling of chemicals required during regeneration and pH adjustment may be too difficult for small systems without an adequately trained operator.

(i) Assumes modification to a coagulation/filtration process already in place.

Table 6-7 Compliance Technologies by System Size Category

Contaminant	**Compliance Technologies 1 For System Size Categories (population served)**		
.	25—500	501—3,300	3,301—10,000
Combined radium-226 and radium-228	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7. 8, 9
Gross alpha particle activity	3, 4	3, 4	3, 4.
Beta particle activity and photon activity	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4.
Uranium	1, 2, 4, 10, 11	1, 2, 3, 4, 5, 10, 11	1, 2, 3, 4, 5, 10, 11.

1 These numbers correspond to the "Unit Technologies" listed in the Table 6-6 of section 6.3.7(b). These numbers correspond to the "Unit Technologies" listed in the Table 6-6 of section 6.3.7(b).

6.4 Unregulated Contaminant Monitoring

All community and non-transient, non-community water systems shall monitor for the unregulated contaminants as described in 40 CFR 141.40.

Article 7 Filtration, Disinfection, and Disinfection Byproducts

7.1 Filtration and Disinfection for Surface Water

7.1.1 General Requirements

(a) The requirements of this section 7.1 establish criteria under which filtration is required as a treatment technique for public water systems supplied by a surface water source and public water systems supplied by a groundwater source under the direct influence of surface water. In addition, these regulations establish treatment technique requirements for the following contaminants: Giardia lamblia, viruses, heterotrophic plate count bacteria, Legionella, and turbidity. Each public water system with a surface water source or a groundwater source under the direct influence of surface water must provide treatment of that source water that complies with these treatment technique requirements. The treatment technique requirements consist of installing and properly operating water treatment processes which reliably achieve:

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

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

(b) A public water system using a surface water source or a groundwater source under the direct influence of surface water is considered to be in compliance with the requirements of section 7.1.1(a) if it meets the filtration requirements in section 7.1.3 and the disinfection requirements in section 7.1.2.

(c) Each public water system using a surface water source or a groundwater source under the direct influence of surface water must be operated by qualified personnel who meet the requirements of Regulation 100 for operator certification.

(d) In addition to complying with requirements in this section 7.1, public water systems serving 10,000 or more people must also comply with the requirements in section 7.2 of this Article 7.

(e) In addition to complying with requirements in this section 7.1, public water systems serving fewer than 10,000 people must also comply with the requirements in section 7.3 of this Article 7 beginning on January 1, 2005 unless otherwise specified.

7.1.2 Disinfection

(a) If the Department has determined that a system must install filtration, the system shall take such action to protect the public health as the Department determines to be necessary before filtration is installed. A system that uses a surface water source or a groundwater source under the direct influence of surface water must provide the disinfection treatment specified in section 7.1.2(c).

(1) Once a groundwater source has been determined, through the results of an microscopic particulate analysis (MPA), visual well inspection or correlation of source water parameters with surface conditions, to be under the direct influence of surface water, the system must provide disinfection treatment as specified in section 7.1.2(c) beginning 60 days from the date the system has been reclassified.

(b) Failure to meet any requirement of this section 7.1.2 is a treatment technique violation.

(c) Disinfection requirements for public water systems which provide filtration. Each public water system that provides filtration treatment must provide disinfection treatment as follows.

(1) The disinfection treatment must be sufficient to ensure that the total treatment processes of that system achieve at least 99.9 percent (3-log) inactivation and/or removal of Giardia lamblia cysts and at least 99.99 percent (4-log) inactivation and/or removal of viruses, as determined by the Department.

(2) The residual disinfectant concentration in the water entering the distribution system, measured as specified in sections 7.1.4(a)(2) and 10.5.1(a)(2), cannot be less than 0.2 mg/L for more than 4 hours.

(3) The residual disinfectant concentration in the distribution system:

(i) The residual disinfectant concentration in the distribution system, measured as total chlorine, free chlorine or chlorine dioxide, as specified in sections 7.1.4(a)(3) and 10.5.1(a)(2), cannot be undetectable in more than 5 percent of the samples each month, for any two consecutive months that the system serves water to the public. Water in the distribution system with a heterotrophic bacteria concentration less than or equal to 500/mL, measured as heterotrophic plate count (HPC) as specified in section 10.5.1, is deemed to have a detectable disinfectant residual for purposes of determining compliance with this requirement. Thus, the value "V" in the following formula cannot exceed 5 percent in one month, for any two consecutive months:

$$V=((c+d+e)/(a+b)) * 100$$

where:

a = number of instances where the residual disinfectant concentration is measured;

b = number of instances where the residual disinfectant concentration is not measured but heterotrophic bacteria plate count (HPC) is measured;

c = number of instances where the residual disinfectant concentration is measured but not detected and no HPC is measured;

d = number of instances where no residual disinfectant concentration is detected and where the HPC is >500/mL; and

e = number of instances where the residual disinfectant concentration is not measured and HPC is >500/mL.

(ii) If the Department determines, based on site-specific considerations, that a system has no means for having a sample transported and analyzed for HPC by a certified laboratory under the requisite time and temperature conditions specified in section 10.5.1(a)(1) and that the system is providing adequate disinfection in the distribution system, the requirements of section 7.1.2(c)(3)(i) do not apply.

7.1.3 Filtration

7.1 Filtration and Disinfection for Surface Water

(a) A public water system that uses a surface water source or a groundwater source under the direct influence of surface water and serves 10,000 or more people must provide treatment consisting of both disinfection, as specified in section 7.1.2, and filtration treatment which complies with the requirements of Sections 7.1.3(f) or (g) or Sections 7.2.3(a), (b) or (c).

(b) A public water system that uses a surface water source or a groundwater source under the direct influence of surface water and serves fewer than 10,000 people must provide treatment consisting of both disinfection, as specified in section 7.1.2, and filtration treatment which complies with the requirements of section 7.1.3(e), (f), (g) or (h) through December 31, 2004. Beginning January 1, 2005, these systems must provide treatment consisting of both disinfection, as specified in section 7.1.2, and filtration treatment which complies with the requirements of Sections 7.1.3(f) or (g) or Sections 7.3.4(a), (b) or (c).

(c) Failure to meet any requirement of this section 7.1.3 is a treatment technique violation

(d) Once a groundwater source has been determined, through the results of an MPA, visual well inspection or correlation of source water parameters with surface conditions, to be under the direct influence of surface water, the system must install filtration treatment designed to meet the turbidity requirements specified in section 7.1.3(e), (f), (g) or (h), section 7.2.3(a), (b) or (c), or section 7.3.4(a), (b), or (c) within 18 months of written notice from the Department.

(e) Conventional filtration treatment or direct filtration.

(1) For systems using conventional filtration or direct filtration, the turbidity level of representative samples of a system's filtered water must be less than or equal to 0.5 NTU in at least 95 percent of the measurements taken each month, measured as specified in sections 7.1.4(a)(1) and 10.5.1(a)(1), except that if the Department determines that the system is capable of achieving at least 99.9 percent removal and/or inactivation of Giardia lamblia cysts at some turbidity level higher than 0.5 NTU in at least 95 percent of the measurements taken each month, the Department may substitute this higher turbidity limit for that system. However, in no case may the Department approve a turbidity limit that allows more than 1 NTU in more than 5 percent of the samples taken each month, measured as specified in sections 7.1.4(a)(1) and 10.5.1(a)(1).

(2) The turbidity level of representative samples of a system's filtered water must at no time exceed 5 NTU, measured as specified in sections 7.1.4(a)(1) and 10.5.1(a)(1).

(f) Slow sand filtration.

(1) For systems using slow sand filtration, the turbidity level of representative samples of a system's filtered water must be less than or equal to 1 NTU in at least 95 percent of the measurements taken each month, measured as specified in sections 7.1.4(a)(1) and 10.5.1(a)(1), except that if the Department determines there is no significant interference with disinfection at a higher turbidity level, the Department may substitute this higher turbidity limit for that system.

(2) The turbidity level of representative samples of a system's filtered water must at no time exceed 5 NTU, measured as specified in sections 7.1.4(a)(1) and 10.5.1(a)(1).

(g) Diatomaceous earth filtration.

(1) For systems using diatomaceous earth filtration, the turbidity level of representative samples of a system's filtered water must be less than or equal to 1 NTU in at least 95 percent of the measurements taken each month, measured as specified in sections 7.1.4(a)(1) and 10.5.1(a)(1).

(2) The turbidity level of representative samples of a system's filtered water must at no time exceed 5 NTU, measured as specified in sections 7.1.4(a)(1) and 10.5.1(a)(1).

(h) Other filtration technologies. A public water system may use a filtration technology not listed in sections 7.1.3(e) -(g) if it demonstrates to the Department, using pilot plant studies or other means, that the alternative filtration technology, in combination with disinfection treatment that meets the requirements of section 7.1.3, consistently achieves 99.9 percent removal and/or inactivation of Giardia lamblia cysts and 99.99 percent removal and/or inactivation of viruses. For a system that makes this demonstration, the requirements of section 7.1.3(f) shall apply.

7.1.4 Monitoring Requirements

(a) Monitoring requirements for systems using filtration treatment. A public water system that uses a surface water source or a groundwater source under the influence of surface water must monitor in accordance with this section 7.1.4. Groundwater systems found to be under the influence must begin monitoring in accordance with this section 7.1.4 beginning 18 months following written notification from the Department.

(1) Turbidity measurements as required by section 7.1.3 must be performed every four hours (or more frequently) on samples of water collected from a location representative of the combined filtered water provided to the public. A public water system may substitute continuous turbidity monitoring for grab sample monitoring if it validates the continuous measurement for accuracy on a regular basis using a protocol approved by the Department. For any systems using slow sand filtration or filtration treatment other than conventional treatment, direct filtration, or diatomaceous earth filtration, the Department may reduce the sampling frequency to once per day if it determines that less frequent monitoring is sufficient to indicate effective filtration performance. For systems serving 500 or fewer persons, the Department may reduce the turbidity sampling frequency to once per day, regardless of the type of filtration treatment used, if the Department determines that less frequent monitoring is sufficient to indicate effective filtration performance.

(2) The residual disinfectant concentration of the water entering the distribution system must be monitored continuously, and the lowest value must be recorded each day, except that if there is a failure in the continuous monitoring equipment, grab sampling every 4 hours may be conducted in lieu of continuous monitoring, but for no more than 5 working days following the failure of the equipment, and systems serving 3,300 or fewer persons may take grab samples in lieu of providing continuous monitoring on an ongoing basis at the frequencies each day prescribed below:

Table 7-1 Minimum Grab Samples in the Event of Continuous Monitor Equipment Failure

System size by population	Samples/day[1]
≤ 500	1
501 – 1,000	2
1,001 – 2,500	3
2,501 – 3,300	4

1 When more than one sample is required, each sample must be taken at a different time during the day. The sampling intervals are subject to Department review and approval.

If at any time the residual disinfectant concentration entering the distribution system falls below 0.2 mg/L in a system using grab sampling in lieu of continuous monitoring, the system must take a grab sample every 4 hours until the residual disinfectant concentration is equal to or greater than 0.2 mg/L.

(3) (i) The residual disinfectant concentration must be measured at least at the same points in the distribution system and at the same time as total coliforms are sampled, as specified in section 5.1.1, except that the Department may allow a public water system which uses both a surface water source or a groundwater source under direct influence of surface water, and a groundwater source to take disinfectant residual samples at points other than the total coliform sampling points if the Department determines that such points are more representative of treated (disinfected) water quality within the distribution system. Heterotrophic bacteria, measured as heterotrophic plate count (HPC) as specified in section 10.5.1(a)(1), may be measured in lieu of residual disinfectant concentration.

(ii) If the Department determines, based on site-specific considerations, that a system has no means for having a sample transported and analyzed for HPC by a certified laboratory under the requisite time and temperature conditions specified by section 10.5.1(a)(1) and that the system is providing adequate disinfection in the distribution system, the requirements of section 7.1.4(a)(3)(i) do not apply to that system.

7.1.5 Reporting and Recordkeeping Requirements

(a) A public water system that uses a surface water source or a groundwater source under the direct influence of surface water and provides filtration treatment must report monthly to the Department the information specified in this section 7.1.5.

(1) Turbidity measurements as required by section 7.1.4(a)(1) must be reported within 10 days after the end of each month the system serves water to the public. Information that must be reported includes:

(i) The total number of filtered water turbidity measurements recorded during the month.

(ii) The number and percentage of filtered water turbidity measurements recorded during the month which are less than or equal to the turbidity limits specified in section 7.1.3 for the filtration technology being used.

(iii) The date and value of any turbidity measurements taken during the month, which exceed 5 NTU.

(2) Disinfection information specified in section 7.1.4(a)(2) – (3) must be reported to the Department within 10 days after the end of each month the system serves water to the public. Information that must be reported includes:

(i) For each day, the lowest measurement of residual disinfectant concentration in mg/L in water entering the distribution system.

(ii) The date and duration of each period when the residual disinfectant concentration in water entering the distribution system fell below 0.2 mg/L and when the Department was notified of the occurrence.

(iii) The following information on the samples taken in the distribution system in conjunction with total coliform monitoring pursuant to section 7.1.2:

(A) Number of instances where the residual disinfectant concentration is measured;

(B) Number of instances where the residual disinfectant concentration is not measured but heterotrophic bacteria plate count (HPC) is measured;

(C) Number of instances where the residual disinfectant concentration is measured but not detected and no HPC is measured;

(D) Number of instances where no residual disinfectant concentration is detected and where HPC is >500/mL;

(E) Number of instances where the residual disinfectant concentration is not measured and HPC is >500/mL;

(F) For the current and previous month the system serves water to the public, the value of "V" in the following formula:

*V=((c+d+e)/(a+b)) * 100*

where:

a = the value in section 7.1.5(a)(2)(iii)(A),

b = the value in section 7.1.5(a)(2)(iii)(B),

c = the value in section 7.1.5(a)(2)(iii)(C),

d = the value in section 7.1.5(a)(2)(iii)(D), and

e = the value in section 7.1.5(a)(2)(iii)(E).

(G) If the Department determines, based on site-specific considerations, that a system has no means for having a sample transported and analyzed for HPC by a certified laboratory within the requisite time and temperature conditions specified by section 10.5.1(a)(1) and that the system is providing adequate disinfection in the distribution system, the requirements of Sections 7.1.5(a)(2)(iii) (A)-(F) do not apply.

(iv) A system need not report the data listed in section 7.1.5(a)(2)(i) if all data listed in section 7.1.5(a)(2) (i)-(iii) remain on file at the system and the Department determines that the system has submitted all the information required by section 7.1.5(a)(2) (i)-(iii) for at least 12 months.

(3) (i) Each system, upon discovering that a waterborne disease outbreak potentially attributable to that water system has occurred, must report that occurrence to the Department as soon as possible, but no later than by the end of the next business day.

(ii) If at any time the turbidity exceeds 5 NTU, the system must consult with the Department as soon as practical, but no later than 24 hours after the exceedance is known, in accordance with the public notification requirements under Article 9.

(iii) If at any time the residual falls below 0.2 mg/L in the water entering the distribution system, the system must notify the Department as soon as possible, but no later than by the end of the next business day. The system also must notify the Department by the end of the next business day whether or not the residual was restored to at least 0.2 mg/L within 4 hours.

7.2 Enhanced Surface Water Treatment – Systems Serving 10,000 or More

7.2.1 General Requirements

(a) The requirements of this section 7.2 constitute national primary drinking water regulations. These regulations establish requirements for filtration and disinfection that are in addition to criteria under which filtration and disinfection are required under section 7.1. The requirements of this section 7.2 are applicable to surface water or groundwater under the direct influence of surface water systems serving 10,000 or more people. The regulations in this section 7.2 establish or extend treatment technique requirements in lieu of maximum contaminant levels for the following contaminants: Giardia lamblia, viruses, heterotrophic plate count bacteria, Legionella, Cryptosporidium, and turbidity. Each surface water or groundwater under the direct influence of surface water system serving 10,000 or more people must provide treatment of its source water that complies with these treatment technique requirements and are in addition to those identified in section 7.1. The treatment technique requirements consist of installing and properly operating water treatment processes which reliably achieve:

(1) At least 99 percent (2-log) removal of Cryptosporidium between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer.

(2) Compliance with the profiling and benchmark requirements under the provisions of section 7.2.2.

(b) A public water system subject to the requirements of this section 7.2 is considered to be in compliance with the requirements of section 7.2.1(a) if:

(1) It meets the applicable filtration requirements in either section 7.1.3 or section 7.2.3, the disinfection requirements in section 7.1.2 and the disinfection profiling requirements in section 7.2.2.

(c) Systems are not permitted to begin construction of uncovered finished water storage facilities.

(d) Surface water or groundwater under the direct influence of surface water systems that did not conduct optional monitoring under section 7.2.2 because they served fewer than 10,000 persons when such monitoring was required, but serve 10,000 or more persons prior to January 1, 2005 must comply with sections 7.2.1, 7.2.3, 7.2.4, and 7.2.5. These systems must also consult with the Department to establish a disinfection benchmark. A system that decides to make a significant change to its disinfection practice, as described in section 7.2.2(c)(1)(i) - (iv) must consult with the Department prior to making such change

7.2.2 Disinfection Profiling and Benchmarking

(a) Disinfection Profiling

(1) The system must monitor daily for a period of 12 consecutive calendar months to determine the total logs of inactivation for each day of operation, based on the CT99.9 values in section 10.6, as appropriate, through the entire treatment plant. As a minimum, the system with a single point of disinfectant application prior to entrance to the

distribution system must conduct the monitoring in sections 7.2.2(a)(1)(i) -(iv). A system with more than one point of disinfectant application must conduct the monitoring in sections 7.2.2(a)(1)(i) - (iv) for each disinfection segment. The system must monitor the parameters necessary to determine the total inactivation ratio, using analytical methods in sections 10.2.2(a) and 10.5.1(a)(2), as follows:

(i) The temperature of the disinfected water must be measured once per day at each residual disinfectant concentration sampling point during peak hourly flow.

(ii) If the system uses chlorine, the pH of the disinfected water must be measured once per day at each chlorine residual disinfectant concentration sampling point during peak hourly flow.

(iii) The disinfectant contact time(s) ("T") must be determined for each day during peak hourly flow.

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

(2) In lieu of the monitoring conducted under the provisions of section 7.2.2(a)(1) to develop the disinfection profile, the system may elect to meet the requirements of section 7.2.2 (a)(2)(i). In addition to the monitoring conducted under the provisions of section 7.2.2(a)(1) to develop the disinfection profile, the system may elect to meet the requirements of section 7.2.2(a)(2)(ii).

(i) A PWS that has three years of existing operational data may submit that data, a profile generated using that data, and a request that the Department approve use of that data in lieu of monitoring under the provisions of section 7.2.2(a)(1). The Department must determine whether these operational data are substantially equivalent to data collected under the provisions of section 7.2.2(a)(1). These data must also be representative of Giardia lamblia inactivation through the entire treatment plant and not just of certain treatment segments. Until the Department approves this request, the system is required to conduct monitoring under the provisions of section 7.2.2(a)(1).

(ii) In addition to the disinfection profile generated under section 7.2.2(a)(1) of this section, a PWS that has existing operational data may use those data to develop a disinfection profile for additional years. Such systems may use these additional yearly disinfection profiles to develop a benchmark under the provisions of section 7.2.2(b) of this section. The Department must determine whether these operational data are substantially equivalent to data collected under the provisions of section 7.2.2(a)(1). These data must also be representative of inactivation through the entire treatment plant and not just of certain treatment segments.

(3) The system must calculate the total inactivation ratio as follows:

(i) If the system uses only one point of disinfectant application, the system may determine the total inactivation ratio for the disinfection segment based on either of the methods in section 7.2.2(a)(3)(i)(A) or (B).

(A) Determine one inactivation ratio (CTcalc/CT99.9) before or at the first customer during peak hourly flow.

(B) Determine successive CTcalc/CT99.9 values, representing sequential inactivation ratios, between the point of disinfectant application and a point before or at the first customer during peak hourly flow. Under this alternative, the system must calculate the total inactivation ratio by determining (CTcalc/CT99.9) for each sequence and then adding the (CTcalc/CT99.9) values together to determine (Σ (CTcalc/CT99.9)).

(ii) If the system uses more than one point of disinfectant application before the first customer, the system must determine the CT value of each disinfection segment immediately prior to the next point of disinfectant application, or for the final segment, before or at the first customer, during peak hourly flow. The (CTcalc/CT99.9) value of each segment and (Σ (CTcalc/CT99.9)) must be calculated using the method in section 7.2.2(a)(3)(i)(B).

(iii) The system must determine the total logs of inactivation by multiplying the value calculated in section 7.2.2(a)(3)(i) or (ii) by 3.0.

(4) A system that uses either chloramines or ozone for primary disinfection must also calculate the logs of inactivation for viruses using a method approved by the Department.

(5) The system must retain disinfection profile data in graphic form, as a spreadsheet, or in some other format acceptable to the Department for review as part of sanitary surveys conducted by the Department.

(b) Disinfection benchmarking.

(1) Any system required to develop a disinfection profile, in accordance with section 7.2.2(a), that decides to make a significant change to its disinfection practice must consult with the Department prior to making such change. Significant changes to disinfection practice are:

(i) Changes to the point of disinfection;

(ii) Changes to the disinfectant(s) used in the treatment plant;

(iii) Changes to the disinfection process; and

(iv) Any other modification identified by the Department.

(2) Any system, required to develop a disinfection profile in accordance with 7.2.2(a), that is modifying its disinfection practice must calculate its disinfection benchmark using the procedure specified in Sections 7.2.2(b)(2)(i) through (ii).

(i) For each year of profiling data collected, the system must determine the lowest average monthly Giardia lamblia inactivation in each year of profiling data. The system must determine the average Giardia lamblia inactivation for each calendar month for each year of profiling data by dividing the sum of daily Giardia lamblia of inactivation by the number of values calculated for that month.

(ii) The disinfection benchmark is the lowest monthly average value (for systems with one year of profiling data) or average of lowest monthly average values (for systems with more than one year of profiling data) of the monthly logs of Giardia lamblia inactivation in each year of profiling data.

(3) A system that uses either chloramines or ozone for primary disinfection must also calculate the disinfection benchmark for viruses using a method approved by the Department.

(4) The system must submit the following information to the Department as part of its consultation process:

(i) A description of the proposed change;

(ii) The disinfection profile for Giardia lamblia (and, if necessary, viruses) under section 7.2.2(a) and benchmark as required by section 7.2.2(b)(2); and

(iii) An analysis of how the proposed change will affect the current levels of disinfection.

7.2.3 Filtration

A public water system subject to the requirements of this section 7.2 must provide treatment consisting of both disinfection, as specified in section 7.1.2, and filtration treatment which complies with the requirements of section 7.2.3(a), (b) or (c) or section 7.1.3 (f) or (g).

(a) Conventional filtration treatment or direct filtration.

(1) For systems using conventional filtration or direct filtration, the turbidity level of representative samples of a system's filtered water must be less than or equal to 0.3 NTU in at least 95 percent of the measurements taken each month, measured as specified in section 10.5.1(a).

(2) The turbidity level of representative samples of a system's filtered water must at no time exceed 1 NTU, measured as specified in section 10.5.1(a).

(3) A system that uses lime softening may acidify representative samples prior to analysis using a protocol approved by the Department.

(b) Alternative Filtration Technologies

(1) The following table describes the maximum combined filter effluent turbidity limit that a system must not exceed at any time during the month a system serves water to the public. Table 7-2 details the required limits depending upon a specific filtration technology.

Table 7-2 Maximum Turbidity Limits

If your system consists of * * *	**Your maximum turbidity value is * * ***
(i) Membrane Filtration[1]	1 NTU
(ii) Cartridge Filtration	5 NTU
(iii) Bag Filtration	5 NTU

1 Membrane Filtration includes cross-flow membrane filtration (CMF) technologies, such as Microfiltration, Ultrafiltration, Nanofiltration and Reverse Osmosis.

(2) Table 7-3 describes the combined filter effluent “95th percentile” turbidity limit that a system must meet in at least 95 percent of the turbidity measurements taken each month

a system serves water to the public. Table 7-3 details the required limits depending upon a specific filtration technology.

Table 7-3 95th Percentile Turbidity Levels

If your system consists of * * *	**Your 95th percentile turbidity value is * * ***
(i) Membrane Filtration[1]	0.3 NTU
(ii) Cartridge Filtration	1 NTU
(iii) Bag Filtration	1 NTU

1 Membrane Filtration includes cross-flow membrane filtration (CMF) technologies, such Microfiltration, Ultrafiltration, Nanofiltration and Reverse Osmosis.

(c) Filtration technologies other than conventional filtration treatment, direct filtration, slow sand filtration or diatomaceous earth filtration. A public water system may use a filtration technology not listed in Sections 7.2.3(a) or (b) or in section 7.1.3 (f) or (g) if it demonstrates to the Department, using pilot plant studies or other means, that the other filtration technology, in combination with disinfection treatment that meets the requirements of section 7.1.2, consistently achieves 99.9 percent removal and/or inactivation of Giardia lamblia cysts and 99.99 percent removal and/or inactivation of viruses, and 99 percent removal of Cryptosporidium oocysts, and the Department approves the use of the other filtration technology. For each approval, the Department will set turbidity performance requirements that the system must meet at least 95 percent of the time and that the system may not exceed at any time at a level that consistently achieves 99.9 percent removal and/or inactivation of Giardia lamblia cysts, 99.99 percent removal and/or inactivation of viruses, and 99 percent removal of Cryptosporidium oocysts.

7.2.4 Filtration Sampling Requirements

(a) Monitoring requirements for systems using filtration treatment. In addition to monitoring required by section 7.1.4, a public water system subject to the requirements of this section 7.2 that provides conventional filtration treatment or direct filtration must conduct continuous monitoring of turbidity for each individual filter using an approved method in section 10.5.1(a) and must calibrate turbidimeters using the procedure specified by the manufacturer. Systems must record the results of individual filter monitoring every 15 minutes.

(b) If there is a failure in the continuous turbidity monitoring equipment, the system must conduct grab sampling every four hours in lieu of continuous monitoring, but for no more than five working days following the failure of the equipment.

7.2.5 Reporting and Recordkeeping Requirements

In addition to the reporting and recordkeeping requirements in section 7.1.5, a public water system subject to the requirements of this section 7.2 that provides conventional filtration treatment or direct filtration must report monthly to the Department the information specified in sections 7.2.5(a) and (b). In addition to the reporting and recordkeeping requirements in section 7.1.5, a public water system subject to the requirements of this section 7.2 that provides filtration approved under sections 7.2.3(b) or (c) must report monthly to the Department the information specified in section 7.2.5(a). The reporting in section 7.2.5(a) is in lieu of the reporting specified in section 7.1.5.

(a) Turbidity measurements as required by Section 7.2.3 must be reported within 10 days after the end of each month the system serves water to the public. Information that must be reported includes:

(1) The total number of filtered water turbidity measurements taken during the month.

(2) The number and percentage of filtered water turbidity measurements taken during the month which are less than or equal to the turbidity limits specified in Sections 7.2.3(a), (b) or (c).

(3) The date and value of any turbidity measurements taken during the month which exceed 1 NTU for systems using conventional filtration treatment or direct filtration, or which exceed the maximum level set by the Department under section 7.2.3(b) or (c).

(b) Systems must maintain the results of individual filter monitoring taken under section 7.2.4 for at least three years. Systems must report that they have conducted individual filter turbidity monitoring under section 7.2.4 within 10 days after the end of each month the system serves water to the public. Systems must report individual filter turbidity measurement results taken under section 7.2.4 within 10 days after the end of each month the system serves water to the public only if measurements demonstrate one or more of the conditions in sections 7.2.5(b)(1) through (4). Systems that use lime softening may apply to the Department for alternative exceedance levels for the levels specified in sections 7.2.5(b)(1) through (4) if they can demonstrate that higher turbidity levels in individual filters are due to lime carryover only and not due to degraded filter performance.

(1) For any individual filter that has a measured turbidity level of greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart, the system must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, the system must either produce a filter profile for the filter within 7 days of the exceedance (if the system is not able to identify an obvious reason for the abnormal filter performance) and report that the profile has been produced or report the obvious reason for the exceedance.

(2) For any individual filter that has a measured turbidity level of greater than 0.5 NTU in two consecutive measurements taken 15 minutes apart at the end of the first four hours of continuous filter operation after the filter has been backwashed or otherwise taken offline, the system must report the filter number, the turbidity, and the date(s) on which the exceedance occurred. In addition, the system must either produce a filter profile for the filter within 7 days of the exceedance (if the system is not able to identify an obvious reason for the abnormal filter performance) and report that the profile has been produced or report the obvious reason for the exceedance.

(3) For any individual filter that has a measured turbidity level of greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of three consecutive months, the system must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, the system must conduct a self-assessment of the filter within 14 days of the exceedance and report that the self-assessment was conducted. The self assessment must consist of at least the following components: assessment of filter performance; development of a filter profile; identification and prioritization of factors limiting filter performance; assessment of the applicability of corrections; and preparation of a filter self-assessment report.

(4) For any individual filter that has a measured turbidity level of greater than 2.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of two consecutive months, the system must report the filter number, the turbidity measurement, and the date(s) on which the exceedance occurred. In addition, the system must arrange for the conduct of a comprehensive performance evaluation by the Department or a third party approved by the Department no later than 30 days following the exceedance and have the evaluation completed and submitted to the Department no later than 90 days following the exceedance.

(c) Additional reporting requirements.

(1) If at any time the combined filter effluent turbidity exceeds 1 NTU in representative samples of filtered water in a system using conventional filtration treatment or direct filtration, the system must inform the Department as soon as possible, but no later than the end of the next business day.

(2) If at any time the combined filter effluent turbidity in representative samples of filtered water exceeds the maximum level set by the Department under section 7.2.3(b) or (c) for filtration technologies other than conventional filtration treatment, direct filtration, slow sand filtration, or diatomaceous earth filtration, the system must inform the Department as soon as possible, but no later than the end of the next business day.

7.3 Enhanced Surface Water Treatment – Systems Serving Fewer Than 10,000

7.3.1 General Requirements

(a) These regulations establish requirements for filtration and disinfection that are in addition to criteria under which filtration and disinfection are required under section 7.1. The regulations in this Article establish or extend treatment technique requirements in lieu of maximum contaminant levels for the following contaminants: Giardia lamblia, viruses, heterotrophic plate count bacteria, Legionella, Cryptosporidium and turbidity. The requirements of this section 7.3 are applicable to surface water or groundwater under the direct influence of surface water systems serving fewer than 10,000 people, beginning January 1, 2005 unless otherwise specified. The treatment technique requirements consist of installing and properly operating water treatment processes which reliably achieve:

(1) At least 99 percent (2-log) removal of Cryptosporidium between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer.

(2) Compliance with the profiling and benchmark requirements under the provisions of section 7.3.2.

(b) There are six requirements of this Article, and systems must comply with all requirements that are applicable. These requirements are:

(1) Systems must cover any finished water reservoir that they began to construct as described in section 7.3.1(c);

(2) Community and non-transient, non-community water systems must develop a disinfection profile as described in section 7.3.2(a) through (g);

(3) Systems considering making a significant change to their disinfection practices must develop a disinfection benchmark and consult with the Department for approval of the change as described in section 7.3.3;

(4) Systems must comply with the combined filter effluent requirements as described in section 7.3.4;

(5) Systems using conventional or direct filtration must comply with the individual filter turbidity requirements as described section 7.3.5; and

(6) Systems must comply with the applicable reporting and recordkeeping requirements as described in sections 7.3.6 and 1.6.3.

(c) Construction of uncovered finished water storage facilities is prohibited.

7.3.2 Disinfection Profile

(a) If you are a community or non-transient, non-community surface water or groundwater under the direct influence of surface water system which serves fewer than 10,000 persons, your system must develop a disinfection profile unless the Department determines in accordance with section 7.3.2 (b) that your system's profile is unnecessary. The Department may approve the use of a more representative data set for disinfection profiling than the data set required under section 7.3.2 (c)–(g).

(b) The Department may only determine that a system's profile is unnecessary if a system's TTHM and HAA5 levels are below 0.064 mg/L and 0.048 mg/L, respectively. These samples must be taken in accordance with the following:

(1) TTHM and HAA5 samples must be collected after January 1, 1998.

(2) The samples must be taken during the month with the warmest water temperature.

(3) The samples must be taken at the point of maximum residence time in the systems distribution system.

(c) A disinfection profile consists of three steps:

(1) First, a system must collect data for several parameters from the plant as discussed in section 7.3.2(d) over the course of 12 months.

(i) If your system serves between 500 and 9,999 persons you were to begin to collect data no later than July 1, 2003.

(ii) If your system serves fewer than 500 persons you were to begin to collect data no later than January 1, 2004.

(2) Second, a system must use this data to calculate weekly log inactivation as discussed in section 7.3.2(e)–(f).

(3) Third, a system must use these weekly log inactivations to develop a disinfection profile as specified in section 7.3.2(g).

(d) Systems must monitor the following parameters to determine the total log inactivation using the analytical methods in section 10.2.2(a), once per week on the same calendar day, over 12 consecutive months.

(1) The temperature of the disinfected water at each residual disinfectant concentration sampling point during peak hourly flow.

(2) If a system uses chlorine, the pH of the disinfected water at each residual disinfectant concentration sampling point during peak hourly flow.

(3) The disinfectant contact time(s) ("T") during peak hourly flow.

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

(e) Systems must calculate the total inactivation ration as follows, and multiply the value by 3.0 to determine log inactivation of Giardia lamblia

(1) If the system uses only one point of disinfectant application:

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

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

(2) If the system uses more than one point of disinfectant application before the first customer, the system must determine the ($CTcalc/CT_{99.9}$) value of each disinfection segment immediately prior to the next point of disinfectant application, or for the final segment, before or at the first customer, during peak hourly flow using the procedure specified in section 7.3.2(e)(1)(ii).

(f) A system that uses chloramines, ozone, or chlorine dioxide for primary disinfection must also calculate the logs of inactivation for viruses and develop an additional disinfection profile for viruses using methods approved by the Department.

(g) Each log inactivation serves as a data point in the system's disinfection profile. Systems will have obtained 52 measurements (one for every week of the year). This will allow a system and the Department the opportunity to evaluate how microbial inactivation varied over the course of the year by looking at all 52 measurements (the system's Disinfection Profile). Systems must retain the Disinfection Profile data in graphic form, such as a spreadsheet, which must be available for review by the Department as part of a sanitary survey. Systems must use this data to calculate a benchmark if they are considering changes to disinfection practices.

7.3.3 Disinfection Benchmark

(a) Any system required to develop a disinfection profile under the provisions of section 7.3.2, must develop a disinfection benchmark if you decide to make a significant change to your disinfection practice. Your system must consult with the Department for approval prior to making such change.

(b) Significant changes to disinfection practice include the following:

(1) Changes to the point of disinfection;

(2) Changes to the disinfectant(s) used in the treatment plant;

(3) Changes to the disinfection process; or

(4) Any other modification identified by the Department.

(c) Systems considering a significant change to its disinfection practice must calculate a disinfection benchmark(s) as described in section 7.3.3(d) – (e) and provide the benchmark(s) to the Department. A system may only make a significant disinfection practice change after consulting with the Department for approval. The system must submit the following information as part of its consultation and approval process.

(1) A description of the proposed change;

(2) The disinfection profile for Giardia lamblia (and, if necessary, viruses) and disinfection benchmark;

(3) An analysis of how the proposed change will affect the current levels of disinfection; and

(4) Any additional information requested by the Department.

(d) Any system that is making a significant change to its disinfection practice must calculate its disinfection benchmark using the procedure specified in sections 7.3.3(d)(1) through (2) and provide the benchmark(s) to the Department.

(1) Using the data collected to develop the Disinfection Profile, determine the average Giardia lamblia inactivation for each calendar month by dividing the sum of all Giardia lamblia inactivations for that month by the number of values calculated for that month.

(2) Determine the lowest monthly average value out of the twelve values. This value becomes the disinfection benchmark.

(e) A system that uses chloramines, ozone, or chlorine dioxide for primary disinfection must calculate the disinfection benchmark from the data the system collected for viruses to develop the disinfection profile in addition to the Giardia lamblia disinfection benchmark calculated under section 7.3.3(d). This viral benchmark must be calculated in the same manner used to calculate the Giardia lamblia disinfection benchmark in section 7.3.3(d).

7.3.4 Combined Filter Effluent Requirements

(a) All surface water or groundwater under the direct influence of surface water systems which serve populations fewer than 10,000 and utilize filtration other than slow sand filtration or diatomaceous earth filtration must meet the combined filter effluent turbidity requirements of section 7.3.4(b)–(d). If your system uses slow sand or diatomaceous earth filtration you are not required to meet the combined filter effluent turbidity limits of section 7.3, but you must continue to meet the combined filter effluent turbidity limits in section 7.1.3(f) and (g).

(b) Systems required to meet the provisions of this section 7.3 must meet two strengthened combined filter effluent turbidity limits.

(1) The first combined filter effluent turbidity limit is a "95th percentile" turbidity limit that a system must meet in at least 95 percent of the turbidity measurements taken each month. Measurements must continue to be taken as described in section 10.5.1(a). Monthly reporting must be completed according to section 7.3.6. Table 7-4 describes the required limits for specific filtration technologies.

Table 7-4 95th Percentile Turbidity Levels

If your system consists of * * *	**Your 95th percentile turbidity value is *****
(i) Conventional Filtration	0.3 NTU
(ii) Direct Filtration	0.3 NTU
(iii) Membrane Filtration[1]	0.3 NTU
(iv) Cartridge Filtration	1 NTU

(v) Bag Filtration	1 NTU

1 Membrane Filtration includes cross-flow membrane filtration (CMF) technologies, such as Microfiltration, Ultrafiltration, Nanofiltration and Reverse Osmosis.

(2) The second combined filter effluent turbidity is a "maximum" turbidity limit which a system may at no time exceed during the month. Measurements must continue to be taken as described in section 10.5.1(a). Monthly reporting must be completed according to section 7.3.6. Table 7-5 describes the required limits for specific filtration technologies.

Table 7-5 Maximum Turbidity Limits

If your system consists of * * *	**Your maximum turbidity value is * * ***
(i) Conventional Filtration	1 NTU
(ii) Direct Filtration	1 NTU
(iii) Membrane Filtration[1]	1 NTU
(iv) Cartridge Filtration	5 NTU
(v) Bag Filtration	5 NTU

1 Membrane Filtration includes cross-flow membrane filtration (CMF) technologies, such as Microfiltration, Ultrafiltration, Nanofiltration and Reverse Osmosis.

(c) Public water systems that use a filtration technology other than slow sand, diatomaceous earth or those listed in section 7.3.4 (b) must demonstrate to the Department, using pilot plant studies or other means, that the filtration technology, in combination with disinfection treatment, consistently achieves 99.9 percent removal and/or inactivation of Giardia lamblia cysts, 99.99 percent removal and/or inactivation of viruses, and 99 percent removal of Cryptosporidium oocysts. Based on this demonstration, the Department will set to following two turbidity performance requirements:

(1) A turbidity value that the system must meet in at least 95 percent of the measurements taken each month (not to exceed 1 NTU) and,

(2) A turbidity value that the system may not exceed at any time (not to exceed 5 NTU).

(d) Systems practicing lime softening may acidify representative combined filter effluent turbidity samples prior to analysis using a protocol approved by the Department.

7.3.5 Individual Filter Turbidity Requirements

(a) Surface water or groundwater under the direct influence of surface water systems serving fewer than 10,000 people and utilizing conventional filtration or direct filtration, must conduct continuous monitoring of turbidity for each individual filter at the system. The following requirements apply to continuous turbidity monitoring:

(1) Monitoring must be conducted using an approved method in section 10.5.1(a);

(2) Calibration of turbidimeters must be conducted using procedures specified by the manufacturer;

(3) Results of turbidity monitoring must be recorded at least every 15 minutes;

(4) Monthly reporting must be completed according to section 7.3.6; and

(5) Records must be maintained according to section 1.6.3.

(b) If there is a failure in the continuous turbidity monitoring equipment, the system must conduct grab sampling every four hours in lieu of continuous monitoring until the turbidimeter is back on-line. The system has 14 days to resume continuous monitoring before a violation is incurred.

(c) Systems that consist of two or fewer filters may conduct continuous monitoring of combined filter effluent turbidity in lieu of individual filter effluent turbidity monitoring. Continuous monitoring must meet the same requirements set forth in sections 7.3.5(a) and (b).

(d) Follow-up action based on the continuous turbidity monitoring required in section 7.3.5 shall be according to Table 7-6:

Table 7-6 Individual Filter Turbidity Follow-up Actions

If * * *	**Your system must * * ***
(1) The turbidity of an individual filter (or the turbidity of combined filter effluent (CFE) for systems with 2 filters that monitor CFE in lieu of individual filters) exceeds 1.0 NTU in two consecutive recordings 15 minutes apart.	Report to the Department by the 10th of the following month and include the filter number(s), corresponding date(s), turbidity value(s) which exceeded 1.0 NTU, and the cause (if known) for the exceedance(s).
.	.
If a system was required to report to the Department * * *	Your system must * * *
(2) For three months in a row and turbidity exceeded 1.0 NTU in two consecutive recordings 15 minutes apart at the same filter (or CFE for systems with 2 filters that monitor CFE in lieu of individual filters).	Conduct a self-assessment of the filter(s) within 14 days of the day the filter exceeded 1.0 NTU in two consecutive measurements for the third straight month unless a CPE as specified in paragraph (c) of this section was required. Systems with 2 filters that monitor CFE in lieu of individual filters must conduct a self-assessment on both filters. The self-assessment must consist of at least the following components: assessment of filter performance; development of a filter profile; identification and prioritization of factors limiting filter performance; assessment of the applicability of corrections; and preparation of a filter self-assessment report. If a self-assessment is required, the date that it was triggered and the date that it was completed.

(3) For two months in a row and turbidity exceeded 2.0 NTU in 2 consecutive recordings 15 minutes apart at the same filter (or CFE for systems with 2 filters that monitor CFE in lieu of individual filters).	Arrange to have a comprehensive performance evaluation (CPE) conducted by the Department or a third party approved by the Department not later than 60 days following the day the filter exceeded 2.0 NTU in two consecutive measurements for the second straight month. If a CPE has been completed by the Department or a third party approved by the Department within the 12 prior months or the system and Department are jointly participating in an ongoing Comprehensive Technical Assistance (CTA) project at the system, a new CPE is not required. If conducted, a CPE must be completed and submitted to the Department no later than 120 days following the day the filter exceeded 2.0 NTU in two consecutive measurements for the second straight month.

(e) Systems utilizing lime softening may apply to the Department for alternative turbidity exceedance levels for the levels specified in section 7.3.5(d)(1) – (3). Systems must demonstrate that higher turbidity levels are due to lime carryover only, and not due to degraded filter performance.

7.3.6 Reporting Requirements

A system is required to report the information in the following table if it is subject to the requirement shown in the first column.

Table 7-7 Turbidity Reporting Requirements

Corresponding requirement	Description of information to report	Frequency/Due Date
(1) Combined Filter Effluent Requirements. (section 7.3.4)	(i) The total number of filtered water turbidity measurements taken during the month.	By the 10th of the following month.
	(ii) The number and percentage of filtered water turbidity measurements taken during the month which are less than or equal to your system's required 95th percentile limit.	By the 10th of the following month.
	(iii) The date and value of any turbidity measurements taken during the month which exceed the maximum turbidity value for your filtration system.	By the 10th of the following month.
(2) Individual Filter Turbidity Requirements (section 7.3.5)	(i) That your system conducted individual filter turbidity monitoring during the month.	By the 10th of the following month.
	(ii) The filter number(s), corresponding date(s), and the turbidity value(s) which exceeded 1.0 NTU during the month, and the cause (if known) for the exceedance(s), but only if 2 consecutive measurements exceeded 1.0 NTU.	By the 10th of the following month.

	(iii) If a self-assessment is required, the date that it was triggered and the date that it was completed.	By the 10th of the following month (or 14 days after the self-assessment was triggered only if the self-assessment was triggered during the last four days of the month)
	(iv) If a CPE is required, that the CPE is required and the date that it was triggered.	By the 10th of the following month.
	(v) Copy of completed CPE report	Within 120 days after the CPE was triggered.
(3) Disinfection Profiling. (section 7.3.2)	(i) Results of optional monitoring which show TTHM levels <0.064 mg/L and HAA5 levels <0.048 mg/L (Only if your system wishes to forgo profiling) or that your system has begun disinfection profiling.	(i) For systems serving 500–9,999 the profile should have been started by July 1, 2003; (ii) For systems serving fewer than 500 the profile should have been started by January 1, 2004.
(4) Disinfection Benchmarking. (section 7.3.3)	(i) A description of the proposed change in disinfection, your system's disinfection profile for Giardia lamblia (and, if necessary, viruses) and disinfection benchmark, and an analysis of how the proposed change will affect the current levels of disinfection.	Anytime your system is considering a significant change to its disinfection practice.

7.4 Enhanced Treatment for *Cryptosporidium*

7.4.1 General Requirements

(a) The requirements in this section establish or extend treatment technique requirements in lieu of maximum contaminant levels for *Cryptosporidium*. These requirements are in addition to requirements for filtration and disinfection in sections 7.1, 7.2, and 7.3.

(b) Applicability. The requirements in section 7.4 apply to all Surface Water and GWUDI systems, which are public water systems supplied by a surface water source and public water systems supplied by a groundwater source under the direct influence of surface water.

(1) Wholesale systems, as defined in section 1.5.2(155), must comply with the requirements of this section based on the population of the largest system in the combined distribution system.

(2) The requirements of this section apply to systems required by the *Colorado Primary Drinking Water Regulations* to provide filtration treatment, whether or not the system is currently operating a filtration system.

(c) Requirements. Systems subject to this section must comply with the following requirements:

(1) Systems must conduct an initial and a second round of source water monitoring for each plant that treats a surface water or GWUDI source. This monitoring may include sampling

for *Cryptosporidium*, E. *coli*, and turbidity as described in section 7.4.2 through 7.4.5, to determine what level, if any, of additional *Cryptosporidium* treatment they must provide.

(2) Systems that plan to make a significant change to their disinfection practice must develop disinfection profiles and calculate disinfection benchmarks, as described in sections 7.4.7 through 7.4.8.

(3) Filtered systems must determine their *Cryptosporidium* treatment bin classification as described in section 7.4.9 and provide additional treatment for *Cryptosporidium*, if required, as described in section 7.4.10. Filtered systems must implement *Cryptosporidium* treatment according to the schedule in section 7.4.11.

(4) Systems with uncovered finished water storage facilities must comply with the requirements to cover the facility or treat the discharge from the facility as described in section 7.4.12.

(5) Systems required to provide additional treatment for *Cryptosporidium* must implement microbial toolbox options that are designed and operated as described in sections 7.4.13 through 7.4.18.

(6) Systems must comply with the applicable recordkeeping and reporting requirements described in sections 1.6.3 and 7.4.19.

7.4.2 Source Water Monitoring

(a) Initial round of source water monitoring. Systems must conduct the following monitoring on the schedule in paragraph (c) of this section unless they meet the monitoring exemption criteria in paragraph (d) of this section.

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

(2)

(i) Filtered systems serving fewer than 10,000 people must sample their source water for *E. coli* at least once every two weeks for 12 months.

(ii) A filtered system serving fewer than 10,000 people may avoid *E*. *coli* monitoring if the system notifies the Department that it will monitor for *Cryptosporidium* as described in paragraph (a)(3) of this section. The system must notify the Department no later than 3 months prior to the date the system is otherwise required to start *E. coli* monitoring under section 7.4.2(c).

(3) Filtered systems serving fewer than 10,000 people must sample their source water for *Cryptosporidium* at least twice per month for 12 months or at least monthly for 24 months if they meet one of the following, based on monitoring conducted under paragraph (a)(2) of this section:

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

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

(iii) The system does not conduct *E. coli* monitoring as described in paragraph (a)(2) of this section.

(iv) Systems using groundwater under the direct influence of surface water (GWUDI) must comply with the requirements of paragraph (a)(3) of this section based on the *E. coli* level that applies to the nearest surface water body. If no surface water body is nearby, the system must comply based on the requirements that apply to systems using lake/reservoir sources.

(4) For filtered systems serving fewer than 10,000 people, the Department may approve monitoring for an indicator other than *E. coli* under paragraph (a)(2) of this section. The Department also may approve an alternative to the *E. coli* concentration in paragraph (a)(3)(i), (ii) or (iv) of this section to trigger *Cryptosporidium* monitoring. This approval by the Department must be provided to the system in writing and must include the basis for the Department's determination that the alternative indicator and/or trigger level will provide a more accurate identification of whether a system will exceed the Bin 1 *Cryptosporidium* level in Section 7.4.9.

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

(b) Second round of source water monitoring. Systems must conduct a second round of source water monitoring that meets the requirements for monitoring parameters, frequency, and duration described in paragraph (a) of this section, unless they meet the monitoring exemption criteria in paragraph (d) of this section. Systems must conduct this monitoring on the schedule in paragraph (c) of this section.

(c) Monitoring schedule. Systems must begin the monitoring required in paragraphs (a) and (b) of this section no later than the month beginning with the date listed in Table 7-8:

Table 7-8 Source Water Monitoring Starting Dates

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

1 Applies only to filtered systems.

2 Applies to filtered systems that meet the conditions of paragraph (a)(3).

(d) Monitoring avoidance.

(1) Filtered systems are not required to conduct source water monitoring under this section if the system will provide a total of at least 5.5-log of treatment for *Cryptosporidium*, equivalent to meeting the treatment requirements of Bin 4 in Section 7.4.10.

(2) If a system chooses to provide the level of treatment in paragraph (d)(1), as applicable, rather than start source water monitoring, the system must notify the Department in writing no later than the date the system is otherwise required to submit a sampling schedule for monitoring under Section 7.4.3. Alternatively, a system may choose to stop sampling at any point after it has initiated monitoring if it notifies the Department in writing that it will provide this level of treatment. Systems must install and operate technologies to provide this level of treatment by applicable treatment compliance date in Section 7.4.11.

(e) Plants operating only part of the year. Systems with Surface Water and GWUDI plants that operate for only part of the year must conduct source water monitoring in accordance with this section, but with the following modifications:

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

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

(f) (1) New sources. A system that begins using a new source of surface water or GWUDI after the system is required to begin monitoring under paragraph (c) of this section must monitor the new source on a schedule the Department approves. Source water monitoring must meet the requirements of this section. The system must also meet the bin classification and *Cryptosporidium* treatment requirements of sections 7.4.9 and 7.4.10, as applicable, for the new source on a schedule the Department approves.

(2) The requirements of section 7.4.2(f) apply to Surface Water and GWUDI systems that begin operation after the monitoring start date applicable to the system's size under paragraph (c) of this section.

(3) The system must begin a second round of source water monitoring no later than 6 years following initial bin classification under section 7.4.9.

(g) Failure to collect any source water sample required under this section in accordance with the sampling schedule, sampling location, analytical method, approved laboratory, and reporting requirements of sections 7.4.3 through 7.4.5 and Article 10 is a monitoring violation.

(h) Grandfathering monitoring data. Systems may use (grandfather) monitoring data collected prior to the applicable monitoring start date in paragraph (c) of this section to meet the initial source water monitoring requirements in paragraph (a) of this section. Grandfathered data may substitute for an equivalent number of months at the end of the monitoring period. All data submitted under this paragraph must meet the requirements in Section 7.4.6.

7.4.3 Sampling schedules

(a) Systems required to conduct source water monitoring under section 7.4.2 must submit a sampling schedule that specifies the calendar dates when the system will collect each required sample.

(1) Systems must submit sampling schedules no later than 3 months prior to the applicable date listed in section 7.4.2(c) for each round of required monitoring.

(2) (i) Systems serving at least 10,000 people must submit their sampling schedule for the initial round of source water monitoring under section 7.4.2(a) to EPA electronically at https://intranet.epa.gov/lt2/.

(ii) If a system is unable to submit the sampling schedule electronically, the system may use an alternative approach for submitting the sampling schedule that EPA approves.

(3) Systems serving fewer than 10,000 people must submit their sampling schedules for the initial round of source water monitoring section 7.4.2(a) to the Department.

(4) Systems must submit sampling schedules for the second round of source water monitoring section 7.4.2(b) to the Department.

(5) If EPA or the Department does not respond to a system regarding its sampling schedule, the system must sample at the reported schedule.

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

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

(2) (i) If a system is unable to report a valid analytical result for a scheduled sampling date due to equipment failure, loss of or damage to the sample, failure to comply with the analytical method requirements, including the quality control requirements in Article 10, or the failure of an approved laboratory to analyze the sample, then the system must collect a replacement sample.

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

(c) Systems that fail to meet the criteria of paragraph (b) of this section for any source water sample required under section 7.4.2 must revise their sampling schedules to add dates for collecting all missed samples. Systems must submit the revised schedule to the Department for approval prior to when the system begins collecting the missed samples.

7.4.4 Sampling Locations

(a) Systems required to conduct source water monitoring under section 7.4.2 must collect samples for each plant that treats a surface water or GWUDI source. Where multiple plants draw water

from the same influent, such as the same pipe or intake, the Department may approve one set of monitoring results to be used to satisfy the requirements of section 7.4.2 for all plants.

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

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

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

(d) Bank filtration.

(1) Systems that receive *Cryptosporidium* treatment credit for bank filtration under Section 7.2.3(b) or Section 7.3.4(c), as applicable, must collect source water samples in the surface water prior to bank filtration.

(2) Systems that use bank filtration as pretreatment to a filtration plant must collect source water samples from the well (i.e., after bank filtration). Use of bank filtration during monitoring must be consistent with routine operational practice. Systems collecting samples after a bank filtration process may not receive treatment credit for the bank filtration under Section 7.4.15(c).

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

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

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

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

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

(f) Additional Requirements. Systems must submit a description of their sampling location(s) to the Department at the same time as the sampling schedule required under Section 7.4.3. This description must address the position of the sampling location in relation to the system's water source(s) and treatment processes, including pretreatment, points of chemical treatment, and

filter backwash recycle. If the Department does not respond to a system regarding sampling location(s), the system must sample at the reported location(s).

7.4.5 Reporting Source Water Monitoring Results

(a) Systems must report results from the source water monitoring required under Section 7.4.2 no later than 10 days after the end of the first month following the month when the sample is collected.

(b) (1) All systems serving at least 10,000 people must report the results from the initial source water monitoring required under Section 7.4.2(a) to EPA electronically at https://intranet.epa.gov/lt2/.

(2) If a system is unable to report monitoring results electronically, the system may use an alternative approach for reporting monitoring results that EPA approves.

(c) Systems serving fewer than 10,000 people must report results from the initial source water monitoring required under Section 7.4.2(a) to the Department.

(d) All systems must report results from the second round of source water monitoring required under Section 7.4.2 (b) to the Department.

(e) Systems must report the applicable information in paragraphs (e)(1) and (2) of this section for the source water monitoring required under Section 7.4.2.

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

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

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

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

(iii) For samples in which less than 100% of sample volume is examined, systems must also report the volume of resuspended concentrate and volume of this resuspension processed through immunomagnetic separation.

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

Data element.
1. PWS ID.
2. Facility ID.
3. Sample collection date.
4. Analytical method number.

5. Method type.
6. Source type (flowing stream, lake/reservoir, GWUDI).
7. E. *coli*/100 mL.
8. Turbidity[7-1]

7-1 Systems serving fewer than 10,000 people that are not required to monitor for turbidity under Section 7.4.2 are not required to report turbidity with their E. *coli* results.

7.4.6 Grandfathering Previously Collected Data

(a) (1) Systems may comply with the initial source water monitoring requirements of Section 7.4.2(a) by grandfathering sample results collected before the system is required to begin monitoring (i.e., previously collected data). To be grandfathered, the sample results and analysis must meet the criteria in this section and the Department must approve.

(2) A filtered system may grandfather *Cryptosporidium* samples to meet the requirements of Section 7.4.2(a) when the system does not have corresponding E. *coli* and turbidity samples. A system that grandfathers *Cryptosporidium* samples without E. *coli* and turbidity samples is not required to collect E. *coli* and turbidity samples when the system completes the requirements for *Cryptosporidium* monitoring under Section 7.4.2(a).

(b) E. *coli* sample analysis. The analysis of E. *coli* samples must meet the analytical method and approved laboratory requirements of Article 10.

(c) *Cryptosporidium* sample analysis. The analysis of *Cryptosporidium* samples must meet the analytical method and approved laboratory requirements of Article 10.

(d) Sampling location. The sampling location must meet the conditions in Section 7.4.4.

(e) Sampling frequency. *Cryptosporidium* samples were collected no less frequently than each calendar month on a regular schedule, beginning no earlier than January 1999. Sample collection intervals may vary for the conditions specified in Section 7.4.3(b)(1) and (2) if the system provides documentation of the condition when reporting monitoring results.

(1) The Department may approve grandfathering of previously collected data where there are time gaps in the sampling frequency if the system conducts additional monitoring the Department specifies to ensure that the data used to comply with the initial source water monitoring requirements of Section 7.4.2(a) are seasonally representative and unbiased.

(2) Systems may grandfather previously collected data where the sampling frequency within each month varied. If the *Cryptosporidium* sampling frequency varied, systems must follow the monthly averaging procedure in Section 7.4.9(b)(5) when calculating the bin classification for filtered systems.

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

(1) Systems must report that they intend to submit previously collected monitoring results for grandfathering. This report must specify the number of previously collected results the system will submit, the dates of the first and last sample, and whether a system will conduct additional source water monitoring to meet the requirements of Section 7.4.2(a). Systems must report this information no later than the date the sampling schedule under Section 7.4.3 is required.

(2) Systems must report previously collected monitoring results for grandfathering, along with the associated documentation listed in paragraphs (f)(2)(i) through (iv) of this section, no later than two months after the applicable date listed in Section 7.4.2(c).

(i) For each sample result, systems must report the applicable data elements in Section 7.4.5.

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

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

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

(g) If the Department determines that a previously collected data set submitted for grandfathering was generated during source water conditions that were not normal for the system, such as a drought, the Department may disapprove the data. Alternatively, the Department may approve the previously collected data if the system reports additional source water monitoring data, as determined by the Department, to ensure that the data set used under Section 7.4.9 represents average source water conditions for the system.

(h) If a system submits previously collected data that fully meet the number of samples required for initial source water monitoring under Section 7.4.2(a) and some of the data are rejected due to not meeting the requirements of this section, systems must conduct additional monitoring to replace rejected data on a schedule the Department approves. Systems are not required to begin this additional monitoring until two months after notification that data have been rejected and additional monitoring is necessary.

Disinfection Profiling and Benchmarking Requirements

7.4.7 Requirements When Making a Significant Change in Disinfection Practice

(a) Following the completion of initial source water monitoring under Section 7.4.2(a), a system that plans to make a significant change to its disinfection practice, as defined in paragraph (b) of this section, must develop disinfection profiles and calculate disinfection benchmarks for *Giardia lamblia* and viruses as described in Section 7.4.8. Prior to changing the disinfection practice, the system must notify the Department and must include in this notice the information in paragraphs (a)(1) through (3) of this section.

(1) A completed disinfection profile and disinfection benchmark for Giardia lamblia and viruses as described in Section 7.4.8.

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

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

(b) Significant changes to disinfection practice are defined as follows:

(1) Changes to the point of disinfection;

(2) Changes to the disinfectant(s) used in the treatment plant;

(3) Changes to the disinfection process; or

(4) Any other modification identified by the Department as a significant change to disinfection practice.

7.4.8 Developing the Disinfection Profile and Benchmark

(a) Systems required to develop disinfection profiles under Section 7.4.7 must follow the requirements of this section. Systems must monitor at least weekly for a period of 12 consecutive months to determine the total log inactivation for *Giardia lamblia* and viruses. If systems monitor more frequently, the monitoring frequency must be evenly spaced. Systems that operate for fewer than 12 months per year must monitor weekly during the period of operation. Systems must determine log inactivation for *Giardia lamblia* through the entire plant, based on $CT_{99.9}$ values in Tables 10-15 through 10-22 of Section 10.6(b) as applicable. Systems must determine log inactivation for viruses through the entire treatment plant based on a protocol approved by the Department.

(b) Systems with a single point of disinfectant application prior to the entrance to the distribution system must conduct the monitoring in paragraphs (b)(1) through (4) of this section. Systems with more than one point of disinfectant application must conduct the monitoring in paragraphs (b)(1) through (4) of this section for each disinfection segment. Systems must monitor the parameters necessary to determine the total inactivation ratio, using analytical methods in Section 10.6(a).

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

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

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

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

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

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

collected. Systems may develop disinfection profiles using up to three years of existing data.

(2) Systems may use disinfection profile(s) developed under Section 7.2.2 or Section 7.3.2 in lieu of developing a new profile if the system has neither made a significant change to its treatment practice nor changed sources since the profile was developed. Systems that have not developed a virus profile under Section 7.2.2 or Section 7.3.2 must develop a virus profile using the same monitoring data on which the *Giardia lamblia* profile is based.

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

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

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

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

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

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

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

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

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

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

Treatment Technique Requirements

7.4.9 Bin Classification for Filtered Systems

(a) Following completion of the initial round of source water monitoring required under Section 7.4.2(a), filtered systems must calculate an initial *Cryptosporidium* bin concentration for each plant for which monitoring was required. Calculation of the bin concentration must use the *Cryptosporidium* results reported under Section 7.4.2(a) and must follow the procedures in paragraphs (b)(1) through (5) of this section.

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

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

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

(4) For systems with plants operating only part of the year that monitor fewer than 12 months per year under Section 7.4.2(e), the bin concentration is equal to the highest arithmetic mean of all sample concentrations during any year of *Cryptosporidium* monitoring.

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

(c) Filtered systems must determine their initial bin classification from Table 7-9 and using the *Cryptosporidium* bin concentration calculated under paragraphs (a)-(b) of this section:

Table 7-9 Bin Classification for Filtered Systems

For systems that are:	**With a *Cryptosporidium* bin concentration of:**[1]	**The bin classification is:**
Required to monitor for *Cryptosporidium* under section 7.4.2	<0.075 oocyst/L	Bin 1
	0.075 oocyst/L to <1.0 oocyst/L	Bin 2
	1.0 oocyst/L to <3.0 oocyst/L	Bin 3
	≥3.0 oocyst/L	Bin 4
Serving fewer than 10,000 people and NOT required to monitor for *Cryptosporidium* under section 7.4.2(a)(4)	N/A	Bin 1

1 Based on calculations in paragraph (a) or (d) of this section, as applicable.

(d) Following completion of the second round of source water monitoring required under Section 7.4.2(b), filtered systems must recalculate their *Cryptosporidium* bin concentration using the *Cryptosporidium* results reported under Section 7.4.2(b) and following the procedures in paragraphs (b)(1) through (4) of this section. Systems must then re-determine their bin classification using this bin concentration and the table in paragraph (c) of this section.

(e) (1) Filtered systems must report their initial bin classification under paragraph (c) of this section to the Department for approval no later than 6 months after the system is required to complete initial source water monitoring based on the schedule in Section 7.4.2(c).

(2) Systems must report their bin classification under paragraph (d) of this section to the Department for approval no later than 6 months after the system is required to complete the second round of source water monitoring based on the schedule in Section 7.4.2(c).

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

(f) Failure to comply with the conditions of paragraph (e) of this section is a violation of the treatment technique requirement.

7.4.10 Filtered System Additional *Cryptosporidium* Treatment Requirements

(a) Filtered systems must provide the level of additional treatment for *Cryptosporidium* specified in Table 7-10 based on their bin classification as determined under Section 7.4.9 and according to the schedule in Section 7.4.11.

7-10 Additional Treatment Requirements for Filtered Systems

	Conventional filtration treatment (including softening)	**Direct filtration**	**Slow sand or diatomaceous earth filtration**	**Alternative filtration technologies (i.e., bag, cartridge, etc)**
Bin 1	No additional treatment	No additional treatment	No additional treatment	No additional treatment
Bin 2	1-log treatment	1.5-log treatment	1-log treatment	(Endnote[1])
Bin 3	2-log treatment	2.5 log treatment	2-log treatment	(Endnote[2])
Bin 4	2.5-log treatment	3-log treatment	2.5-log treatment	(Endnote[3])

1 As determined by the Department such that the total *Cryptosporidium* removal and inactivation is at least 4.0-log.

2 As determined by the Department such that the total *Cryptosporidium* removal and inactivation is at least 5.0-log.

3 As determined by the Department such that the total *Cryptosporidium* removal and inactivation is at least 5.5-log.

(b) (1) Filtered systems must use one or more of the treatment and management options listed in Section 7.4.13, termed the microbial toolbox, to comply with the additional *Cryptosporidium* treatment required in paragraph (a) of this section.

(2) Systems classified in Bin 3 and Bin 4 must achieve at least 1-log of the additional *Cryptosporidium* treatment required under paragraph (a) of this section using either one or a combination of the following: bag filters, bank filtration, cartridge filters, chlorine dioxide, membranes, ozone, or UV, as described in Section 7.4.14 through 7.4.18.

(c) Failure by a system in any month to achieve treatment credit by meeting criteria in Section 7.4.14 through 7.4.18 for microbial toolbox options that is at least equal to the level of treatment required in paragraph (a) of this section is a violation of the treatment technique requirement.

(d) If the Department determines during a sanitary survey or an equivalent source water assessment that after a system completed the monitoring conducted under Section 7.4.2(a) or (b), significant changes occurred in the system's watershed that could lead to increased contamination of the

source water by *Cryptosporidium*, the system must take actions specified by the Department to address the contamination. These actions may include additional source water monitoring and/or implementing microbial toolbox options listed in Section 7.4.13.

7.4.11 Schedule for Compliance with *Cryptosporidium* Treatment Requirements

(a) Following initial bin classification under Section 7.4.9(c), filtered systems must provide the level of treatment for *Cryptosporidium* required under Section 7.4.10 according to the schedule in paragraph (c) of this section.

(b) *Cryptosporidium* treatment compliance dates.

Table 7-11 Cryptosporidium Treatment Compliance Dates Table

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

1 Departments may allow up to an additional two years for complying with the treatment requirement for systems making capital improvements.

(c) If the bin classification for a filtered system changes following the second round of source water monitoring, as determined under Section 7.4.9(d), the system must provide the level of treatment for *Cryptosporidium* required under Section 7.4.10 on a schedule the Department approves.

7.4.12 Requirements for Uncovered Finished Water Storage Facilities

(a) Systems must notify the Department of the use of each uncovered finished water storage facility no later than April 1, 2008.

(b) Systems must cover any uncovered finished water storage facility.

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

Requirements for Microbial Toolbox Components

7.4.13 Microbial Toolbox Options for Meeting *Cryptosporidium* Treatment Requirements

(a) Systems receive the treatment credits listed in the table in paragraph (b) of this section by meeting the conditions for microbial toolbox options described in Sections 7.4.14 through 7.4.18. Systems apply these treatment credits to meet the treatment requirements in Section 7.4.10, as applicable.

(b) The following table summarizes options in the microbial toolbox:

Table 7-12 Microbial Toolbox Summary Table: Options, Treatment Credits and Criteria

Toolbox Option	***Cryptosporidium* treatment credit with design and**

	implementation criteria
Source Protection and Management Toolbox Options	.
(1) Watershed control program	0.5-log credit for Department-approved program comprising required elements, annual program status report to Department, and regular watershed survey.
(2) Alternative source/intake management	No prescribed credit. Systems may conduct simultaneous monitoring for treatment bin classification at alternative intake locations or under alternative intake management strategies. Specific criteria are in Section 7.4.14(b).
Pre Filtration Toolbox Options	.
(3) Presedimentation basin with coagulation	0.5-log credit during any month that presedimentation basins achieve a monthly mean reduction of 0.5-log or greater in turbidity or alternative Department-approved performance criteria. To be eligible, basins must be operated continuously with coagulant addition and all plant flow must pass through basins. Specific criteria are in Section 7.4.15(a).
(4) Two-stage lime Softening	0.5-log credit for two-stage softening where chemical addition and hardness precipitation occur in both stages. All plant flow must pass through both stages. Single-stage softening is credited as equivalent to conventional treatment. Specific criteria are in Section 7.4.15(b).
(5) Bank Filtration	0.5-log credit for 25-foot setback; 1.0-log credit for 50-foot setback; aquifer must be unconsolidated sand containing at least 10 percent fines; average turbidity in wells must be less than 1 NTU. Systems using wells followed by filtration when conducting source water monitoring must sample the well to determine bin classification and are not eligible for additional credit. Specific criteria are in Section 7.4.15(c).
Treatment Performance Toolbox Options	.
(6) Combined filter performance	0.5-log credit for combined filter effluent turbidity less than or equal to 0.15 NTU in at least 95 percent of measurements each month. Specific criteria are in Section 7.4.16(a).
(7) Individual filter performance	0.5-log credit (in addition to 0.5-log combined filter performance credit) if individual filter effluent turbidity is less than or equal to 0.15 NTU in at least 95 percent of samples each month in each filter and is never greater than 0.3 NTU in two consecutive measurements in any filter. Specific criteria are in Section 7.4.16(b).
(8) Demonstration of performance	Credit awarded to unit process or treatment train based on a demonstration to the Department with a Department- approved protocol. Specific criteria are in Section 7.4.16(c).

Additional Filtration Toolbox Options	.
(9) Bag or cartridge filters (individual filters)	Up to 2-log credit based on the removal efficiency demonstrated during challenge testing with a 1.0-log factor of safety. Specific criteria are in Section 7.4.17(a).
(10) Bag or cartridge filters (in series)	Up to 2.5-log credit based on the removal efficiency demonstrated during challenge testing with a 0.5-log factor of safety. Specific criteria are in Section 7.4.17(a).
(11) Membrane filtration	Log credit equivalent to removal efficiency demonstrated in challenge test for device if supported by direct integrity testing. Specific criteria are in Section 7.4.17(b).
(12) Second stage filtration	0.5-log credit for second separate granular media filtration stage if treatment train includes coagulation prior to first filter. Specific criteria are in Section 7.4.17(c).
(13) Slow sand filters	2.5-log credit as a secondary filtration step; 3.0-log credit as a primary filtration process. No prior chlorination for either option. Specific criteria are in Section 7.4.17(d).
Inactivation Toolbox Options	.
(14) Chlorine dioxide	Log credit based on measured CT in relation to CT table. Specific criteria in Section 7.4.18(b).
(15) Ozone	Log credit based on measured CT in relation to CT table. Specific criteria in Section 7.4.18(b).
(16) UV	Log credit based on validated UV dose in relation to UV dose table; reactor validation testing required to establish UV dose and associated operating conditions. Specific criteria in Section 7.4.18(c).

7.4.14 Source Toolbox Components

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

(1) Systems that intend to apply for the watershed control program credit must notify the Department of this intent no later than two years prior to the treatment compliance date applicable to the system in section 7.4.11.

(2) Systems must submit to the Department a proposed watershed control plan no later than one year before the applicable treatment compliance date in section 7.4.11. The Department must approve the watershed control plan for the system to receive watershed control program treatment credit. The watershed control plan must include the elements in paragraphs (a)(2)(i) through (iv) of this section.

(i) Identification of an “area of influence” outside of which the likelihood of *Cryptosporidium* or fecal contamination affecting the treatment plant intake is not

significant. This is the area to be evaluated in future watershed surveys under paragraph (a)(5)(ii) of this section.

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

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

(iv) A statement of goals and specific actions the system will undertake to reduce source water *Cryptosporidium* levels. The plan must explain how the actions are expected to contribute to specific goals, identify watershed partners and their roles, identify resource requirements and commitments, and include a schedule for plan implementation with deadlines for completing specific actions identified in the plan.

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

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

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

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

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

(A) The watershed sanitary survey must meet the following criteria: encompass the region identified in the Department-approved watershed control plan as the area of influence; assess the implementation of

actions to reduce source water *Cryptosporidium* levels; and identify any significant new sources of *Cryptosporidium*.

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

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

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

(b) Alternative source.

(1) A system may conduct source water monitoring that reflects a different intake location (either in the same source or for an alternate source) or a different procedure for the timing or level of withdrawal from the source (alternative source monitoring). If the Department approves, a system may determine its bin classification under Section 7.4.9 based on the alternative source monitoring results.

(2) If systems conduct alternative source monitoring under paragraph (b)(1) of this section, systems must also monitor their current plant intake concurrently as described in Section 7.4.2.

(3) Alternative source monitoring under paragraph (b)(1) of this section must meet the requirements for source monitoring to determine bin classification, as described in Sections 7.4.2 through 7.4.5 and Article 10. Systems must report the alternative source monitoring results to the Department, along with supporting information documenting the operating conditions under which the samples were collected.

(4) If a system determines its bin classification under Section 7.4.9 using alternative source monitoring results that reflect a different intake location or a different procedure for managing the timing or level of withdrawal from the source, the system must relocate the intake or permanently adopt the withdrawal procedure, as applicable, no later than the applicable treatment compliance date in Section 7.4.11.

7.4.15 Pre-filtration Treatment Toolbox Components

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

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

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

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

(i) Demonstrates at least 0.5-log mean reduction of influent turbidity. This reduction must be determined using daily turbidity measurements in the presedimentation process influent and effluent and must be calculated as follows: $\log_{10}$(monthly mean of daily influent turbidity)-$\log_{10}$(monthly mean of daily effluent turbidity).

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

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

(c) Bank filtration. Systems receive *Cryptosporidium* treatment credit for bank filtration that serves as pretreatment to a filtration plant by meeting the criteria in this paragraph. Systems using bank filtration when they begin source water monitoring under Section 7.4.2(a) must collect samples as described in Section 7.4.4(d) and are not eligible for this credit.

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

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

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

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

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

(6) Springs and infiltration galleries are not eligible for treatment credit under this section, but are eligible for credit under section 7.4.16(c).

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

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

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

7.4.16 Treatment Performance Toolbox Components

(a) Combined filter performance. Systems using conventional filtration treatment or direct filtration treatment receive an additional 0.5-log *Cryptosporidium* treatment credit during any month the system meets the criteria in this paragraph. Combined filter effluent (CFE) turbidity must be less than or equal to 0.15 NTU in at least 95 percent of the measurements. Turbidity must be measured as described in Section 10.5.

(b) Individual filter performance. Systems using conventional filtration treatment or direct filtration treatment receive 0.5-log *Cryptosporidium* treatment credit, which can be in addition to the 0.5-log credit under paragraph (a) of this section, during any month the system meets the criteria in this paragraph. Compliance with these criteria must be based on individual filter turbidity monitoring as described in Section 7.2.4 or Section 7.3.5, as applicable.

(1) The filtered water turbidity for each individual filter must be less than or equal to 0.15 NTU in at least 95 percent of the measurements recorded each month.

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

(3) Any system that has received treatment credit for individual filter performance and fails to meet the requirements of paragraph (b)(1) or (2) of this section during any month does not receive a treatment technique violation under Section 7.4.10(c) if the Department determines the following:

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

(ii) The system has experienced no more than two such failures in any calendar year.

(c) Demonstration of performance. The Department may approve *Cryptosporidium* treatment credit for drinking water treatment processes based on a demonstration of performance study that meets the criteria in this paragraph. This treatment credit may be greater than or less than the prescribed treatment credits in Section 7.4.10 or Sections 7.4.15 through 7.4.18 and may be awarded to treatment processes that do not meet the criteria for the prescribed credits.

(1) Systems cannot receive the prescribed treatment credit for any toolbox box option in Sections 7.4.15 through 7.4.18 if that toolbox option is included in a demonstration of performance study for which treatment credit is awarded under this paragraph.

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

(3) Approval by the Department must be in writing and may include monitoring and treatment performance criteria that the system must demonstrate and report on an ongoing basis to remain eligible for the treatment credit. The Department may designate such criteria where necessary to verify that the conditions under which the demonstration of performance credit was approved are maintained during routine operation.

7.4.17 Additional Filtration Toolbox Components

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

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

(2) Challenge testing must be performed on full-scale bag or cartridge filters, and the associated filter housing or pressure vessel, that are identical in material and construction to the filters and housings the system will use for removal of *Cryptosporidium*. Bag or cartridge filters must be challenge tested in the same configuration that the system will use, either as individual filters or as a series configuration of filters.

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

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

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

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

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

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

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

Where:

LRV = log removal value demonstrated during challenge testing;

C_f = the feed concentration measured during the challenge test; and

C_p = the filtrate concentration measured during the challenge test. In applying this equation, the same units must be used for the feed and filtrate concentrations. If the challenge particulate is not detected in the filtrate, then the term C_p must be set equal to the detection limit.

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

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

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

(b) Membrane filtration.

(1) Systems receive *Cryptosporidium* treatment credit for membrane filtration that meets the criteria of this paragraph. Membrane cartridge filters that meet the definition of membrane filtration in Section 1.5.2 are eligible for this credit. The level of treatment credit a system receives is equal to the lower of the values determined under paragraph (b)(1)(i) and (ii) of this section.

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

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

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

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

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

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

Maximum Feed Concentration = 3.16 x 106 x (Filtrate Detection Limit)

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

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

$$LRV = LOG_{10}(C_f) \times LOG_{10}(C_p)$$

Where:

LRV = log removal value demonstrated during the challenge test;

C_f = the feed concentration measured during the challenge test; and

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

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

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

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

(3) Direct integrity testing. Systems must conduct direct integrity testing in a manner that demonstrates a removal efficiency equal to or greater than the removal credit awarded to the membrane filtration process and meets the requirements described in paragraphs (b)(3)(i) through (vi) of this section. A direct integrity test is defined as a physical test applied to a membrane unit in order to identify and isolate integrity breaches (i.e., one or more leaks that could result in contamination of the filtrate).

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

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

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

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

$$LRV_{DIT} = LOG_{10} (Q_p /(VCF \times Q_{breach}))$$

Where:

LRV_{DIT} = the sensitivity of the direct integrity test;

Q_p = total design filtrate flow from the membrane unit;

Q_{breach} = flow of water from an integrity breach associated with the smallest integrity test response that can be reliably measured, and

VCF = volumetric concentration factor. The volumetric concentration factor is the ratio of the suspended solids concentration on the high pressure side of the membrane relative to that in the feed water.

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

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

Where:

LRV_{DIT} = the sensitivity of the direct integrity test;

C_f = the typical feed concentration of the marker used in the test; and

C_p = the filtrate concentration of the marker from an integral membrane unit.

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

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

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

(4) Indirect integrity monitoring. Systems must conduct continuous indirect integrity monitoring on each membrane unit according to the criteria in paragraphs (b)(4)(i) through (v) of this section. Indirect integrity monitoring is defined as monitoring some aspect of filtrate water quality that is indicative of the removal of particulate matter. A system that implements continuous direct integrity testing of membrane units in accordance with the criteria in paragraphs (b)(3)(i) through (v) of this section is not subject to the requirements for continuous indirect integrity monitoring. Systems must submit a monthly report to the Department summarizing all continuous indirect integrity monitoring results triggering direct integrity testing and the corrective action that was taken in each case.

(i) Unless the Department approves an alternative parameter, continuous indirect integrity monitoring must include continuous filtrate turbidity monitoring.

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

(iii) Continuous monitoring must be separately conducted on each membrane unit.

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

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

(c) Second stage filtration. Systems receive 0.5-log *Cryptosporidium* treatment credit for a separate second stage of filtration that consists of sand, dual media, GAC, or other fine grain media following granular media filtration if the Department approves. To be eligible for this credit, the first stage of filtration must be preceded by a coagulation step and both filtration stages must treat the entire plant flow taken from a surface water or GWUDI source. A cap, such as GAC, on a single stage of filtration is not eligible for this credit. The Department must approve the treatment credit based on an assessment of the design characteristics of the filtration process.

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

7.4.18 Inactivation Toolbox Components

(a) Calculation of CT values.

(1) CT is the product of the disinfectant contact time (T, in minutes) and disinfectant concentration (C, in milligrams per liter). Systems with treatment credit for chlorine dioxide or ozone under paragraph (b) or (c) of this section must calculate CT at least once each day, with both C and T measured during peak hourly flow as specified in Sections 10.5.

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

(b) CT values for chlorine dioxide and ozone.

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

Table 7-13 CT Values (mg-min/L) for Cryptosporidium inactivation by Chlorine Dioxide[1]

Log Credit	Water Temperature, °C										
.	**≤0.5**	**1**	**2**	**3**	**5**	**7**	**10**	**15**	**20**	**25**	**30**
(i) 0.25	159	153	140	128	107	90	69	45	29	19	12
(ii) 0.5	319	305	279	256	214	180	138	89	58	38	24
(iii) 1.0	637	610	558	511	429	360	277	179	116	75	49
(iv) 1.5	956	915	838	767	643	539	415	268	174	113	73
(v) 2.0	1275	1220	1117	1023	858	719	553	357	232	150	98
(vi) 2.5	1594	1525	1396	1278	1072	899	691	447	289	188	122
(vii) 3.0	1912	1830	1675	1534	1286	1079	830	536	347	226	147

1 Systems may use this equation to determine log credit between the indicated values: Log credit = (0.001506 x (1.09116) Temp) x CT.

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

Table 7-14 CT Values (mg-min/L) for Cryptosporidium inactivation by Ozone[1]

Log Credit	Water Temperature, °C										
.	**≤0.5**	**1**	**2**	**3**	**5**	**7**	**10**	**15**	**20**	**25**	**30**
(i) 0.25	6.0	5.8	5.2	4.8	4.0	3.3	2.5	1.6	1.0	0.6	0.39
(ii) 0.5	12	12	10	9.5	7.9	6.5	4.9	3.1	2.0	1.2	0.78
(iii) 1.0	24	23	21	19	16	13	9.9	6.2	3.9	2.5	1.6
(iv) 1.5	36	35	31	29	24	20	15	9.3	5.9	3.7	2.4
(v) 2.0	48	46	42	38	32	26	20	12	7.8	4.9	3.1
(vi) 2.5	60	58	52	48	40	33	25	16	9.8	6.2	3.9
(vii) 3.0	72	69	63	57	47	39	30	19	12	7.4	4.7

1 Systems may use this equation to determine log credit between the indicated values: Log credit = (0.0397 x (1.09757)Temp) x CT.

(c) Ultraviolet light. Systems receive *Cryptosporidium*, Giardia lamblia, and virus treatment credits for ultraviolet (UV) light reactors by achieving the corresponding UV dose values shown in paragraph (c)(1) of this section. Systems must validate and monitor UV reactors as described in paragraphs (c)(2) and (3) of this section to demonstrate that they are achieving a particular UV dose value for treatment credit.

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

Table 7-15 UV Dose Table for Cryptosporidium, Giardia lamblia, and Virus Inactivation Credit

Log Credit	***Cryptosporidium* UV dose (mJ/cm2)**	**Giardia lamblia UV dose (mJ/cm2)**	**Virus UV dose (mJ/cm2)**
(i) 0.5	1.6	1.5	39
(ii) 1.0	2.5	2.1	58
(iii) 1.5	3.9	3.0	79
(iv) 2.0	5.8	5.2	100
(v) 2.5	8.5	7.7	121
(vi) 3.0	12	11	143
(vii) 3.5	15	15	163
(viii) 4.0	22	22	186

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

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

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

(3) Reactor monitoring.

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

(ii) To receive treatment credit for UV light, systems must treat at least 95 percent of the water delivered to the public during each month by UV reactors operating within validated conditions for the required UV dose, as described in paragraphs (c)(1) and (2) of this section. Systems must demonstrate compliance with this condition by the monitoring required under paragraph (c)(3)(i) of this section.

Reporting Requirements

7.4.19 Reporting Requirements

(a) Systems must report sampling schedules under Section 7.4.3 and source water monitoring results under Section 7.4.5 unless they notify the Department that they will not conduct source water monitoring due to meeting the criteria of Section 7.4.2(d).

(b) Systems must report the use of uncovered finished water storage facilities to the Department as described in Section 7.4.12 (a).

(c) Filtered systems must report their *Cryptosporidium* bin classification as described in Section 7.4.9.

(d) Systems must report disinfection profiles and benchmarks to the Department as described in Sections 7.4.7 through 7.4.8 prior to making a significant change in disinfection practice.

(e) Systems must report to the Department in accordance with the following table for any microbial toolbox options used to comply with treatment requirements under Section 7.4.10. Alternatively, the Department may approve a system to certify operation within required parameters for treatment credit rather than reporting monthly operational data for toolbox options.

Table 7-16 Microbial Toolbox Reporting Requirements

Toolbox Option	Systems must submit the following information:	On the following schedule:
(1) Watershed control program (WCP)	(i) Notice of intention to develop a new or continue an existing water shed control program.	No later than two years before the applicable treatment compliance date in 7.4.11.
	(ii) Watershed control plan.	No later than one year before the applicable treatment compliance date in 7.4.11.
	(iii) Annual watershed control program status report.	Every 12 months, beginning one year after the applicable treatment compliance date in 7.4.11.
	(iv) Watershed sanitary survey report.	For community water systems, every three years beginning three years after the applicable treatment compliance date in 7.4.11. For non-community water systems, every five years beginning five years after the applicable compliance date in 7.4.11.
(2) Alternative source/intake management	Verification that system has relocated the intake or adopted the intake withdrawal procedure	No later than the applicable treatment compliance date in 7.4.11.

	reflected in monitoring results.	
(3) Presedimentation	Monthly verification of the following: (i) Continuous basin operation (ii) Treatment of 100% of the flow (iii) Continuous addition of a coagulant (iv) At least 0.5-log mean reduction of influent turbidity or compliance with alternative State-approved performance criteria.	Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.
(4) Two-stage lime Softening	Monthly verification of the following: (i) Chemical addition and hardness precipitation occurred in two separate and sequential softening stages prior to filtration (ii) Both stages treated 100% of the plant flow.	Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.
(5) Bank Filtration	(i) Initial demonstration of the following: (A) Unconsolidated, predominantly sandy aquifer (B) Setback distance of at least 25 ft. (0.5-log credit) or 50 ft. (1.0-log credit (ii) If monthly average of daily max turbidity is greater than 1 NTU then system must report result and submit an assessment of the cause.	No later than the applicable treatment compliance date in Section 7.4.11. Report within 30 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.
(6) Combined filter performance	Monthly verification of combined filter effluent (CFE) turbidity levels less than or equal to 0.15 NTU in at least 95 percent of the 4 hour CFE measurements taken each month.	Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.
(7) Individual filter performance	Monthly verification of the following: (i) Individual filter effluent (IFE) turbidity levels less than or equal to 0.15 NTU in at least 95 percent of samples each month in each filter (ii) No individual filter greater than 0.3 NTU in two consecutive readings 15 minutes apart.	Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.
(8) Demonstration of performance	(i) Results from testing following a Department approved protocol. (ii) As required by the Department, monthly verification of operation within conditions of Department approval for demonstration of performance credit.	No later than the applicable treatment compliance date in Section 7.4.11. Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.

(9) Bag or cartridge filters	(i) Demonstration that the following criteria are met: (A) Process meets the definition of bag or cartridge filtration; (B) Removal efficiency established through challenge testing that meets criteria in this section. (ii) Monthly verification that 100% of plant flow was filtered.	No later than the applicable treatment compliance date in Section 7.4.11. Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.
(10) Membrane filtration	(i) Results of verification testing demonstrating the following: (A) Removal efficiency established through challenge testing that meets criteria in this section; (B) Integrity test method and parameters, including resolution, sensitivity, test frequency, control limits, and associated baseline. (ii) Monthly report summarizing the following: (A) All direct integrity tests above the control limit; (B) If applicable, any turbidity or alternative Department-approved indirect integrity monitoring results triggering direct integrity testing and the corrective action that was taken.	No later than the applicable treatment compliance date in Section 7.4.11. Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.
(11) Second stage filtration	Monthly verification that 100% of flow was filtered through both stages and that first stage was preceded by coagulation step.	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.
(12) Slow sand filters Inactivation Toolbox Options	Monthly verification that both a slow sand filter and a preceding separate stage of filtration treated 100% of flow from Surface Water and GWUDI sources.	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.
(13) Chlorine dioxide	Summary of CT values for each day as described in Section 7.4.18.	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.
(14) Ozone	Summary of CT values for each day as described in Section 7.4.18.	Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.
(15) UV	(i) Validation test results	No later than the applicable treatment

	demonstrating operating conditions that achieve required UV dose. (ii) Monthly report summarizing the percentage of water entering the distribution system that was not treated by UV reactors operating within validated conditions for the required dose as specified in 7.4.18(c).	compliance date in Section 7.4.11. Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in Section 7.4.11.

7.5 Recycle Provisions

7.5.1 Applicability

All surface water or groundwater under the direct influence of surface water systems that employ conventional filtration or direct filtration treatment and that recycle spent filter backwash water, thickener supernatant, or liquids from dewatering processes must meet the requirements in sections 7.5.2 through 7.5.3 of this Article 7 and the requirements of section 1.6.3(i).

7.5.2 Reporting

(a) A system must notify the Department in writing by December 8, 2003, if the system recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes. This notification must include, at a minimum, the information specified in sections 7.5.2(a)(1) and (2) below.

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

(2) Typical recycle flow in gallons per minute (gpm), the highest observed plant flow experienced in the previous year (gpm), design flow for the treatment plant (gpm), and Department-approved operating capacity for the plant where the Department has made such determinations.

7.5.3 Treatment technique requirement

(a) Any system that recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes must return these flows at the head-works prior to the processes of a system's existing conventional or direct filtration system as defined in Article 1 or at an alternate location approved by the Department by June 8, 2004. If capital improvements are required to modify the recycle location to meet this requirement, all capital improvements must be completed no later than June 8, 2006.

7.6 Disinfectant Residuals, Disinfection Byproducts, and Disinfection Byproduct Precursors

7.6.1 General

(a) Requirements.

(1) The regulations in this section 7.6 establish criteria under which community water systems and non-transient, non-community water systems which add a chemical disinfectant to the water in any part of the drinking water treatment process must modify

their practices to meet MCLs and MRDLs in Tables 2-5 and 2-6, respectively, and must meet the treatment technique requirements for disinfection byproduct precursors in section 7.6.4(d).

(2) The regulations in this section 7.6 establish criteria under which transient, non-community water systems that use chlorine dioxide as a disinfectant or oxidant must modify their practices to meet the MRDL for chlorine dioxide in Table 2-6.

(3) The Department has established MCLs for TTHM and HAA5 and treatment technique requirements for disinfection byproduct precursors to limit the levels of known and unknown disinfection byproducts which may have adverse health effects. These disinfection byproducts may include chloroform; bromodichloromethane; dibromochloromethane; bromoform; dichloroacetic acid; and trichloroacetic acid.

(b) Compliance applicability.

(1) Community water systems and non-transient, non-community water systems. Unless otherwise noted, all community water systems and non-transient, non-community water systems must comply with the requirements of this section 7.6 and the MCLs and MRDLs in Tables 2-5 and 2-6.

(2) Transient, non-community water systems that use chlorine dioxide as a disinfectant or oxidant must comply with the MRDL for chlorine dioxide in Table 2-6 and the corresponding requirements of this section 7.6.

(c) Each community water system and non-transient, non-community water system regulated under section 7.6.1(a) must be operated by qualified personnel who meet the requirements of Regulation 100 and are included in a State register of qualified operators.

(d) Control of disinfectant residuals. Notwithstanding the MRDLs in Table 2-6, systems may increase residual disinfectant levels in the distribution system of chlorine or chloramines (but not chlorine dioxide) to a level and for a time necessary to protect public health, to address specific microbiological contamination problems caused by circumstances such as, but not limited to, distribution line breaks, storm run-off events, source water contamination events, or cross-connection events.

(e) The Department hereby identifies in Table 7-17 the following as the best technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant levels for disinfection byproducts identified in Table 2-5:

Table 7-17 BAT for Disinfection Byproducts

Disinfection byproduct	**Best available technology**
TTHM	Enhanced coagulation or enhanced softening or GAC10, with chlorine as the primary and residual disinfectant
HAA5	Enhanced coagulation or enhanced softening or GAC10, with chlorine as the primary and residual disinfectant.
Bromate	Control of ozone treatment process to reduce production of bromate.
Chlorite	Control of treatment processes to reduce disinfectant demand and control of disinfection treatment processes to reduce disinfectant levels.

(f) The Department hereby identifies the following as the best technology, treatment techniques, or other means available for achieving compliance with the maximum residual disinfectant levels

identified in Table 2-6 Control Of Treatment Processes to Reduce Disinfectant Demand and Control of Disinfection Treatment Processes to Reduce Disinfectant Levels.

7.6.2 Analytical Requirements

Systems must only use the analytical method(s) specified in section 10.7 to demonstrate compliance with the requirements of this section 7.6.

7.6.3 Monitoring Requirements

(a) General requirements.

(1) Systems must take all samples during normal operating conditions.

(2) Systems may consider multiple wells drawing water from a single aquifer as one treatment plant for determining the minimum number of TTHM and HAA5 samples required, with Department approval.

(3) Failure to monitor in accordance with the monitoring plan required under section 7.6.3(e) is a monitoring violation.

(4) Failure to monitor will be treated as a violation for the entire period covered by the annual average where compliance is based on a running annual average of monthly or quarterly samples or averages and the system's failure to monitor makes it impossible to determine compliance with MCLs or MRDLs.

(5) Systems may use only data collected under the provisions of this section 7.6 to qualify for reduced monitoring.

(b) Monitoring requirements for disinfection byproducts.

(1) TTHMs and HAA5.

(i) Routine monitoring. Systems must monitor at the frequency indicated in the following table:

Table 7-18 Routine Monitoring Frequency for TTHM And HAA5

Type of System	Minimum Monitoring Frequency	Sample Location in the Distribution System
Surface water or groundwater under the direct influence of surface water system serving 10,000 or more persons.	Four water samples per quarter per treatment plant.	At least 25 percent of all samples collected each quarter at locations representing maximum residence time. Remaining samples taken at locations representative of at least average residence time in the distribution system and representing the entire distribution system, taking into account number of persons served, different sources of water, and different treatment methods.[1]
Surface water or groundwater under the direct influence of surface water system serving from 500 to 9,999 persons.	One water sample per quarter per treatment plant.	Locations representing maximum residence time.[1]

Surface water or groundwater under the direct influence of surface water system serving fewer than 500 persons.	One sample per year per treatment plant during month of warmest water temperature.	Locations representing maximum residence time.[1] If the sample (or average of annual samples, if more than one sample is taken) exceeds the MCL, the system must increase monitoring to one sample per treatment plant per quarter, taken at a point reflecting the maximum residence time in the distribution system, until the system meets criteria in paragraph (b)(1)(v) of this section.
System using only groundwater not under direct influence of surface water using chemical disinfectant and serving 10,000 or more persons.	One water sample per quarter per treatment plant.[2]	Locations representing maximum residence time.[1]
System using only groundwater not under direct influence of surface water using chemical disinfectant and serving fewer than 10,000 persons.	One sample per year per treatment plant [2] during month of warmest water temperature.	Locations representing maximum residence time.[1] If the sample (or average of annual samples, if more than one sample is taken) exceeds the MCL, the system must increase monitoring to one sample per treatment plant per quarter, taken at a point reflecting the maximum residence time in the distribution system, until the system meets criteria in paragraph (b)(1)(v) of this section.

1 If a system elects to sample more frequently than the minimum required, at least 25 percent of all samples collected each quarter (including those taken in excess of the required frequency) must be taken at locations that represent the maximum residence time of the water in the distribution system. The remaining samples must be taken at locations representative of at least average residence time in the distribution system.

2 Multiple wells drawing water from a single aquifer may be considered one treatment plant for determining the minimum number of samples required, with Department approval.

(ii) Systems may reduce monitoring, except as otherwise provided, in accordance with the following table:

Table 7-19 Reduced Monitoring Frequency for TTHM and HAA5

If you are a . . .	You may reduce monitoring if you have monitored at least one year and your . . .	To this level
Surface water or groundwater under the direct influence of surface water system serving 10,000 or more persons which has a source water annual average TOC level, before any treatment, less than or equal to (<) 4.0 mg/L.	TTHM annual average less than or equal to (<) 0.040 mg/L and HAA5 annual average less than or equal to (<) 0.030 mg/L.	One sample per treatment plant per quarter at distribution system location reflecting maximum residence time.

Surface water or groundwater under the direct influence of surface water system serving from 500 to 9,999 persons which has a source water annual average TOC level, before any treatment, less than or equal to (<) 4.0 mg/L.	TTHM annual average less than or equal to (<) 0.040 mg/L and HAA5 annual average less than or equal to (<) 0.030 mg/L.	One sample per treatment plant per year at distribution system location reflecting maximum residence time during month of warmest water temperature. NOTE: Any surface water or groundwater under the direct influence of surface water system serving fewer than 500 persons may not reduce its monitoring to less than one sample per treatment plant per year.
System using only groundwater not under direct influence of surface water using chemical disinfectant and serving 10,000 or more persons.	TTHM annual average less than or equal to (<) 0.040 mg/L and HAA5 annual average less than or equal to (<) 0.030 mg/L.	One sample per treatment plant per year at distribution system location reflecting maximum residence time during month of warmest water temperature
System using only groundwater not under direct influence of surface water using chemical disinfectant and serving fewer than 10,000 persons.	TTHM annual average less than or equal to (<) 0.040 mg/L and HAA5 annual average less than or equal to (<) 0.030 mg/L for two consecutive years OR TTHM annual average less than or equal to (<) 0.020 mg/L and HAA5 annual average less than or equal to (<) 0.015 mg/L for one year.	One sample per treatment plant per three year monitoring cycle at distribution system location reflecting maximum residence time during month of warmest water temperature, with the three-year cycle beginning on January 1 of the following calendar year.

(iii) *Monitoring requirements for source water TOC.* In order to qualify for reduced monitoring for TTHM and HAA5 under paragraph (b)(1)(ii) of this section, Surface Water and GWUDI systems not monitoring under the provisions of paragraph (d) of this section must take monthly TOC samples every 30 days at a location prior to any treatment, beginning April 1, 2008 or earlier, if specified by the Department. In addition to meeting other criteria for reduced monitoring in paragraph (b)(1)(ii) of this section, the source water TOC running annual average must be ≤4.0 mg/L (based on the most recent four quarters of monitoring) on a continuing basis at each treatment plant to reduce or remain on reduced monitoring for TTHM and HAA5. Once qualified for reduced monitoring for TTHM and HAA5 under paragraph (b)(1)(ii) of this section, a system may reduce source water TOC monitoring to quarterly TOC samples taken every 90 days at a location prior to any treatment.

(iv) Systems on a reduced monitoring schedule may remain on that reduced schedule as long as the average of all samples taken in the year (for systems which must monitor quarterly) or the result of the sample (for systems which must monitor no more frequently than annually) is no more than 0.060 mg/L and 0.045 mg/L for TTHMs and HAA5, respectively. Systems that do not meet these levels must resume monitoring at the frequency identified in paragraph (b)(1)(i) of this section (minimum monitoring frequency column) in the quarter immediately following the monitoring period in which the system exceeds 0.060 mg/L or 0.045 mg/L for TTHMs and HAA5, respectively. For systems using only groundwater not under the direct influence of surface water and serving fewer than 10,000

persons, if either the TTHM annual average is >0.080 mg/L or the HAA5 annual average is >0.060 mg/L, the system must go to the increased monitoring identified in paragraph (b)(1)(i) of this section (sample location column) in the quarter immediately following the monitoring period in which the system exceeds 0.080 mg/L or 0.060 mg/L for TTHMs or HAA5 respectively.

(v) Systems on increased monitoring may return to routine monitoring if, after at least one year of monitoring their TTHM annual average is less than (<) 0.060 mg/L and their HAA5 annual average is less than (<) 0.045 mg/L.

(vi) The Department may return a system to routine monitoring at the Department's discretion.

(2) Chlorite. Community and non-transient, non-community water systems using chlorine dioxide for disinfection or oxidation must conduct monitoring for chlorite.

(i) Routine monitoring.

(A) Daily monitoring. Systems must take daily samples at the entrance to the distribution system. For any daily sample that exceeds the chlorite MCL, the system must take additional samples in the distribution system the following day at the locations required by section 7.6.3(b)(2)(ii), in addition to the sample required at the entrance to the distribution system.

(B) Monthly monitoring. Systems must take a three-sample set each month in the distribution system. The system must take one 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. Any additional routine sampling must be conducted in the same manner (as three-sample sets, at the specified locations). The system may use the results of additional monitoring conducted under section 7.6.3(b)(2)(ii) to meet the requirement for monitoring in this paragraph.

(ii) Additional monitoring. On each day following a routine sample monitoring result that exceeds the chlorite MCL at the entrance to the distribution system, the system is required to take three chlorite distribution system samples at the following locations: as close to the first customer as possible, in 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).

(iii) Reduced monitoring.

(A) Chlorite monitoring at the entrance to the distribution system required by section 7.6.3(b)(2)(i)(A) may not be reduced.

(B) Chlorite monitoring in the distribution system required by section 7.6.3(b)(2)(i)(B) may be reduced to one three-sample set per quarter after one year of monitoring where no individual chlorite sample taken in the distribution system under section 7.6.3(b)(2)(i)(B) has exceeded the chlorite MCL and the system has not been required to conduct monitoring under section 7.6.3(b)(2)(ii). The system may remain on the reduced monitoring schedule until either any of the three individual chlorite samples taken quarterly in the distribution system under section

7.6.3(b)(2)(i)(B) exceeds the chlorite MCL or the system is required to conduct monitoring under section 7.6.3(b)(2)(ii), at which time the system must revert to routine monitoring.

(3) Bromate.

(i) Routine monitoring. Community and non-transient, non-community systems using ozone for disinfection or oxidation must take one sample per month for each treatment plant in the system using ozone. Systems must take samples monthly at the entrance to the distribution system while the ozonation system is operating under normal conditions.

(ii) Reduced monitoring.

(A) A system required to analyze for bromate may reduce monitoring from monthly to quarterly, if the system's running annual average bromate concentration is ≤0.0025 mg/L based on monthly bromate measurements under paragraph (b)(3)(i) of this section for the most recent four quarters, with samples analyzed using Method 317.0 Revision 2.0, 326.0 or 321.8. If a system has qualified for reduced bromate monitoring prior to April 1, 2009, that system may remain on reduced monitoring as long as the running annual average of quarterly bromate samples is ≤0.0025 mg/L based on samples analyzed using Method 317.0 Revision 2.0, 326.0, or 321.8. If the running annual average bromate concentration is >0.0025 mg/L, the system must resume routine monitoring required by paragraph (b)(3)(i) of this section.

(c) Monitoring requirements for disinfectant residuals.

(1) Chlorine and chloramines.

(i) Routine monitoring. Community and non-transient, non-community water systems that use chlorine or chloramines must measure the residual disinfectant level in the distribution system at the same point in the distribution system and at the same time as total coliforms are sampled, as specified in Article 5. Surface water or groundwater under the direct influence of surface water systems may use the results of residual disinfectant concentration sampling conducted under section 7.1.4(a)(3)(i) for systems which filter, in lieu of taking separate samples.

(ii) Reduced monitoring. Monitoring may not be reduced.

(2) Chlorine dioxide.

(i) Routine monitoring. Community, non-transient non-community, and transient non-community water systems that use chlorine dioxide for disinfection or oxidation must take daily samples at the entrance to the distribution system. For any daily sample that exceeds the MRDL, the system must take samples in the distribution system the following day at the locations required by section 7.6.3(c)(2)(ii), in addition to the sample required at the entrance to the distribution system.

(ii) Additional monitoring. On each day following a routine sample monitoring result that exceeds the MRDL, the system is required to take three chlorine dioxide distribution system samples. If chlorine dioxide or chloramines are used to maintain a disinfectant residual in the distribution system, or if chlorine is used to

maintain a disinfectant residual in the distribution system and there are no disinfection addition points after the entrance to the distribution system (i.e., no booster chlorination), the system must take three samples as close to the first customer as possible, at intervals of at least six hours. If chlorine is used to maintain a disinfectant residual in the distribution system and there are one or more disinfection addition points after the entrance to the distribution system (i.e., booster chlorination), the system must take one sample at each of the following locations: as close to the first customer as possible, in 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).

(iii) Reduced monitoring. Chlorine dioxide monitoring may not be reduced.

(d) Monitoring requirements for disinfection byproduct precursors (DBPP).

(1) Routine monitoring. Surface water or groundwater under the direct influence of surface water systems which use conventional filtration treatment [as defined in section 1.5.2] must monitor each treatment plant for TOC no later than the point of combined filter effluent turbidity monitoring and representative of the treated water. All systems required to monitor under this section 7.6.3(d)(1) must also monitor for TOC in the source water prior to any treatment at the same time as monitoring for TOC in the treated water. These samples (source water and treated water) are referred to as paired samples. At the same time as the source water sample is taken, all systems must monitor for alkalinity in the source water prior to any treatment. Systems must take one paired sample and one source water alkalinity sample per month per plant at a time representative of normal operating conditions and influent water quality.

(2) Reduced monitoring. Surface water or groundwater under the direct influence of surface water systems with an average treated water TOC of less than (<) 2.0 mg/L for two consecutive years, or less than 1.0 mg/L for one year, may reduce monitoring for both TOC and alkalinity to one paired sample and one source water alkalinity sample per plant per quarter. The system must revert to routine monitoring in the month following the quarter when the annual average treated water TOC greater than or equal to (≥) 2.0 mg/L.

(e) Monitoring plans. Each system required to monitor under this section 7.6 must develop and implement a monitoring plan. The system must maintain the plan and make it available for inspection by the Department. All Surface water or groundwater under the direct influence of surface water systems serving more than 3,300 people must submit a copy of the monitoring plan to the Department no later than the date of the first report required under section 7.6.5(a). The Department may also require the plan to be submitted by any other system. If the Department has not requested additional information or approved the submitted plan within 60 days of its receipt, the plan shall be deemed to be approved. The Department however reserves the right to review the plan and request information at any time, and may require changes to the plan. After review, the Department may require changes in any plan elements. The plan must include at least the following elements.

(1) Specific locations and schedules for collecting samples for any parameters included in this Article.

(2) How the system will calculate compliance with MCLs, MRDLs, and treatment techniques.

(3) If approved for monitoring as a consecutive system, or if providing water to a consecutive system, under the provisions of sections 1.9 through 1.10, the sampling plan must reflect the entire distribution system.

7.6.4 Compliance Requirements

(a) General requirements.

(1) Where compliance is based on a running annual average of monthly or quarterly samples or averages and the system fails to monitor for TTHM, HAA5, or bromate, this failure to monitor will be treated as a monitoring violation for the entire period covered by the annual average. Where compliance is based on a running annual average of monthly or quarterly samples or averages and the system failure to monitor makes it impossible to determine compliance with MRDLs for chlorine and chloramines, this failure to monitor will be treated as a monitoring violation for the entire period covered by the annual average.

(2) All samples taken and analyzed under the provisions of this section 7.6 must be included in determining compliance, even if that number is greater than the minimum required.

(3) If, during the first year of monitoring under section 7.6.3, any individual quarter's average will cause the running annual average of that system to exceed the MCL for total trihalomethanes, haloacetic acids (five), or bromate; or the MRDL for chlorine or chloramine, the system is out of compliance at the end of that quarter.

(b) Disinfection byproducts.

(1) TTHMs and HAA5.

(i) For systems monitoring quarterly, compliance with MCLs in Table 2-5 must be based on a running annual arithmetic average, computed quarterly, of quarterly arithmetic averages of all samples collected by the system as prescribed by section 7.6.3(b)(1).

(ii) For systems monitoring less frequently than quarterly, systems demonstrate MCL compliance if the average of samples taken that year under the provisions of section 7.6.3(b)(1) does not exceed the MCLs in Table 2-5. If the average of these samples exceeds the MCL, the system must increase monitoring to once per quarter per treatment plant and such a system is not in violation of the MCL until it has completed one year of quarterly monitoring, unless the result of fewer than four quarters of monitoring will cause the running annual average to exceed the MCL, in which case the system is in violation at the end of that quarter. Systems required to increase monitoring frequency to quarterly monitoring must calculate compliance by including the sample which triggered the increased monitoring plus the following three quarters of monitoring.

(iii) If the running annual arithmetic average of quarterly averages covering any consecutive four-quarter period exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to Article 9, section 9.2–Public Notification in addition to reporting to the Department pursuant to section 7.6.5.

(iv) If a PWS fails to complete four consecutive quarters of monitoring, compliance with the MCL for the last four-quarter compliance period must be based on an average of the available data.

(2) Bromate. Compliance must be based on a running annual arithmetic average, computed quarterly, of monthly samples (or, for months in which the system takes more than one sample, the average of all samples taken during the month) collected by the system as prescribed by section 7.6.3(b)(3). If the average of samples covering any consecutive

four-quarter period exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to Article 9, section 9.2 – Public Notification, in addition to reporting to the Department pursuant to section 7.6.5. If a PWS fails to complete 12 consecutive months' monitoring, compliance with the MCL for the last four-quarter compliance period must be based on an average of the available data.

(3) Chlorite. Compliance must be based on an arithmetic average of each three sample set taken in the distribution system as prescribed by section 7.6.3(b)(2)(i)(B) and section 7.6.3(b)(2)(ii). If the arithmetic average of any three sample set exceeds the MCL, the system is in violation of the MCL and must notify the public pursuant to Article 9, section 9.2–Public Notification, in addition to reporting to the Department pursuant to section 7.6.5.

(c) Disinfectant residuals.

(1) Chlorine and chloramines.

(i) Compliance must be based on a running annual arithmetic average, computed quarterly, of monthly averages of all samples collected by the system under section 7.6.3(c)(1). If the average covering any consecutive four-quarter period exceeds the MRDL, the system is in violation of the MRDL and must notify the public pursuant to Article 9, section 9.2–Public Notification, in addition to reporting to the Department pursuant to section 7.6.5.

(ii) In cases where systems switch between the use of chlorine and chloramines for residual disinfection during the year, compliance must be determined by including together all monitoring results of both chlorine and chloramines in calculating compliance. Reports submitted pursuant to section 7.6.5 must clearly indicate which residual disinfectant was analyzed for each sample.

(2) Chlorine dioxide.

(i) Acute violations. Compliance must be based on consecutive daily samples collected by the system under section 7.6.3(c)(2). If any daily sample taken at the entrance to the distribution system exceeds the MRDL, and on the following day one (or more) of the three samples taken in the distribution system exceed the MRDL, the system is in violation of the MRDL and must take immediate corrective action to lower the level of chlorine dioxide below the MRDL and must notify the public pursuant to the procedures for acute health risks in Article 9, section 9.2–Public Notification in addition to reporting to the Department pursuant to section 7.6.5. Failure to take samples in the distribution system the day following an exceedance of the chlorine dioxide MRDL at the entrance to the distribution system will also be considered an MRDL violation and the system must notify the public of the violation in accordance with the provisions for acute violations under Article 9, section 9.2.2 in addition to reporting to the Department pursuant to section 7.6.5.

(ii) Non-acute violations. Compliance must be based on consecutive daily samples collected by the system under section 7.5.3(c)(2). If any two consecutive daily samples taken at the entrance to the distribution system exceed the MRDL and all distribution system samples taken are below the MRDL, the system is in violation of the MRDL and must take corrective action to lower the level of chlorine dioxide below the MRDL at the point of sampling and will notify the public pursuant to the procedures for non-acute health risks in Article 9, section 9.2–Public Notification in addition to reporting to the Department pursuant to section 7.5.5. Failure to monitor at the entrance to the distribution system the day

following an exceedance of the chlorine dioxide MRDL at the entrance to the distribution system is also an MRDL violation and the system must notify the public of the violation in accordance with the provisions in Article 9, section 9.2–Public Notification in addition to reporting to the Department pursuant to section 7.6.5.

(d) Disinfection byproduct precursors (DBPP). Compliance must be determined as specified by section 7.6.6(c). Systems may begin monitoring to determine whether Step 1 TOC removals can be met 12 months prior to the compliance date for the system. This monitoring is not required and failure to monitor during this period is not a violation. However, any system that does not monitor during this period, and then determines in the first 12 months after the compliance date that it is not able to meet the Step 1 requirements in section 7.6.6(b)(2) and must therefore apply for alternate minimum TOC removal (Step 2) requirements, is not eligible for retroactive approval of alternate minimum TOC removal (Step 2) requirements as allowed pursuant to section 7.6.6(b)(3) and is in violation. Systems may apply for alternate minimum TOC removal (Step 2) requirements any time after the compliance date. For systems required to meet Step 1 TOC removals, if the value calculated under section 7.6.6(c)(1)(iv) is less than 1.00, the system is in violation of the treatment technique requirements and must notify the public pursuant to Article 9, section 9.2–Public Notification, in addition to reporting to the Department pursuant to section 7.6.5.

7.6.5 Reporting and Recordkeeping Requirements

(a) Systems required to sample quarterly or more frequently must report to the Department within 10 days after the end of each quarter in which samples were collected, notwithstanding the provisions of Article 1, section 1.6.4. Systems required to sample less frequently than quarterly must report to the Department within 10 days after the end of each monitoring period in which samples were collected.

(b) Disinfection byproducts. Systems must report the information specified in the following table:

Table 7-20 Disinfection Byproduct Reporting Requirements

If you are a * * *	**You must report * * *[1]**
(1) System monitoring for TTHMs and HAA5 under the requirements of section 7.6.3(b) on a quarterly or more frequent basis.	(i) The number of samples taken during the last quarter.
.	(ii) The location, date, and result of each sample taken during the last quarter.
.	(iii) The arithmetic average of all samples taken in the last quarter.
.	(iv) The annual arithmetic average of the quarterly arithmetic averages of this section for the last four quarters.
.	(v) Whether, based on section 7.6.4(b)(1), the MCL was violated.
(2) System monitoring for TTHMs and HAA5 under the requirements of section 7.6.3(b) less frequently than quarterly (but as least annually).	(i) The number of samples taken during the last year.
.	(ii) The location, date, and result of each sample taken during the last monitoring period.
.	(iii) The arithmetic average of all samples taken over the last year.

.	(iv) Whether, based on section 7.6.4(b)(1), the MCL was violated.
(3) System monitoring for TTHMs and HAA5 under the requirements of section 7.6.3(b) less frequently than annually.	(i) The location, date, and result of each sample taken
.	(ii) Whether, based on section 7.6.4(b)(1), the MCL was violated.
(4) System monitoring for chlorite under the requirements of section 7.6.3(b).	(i) The number of entry point samples taken each month for the last 3 months.
.	(ii) The location, date, and result of each sample (both entry point and distribution system) taken during the last quarter.
.	(iii) For each month in the reporting period, the arithmetic average of all samples taken in each three samples set taken in the distribution system.
.	(iv) Whether, based on section 7.6.4(b)(3), the MCL was violated, in which month, and how many times it was violated each month.
(5) System monitoring for bromate under the requirements of section 7.6.3(b).	(i) The number of samples taken during the last quarter.
.	(ii) The location, date, and result of each sample taken during the last quarter.
.	(iii) The arithmetic average of the monthly arithmetic averages of all samples taken in the last year.
.	(iv) Whether, based on section 7.6.4(b)(2), the MCL was violated.

1 The Department may perform calculations and determine whether the MCL was exceeded, in lieu of having the system report that information.

(c) Disinfectants. Systems must report the information specified in the following table:

Table 7-21 Disinfectant Reporting Requirements

If you are a * * *	**You must report * * *[1]**
(1) System monitoring for chlorine or chloramines under the requirements of section 7.6.3(c).	(i) The number of samples taken during each month of the last quarter.
.	(ii) The month arithmetic average of all samples taken in each month for the last 12 months.
.	(iii) The arithmetic average of the monthly averages for the last 12 months.
.	(iv) Whether, based on section 7.6.4(c)(1), the MRDL was violated.
(2) System monitoring for chlorine dioxide under the requirements of section 7.6.3(c).	(i) The dates, result, and locations of samples taken during the last quarter.
.	(ii) Whether, based on section 7.6.4(c)(2), the MRDL was violated.
.	(iii) Whether the MRDL was exceeded in any two consecutive daily samples and whether the resulting violation was acute or nonacute.

1 The Department may perform calculations and determine whether the MRDL was exceeded, in lieu of having the system report that information.

(d) Disinfection byproduct precursors and enhanced coagulation or enhanced softening. Systems must report the information specified in the following table:

Table 7-22 Disinfection Byproduct Precursor Reporting Requirements

If you are a * * *	You must report * * *[1]
(1) System monitoring monthly or quarterly for TOC under the requirements of section 7.6.3(d) and required to meet the enhanced coagulation or enhanced softening requirements in section 7.6.6(b)(2) or (3).	(i) The number of paired (source water and treated water) samples taken during the last quarter.
.	(ii) The location, date, and results of each paired sample and associated alkalinity taken during the last quarter.
.	(iii) For each month in the reporting period that paired samples were taken, the arithmetic average of the percent reduction of TOC for each paired sample and the required TOC percent removal.
.	(iv) Calculations for determining compliance with the TOC percent removal requirements, as provided in section 7.6.6(c)(1).
.	(v) Whether the system is in compliance with the enhanced coagulation or enhanced softening percent removal requirements in section 7.6.6(b) for the last four quarters.
(2) System monitoring monthly or quarterly for TOC under the requirements of section 7.6.3(d) and meeting one or more of the alternative compliance criteria in section 7.6.6(a)(2) or (3).	(i) The alternative compliance criterion that the system is using.
.	(ii) The number of paired samples taken during the last quarter.
.	(iii) The location, date, and result of each paired sample and associated alkalinity taken during the last quarter.
.	(iv) The running annual arithmetic average based on monthly averages (or quarterly samples) of source water TOC for systems meeting a criterion in Sections 15.3.3(a)(2)(i) or (iii) or of treated water TOC for systems meeting the criterion in section 7.6.6(a)(2)(ii).
.	(v) The running annual arithmetic average based on monthly averages (or quarterly samples) of source water SUVA for systems meeting the criterion in section 7.6.6(a)(2)(v) or of treated water SUVA for systems meeting the criterion in section 7.6.6(a)(2)(vi).
.	(vi) The running annual average of source water alkalinity for systems meeting the criterion in section 7.5.6(a)(2)(iii) and of treated water alkalinity for systems meeting the criterion in section 7.5.6(a)(3)(i).
.	(vii) The running annual average for both TTHM and HAA5 for systems meeting the criterion in section 7.6.6(a)(2)(iii) or (iv).
.	(viii) The running annual average of the amount of magnesium

	hardness removal (as $CaCO_3$, in mg/L) for systems meeting the criterion in section 7.6.6(a)(3)(ii).
.	(ix) Whether the system is in compliance with the particular alternative compliance criterion in section 7.6.6(a)(2) or (3).

1 The Department may perform calculations and determine whether the treatment technique was met, in lieu of having the system report that information.

7.6.6 Treatment Technique for Control of Disinfection Byproduct (DBP) Precursors

(a) Applicability

(1) Surface water or groundwater under the direct influence of surface water systems using conventional filtration treatment (as defined in section 1.5.2(27)) must operate with enhanced coagulation or enhanced softening to achieve the TOC percent removal levels specified in section 7.6.6(b) unless the system meets at least one of the alternative compliance criteria listed in section 7.6.6(a)(2) or (a)(3).

(2) Alternative compliance criteria for enhanced coagulation and enhanced softening systems. Surface water or groundwater under the direct influence of surface water systems using conventional filtration treatment may use the alternative compliance criteria in sections 7.6.6(a)(2)(i) through (vi) to comply with this section in lieu of complying with section 7.6.6(b). Systems must still comply with monitoring requirements in section 7.6.3(d).

(i) The system's source water TOC level, measured according to section 10.7.4(c), is less than 2.0 mg/L, calculated quarterly as a running annual average.

(ii) The system's treated water TOC level, measured according to section 10.7.4(c), is less than 2.0 mg/L, calculated quarterly as a running annual average.

(iii) The system's source water TOC level, measured according to section 10.7.4(c), is less than 4.0 mg/L, calculated quarterly as a running annual average; the source water alkalinity, measured according to section 10.2.2 (a), is greater than 60 mg/L (as $CaCO_3$), calculated quarterly as a running annual average; and either the TTHM and HAA5 running annual averages are no greater than 0.040 mg/L and 0.030 mg/L, respectively; or prior to the effective date for compliance in section 7.6.1 (b), the system has made a clear and irrevocable financial commitment not later than the effective date for compliance in section 7.6.1(b) to use of technologies that will limit the levels of TTHMs and HAA5 to no more than 0.040 mg/L and 0.030 mg/L, respectively. Systems must submit evidence of a clear and irrevocable financial commitment, in addition to a schedule containing milestones and periodic progress reports for installation and operation of appropriate technologies, to the Department for approval not later than the effective date for compliance in section 7.6.1(b). These technologies must be installed and operating not later than June 30, 2005. Failure to install and operate these technologies by the date in the approved schedule will constitute a violation of Colorado Primary Drinking Water Regulations.

(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.

(v) The system's source water SUVA, prior to any treatment and measured monthly according to section 10.7.4(d), is less than or equal to (≤) 2.0 L/mg-m, calculated quarterly as a running annual average.

(vi) The system's finished water SUVA, measured monthly according to section 10.7.4(d), is less than or equal to (≤) 2.0 L/mg-m, calculated quarterly as a running annual average.

(3) Additional alternative compliance criteria for softening systems. Systems practicing enhanced softening that cannot achieve the TOC removals required by section 7.6.6(b)(2) may use the alternative compliance criteria in section 7.6.6(a)(3)(i) and (ii) in lieu of complying with section 7.6.6(b). Systems must still comply with monitoring requirements in section 7.6.3(d).

(i) Softening that results in lowering the treated water alkalinity to less than 60 mg/L (as $CaCO_3$), measured monthly according to section 10.2.2(a) and calculated quarterly as a running annual average.

(ii) Softening that results in removing at least 10 mg/L of magnesium hardness (as $CaCO_3$), measured monthly according to section 10.7.4(f) and calculated quarterly as an annual running average.

(b) Enhanced coagulation and enhanced softening performance requirements

(1) Systems must achieve the percent reduction of TOC specified in section 7.6.6(b)(2) between the source water and the combined filter effluent, unless the Department approves a system's request for alternate minimum TOC removal (Step 2) requirements under section 7.6.6(b)(3).

(2) Required Step 1 TOC reductions, indicated in the following table, are based upon specified source water parameters measured in accordance with section 10.7.4. Systems practicing softening are required to meet the Step 1 TOC reductions in the far-right column (Source water alkalinity 120 mg/L) for the specified source water TOC:

Table 7-23 3 x 3 Table for Step1 TOC Removal Requirements

Step 1-Required removal of TOC by Enhanced Coagulation and Enhanced Softening for surface water or groundwater under the direct influence of surface water systems using conventional treatment.[1,2]			
	Source-water alkalinity, mg/L as $CaCO_3$		
Source-water TOC, mg/L	0-60	>60-120	>120[3]
	TOC Required Removal (in percentages)		
>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

1 Systems meeting at least one of the conditions in section 7.6.6(a)(2)(i) – (vi) are not required to operate with enhanced coagulation.

2 Softening system meeting one of the alternative compliance criteria in section 7.6.6(a)(3)(i) – (ii) are not required to operate with enhanced softening.

3 System practicing softening must meet the TOC removal requirements in this column.

(3) Surface water or groundwater under the direct influence of surface water conventional treatment systems that cannot achieve the Step 1 TOC removals required by section 7.6.6(b)(2) due to water quality parameters or operational constraints must apply to the Department, within three months of failure to achieve the TOC removals required by section 7.6.6(b)(2), for approval of alternative minimum TOC (Step 2) removal requirements submitted by the system. If the Department approves the alternative minimum TOC removal (Step 2) requirements, the Department may make those requirements retroactive for the purposes of determining compliance. Until the

Department approves the alternate minimum TOC removal (Step 2) requirements, the system must meet the Step 1 TOC removals contained in section 7.6.6(b)(2).

(4) Alternate minimum TOC removal (Step 2) requirements. Applications made to the Department by enhanced coagulation systems for approval of alternate minimum TOC removal (Step 2) requirements under section 7.6.6(b)(3) must include, at a minimum, results of bench- or pilot-scale testing conducted under section 7.6.6(b)(4)(i). The submitted bench- or pilot-scale testing must be used to determine the alternate enhanced coagulation level.

(i) Alternate enhanced coagulation level is defined as coagulation at a coagulant dose and pH as determined by the method described in sections 7.6.6(b)(4)(i) through (v) such that an incremental addition of 10 mg/L of alum (or equivalent amount of ferric salt) results in a TOC removal of <0.3 mg/L. The percent removal of TOC at this point on the "TOC removal versus coagulant dose" curve is then defined as the minimum TOC removal required for the system. Once approved by the Department, this minimum requirement supersedes the minimum TOC removal required by the table in section 7.6.6(b)(2). This requirement will be effective until such time as the Department approves a new value based on the results of a new bench- and pilot-scale test. Failure to achieve Department-set alternative minimum TOC removal levels is a violation of Colorado Primary Drinking Water Regulations.

(ii) Bench- or pilot-scale testing of enhanced coagulation must be conducted by using representative water samples and adding 10 mg/L increments of alum (or equivalent amounts of ferric salt) until the pH is reduced to a level less than or equal to the enhanced coagulation Step 2 target pH shown in the following table:

Table 7-24 Target pH for Step 2

Enhanced Coagulation STEP 2—Target pH	.
Alkalinity (mg/L as $CaCO_3$)	Target pH
0–60	5.5
>60–120	6.3
>120–240	7.0
>240	7.5

(iii) For waters with alkalinities of less than 60 mg/L for which addition of small amounts of alum or equivalent addition of iron coagulant drives the pH below 5.5 before significant TOC removal occurs, the system must add necessary chemicals to maintain the pH between 5.3 and 5.7 in samples until the TOC removal of 0.3 mg/L per 10 mg/L alum added (or equivalent addition of iron coagulant) is reached.

(iv) The system may operate at any coagulant dose or pH necessary (consistent with other requirements of the CPDWR) to achieve the minimum TOC percent removal approved under section 7.5.6(b)(3).

(v) If the TOC removal is consistently less than 0.3 mg/L of TOC per 10 mg/L of incremental alum dose at all dosages of alum (or equivalent addition of iron

coagulant), the water is deemed to contain TOC not amenable to enhanced coagulation. The system may then apply to the Department for a waiver of enhanced coagulation requirements.

(c) Compliance calculations

(1) Surface water or groundwater under the direct influence of surface water systems other than those identified in section 7.6.6(a)(2) or (a)(3) must comply with requirements contained in section 7.6.6(b)(2) or (b)(3). Systems must calculate compliance quarterly, beginning after the system has collected 12 months of data, by determining an annual average using the following method:

(i) Determine actual monthly TOC percent removal, equal to:(1-(treated water TOC/source water TOC)) x 100

(ii) Determine the required monthly TOC percent removal (from either the table in section 7.6.6(b)(2) or from section 7.6.6(b)(3).

(iii) Divide the value in section 7.5.6(c)(1)(i) by the value in section 7.6.6(c)(1)(ii).

(iv) Add together the results of section 7.6.6 (c)(1)(iii) for the last 12 months and divide by 12.

(v) If the value calculated in section 7.6.6 (c)(1)(iv) is less than 1.00, the system is not in compliance with the TOC percent removal requirements.

(2) Systems may use the provisions in sections 7.6.6(c)(2)(i) through (v) in lieu of the calculations in section 7.6.6(c)(1)(i) through (v) to determine compliance with TOC percent removal requirements.

(i) In any month that the system's treated or source water TOC level, measured according to section 10.7.4(c), is less than 2.0 mg/L, the system may assign a monthly value of 1.0 [in lieu of the value calculated in section 7.6.6(c)(1)(iii)] when calculating compliance under the provisions of section 7.6.6(c)(1).

(ii) In any month that a system practicing softening removes at least 10 mg/L of magnesium hardness (as $CaCO_3$), the system may assign a monthly value of 1.0 (in lieu of the value calculated in section 7.6.6 (c)(1)(iii)) when calculating compliance under the provisions of section 7.6.6(c)(1).

(iii) In any month that the system's source water SUVA, prior to any treatment and measured according to section 10.7.4(d), is <2.0 L/mg-m, the system may assign a monthly value of 1.0 (in lieu of the value calculated in section 7.6.6(c)(1)(iii)) when calculating compliance under the provisions of section 7.6.6(c)(1).

(iv) In any month that the system's finished water SUVA, measured according to section 10.7.4(d), is <2.0 L/mg-m, the system may assign a monthly value of 1.0 (in lieu of the value calculated in section 7.6.6(c)(1)(iii)) when calculating compliance under the provisions of section 7.6.6(c)(1).

(v) In any month that a system practicing enhanced softening lowers alkalinity below 60 mg/L (as $CaCO_3$), the system may assign a monthly value of 1.0 (in lieu of the value calculated in section 7.6.6 (c)(1)(iii)) when calculating compliance under the provisions of section 7.6.6(c)(1).

(3) Surface water or groundwater under the direct influence of surface water systems using conventional treatment may also comply with the requirements by meeting the criteria in section 7.6.6(a)(2) or (3).

(d) Treatment technique requirements for DBP precursors. The Department identifies the following as treatment techniques to control the level of disinfection byproduct precursors in drinking water treatment and distribution systems: For Surface water or groundwater under the direct influence of surface water systems using conventional treatment, enhanced coagulation or enhanced softening.

7.7 Initial Distribution System Evaluations (IDSE)

7.7.1 General Requirements

(a) The requirements of section 7.7 establish monitoring and other requirements for identifying monitoring locations for determining compliance with maximum contaminant levels for total trihalomethanes (TTHM) and haloacetic acids (five)(HAA5) in section 7.8 of these regulations. The system must use an Initial Distribution System Evaluation (IDSE) to determine locations with representative high TTHM and HAA5 concentrations throughout the distribution system. IDSEs are used in conjunction with, but separate from, section 7.6 compliance monitoring, to identify and select section 7.8 compliance monitoring locations.

(b) Applicability. The system is subject to the requirements of this section 7.7 if the system is a community water system that uses a primary or residual disinfectant other than ultraviolet light or delivers water that has been treated with a primary or residual disinfectant other than ultraviolet light; or if the system is a nontransient noncommunity water system that serves at least 10,000 people and uses a primary or residual disinfectant other than ultraviolet light or delivers water that has been treated with a primary or residual disinfectant other than ultraviolet light.

(c) Schedule.

(1) The system must comply with the requirements of section 7.7 in accordance with the schedule outlined in Table 7-25.

Table 7-25 Early Implementation Schedule

Population Served	Submittal Date for standard monitoring plan or system specific study plan[1] or 40/30 certification[2] to the Department by or receive very small system waiver from Department	Complete the standard monitoring or system specific study by	Submit the IDSE report to the Department by[3]
Systems that are not part of a combined distribution system and systems that serve the largest population in the combined distribution system			
(i) ≥ 100,000	October 1, 2006	September 30, 2008	January 1, 2009
(ii) 50,000 – 99,999	April 1, 2007	March 31, 2009	July 1, 2009
(iii) 10,000 – 49,999	October 1, 2007	September 30, 2009	January 1, 2010

(iv) < 10,000 (CWS Only)	April 1, 2008	March 31, 2010	July 1, 2010
Other systems that are part of a combined distribution system			
(v) Wholesale system or consecutive system	- At the same time as the system with the earliest compliance date in the combined distribution system	- At the same time as the system with the earliest compliance date in the combined distribution system	- At the same time as the system with the earliest compliance date in the combined distribution system

1 If, within 12 months after the date identified in this column, the Department does not approve the system's plan or notify the system that it has not yet completed its review, the system may consider the plan submitted as approved. The system must implement that plan and must complete standard monitoring or a system specific study no later than the date identified in the third column.

2 The system must submit the 40/30 certification under Section 7.7.4 by the date indicated.

3 If, within three months after the date identified in this column (nine months after the date identified in this column if the system must comply on the schedule in paragraph (c)(1)(iii) of this section), the Department does not approve the IDSE report or notify you that it has not yet completed its review, the system may consider the report submitted as approved and the system must implement the recommended section 7.8 monitoring as required.

(2) For the purpose of the schedule in paragraph (c)(1) of this section, the Department may determine that the combined distribution system does not include certain consecutive systems based on factors such as receiving water from a wholesale system only on an emergency basis as defined in section 1.5.2 or receiving less than 5 percent of the receiving system's total annual volume of water from a wholesale system. The Department may also determine that the combined distribution system does not include certain wholesale systems based on factors such as delivering water to a consecutive system only on an emergency basis or delivering only a small percentage and small volume of water to a consecutive system.

(d) The system must conduct standard monitoring that meets the requirements in section 7.7.2, or a system specific study that meets the requirements in section 7.7.3, or certify to the Department that the system meets 40/30 certification criteria under section 7.7.4, or qualifies for a very small system waiver under section 7.7.5.

(1) The system must have taken the full complement of routine TTHM and HAA5 compliance samples required under section 7.6 of this part (or the system must have taken the full complement of reduced TTHM and HAA5 compliance samples required under section 7.6 if the system meets reduced monitoring criteria under section 7.6 of this part) during the period specified in section 7.7.4(a) to meet the 40/30 certification criteria in Section 7.7.4. The system must have taken TTHM and HAA5 samples under sections 7.6.2 and 7.6.3 to be eligible for the very small system waiver in section 7.7.5.

(2) If the system has not taken the required samples, the system must conduct standard monitoring that meets the requirements in section 7.7.2, or a system specific study that meets the requirements in section 7.7.3.

(e) The system must use only the analytical methods specified in section 10.7, or otherwise approved by EPA for monitoring under this section, to demonstrate compliance with the requirements of section 7.7.

(f) IDSE results will not be used for the purpose of determining compliance with MCLs in section 2.4.

7.7.2 Standard monitoring

(a) Standard monitoring plan. The system's standard monitoring plan must comply with paragraphs (a)(1) through (a)(4) of this section. The system must prepare and submit a standard monitoring plan to the Department according to the schedule in section 7.7.1.

(1) The system's standard monitoring plan must include a schematic of the distribution system (including distribution system entry points and their sources, and storage facilities), with notes indicating locations and dates of all projected standard monitoring, and all projected section 7.6 compliance monitoring.

(2) The system's standard monitoring plan must include justification of standard monitoring location selection and a summary of data relied on to justify standard monitoring location selection.

(3) The system's standard monitoring plan must specify the population served and system type (Surface Water or GWUDI or groundwater).

(4) The system must retain a complete copy of the standard monitoring plan submitted under this paragraph (a), including any Department modification of the standard monitoring plan, for as long as the system is required to retain the IDSE report under paragraph (c)(4) of this section.

(b) Standard monitoring.

(1) The system must monitor as indicated in the table in this paragraph (b)(1). The system must collect dual sample sets at each monitoring location. One sample in the dual sample set must be analyzed for TTHM. The other sample in the dual sample set must be analyzed for HAA5. The system must conduct one monitoring period during the peak historical month for TTHM levels or HAA5 levels or the month of warmest water temperature. The system must review available compliance, study, or operational data to determine the peak historical month for TTHM or HAA5 levels or warmest water temperature.

Table 7-26 Monitoring Locations and Frequencies for Standard Monitoring

Source water type	**Population size category**	**Monitoring periods and frequency of monitoring**	**Distribution system monitoring locations[1]**				
			Total per monitoring period	**Near entry points**	**Average residence time**	**High TTHM locations**	**High HAA5 locations**
Surface Water and GWUDI	< 500 consecutive systems	One (during peak historical month)[2]	2	1		1	
	< 500 non-consecutive systems	One (during peak historical month) [2]	2			1	1
	500 – 3,300 consecutive systems	Four (every 90 days)	2	1		1	

	500 – 3,300 non-consecutive systems	Four (every 90 days)	2			1	1
	3,301 – 9,999	Four (every 90 days)	4		1	2	1
	10,000 – 49,999	Six (every 60 days)	8	1	2	3	2
	50,000 – 249,999	Six (every 60 days)	16	3	4	5	4
	250,000 – 999,999	Six (every 60 days)	24	4	6	8	6
	1,000,000 – 4,999,999	Six (every 60 days)	32	6	8	10	8
	≥ 5,000,000	Six (every 60 days)	40	8	10	12	10
Groundwater	< 500 consecutive systems	One (during peak historical month) [2]	2	1		1	
	< 500 non-consecutive systems	One (during peak historical month) [2]	2			1	1
	500 – 9,999	Four (every 90 days)	2			1	1
	10,000 – 99,999	Four (every 90 days)	6	1	1	2	2
	100,000 – 499,999	Four (every 90 days)	8	1	1	3	3
	≥ 500,000	Four (every 90 days)	12	2	2	4	4

1 A dual sample set (i.e., a TTHM and an HAA5 sample) must be taken at each monitoring location during each monitoring period.

2 The peak historical month is the month with the highest TTHM or HAA5 levels or the warmest water temperature.

(2) The system must take samples at locations other than the existing section 7.6 monitoring locations. Monitoring locations must be distributed throughout the distribution system.

(3) If the number of entry points to the distribution system is fewer than the specified number of entry point monitoring locations, excess entry point samples must be replaced equally

at high TTHM and HAA5 locations. If there is an odd extra location number, the system must take a sample at a high TTHM location. If the number of entry points to the distribution system is more than the specified number of entry point monitoring locations, the system must take samples at entry points to the distribution system having the highest annual water flows.

(4) Monitoring under this paragraph (b) may not be reduced under the provisions of section 1.9.

(c) IDSE report. The system's IDSE report must include the elements required in paragraphs (c)(1) through (c)(3) of this section. The system must submit an IDSE report to the Department according to the schedule in section 7.7.1(c).

(1) The system's IDSE report must include all TTHM and HAA5 analytical results from Section 7.6 compliance monitoring and all standard monitoring conducted during the period of the IDSE as individual analytical results and LRAAs presented in a tabular or spreadsheet format acceptable to the Department. If changed from the standard monitoring plan submitted under paragraph (a) of this section, the report must also include a schematic of the distribution system, the population served, and system type (Surface Water and GWUDI or groundwater).

(2) The system's IDSE report must include an explanation of any deviations from the approved standard monitoring plan.

(3) The system must recommend and justify section 7.8 compliance monitoring locations and timing based on the protocol in section 7.7.6.

(4) The system must retain a complete copy of the IDSE report submitted under this section for 10 years after the date that the report was submitted. If the Department modifies the section 7.8 monitoring requirements that were recommended in the system's IDSE report or if the Department approves alternative monitoring locations, the system must keep a copy of the Department's notification on file for 10 years after the date of the Department's notification. The system must make the IDSE report and any Department notification available for review by the Department or the public.

7.7.3 System specific studies

(a) System specific study plan. A system specific study plan must be based on either existing monitoring results as required under paragraph (a)(1) of this section or modeling as required under paragraph (a)(2) of this section. The system must prepare and submit a system specific study plan to the Department according to the schedule in section 7.7.1(c).

(1) Existing monitoring results. The system may comply by submitting monitoring results collected before required to begin monitoring under section 7.7.1(c). The monitoring results and analysis must meet the criteria in paragraphs (a)(1)(i) and (a)(1)(ii) of this section.

(i) Minimum requirements.

(A) TTHM and HAA5 results must be based on samples collected and analyzed in accordance with Section 7.6.2. Samples must be collected no earlier than five years prior to the study plan submission date.

(B) The monitoring locations and frequency must meet the conditions identified in Table 7-27. Each location must be sampled once during the

peak historical month for TTHM levels or HAA5 levels or the month of warmest water temperature for every 12 months of data submitted for that location. Monitoring results must include all Section 7.6 compliance monitoring results plus additional monitoring results as necessary to meet minimum sample requirements.

Table 7-27 Monitoring Locations and Frequencies for System Specific Studies

System Type	Population Size Category	Number of Monitoring Locations	Number of Samples	
			TTHM	HAA5
Surface Water and GWUDI	< 500	3	3	3
	500 – 3,300	3	9	9
	3,301 – 9,999	6	36	36
	10,000 – 49,999	12	72	72
	50,000 – 249,999	24	144	144
	250,000 – 999,999	36	216	216
	1,000,000 – 4,999,999	48	288	288
	≥ 5,000,000	60	360	360
Groundwater	< 500	3	3	3
	500 – 9,999	3	9	9
	10,000 – 99,999	12	48	48
	100,000 – 499,999	18	72	72
	≥500,000	24	96	96

(ii) Reporting monitoring results. The system must report the information in this paragraph (a)(1)(ii).

(A) The system must report previously collected monitoring results and certify that the reported monitoring results include all compliance and non-compliance results generated during the time period beginning with the first reported result and ending with the most recent Section 7.6 results.

(B) The system must certify that the samples were representative of the entire distribution system and that treatment, and distribution system have not changed significantly since the samples were collected.

(C) The system's study monitoring plan must include a schematic of the distribution system (including distribution system entry points and their

sources, and storage facilities), with notes indicating the locations and dates of all completed or planned system specific study monitoring.

(D) The system specific study plan must specify the population served and system type (Surface Water and GWUDI or groundwater).

(E) The system must retain a complete copy of the system specific study plan submitted under this paragraph (a)(1), including any Department modification of the system specific study plan, for as long as the system is required to retain your IDSE report under paragraph (b)(5) of this section.

(F) If the system submits previously collected data that fully meet the number of samples required under paragraph (a)(1)(i)(B) of this section and the Department rejects some of the data, the system must either conduct additional monitoring to replace rejected data on a schedule the Department approves or conduct standard monitoring under section 7.7.2.

(2) Modeling. The system may comply through analysis of an extended period simulation hydraulic model. The extended period simulation hydraulic model and analysis must meet the criteria in this paragraph (a)(2).

(i) Minimum requirements.

(A) The model must simulate 24 hour variation in demand and show a consistently repeating 24 hour pattern of residence time.

(B) The model must represent the criteria listed in paragraphs (a)(2)(i)(B)(1) through (9) of this section.

(1) 75% of pipe volume;

(2) 50% of pipe length;

(3) All pressure zones;

(4) All 12-inch diameter and larger pipes;

(5) All 8-inch and larger pipes that connect pressure zones, influence zones from different sources, storage facilities, major demand areas, pumps, and control valves, or are known or expected to be significant conveyors of water;

(6) All 6-inch and larger pipes that connect remote areas of a distribution system to the main portion of the system;

(7) All storage facilities with standard operations represented in the model; and

(8) All active pump stations with controls represented in the model; and

(9) All active control valves.

(C) The model must be calibrated, or have calibration plans, for the current configuration of the distribution system during the period of high TTHM formation potential. All storage facilities must be evaluated as part of the calibration process. All required calibration must be completed no later than 12 months after plan submission.

(ii) Reporting modeling. The system specific study plan must include the information in this paragraph (a)(2)(ii).

(A) Tabular or spreadsheet data demonstrating that the model meets requirements in paragraph (a)(2)(i)(B) of this section.

(B) A description of all calibration activities undertaken, and if calibration is complete, a graph of predicted tank levels versus measured tank levels for the storage facility with the highest residence time in each pressure zone, and a time series graph of the residence time at the longest residence time storage facility in the distribution system showing the predictions for the entire simulation period (i.e., from time zero until the time it takes to for the model to reach a consistently repeating pattern of residence time).

(C) Model output showing preliminary 24 hour average residence time predictions throughout the distribution system.

(D) Timing and number of samples representative of the distribution system planned for at least one monitoring period of TTHM and HAA5 dual sample monitoring at a number of locations no less than would be required for the system under standard monitoring in Section 7.7.2 during the historical month of high TTHM. These samples must be taken at locations other than existing Section 7.6 compliance monitoring locations.

(E) Description of how all requirements will be completed no later than 12 months after submitting the system specific study plan.

(F) Schematic of the system's distribution system (including distribution system entry points and their sources, and storage facilities), with notes indicating the locations and dates of all completed system specific study monitoring (if calibration is complete) and all section 7.6 compliance monitoring.

(G) Population served and system type (Surface Water and GWUDI or groundwater).

(H) The system must retain a complete copy of the system specific study plan submitted under paragraph (a)(2) of this section, including any Department modification of the system specific study plan, for as long as the system is required to retain the IDSE report under paragraph (b)(7) of this section.

(iii) If the system submits a model that does not fully meet the requirements under paragraph (a)(2) of this section, the system must correct the deficiencies and respond to Department inquiries concerning the model. If the system fails to correct deficiencies or respond to inquiries to the Department's satisfaction, you must conduct standard monitoring under section 7.7.2.

(b) IDSE report. The system's IDSE report must include the elements required in paragraphs (b)(1) through (b)(6) of this section. The system must submit the IDSE report according to the schedule in section 7.7.1(c).

(1) The IDSE report must include all TTHM and HAA5 analytical results from section 7.6 compliance monitoring and all system specific study monitoring conducted during the period of the system specific study presented in a tabular or spreadsheet format acceptable to the Department. If changed from the system specific study plan submitted under paragraph (a) of this section, the system's IDSE report must also include a schematic of the distribution system, the population served, and system type (Surface Water and GWUDI or groundwater).

(2) If the system used the modeling provision under paragraph (a)(2) of this section, the system must include final information for the elements described in paragraph (a)(2)(ii) of this section, and a 24-hour time series graph of residence time for each section 7.8 compliance monitoring location selected.

(3) The system must recommend and justify section 7.8 compliance monitoring locations and timing based on the protocol in section 7.7.6.

(4) The system IDSE report must include an explanation of any deviations from the approved system specific study plan.

(5) The IDSE report must include the basis (analytical and modeling results) and justification you used to select the recommended section 7.8 monitoring locations.

(6) The system may submit the IDSE report in lieu of the system specific study plan on the schedule identified in section 7.7.1(c) for submission of the system specific study plan if the system believes that the necessary information is available by the time that the system specific study plan is due. If the system elects this approach, the IDSE report must also include all information required under paragraph (a) of this section.

(7) The system must retain a complete copy of the IDSE report submitted under this section for 10 years after the date that the system submitted the IDSE report. If the Department modifies the section 7.8 monitoring requirements that were recommended in the IDSE report or if the Department approves alternative monitoring locations, the system must keep a copy of the Department's notification on file for 10 years after the date of the Department's notification. The system must make the IDSE report and any Department notification available for review by the Department or the public.

7.7.4 40/30 Certification

(a) Eligibility. The system is eligible for 40/30 certification if no TTHM or HAA5 monitoring violations were received under section 7.6 and no individual sample exceeded 0.040 mg/L for TTHM or 0.030 mg/L for HAA5 during an eight (8) consecutive calendar quarter period beginning no earlier than the date specified in section 7.7.4(b).

Table 7-28 40/30 Certification Submittal Dates

If the system's 40/30 certification is due	**Then the eligibility for 40/30 certification is based on eight consecutive calendar quarters of section 7.6 compliance monitoring results beginning no earlier than[1]**
(1) October 1, 2006	January 2004

(2) April 1, 2007	January 2004
(3) October 1, 2007	January 2005
(4) April 1, 2008	January 2005

1 Unless the system is on reduced monitoring under section 7.6 of this part and wasnot required to monitor during the specified period. If the system did not monitor during the specified period, the system must base eligibility on compliance samples taken during the 12 months preceding the specified period.

(b) 40/30 certification.

(1) The system must certify to the Department that every individual compliance sample taken under section 7.6 of this part during the periods specified in paragraph (a) of this section were ≤ 0.040 mg/L for TTHM and ≤ 0.030 mg/L for HAA5, and that the system has not had any TTHM or HAA5 monitoring violations during the period specified in paragraph (a) of this section.

(2) The Department may require the system to submit compliance monitoring results, distribution system schematics, and/or recommended section 7.8 compliance monitoring locations in addition to the certification. If the system fails to submit the requested information, the Department may require standard monitoring under section 7.7.2 or a system specific study under section 7.7.3.

(3) The Department may still require standard monitoring under section 7.7.2 or a system specific study under section 7.7.3 even if the system meets the criteria in paragraph (a) of this section.

(4) The system must retain a complete copy of the certification submitted under this section for 10 years after the date that the certification was submitted. The system must make the certification, all data upon which the certification is based, and any Department notification available for review by the Department or the public.

7.7.5 Very small system waivers

(a) If the system serves fewer than 500 people and has taken TTHM and HAA5 samples under section 7.6 of this part, the system is not required to comply with this section unless the Department notifies the system that it must conduct standard monitoring under section 7.7.2 or a system specific study under section 7.7.3.

(b) If the system has not taken TTHM and HAA5 samples under section 7.6 of this part or if the Department notifies the system that it must comply with this section, the system must conduct standard monitoring under section 7.7.2 or a system specific study under section 7.7.3.

7.7.6 Section 7.8 compliance monitoring location recommendations

(a) The IDSE report must include recommendations and justification for where and during what month(s) TTHM and HAA5 monitoring for section 7.8 of this part should be conducted. The system must base recommendations on the criteria in paragraphs (b) through (e) of this section.

(b) The system must select the number of monitoring locations specified in Table 7-29 in this paragraph (b). The system will use these recommended locations as section 7.8 routine compliance monitoring locations, unless Department requires different or additional locations. The system should distribute locations throughout the distribution system to the extent possible.

Table 7-29 Recommended Compliance Monitoring Locations and Frequencies

Source Water Type	Population Size Category	Monitoring Frequency[1]	Distribution System Monitoring Locations			
			Total per Monitoring Period[2]	Highest TTHM Locations	Highest HAA5 Locations	Existing Section 7.6 Compliance Locations
Surface Water and GWUDI	< 500	per year	2	1	1	N/A
	500 – 3,300	per quarter	2	1	1	N/A
	3,301 – 9,999	per quarter	2	1	1	N/A
	10,000 – 49,999	per quarter	4	2	1	1
	50,000 – 249,999	per quarter	8	3	3	2
	250,000 – 999,999	per quarter	12	5	4	3
	1,000,000 – 4,999,999	per quarter	16	6	6	4
	≥ 5,000,000	per quarter	20	8	7	5
Groundwater	< 500	per year	2	1	1	N/A
	500 – 9,999	per year	2	1	1	N/A
	10,000 – 99,999	per quarter	4	2	1	1
	100,000 – 499,999	per quarter	6	3	2	1
	≥ 500,000	per quarter	8	3	3	2

1 All systems must monitor during month of highest DBP concentrations.

2 Systems on quarterly monitoring must take dual sample sets every 90 days at each monitoring location, except for surface water and GWUDI systems serving 500 - 3,300. Groundwater systems serving 500–9,999 on annual monitoring must take dual sample sets at each monitoring location. All other systems on annual monitoring and surface water and GWUDI systems serving 500–3,300 are required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentrations, respectively. For systems serving fewer than 500 people, only one location with a dual sample set per monitoring period is needed if the highest TTHM and HAA5 concentrations occur at the same location and month.

(c) The system must recommend section 7.8 compliance monitoring locations based on standard monitoring results, system specific study results, and section 7.6 compliance monitoring results. The system must follow the protocol in paragraphs (c)(1) through (c)(8) of this section. If required to monitor at more than eight locations, the system must repeat the protocol as necessary. If the system does not have existing section 7.6 compliance monitoring results or does not have enough existing section 7.6 compliance monitoring results, the system must repeat the protocol, skipping the provisions of paragraphs (c)(3) and (c)(7) of this section as necessary, until the system has identified the required total number of monitoring locations.

(1) Location with the highest TTHM LRAA not previously selected as a section 7.8 monitoring location.

(2) Location with the highest HAA5 LRAA not previously selected as a section 7.8 monitoring location.

(3) Existing section 7.6 average residence time compliance monitoring location (maximum residence time compliance monitoring location for groundwater systems) with the highest HAA5 LRAA not previously selected as a Section 7.8 monitoring location.

(4) Location with the highest TTHM LRAA not previously selected as a section 7.8 monitoring location.

(5) Location with the highest TTHM LRAA not previously selected as a section 7.8 monitoring location.

(6) Location with the highest HAA5 LRAA not previously selected as a section 7.8 monitoring location.

(7) Existing section 7.6 average residence time compliance monitoring location (maximum residence time compliance monitoring location for groundwater systems) with the highest TTHM LRAA not previously selected as a section 7.8 monitoring location.

(8) Location with the highest HAA5 LRAA not previously selected as a section 7.8 monitoring location.

(d) A systems may recommend locations other than those specified in paragraph (c) of this section if the system includes a rationale for selecting other locations. If the Department approves the alternate locations, the system must monitor at these locations to determine compliance under section 7.8 of this part.

(e) The system's recommended schedule must include section 7.8 monitoring during the peak historical month for TTHM and HAA5 concentration, unless the Department approves another month. Once the system has identified the peak historical month, and if the system is required to conduct routine monitoring at least quarterly, the system must schedule section 7.8 compliance monitoring at a regular frequency of every 90 days or fewer.

7.8 Stage 2 Disinfection Byproducts Requirement

7.8.1 General requirements

(a) The requirements of section 7.8 establish monitoring and other requirements for achieving compliance with the maximum contaminant levels listed in section 2.4 based on locational running annual averages (LRAA) for total trihalomethanes (TTHM) and haloacetic acids (five)(HAA5), and for achieving compliance with maximum residual disinfectant residuals for chlorine and chloramine for certain consecutive systems.

(b) The system is subject to the requirements of section 7.8 if the system is a community water system or a nontransient noncommunity water system that uses a primary or residual disinfectant other than ultraviolet light or delivers water that has been treated with a primary or residual disinfectant other than ultraviolet light.

(c) The system must comply with the requirements of section 7.8 in accordance with the schedule in the Table 7-30.

Table 7-30 Compliance Dates

If the system is a…….	**The system must comply with section 7.8 monitoring by[1]**
Systems that are not part of a combined distribution system and systems that serve the largest population in the combined distribution system	
(1) System serving ≥ 100,000	April 1, 2012
(2) System serving 50,000 – 99,999	October 1, 2012
(3) System serving 10,000 – 49,999	October 1, 2013
(4) System serving < 10,000	October 1, 2013 if no Cryptosporidium monitoring is required under section 7.4.2(a)(3) or October 1, 2014 if Cryptosporidium monitoring is required under sections 7.4.2(a)(3) and 7.4.2(a)(4)
Other systems that are part of a combined distribution system	
(5) Consecutive system or wholesale system	At the same time as the system with the earliest compliance date in the combined distribution system

1 The Department may grant up to an additional 24 months for compliance with MCLs and operational evaluation levels if you require capital improvements to comply with an MCL.

(1) The system's monitoring frequency is specified in section 7.8.2(a)(2).

(i) If the system is required to conduct quarterly monitoring, the system must begin monitoring in the first full calendar quarter that includes the compliance date in Table 7-30.

(ii) If the system is required to conduct monitoring at a frequency that is less than quarterly, the system must begin monitoring in the calendar month recommended in the IDSE report prepared under section 7.7.2 or section 7.7.3 or the calendar month identified in the section 7.8 monitoring plan developed under section 7.8.3 no later than 12 months after the compliance date in this table.

(2) If the system is required to conduct quarterly monitoring, the system must make compliance calculations at the end of the fourth calendar quarter that follows the compliance date and at the end of each subsequent quarter (or earlier if the LRAA calculated based on fewer than four quarters of data would cause the MCL to be exceeded regardless of the monitoring results of subsequent quarters). If the system is required to conduct monitoring at a frequency that is less than quarterly, compliance calculations must be made beginning with the first compliance sample taken after the compliance date.

(3) For the purpose of the schedule in this paragraph (c), the Department may determine that the combined distribution system does not include certain consecutive systems based on factors such as receiving water from a wholesale system only on an emergency basis or receiving only a small percentage and small volume of water from a wholesale system. The Department may also determine that the combined distribution system does not include certain wholesale systems based on factors such as delivering water to a

consecutive system only on an emergency basis or delivering only a small percentage and small volume of water to a consecutive system.

(d) Monitoring and compliance.

(1) Systems required to monitor quarterly. To comply with disinfection byproducts MCLs in Table 2-5, a system must calculate LRAAs for TTHM and HAA5 using monitoring results collected under this section and determine that each LRAA does not exceed the MCL. If the system fails to complete four consecutive quarters of monitoring, the system must calculate compliance with the MCL based on the average of the available data from the most recent four quarters. If the system takes more than one sample per quarter at a monitoring location, the system must average all samples taken in the quarter at that location to determine a quarterly average to be used in the LRAA calculation.

(2) Systems required to monitor yearly or less frequently. To determine compliance with section 2.4 MCLs, the system must determine that each sample taken is less than the MCL. If any sample exceeds the MCL, the system must comply with the requirements of Section 7.8.6. If no sample exceeds the MCL, the sample result for each monitoring location is considered the LRAA for that monitoring location.

(e) Violation. The system is in violation of the monitoring requirements for each quarter that a monitoring result would be used in calculating an LRAA if the system fails to monitor.

(f) Best Available Technologies

(1) The Department hereby identifies the following as the best technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant levels for TTHM and HAA5 as a locational running annual average for all systems that disinfect their source water:

Table 7-31 Wholesale System Best Available Technology (BAT)

Disinfection byproduct	Best available technology
TTHM & HAA5	Enhanced coagulation or enhanced softening, plus GAC10; or nanofiltration with a molecular weight cutoff ≤ 1000 Daltons; or GAC20

(2) The Department hereby identifies the following as the best technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant levels for TTHM and HAA5 as a locational running annual average for consecutive systems and applies only to the disinfected water that consecutive systems buy or otherwise receive:

Table 7-32 Consecutive System Best Available Technology (BAT)

Disinfection byproduct	Best available technology
TTHM & HAA5	Systems serving ≥ 10,000: Improved distribution system and storage tank management to reduce residence time, plus the use of chloramines for disinfectant residual maintenance.
TTHM & HAA5	Systems serving < 10,000: Improved distribution system and storage tank management to reduce residence time.

7.8.2 Routine monitoring

(a) Monitoring.

(1) If a system submitted an IDSE report, the system must begin monitoring at the locations and months recommended in the IDSE report submitted under section 7.7.6 following the schedule in section 7.8.1(c), unless the Department requires other locations or additional locations after its review. If a system submitted a 40/30 certification under section 7.7.4 or qualified for a very small system waiver under section 7.7.5 or is a nontransient noncommunity water system serving < 10,000, the system must monitor at the location(s) and dates identified in the monitoring plan in section 7.6.3(e), updated as required by section 7.8.3.

(2) A system must monitor at no fewer than the number of locations identified in this paragraph (a)(2).

Table 7-33 Compliance Monitoring Locations and Frequencies

Source Water Type	**Population Size Category**	**Monitoring Frequency[1]**	**Distribution System Monitoring Location Total Per Monitoring Period[2]**
Surface Water and GWUDI	< 500	per year	2
	500 – 3,300	per quarter	2
	3,301 – 9,999	per quarter	2
	10,000 – 49,999	per quarter	4
	50,000 – 249,999	per quarter	8
	250,000 – 999,999	per quarter	12
	1,000,000 – 4,999,999	per quarter	16
	≥ 5,000,000	per quarter	20
Groundwater	< 500	per year	2
	500 – 9,999	per year	2
	10,000 – 99,999	per quarter	4
	100,000 – 499,999	per quarter	6
	≥ 500,000	per quarter	8

1 All systems must monitor during month of highest DBP concentrations.

2 Systems on quarterly monitoring must take dual sample sets every 90 days at each monitoring location, except for surface water and GWUDI systems serving 500-3,300. Groundwater systems serving 500–9,999 on annual monitoring must take dual sample sets at each monitoring location. All other systems on annual monitoring and surface water and GWUDI systems serving 500–3,300 are required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentrations, respectively. For systems serving fewer than 500 people, only one location with a dual sample set per monitoring period is needed if the highest TTHM and HAA5 concentrations occur at the same location and month.

(3) If a system is an undisinfected system that begins using a disinfectant other than UV light after the dates in section 7.7 for complying with the Initial Distribution System Evaluation

requirements, the system must consult with the Department to identify compliance monitoring locations for this section. The system must then develop a monitoring plan under section 7.8.3 that includes those monitoring locations.

(b) Analytical methods. A system must use an approved method listed in section 10.7 for TTHM and HAA5 analyses in this section. Analyses must be conducted by laboratories that have received certification by EPA or the Department as specified in section 10.7.

7.8.3 Section 7.8 monitoring plan

(a)

(1) A system must develop and implement a monitoring plan to be kept on file for Department and public review. The monitoring plan must contain the elements in paragraphs (a)(1)(i) through (a)(1)(iv) of this section and be complete no later than the date you conduct your initial monitoring under this section.

(i) Monitoring locations;

(ii) Monitoring dates;

(iii) Compliance calculation procedures; and

(iv) Monitoring plans for any other systems in the combined distribution system if the Department has reduced monitoring requirements under the Department authority in section 1.9.

(2) If a system was not required to submit an IDSE report under either section 7.7.2 or section 7.7.3, and does not have sufficient section 7.6 monitoring locations to identify the required number of section 7.8 compliance monitoring locations indicated in section 7.7.6(b), the system must identify additional locations by alternating selection of locations representing high TTHM levels and high HAA5 levels until the required number of compliance monitoring locations has been identified. The system must also provide the rationale for identifying the locations as having high levels of TTHM or HAA5. If a system has more section 7.6 monitoring locations than required for section 7.8 compliance monitoring in section 7.7.6(b), the system must identify which locations will be used for section 7.8 compliance monitoring by alternating selection of locations representing high TTHM levels and high HAA5 levels until the required number of section 7.8 compliance monitoring locations have been identified.

(b) If a system is a Surface Water and GWUDI system serving > 3,300 people, the system must submit a copy of the system's monitoring plan to the Department prior to the date required to conduct initial monitoring under this section, unless the system's IDSE report submitted under section 7.7 of this part contains all the information required by this section.

(c) A system may revise the monitoring plan to reflect changes in treatment, distribution system operations and layout (including new service areas), or other factors that may affect TTHM or HAA5 formation, or for Department-approved reasons, after consultation with the Department regarding the need for changes and the appropriateness of changes. If the system changes monitoring locations, the system must replace existing compliance monitoring locations with the lowest LRAA with new locations that reflect the current distribution system locations with expected high TTHM or HAA5 levels. The Department may also require modifications in the system's monitoring plan. If the system is a Surface Water and GWUDI system serving > 3,300 people, the system must submit a copy of the modified monitoring plan to the Department prior to the date required to comply with the revised monitoring plan.

7.8.4 Reduced monitoring

(a) A system may reduce monitoring to the level specified in the table in this paragraph (a) any time the LRAA is ≤ 0.040 mg/L for TTHM and ≤0.030 mg/L for HAA5 at all monitoring locations. The system may only use data collected under the provisions of this section or section 7.6 of this part to qualify for reduced monitoring. In addition, the source water annual average TOC level, before any treatment, must be ≤ 4.0 mg/L at each treatment plant treating surface water or groundwater under the direct influence of surface water, based on monitoring conducted under either section 7.6.3(b)(1)(iii) or section 7.6.3(d).

Table 7-34 Reduced Monitoring Frequencies

Source Water Type	Population Size Category	Monitoring Frequency[1]	Distribution System Monitoring Location per Monitoring Period
Surface Water and GWUDI	< 500	per year	monitoring may not be reduced
	500 – 3,300	per year	1 TTHM and 1 HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement; or, 1 dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	3,301 – 9,999	per year	2 dual sample sets: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement.
	10,000 – 49,999	per quarter	2 dual sample sets at the locations with the highest TTHM and highest HAA5 LRAAs.
	50,000 – 249,999	per quarter	4 dual sample sets – at the locations with the two highest TTHM and two highest HAA5 LRAAs.
	250,000 – 999,999	per quarter	6 dual sample sets – at the locations with the three highest TTHM and three highest HAA5 LRAAs.
	1,000,000 – 4,999,999	per quarter	8 dual sample sets – at the locations with the four highest TTHM and four highest HAA5 LRAAs.
	≥ 5,000,000	per quarter	10 dual sample sets – at the locations with the five highest TTHM and five highest HAA5 LRAAs.

Groundwater	< 500	every third year	1 TTHM and 1 HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement; or, 1 dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	500 – 9,999	per year	1 TTHM and 1 HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement; or, 1 dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	10,000 – 99,999	per year	2 dual sample sets: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement.
	100,000 – 499,999	per quarter	2 dual sample sets at the locations with the highest TTHM and highest HAA5 LRAAs.
	≥ 500,000	per quarter	4 dual sample sets – at the locations with the two highest TTHM and two highest HAA5 LRAAs.

1 Systems on quarterly monitoring must take dual sample sets every calendar quarter.

(b) A system may remain on reduced monitoring as long as the TTHM LRAA ≤ 0.040 mg/L and the HAA5 LRAA ≤ 0.030 mg/L at each monitoring location (for systems with quarterly reduced monitoring) or each TTHM sample ≤ 0.060 mg/L and each HAA5 sample ≤ 0.045 mg/L (for systems with annual or less frequent monitoring). In addition, the source water annual average TOC level, before any treatment, must be ≤4.0 mg/L at each treatment plant treating surface water or groundwater under the direct influence of surface water, based on monitoring conducted under either section 7.6.3(b)(1)(iii) or section 7.6.3(d).

(c) If the LRAA based on quarterly monitoring at any monitoring location exceeds either 0.040 mg/L for TTHM or 0.030 mg/L for HAA5 or if the annual (or less frequent) sample at any location exceeds either 0.060 mg/L for TTHM or 0.045 mg/L for HAA5, or if the source water annual average TOC level, before any treatment, >4.0 mg/L at any treatment plant treating surface water or groundwater under the direct influence of surface water, the system must resume routine monitoring under section 7.8.2 or begin increased monitoring if section 7.8.6 applies.

7.8.5 Additional requirements for consecutive systems

If a system is a consecutive system that does not add a disinfectant but delivers water that has been treated with a primary or residual disinfectant other than ultraviolet light, the system must comply with analytical and monitoring requirements for chlorine and chloramines in section 7.6.3 (c) and section 7.6.3(c)(1) and the compliance requirements in section 7.6.4(c)(1) beginning April 1, 2009, unless required earlier by the Department, and report monitoring results under section 7.6.5(c).

7.8.6 Conditions requiring increased monitoring

(a) If a system is required to monitor at a particular location annually or less frequently than annually under section 7.8.2 or section 7.8.4, the system must increase monitoring to dual sample sets taken every 90 days at all locations if a TTHM sample is >0.080 mg/L or a HAA5 sample is >0.060 mg/L at any location.

(b) A system is in violation of the MCL when the LRAA exceeds the disinfection byproducts MCLs in Table 2-5, calculated based on four consecutive quarters of monitoring (or the LRAA calculated based on fewer than four quarters of data if the MCL would be exceeded regardless of the monitoring results of subsequent quarters). A system is in violation of the monitoring requirements for each quarter that a monitoring result would be used in calculating an LRAA if the system fails to monitor.

(c) A system may return to routine monitoring once increased monitoring for at least four consecutive quarters has been conducted and the LRAA for every monitoring location is < =0.060 mg/L for TTHM and < =0.045 mg/L for HAA5.

7.8.7 Operational evaluation levels

(a) A system has exceeded the operational evaluation level at any monitoring location where the sum of the two previous quarters' TTHM results plus twice the current quarter's TTHM result, divided by 4 to determine an average, exceeds 0.080 mg/L, or where the sum of the two previous quarters' HAA5 results plus twice the current quarter's HAA5 result, divided by 4 to determine an average, exceeds 0.060 mg/L.

(b)

(1) If the system exceeds the operational evaluation level, the system must conduct an operational evaluation and submit a written report of the evaluation to the Department no later than 90 days after being notified of the analytical result that causes the system to exceed the operational evaluation level. The written report must be made available to the public upon request.

(2) The system’s operational evaluation must include an examination of system treatment and distribution operational practices, including storage tank operations, excess storage capacity, distribution system flushing, changes in sources or source water quality, and treatment changes or problems that may contribute to TTHM and HAA5 formation and what steps could be considered to minimize future exceedences.

7.8.8 Requirements for remaining on reduced TTHM and HAA5 monitoring based on Section 7.8 results

(a) The system may remain on reduced monitoring after the dates identified in section 7.8.1(c) for compliance with this section only if the system qualifies for a 40/30 certification under section 7.7.4 or has received a very small system waiver under section 7.7.5, meets the reduced monitoring criteria in section 7.8.4(a), and does not change or add monitoring locations from those used for compliance monitoring under section 7.6 of this part. If the monitoring locations

under this section differ from the monitoring locations under section 7.6 of this part, the system may not remain on reduced monitoring after the dates identified in section 7.8.1(c) for compliance with this section.

7.8.9 Requirements for remaining on increased TTHM and HAA5 monitoring based on Section 7.6 results

(a) If a system was on increased monitoring under section 7.6.3(b)(1), the system must remain on increased monitoring until qualifying for a return to routine monitoring under section 7.8.6(c). The system must conduct increased monitoring under section 7.8.6 at the monitoring locations in the monitoring plan developed under section 7.8.3 beginning at the date identified in section 7.8.1(c) for compliance with this section and remain on increased monitoring until qualifying for a return to routine monitoring under section 7.8.6(c).

7.8.10 Reporting and recordkeeping requirements

(a) Reporting.

(1) A system must report the following information for each monitoring location to the Department within 10 days of the end of any quarter in which monitoring is required:

(i) Number of samples taken during the last quarter.

(ii) Date and results of each sample taken during the last quarter.

(iii) Arithmetic average of quarterly results for the last four quarters for each monitoring location (LRAA), beginning at the end of the fourth calendar quarter that follows the compliance date and at the end of each subsequent quarter. If the LRAA calculated based on fewer than four quarters of data would cause the MCL to be exceeded regardless of the monitoring results of subsequent quarters, the system must report this information to the Department as part of the first report due following the compliance date or anytime thereafter that this determination is made. If the system is are required to conduct monitoring at a frequency that is less than quarterly, the system must make compliance calculations beginning with the first compliance sample taken after the compliance date, unless you are required to conduct increased monitoring under section 7.8.6.

(iv) Whether, based on Table 2-5 and this section, the MCL was violated at any monitoring location.

(v) Any operational evaluation levels that were exceeded during the quarter and, if so, the location and date, and the calculated TTHM and HAA5 levels.

(2) If a system is a Surface Water and GWUDI system seeking to qualify for or remain on reduced TTHM/HAA5 monitoring, the system must report the following source water TOC information for each treatment plant that treats surface water or groundwater under the direct influence of surface water to the Department within 10 days of the end of any quarter in which monitoring is required:

(i) The number of source water TOC samples taken each month during last quarter.

(ii) The date and result of each sample taken during last quarter.

(iii) The quarterly average of monthly samples taken during last quarter or the result of the quarterly sample.

(iv) The running annual average (RAA) of quarterly averages from the past four quarters.

(v) Whether the RAA exceeded 4.0 mg/L.

(3) The Department may choose to perform calculations and determine whether the MCL was exceeded or the system is eligible for reduced monitoring in lieu of having the system report that information.

(b) Recordkeeping. A system must retain any section 7.8 monitoring plans and section 7.8 monitoring results as required by section 1.6.3.

Article 8 Lead and Copper Control

8.1 General Requirements

Unless otherwise indicated, the provisions of Article 8 apply to community water systems and non-transient, non-community water systems.

These regulations establish a treatment technique that includes requirements for corrosion control treatment, source water treatment, lead service line replacement, and public education. These requirements are triggered, in some cases, by lead and copper action levels measured in samples collected at consumers' taps.

(a) Lead and copper action levels.

(1) The lead action level is exceeded if the concentration of lead in more than 10 percent of tap water samples collected during any monitoring period conducted in accordance with section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) is greater than 0.015 mg/L (i.e., if the "90th percentile" lead level is greater than 0.015 mg/L).

(2) The copper action level is exceeded if the concentration of copper in more than 10 percent of tap water samples collected during any monitoring period conducted in accordance with section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) is greater than 1.3 mg/L (i.e., if the "90th percentile" copper level is greater than 1.3 mg/L).

(3) 90th percentile computation. The 90th percentile lead and copper levels shall be computed as follows:

(i) The results of all lead or copper samples taken during a monitoring period shall be placed in ascending order from the sample with the lowest concentration to the sample with the highest concentration. Each sampling result shall be assigned a number, ascending by single integers beginning with the number 1 for the sample with the lowest contaminant level. The number assigned to the sample with the highest contaminant level shall be equal to the total number of samples taken.

(ii) The number of samples taken during the monitoring period shall be multiplied by 0.9.

(iii) The contaminant concentration in the numbered sample yielded by the calculation in section 8.1(a)(3)(ii) (above) is the 90th percentile contaminant level.

(iv) For water systems serving a population of fewer than 100 that collect 5 samples per monitoring period, the 90th percentile is computed by taking the average of the highest and second highest concentrations.

(b) Corrosion control treatment requirements.

(1) All water systems shall install and operate optimal corrosion control treatment as defined in section 1.5.2.

(2) Any water system that complies with the applicable corrosion control treatment requirements specified by the Department under sections 8.5 (Corrosion Control Treatment Steps) and 8.6 (Description of Corrosion Control Treatment Requirements) shall be deemed in compliance with the treatment requirement contained in section 8.1(b)(1) (above).

(c) Source water treatment requirements. Any system exceeding the lead or copper action level shall implement all applicable source water treatment requirements specified by the Department under section 8.7 (Source Water Treatment Requirements).

(d) Lead service line replacement requirements. Any system exceeding the lead action level after implementation of applicable corrosion control and source water treatment requirements shall complete the lead service line replacement requirements contained in section 8.8 (Lead Service Line Replacement Requirements).

(e) Public education requirements. Pursuant to section 8.9 (Public Education and Supplemental Monitoring Requirements), all water systems must provide a consumer notice of lead tap water monitoring results to persons served at the sites (taps) that are tested. Any system exceeding the lead action level shall implement the public education requirements.

(f) Monitoring and analytical requirements. Tap water monitoring for lead and copper, monitoring for water quality parameters, source water monitoring for lead and copper, and analyses of the monitoring results under Article 8 shall be completed in compliance with sections 8.2 (Monitoring Requirements for Lead and Copper in Tap Water), 8.3 (Monitoring Requirements for Water Quality Parameters), 8.4 (Monitoring Requirements for Lead and Copper in Source Water), and 10.8 (Lead and Copper Analytical Requirements).

(g) Reporting requirements. Systems shall report to the Department any information required by the treatment provisions of Article 8 in addition to the requirements of section 8.10 (Reporting Requirements).

(h) Recordkeeping requirements. Systems shall maintain records in accordance with section 8.11 (Recordkeeping Requirements).

(i) Violations of the Colorado Primary Drinking Water Regulations. Failure to comply with the applicable requirements of sections 8.1-8.12 shall constitute a violation of the Colorado Primary Drinking Water Regulations.

8.2 Monitoring Requirements for Lead and Copper in Tap Water

(a) Sample site location.

8.2 Monitoring Requirements for Lead and Copper in Tap Water

(1) Each water system shall complete a materials evaluation[8-1] of its distribution system in order to identify a pool of targeted sampling sites that meets the requirements, and which is sufficiently large to ensure that the water system can collect the number of lead and copper tap samples required in section 8.2(c) (Number of lead and copper tap samples). All sites from which first draw samples are collected shall be selected from this pool of targeted sampling sites. Sampling sites may not include faucets that have point-of-use or point-of-entry treatment devices designed to remove inorganic contaminants.

8-1 See section 1.6.9 (Special Monitoring for Construction Materials) for a list of materials that must be reported to the Department.

(2) A water system shall use the information on lead, copper, and galvanized steel that it is required to collect under section 1.6.9 (Special Monitoring for Construction Materials) when conducting a materials evaluation. When an evaluation of the information collected pursuant to section 1.6.9 (Special Monitoring for Construction Materials) is insufficient to locate the requisite number of lead and copper sampling sites that meet the targeting criteria in section 8.2(a) (Sample site location), the water system shall review the sources of information listed below in order to identify a sufficient number of sampling sites. In addition, the system shall seek to collect such information where possible in the course of its normal operations (e.g., checking service line materials when reading water meters or performing maintenance activities):

(i) All plumbing codes, permits, and records in the files of the building department(s) which indicate the plumbing materials that are installed within publicly and privately owned structures connected to the distribution system;

(ii) All inspections and records of the distribution system that indicate the material composition of the service connections that connect a structure to the distribution system; and

(iii) All existing water quality information, which includes the results of all prior analyses of the system or individual structures connected to the system, indicating locations that may be particularly susceptible to high lead or copper concentrations.

(3) Community water system tier 1 sampling sites. The sampling sites selected for a community water system's sampling pool ("tier 1 sampling sites") shall consist of single family structures that:

(i) Contain copper pipes with lead solder installed after 1982 or contain lead pipes; and/or

(ii) Are served by a lead service line. When multiple-family residences comprise at least 20 percent of the structures served by a water system, the system may include these types of structures in its sampling pool.

(4) Community water system tier 2 sampling sites. Any community water system with insufficient tier 1 sampling sites shall complete its sampling pool with "tier 2 sampling sites", consisting of buildings, including multiple-family residences that:

(i) Contain copper pipes with lead solder installed after 1982 or contain lead pipes; and/or

(ii) Are served by a lead service line.

(5) Community water system tier 3 or representative sampling sites. Any community water system with insufficient tier 1 and tier 2 sampling sites shall complete its sampling pool with "tier 3 sampling sites", consisting of single family structures that contain copper pipes with lead solder installed before 1983. A community water system with insufficient tier 1, tier 2, and tier 3 sampling sites shall complete its sampling pool with representative sites throughout the distribution system. A community water system representative site is a site in which the plumbing materials used at that site would be commonly found at other sites served by the water system.

(6) Non-transient, non-community water system tier 1 sampling sites. The sampling sites selected for a non-transient, non-community water system ("tier 1 sampling sites") shall consist of buildings that:

(i) Contain copper pipes with lead solder installed after 1982 or contain lead pipes; and/or

(ii) Are served by a lead service line.

(7) Non-transient, non-community water system non-tier 1 or representative sampling sites. A non-transient, non-community water system with insufficient tier 1 sites that meet the targeting criteria in section 8.2(a)(6) (Non-transient, non-community water system tier 1 sampling sites) shall complete its sampling pool with sampling sites that contain copper pipes with lead solder installed before 1983. If additional sites are needed to complete the sampling pool, the non-transient, non-community water system shall use representative sites throughout the distribution system. A non-community water system representative site is a site in which the plumbing materials used at that site would be commonly found at other sites served by the water system.

(8) Any water system whose distribution system contains lead service lines shall draw 50 percent of the samples it collects during 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 identify a sufficient number of sampling sites served by a lead service line shall collect first-draw samples from all of the sites identified as being served by such lines.

(b) Sample collection methods.

(1) All tap samples for lead and copper collected in accordance with Article 8, with the exception of lead service line samples collected under section 8.2(b)(3) (Lead service line samples) and samples collected under section 8.2(b)(5) (Substituting non-first-draw samples) shall be first-draw samples.

(2) First draw samples. Each first-draw tap sample for lead and copper shall be one liter in volume and have stood motionless in the plumbing system of each sampling site for at least six hours. First-draw samples from residential housing shall be collected from the cold water kitchen tap or bathroom sink tap. First-draw samples from a nonresidential building shall be one liter in volume and shall be collected at an interior tap from which water is typically drawn for consumption. Non-first-draw samples collected in lieu of first-draw samples pursuant to section 8.2(b)(5) (Substituting non-first-draw samples) shall be one liter in volume and shall be collected at an interior tap from which water is typically drawn for consumption. First-draw samples may be collected by the system or the system may allow residents to collect first-draw samples after instructing the residents of the sampling procedures specified in section 8.2(b) (Sample collection methods). To avoid problems of residents handling nitric acid, acidification of first-draw samples may be done up to 14 days after the sample is collected. After acidification to resolubilize the metals, the sample must stand in the original container for the time specified in the

approved EPA method before the sample can be analyzed. If a system allows residents to perform sampling, the system may not challenge the accuracy of sampling results, based solely on alleged errors in sample collection.

(3) Lead service line samples. Each service line sample shall be one liter in volume and have stood motionless in the lead service line for at least six hours. Lead service line samples shall be collected in one of the following three ways:

(i) At the tap after flushing the volume of water between the tap and the lead service line. The volume of water shall be calculated based on the interior diameter and length of the pipe between the tap and the lead service line;

(ii) Tapping directly into the lead service line; or

(iii) If the sampling site is a building constructed as a single-family residence, allowing the water to run until there is a significant change in temperature that would be indicative of water that has been standing in the lead service line.

(4) A water system shall collect each first draw tap sample from the same sampling site from which it collected a previous sample. If, for any reason, the water system cannot gain entry to a sampling site in order to collect a follow-up tap sample, the system may collect the follow-up tap sample from another sampling site in its sampling pool as long as the new site meets the same targeting criteria, and is within reasonable proximity of the original site.

(5) Substituting non-first-draw samples. A non-transient, non-community water system, or a community water system that meets the criteria of section 8.9(b)(7) (Alternative public education for community water systems), that does not have enough taps that can supply first-draw samples, as defined in section 1.5.2, may apply to the Department in writing to substitute non-first-draw samples. Such systems must collect as many first-draw samples from appropriate taps as possible and identify sampling times and locations that would likely result in the longest standing time for the remaining sites.

(c) Number of lead and copper tap samples. Water systems shall collect at least one sample during each monitoring period specified in section 8.2(d) (Timing of monitoring) from the number of sites listed in the first column ("standard monitoring") of Table 8-1. A system conducting reduced monitoring under section 8.2(d)(4) (Reduced monitoring for lead and copper in tap water) shall collect at least one sample from the number of sites specified in the second column ("reduced monitoring") of Table 8-1 during each monitoring period specified in section 8.2(d)(4) (Reduced monitoring for lead and copper in tap water). Such reduced monitoring sites shall be representative of the sites required for standard monitoring.

(1) A public water system that has fewer than five drinking water taps, that can be used for human consumption meeting the sample site criteria of section 8.2(a) (Sample site location) to reach the required number of sample sites listed in this section 8.2(c), must collect at least one sample from each tap and then must collect additional samples from those taps on different days during the monitoring period to meet the required number of sites.

(2) The Department may specify sampling locations when a system is conducting reduced monitoring.

Table 8-1 Lead and Copper Monitoring Sampling Sites

System size (population served)	Number of sites (standard monitoring)	Number of sites (reduced monitoring)
Greater than (>) 100,000	100	50
10,001 to 100,000	60	30
3,301 to 10,000	40	20
501 to 3,300	20	10
101 to 500	10	5
Less than or equal to (≤) 100	5	5

(d) Timing of monitoring

(1) Initial tap sampling.

(i) All systems serving a population of greater than (>) 50,000 shall monitor during two consecutive six-month periods.

(ii) All systems serving a population of less than or equal to (≤) 50,000 shall monitor during each six-month monitoring period until:

(A) The system exceeds the lead or copper action level and is therefore required to implement the corrosion control treatment requirements under section 8.5 (Corrosion Control Treatment Steps), in which case the system shall continue monitoring in accordance with section 8.2(d)(2) (Monitoring after installation of corrosion control and source water treatment), or

(B) The system meets the lead and copper action levels during two consecutive six-month monitoring periods, in which case the system may reduce monitoring in accordance with section 8.2(d)(4) (Reduced monitoring for lead and copper in tap water).

(2) Monitoring after installation of corrosion control and source water treatment.

(i) Monitoring timing after installation of corrosion control. Any system that installs optimal corrosion control treatment pursuant to section 8.5(d)(5) (Treatment steps and timelines) shall monitor during two consecutive six-month monitoring periods.

(ii) Monitoring timing after installation of source water treatment Any system that installs source water treatment pursuant to section 8.7(a)(3) (Deadlines for completing source water treatment steps) shall monitor during two consecutive six-month monitoring periods by the date specified in section 8.7(a)(4) (Deadlines for completing source water treatment steps).

(3) Timing of monitoring for water quality control parameters. After the Department specifies the values for water quality control parameters under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters), the system shall monitor during each subsequent six-month monitoring period, with the first monitoring period to

begin on the date the Department specifies the optimal values under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters).

(4) Reduced monitoring for lead and copper in tap water.

(i) A system serving a population of less than or equal to (≤) 50,000 that meets the lead and copper action levels during each of two consecutive six-month monitoring periods may reduce the number of samples in accordance with section 8.2(c) (Number of lead and copper tap samples), and reduce the frequency of sampling to once per year. This sampling shall begin during the calendar year immediately following the end of the second consecutive six-month monitoring period.

(ii) Any water system that meets the lead action level and maintains the range of values for the water quality control parameters reflecting optimal corrosion control treatment specified by the Department under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters) during each of two consecutive six-month monitoring periods may reduce the frequency of monitoring to once per year and reduce the number of lead and copper samples in accordance with section 8.2(c) (Number of lead and copper tap samples) if it receives written approval from the Department. This sampling shall begin during the calendar year immediately following the end of the second consecutive six-month monitoring period. The Department shall review monitoring, treatment, and other relevant information submitted by the water system in accordance with section 8.10 (Reporting Requirements), and shall notify the system in writing when it determines the system is eligible to commence reduced monitoring pursuant to this section 8.2(d)(4). The Department shall review, and where appropriate, revise its determination when the system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

(iii) A system serving a population of less than or equal to (≤) 50,000 that meets the lead and copper action levels during three consecutive years of monitoring may reduce the frequency of monitoring for lead and copper from annually to once every three years. Any water system that meets the lead action level and maintains the range of values for the water quality control parameters reflecting optimal corrosion control treatment specified by the Department under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters) during three consecutive years of monitoring may reduce the frequency of monitoring from annually to once every three years if it receives written approval from the Department. Samples collected once every three years shall be collected no later than every third calendar year. The Department shall review monitoring, treatment, and other relevant information submitted by the water system in accordance with section 8.10 (Reporting Requirements), and shall notify the system in writing when it determines the system is eligible to reduce the frequency of monitoring to once every three years. The Department shall review, and where appropriate, revise its determination when the system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

(iv) A water system that reduces the number and frequency of sampling shall collect these samples from representative sites included in the pool of targeted sampling sites identified in section 8.2(a) (Sample site location). Systems sampling annually or less frequently shall conduct the lead and copper tap sampling during the months of June, July, August, or September unless the Department has

approved a different sampling period in accordance with the following section 8.2(d)(4)(iv)(A).

(A) The Department, at its discretion, may approve a different period for conducting the lead and copper tap sampling for systems collecting a reduced number of samples. Such a period shall be no longer than four consecutive months and must represent a time of normal operation where the highest levels of lead are most likely to occur. For a non-transient, non-community water system that does not operate during the months of June through September, and for which the period of normal operation where the highest levels of lead are most likely to occur is not known, the Department shall designate a period that represents a time of normal operation for the system. This sampling shall begin during the period approved or designated by the Department in the calendar year immediately following the end of the second consecutive six-month monitoring period for systems initiating annual monitoring and during the three-year period following the end of the third consecutive calendar year of annual monitoring for systems initiating triennial monitoring.

(B) Systems monitoring annually, that have been collecting samples during the months of June through September and that receive Department approval to alter their sample collection period under the previous section 8.2(d)(4)(iv)(A), must collect their next round of samples during a time period that ends no later than 21 months after the previous round of sampling. Systems monitoring triennially that have been collecting samples during the months of June through September, and receive Department approval to alter the sampling collection period as per the previous section 8.2(d)(4)(iv)(A), must collect their next round of samples during a time period that ends no later than 45 months after the previous round of sampling. Subsequent rounds of sampling must be collected annually or triennially, as required by section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water). Systems serving a population of ≤ 3,300 with waivers, granted pursuant to section 8.2(g) (Monitoring waivers for small systems), that have been collecting samples during the months of June through September and receive Department approval to alter their sample collection period under the previous section 8.2(d)(4)(iv)(A) must collect their next round of samples before the end of the 9-year period.

(v) Any water system that demonstrates for two consecutive 6-month monitoring periods that the tap water lead level computed under section 8.1(a)(3) (90th percentile computation) is less than or equal to 0.005 mg/L and the tap water copper level computed under section 8.1(a)(3) (90th percentile computation) is less than or equal to 0.65 mg/L may reduce the number of samples in accordance with section 8.2(c) (Number of lead and copper tap samples) and reduce the frequency of sampling to once every three calendar years.

(vi)

(A) A system serving a population of less than or equal to (≤) 50,000 subject to reduced monitoring that exceeds the lead or copper action level shall resume sampling in accordance with section 8.2(d)(3) (Timing of monitoring for water quality control parameters) and collect the number of samples specified for standard monitoring under section 8.2(c) (Number of lead and copper tap samples). Such a system shall also conduct water quality parameter monitoring in accordance with section

8.3(b) (Initial sampling for water quality parameters), 8.3(c) (Monitoring for water quality parameters after installation of corrosion control) or 8.3(d) (Monitoring after Department specifies water quality parameter values for optimal corrosion control) (as appropriate) during the monitoring period in which it exceeded the action level. Any such system may resume annual monitoring for lead and copper at the tap at the reduced number of sites specified in section 8.2(c) (Number of lead and copper tap samples) after it has completed two subsequent consecutive six-month rounds of monitoring that meet the criteria of section 8.2(d)(4)(i) (Reduced monitoring for lead and copper in tap water) and/or may resume triennial monitoring for lead and copper at the reduced number of sites after it demonstrates through subsequent rounds of monitoring that it meets the criteria of either section 8.2(d)(4)(iii) (Reduced monitoring for lead and copper in tap water) or 8.2(d)(4)(v) (Reduced monitoring for lead and copper in tap water).

(B) Any water system subject to the reduced monitoring frequency that fails to meet the lead action level during any four-month monitoring period or that fails to operate at or above the minimum value or within the range of values for the water quality parameters specified by the Department under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters) for more than nine days in any six-month period specified in section 8.3(d) (Monitoring after Department specifies water quality parameter values for optimal corrosion control) shall conduct tap water sampling for lead and copper at the frequency specified in section 8.2(d)(3) (Timing of monitoring for water quality control parameters), collect the number of samples specified for standard monitoring under section 8.2(c) (Number of lead and copper tap samples)), and shall resume monitoring for water quality parameters within the distribution system in accordance with section 8.3(d) (Monitoring after Department specifies water quality parameter values for optimal corrosion control). This standard tap water sampling shall begin no later than the six-month period beginning January 1 of the calendar year following the lead action level exceedance or water quality parameter excursion. Such a system may resume reduced monitoring for lead and copper at the tap and for water quality parameters within the distribution system under the following conditions:

(I) The system may resume annual monitoring for lead and copper at the tap at the reduced number of sites specified in section 8.2(c) (Number of lead and copper tap samples) after it has completed two subsequent six-month rounds of monitoring that meet the criteria of section 8.2(d)(4)(ii) (Reduced monitoring for lead and copper in tap water) and the system has received written approval from the Department that it is appropriate to resume reduced monitoring on an annual frequency. This sampling shall begin during the calendar year immediately following the end of the second consecutive six-month monitoring period.

(II) The system may resume triennial monitoring for lead and copper at the tap at the reduced number of sites after it demonstrates through subsequent rounds of monitoring that it meets the criteria of either section 8.2(d)(4)(iii) (Reduced monitoring for lead and copper in tap water) or 8.2(d)(4)(v) (Reduced monitoring for lead and copper in tap water) and the system has

received written approval from the Department that it is appropriate to resume triennial monitoring.

(III) The system may reduce the number of water quality parameter tap water samples required in accordance with section 8.3(e)(1) (Reduced number of water quality parameter sites) and the frequency with which it collects such samples in accordance with section 8.3(e)(2) (Maintaining water quality parameters and reduced frequency of water quality parameter tap samples). Such a system may not resume triennial monitoring for water quality parameters at the tap until it demonstrates in accordance with the requirements of section 8.3(e)(2) (Maintaining water quality parameters and reduced frequency of water quality parameter tap samples) that it has re-qualified for triennial monitoring.

(vii) Any water system subject to a reduced monitoring frequency under section 8.2(d)(4) (Reduced monitoring for lead and copper in tap water) shall notify the Department in writing in accordance with section 8.10(a)(3) (Reporting requirements for a new source or long term change in water treatment) of any upcoming long-term change in treatment or addition of a new source as described in that section. The Department must review and approve the addition of a new source or long-term change in water treatment before it is implemented by the water system. The Department may require the system to resume sampling in accordance with section 8.2(d)(3) (Timing of monitoring for water quality control parameters) and collect the number of samples specified for standard monitoring under section 8.2(c) (Number of lead and copper tap samples) or take other appropriate steps such as increased water quality parameter monitoring or re-evaluation of its corrosion control treatment given the potentially different water quality considerations.

(e) Additional monitoring by system. The results of any monitoring conducted in addition to the minimum requirements of section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) shall be considered by the system and the Department in making any determinations (i.e., calculating the 90th percentile lead or copper level) under Article 8.

(f) Invalidation of lead or copper tap water samples. A sample invalidated under this section 8.2(f) does not count toward determining lead or copper 90th percentile levels under section 8.1(a)(3) (90th percentile computation) or toward meeting the minimum monitoring requirements of section 8.2(c) (Number of lead and copper tap samples).

(1) The Department may invalidate a lead or copper tap water sample if at least one of the following conditions is met.

(i) The laboratory establishes that improper sample analysis caused erroneous results.

(ii) The Department determines that the sample was taken from a site that did not meet the site selection criteria of section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water).

(iii) The sample container was damaged in transit.

(iv) There is substantial reason to believe that the sample was subject to tampering.

(v) Sampling or analytic errors.

(2) The system must report the results of all samples to the Department and all supporting documentation for samples the system believes should be invalidated.

(3) To invalidate a sample under section 8.2(f)(1) (Invalidation of lead or copper tap water samples), the decision and the rationale for the decision must be documented in writing. The Department may not invalidate a sample solely on the grounds that a follow-up sample result is higher or lower than that of the original sample.

(4) The water system must collect replacement samples for any samples invalidated under section 8.2(f) (Invalidation of lead or copper tap water samples) if, after the invalidation of one or more samples, the system has too few samples to meet the minimum requirements of section 8.2(c) (Number of lead and copper tap samples). Any such replacement samples must be taken as soon as possible, but no later than 20 days after the date the Department invalidates the sample or by the end of the applicable monitoring period, whichever occurs later. Replacement samples taken after the end of the applicable monitoring period shall not also be used to meet the monitoring requirements of a subsequent monitoring period. The replacement samples shall be taken at the same locations as the invalidated samples or, if that is not possible, at locations other than those already used for sampling during the monitoring period.

(g) Monitoring waivers for small systems. Any system serving a population of less than or equal to (≤) 3,300 that meets the criteria may apply to the Department to reduce the frequency of monitoring for lead and copper under this section 8.2(g) to once every nine years (i.e., a "full waiver") if it meets all of the materials criteria specified in section 8.2(g)(1) (Materials criteria) and all of the monitoring criteria specified in section 8.2(g)(2) (Monitoring criteria for waiver issuance). Any system serving a population of less than or equal to (≤) 3,300 that meets the criteria in section 8.2(g)(1) (Materials criteria) and 8.2(g)(2) (Monitoring criteria for waiver issuance) only for lead, or only for copper, may apply to the Department for a waiver to reduce the frequency of tap water monitoring to once every nine years for that contaminant only (i.e., a "partial waiver").

(1) Materials criteria. The system must demonstrate that its distribution system and service lines and all drinking water supply plumbing, including plumbing conveying drinking water within all residences and buildings connected to the system, are free of lead-containing materials and/or copper-containing materials, as those terms are defined in section 1.5.2, as follows:

(i) Lead. To qualify for a full waiver, or a waiver of the tap water monitoring requirements for lead (i.e., a "lead waiver"), the water system must provide certification and supporting documentation to the Department that the system is free of all lead-containing materials, as follows:

(A) It contains no plastic pipes which contain lead plasticizers, or plastic service lines which contain lead plasticizers; and

(B) It is free of lead service lines, lead pipes, lead soldered pipe joints, and leaded brass or bronze alloy fittings and fixtures, unless such fittings and fixtures meet the specifications of any standard established pursuant to 42 United States Code (U.S.C.) 300g-6(e) (Plumbing fittings and fixtures) (SDWA section 1417(e)).

(ii) Copper. To qualify for a full waiver, or a waiver of the tap water monitoring requirements for copper (i.e., a "copper waiver"), the water system must provide

certification and supporting documentation to the Department that the system contains no copper pipes or copper service lines.

(2) Monitoring criteria for waiver issuance. The system must have completed at least one 6-month round of standard tap water monitoring for lead and copper at sites approved by the Department and from the number of sites required by section 8.2(c) (Number of lead and copper tap samples) and demonstrate that the 90th percentile levels for any and all rounds of monitoring conducted since the system became free of all lead-containing and/or copper-containing materials, as appropriate, meet the following criteria.

(i) Lead levels. To qualify for a full waiver, or a lead waiver, the system must demonstrate that the 90th percentile lead level does not exceed 0.005 mg/L.

(ii) Copper levels. To qualify for a full waiver, or a copper waiver, the system must demonstrate that the 90th percentile copper level does not exceed 0.65 mg/L.

(3) Department approval of waiver application. The Department shall notify the system of its waiver determination, in writing, setting forth the basis of its decision and any condition of the waiver. As a condition of the waiver, the Department may require the system to perform specific activities (e.g., limited monitoring, periodic outreach to customers to remind them to avoid installation of materials that might void the waiver) to avoid the risk of lead or copper concentration of concern in tap water. The system serving a population of ≤ 3,300 must continue monitoring for lead and copper at the tap as required by sections 8.2(d)(1)-(4) (Timing of monitoring), as appropriate, until it receives written notification from the Department that the waiver has been approved.

(4) Monitoring frequency for systems with waivers.

(i) A system with a full waiver must conduct tap water monitoring for lead and copper in accordance with section 8.2(d)(4)(iv) (Reduced monitoring for lead and copper in tap water) at the reduced number of sampling sites identified in section 8.2(c) (Number of lead and copper tap samples) at least once every nine years and provide the materials certification specified in section 8.2(g)(1) (Materials criteria) for both lead and copper to the Department along with the monitoring results. Samples collected every nine years shall be collected no later than every ninth calendar year.

(ii) A system with a partial waiver must conduct tap water monitoring for the waived contaminant in accordance with section 8.2(d)(4)(iv) (Reduced monitoring for lead and copper in tap water) at the reduced number of sampling sites specified in section 8.2(c) (Number of lead and copper tap samples) at least once every nine years and provide the materials certification specified in section 8.2(g)(1) (Materials criteria) pertaining to the waived contaminant along with the monitoring results. Such a system also must continue to monitor for the non-waived contaminant in accordance with requirements of sections 8.2(d)(1)-(4) (Timing of monitoring), as appropriate.

(iii) Any water system with a full or partial waiver shall notify the Department in writing in accordance with section 8.10(a)(3) (Reporting requirements for a new source or long term change in water treatment) of any upcoming long-term change in treatment or addition of a new source, as described in that section. The Department must review and approve the addition of a new source or long-term change in water treatment before it is implemented by the water system. The Department has the authority to require the system to add or modify waiver conditions (e.g., require re-certification that the system is free of lead-containing and/or copper-containing materials, require additional round(s) of monitoring), if it

deems such modifications are necessary to address treatment or source water changes at the system.

(iv) If a system with a full or partial waiver becomes aware that it is no longer free of lead-containing or copper-containing materials, as appropriate, (e.g., as a result of new construction or repairs), the system shall notify the Department in writing no later than 60 days after becoming aware of such a change.

(5) Continued eligibility. If the system continues to satisfy the requirements of section 8.2(g)(4) (Monitoring frequency for systems with waivers), the waiver will be renewed automatically, unless any of the conditions listed in sections 8.2(g)(5)(i)-(iii) (Continued eligibility) occurs. A system whose waiver has been revoked may re-apply for a waiver at such time as it again meets the appropriate materials and monitoring criteria of section 8.2(g)(1) (Materials criteria) and 8.2(g)(2) (Monitoring criteria for waiver issuance).

(i) A system with a full waiver or a lead waiver no longer satisfies the materials criteria of section 8.2(g)(1)(i) (Materials criteria) or has a 90th percentile lead level greater than 0.005 mg/L.

(ii) A system with a full waiver or a copper waiver no longer satisfies the materials criteria of section 8.2(g)(1)(ii) (Materials criteria) or has a 90th percentile copper level greater than 0.65 mg/L.

(iii) The Department notifies the system, in writing, that the waiver has been revoked, setting forth the basis of its decision.

(6) Requirements following waiver revocation. A system whose full or partial waiver has been revoked by the Department is subject to the corrosion control treatment and lead and copper tap water monitoring requirements, as follows:

(i) If the system exceeds the lead and/or copper action level, the system must implement corrosion control treatment in accordance with the deadlines specified in section 8.5 (Corrosion Control Treatment Steps), and any other applicable requirements of Article 8.

(ii) If the system meets both the lead and the copper action level, the system must monitor for lead and copper at the tap no less frequently than once every three years using the reduced number of sample sites specified in section 8.2(c) (Number of lead and copper tap samples).

8.3 Monitoring Requirements for Water Quality Parameters

All systems that exceed the lead or copper action level shall monitor water quality parameters in addition to lead and copper in accordance with this section 8.3. The requirements of this section 8.3 are summarized in the Table 8-4 - Summary of Monitoring Requirements for Water Quality Parameters.

(a) General requirements for water quality parameters.

(1) Sample collection methods.

(i) Tap samples[8-2] shall be representative of water quality throughout the distribution system taking into account the number of individuals served, the different sources of water, the different treatment methods employed by the system, and seasonal variability. Tap sampling under this section 8.3 (Monitoring Requirements for Water Quality Parameters) is not required to be conducted at

taps targeted for lead and copper sampling under section 8.2(a) (Sample site location).

8-2 Systems may find it convenient to conduct tap sampling for water quality parameters at sites used for coliform sampling under Article 5 (Microbiological Contaminants), if coliform sampling sites are customers' residences.

(iii) Samples collected at the entry point(s) to the distribution system shall be from locations representative of each source after treatment. If a system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water is representative of all sources being used).

(2) Number of samples.

(i) Systems shall collect two tap samples for applicable water quality parameters during each monitoring period specified under sections 8.3(b) (Initial sampling for water quality parameters) through (e) (Reduced monitoring for water quality parameters) from the following number of sites.

Table 8-2 Number of Water Quality Parameter Samples for Lead and Copper

System size (population served)	Number of sites for water quality parameters
Greater than (>) 100,000	25
10,001-100,000	10
3,301 to 10,000	3
501 to 3,300	2
101 to 500	1
Less than or equal to (≤) 100	1

(ii) Except as provided in section 8.3(c)(3) (Limited entry point water quality parameter sampling for groundwater systems), systems shall collect two samples for each applicable water quality parameter at each entry point to the distribution system during each monitoring period specified in section 8.3(b) (Initial sampling for water quality parameters). During each monitoring period specified in sections 8.3(c)-(e) (Monitoring for water quality parameters after installation of corrosion control, Monitoring after Department specifies water quality parameter values for optimal corrosion control, Reduced monitoring for water quality parameters), systems shall collect one sample for each applicable water quality parameter at each entry point to the distribution system.

(b) Initial sampling for water quality parameters. All systems serving a population of greater than (>) 50,000 shall measure the applicable water quality parameters as specified below at taps and at each entry point to the distribution system during each six-month monitoring period specified in section 8.2(d)(1) (Initial tap sampling). All systems serving a population of less than or equal to (≤) 50,000 shall measure the applicable water quality parameters at the locations specified below during each six-month monitoring period specified in section 8.2(d)(1) (Initial tap sampling) during which the system exceeds the lead or copper action level.

(1) At taps:

(i) pH;

(ii) Alkalinity;

(iii) Orthophosphate, when an inhibitor containing a phosphate compound is used;

(iv) Silica, when an inhibitor containing a silicate compound is used;

(v) Calcium;

(vi) Conductivity; and

(vii) Water temperature.

(2) At each entry point to the distribution system: all of the applicable parameters listed in section 8.3(b)(1) (Initial sampling for water quality parameters).

(c) Monitoring for water quality parameters after installation of corrosion control. Any system serving a population of greater than (>) 50,000 which installs optimal corrosion control treatment pursuant to section 8.5(d)(4) (Treatment steps and timelines) shall measure the water quality parameters at the locations and frequencies specified below during each six-month monitoring period specified in section 8.2(d)(2)(i) (Monitoring timing after installation of corrosion control). Any system serving a population of less than or equal to (≤) 50,000 which installs optimal corrosion control treatment shall conduct such monitoring during each six-month monitoring period specified in section 8.2(d)(2)(ii) (Monitoring timing after installation of source water treatment) in which the system exceeds the lead or copper action level.

(1) At taps, two samples for:

(i) pH;

(ii) Alkalinity;

(iii) Orthophosphate, when an inhibitor containing a phosphate compound is used;

(iv) Silica, when an inhibitor containing a silicate compound is used;

(v) Calcium, when calcium carbonate stabilization is used as part of corrosion control.

(2) Entry point monitoring for water quality parameters. Except as provided in section 8.3(c)(3) (Limited entry point water quality parameter sampling for groundwater systems), at each entry point to the distribution system, at least one sample no less frequently than every two weeks (biweekly) for:

(i) pH;

(ii) When alkalinity is adjusted as part of optimal corrosion control, a reading of the dosage rate of the chemical used to adjust alkalinity, and the alkalinity concentration; and

(iii) When a corrosion inhibitor is used as part of optimal corrosion control, a reading of the dosage rate of the inhibitor used, and the concentration of orthophosphate or silica (whichever is applicable).

(3) Limited entry point water quality parameter sampling for groundwater systems. Any groundwater system can limit entry point sampling described in section 8.3(c)(2) (Entry point monitoring for water quality parameters) to those entry points that are representative of water quality and treatment conditions throughout the system. If water from untreated groundwater sources mixes with water from treated groundwater sources, the system must monitor for water quality parameters both at representative entry points receiving treatment and representative entry points receiving no treatment. Prior to the start of any monitoring under section 8.3(c) (Monitoring for water quality parameters after installation of corrosion control), the system shall provide to the Department written information identifying the selected entry points and documentation, including information on seasonal variability, sufficient to demonstrate that the sites are representative of water quality and treatment conditions throughout the system.

(d) Monitoring after Department specifies water quality parameter values for optimal corrosion control. After the Department specifies the values for applicable water quality control parameters reflecting optimal corrosion control treatment under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters), all systems serving a population of greater than (>) 50,000 shall measure the applicable water quality parameters in accordance with section 8.3(c) (Monitoring for water quality parameters after installation of corrosion control) and determine compliance with the requirements of section 8.6(g) (Continued operation and monitoring) every six months with the first six-month period to begin on either January 1, or July 1, whichever comes first, after the Department specifies the optimal values under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters). Any system serving a population of less than or equal to (≤) 50,000 shall conduct such monitoring during each six-month period specified in section 8.3(d) (Monitoring after Department specifies water quality parameter values for optimal corrosion control) in which the system exceeds the lead or copper action level. For any system serving a population of less than or equal to (≤) 50,000 that is subject to a reduced monitoring frequency pursuant to section 8.2(d)(4) (Reduced monitoring for lead and copper in tap water) at the time of the action level exceedance, the start of the applicable six-month period under section 8.3(d)) (Monitoring after Department specifies water quality parameter values for optimal corrosion control) shall coincide with the start of the applicable monitoring period under section 8.2(d)(4)) (Reduced monitoring for lead and copper in tap water). Compliance with Department-designated optimal water quality parameter values shall be determined as specified under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters).

(e) Reduced monitoring for water quality parameters.

(1) Reduced number of water quality parameter sites. Any water system that maintains the range of values for the water quality parameters reflecting optimal corrosion control treatment during each of two consecutive six-month monitoring periods under section 8.3(d) (Monitoring after Department specifies water quality parameter values for optimal corrosion control) shall continue monitoring at the entry point(s) to the distribution system as specified in section 8.3(c)(2) (Entry point monitoring for water quality parameters). Such system may collect two tap samples for applicable water quality parameters from the following reduced number of sites during each six-month monitoring period.

Table 8-3 Reduced Sampling Sites for Lead and Copper

System Size (population served)	Reduced number of sites for water quality parameters
Greater than (>) 100,000	10
10,000 to 100,000	7

3,301 to 10,000	3
501 to 3,300	2
101 to 500	1
Less than or equal to (≤) 100	1

(2) Maintaining water quality parameters and reduced frequency of water quality parameter tap samples.

(i) Any water system that maintains the range of values for the water quality parameters reflecting optimal corrosion control treatment specified by the Department under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters) during three consecutive years of monitoring may reduce the frequency with which it collects the number of tap samples for applicable water quality parameters specified in section 8.3(e)(1) (Reduced number of water quality parameter sites) from every six months to annually. This sampling begins during the calendar year immediately following the end of the monitoring period in which the third consecutive year of six-month monitoring occurs. Any water system that maintains the range of values for the water quality parameters reflecting optimal corrosion control treatment specified by the Department under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters) during three consecutive years of annual monitoring under this section 8.3(e)(2)(i) may reduce the frequency with which it collects the number of tap samples for applicable water quality parameters specified in section 8.3(e)(1) (Reduced number of water quality parameter sites) from annually to every three years. This sampling begins no later than the third calendar year following the end of the monitoring period in which the third consecutive year of monitoring occurs.

(ii) A water system may reduce the frequency with which it collects tap samples for applicable water quality parameters specified in section 8.3(e)(1)) (Reduced number of water quality parameter sites) to every three years if it demonstrates during two consecutive monitoring periods that its tap water lead level at the 90th percentile is less than or equal to the PQL for lead specified in section 10.8.1(a)(1)(ii) (Lead and Copper Analysis), that its tap water copper level at the 90th percentile is less than or equal to (≤) 0.65 mg/L for copper in section 8.1(a)(2) (Lead and copper action levels), and that it also has maintained the range of values for the water quality parameters reflecting optimal corrosion control treatment specified by the Department under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters). Monitoring conducted every three years shall be done no later than every third calendar year.

(3) A water system that conducts sampling annually shall collect these samples evenly throughout the year so as to reflect seasonal variability.

(4) Any water system subject to the reduced monitoring frequency that fails to operate at or above the minimum value or within the range of values for the water quality parameters specified by the Department in section 8.6(f) (Department review of treatment and designation of optimal water quality parameters) for more than nine days in any six-month period specified in section 8.6(g) (Continued operation and monitoring) shall resume distribution system tap water sampling in accordance with the number and

frequency requirements in section 8.3(d) (Monitoring after Department specifies water quality parameter values for optimal corrosion control). Such a system may resume annual monitoring for water quality parameters at the tap at the reduced number of sites specified in section 8.3(e)(1) (Reduced number of water quality parameter sites) after it has completed two subsequent consecutive six-month rounds of monitoring that meet the criteria of section 8.3(e) (Reduced monitoring for water quality parameters) and/or may resume triennial monitoring for water quality parameters at the tap at the reduced number of sites after it demonstrates through subsequent rounds of monitoring that it meets the criteria of either section 8.3(e)(2)(i) or 8.3(e)(2)(ii) (Maintaining water quality parameters and reduced frequency of water quality parameter tap samples).

(f) Additional monitoring by systems. The results of any monitoring conducted in addition to the minimum requirements of section 8.3 (Monitoring Requirements for Water Quality Parameters) shall be considered by the system and the Department in making any determinations (i.e., determining concentrations of water quality parameters) under section 8.3 (Monitoring Requirements for Water Quality Parameters) or section 8.6 (Description of Corrosion Control Treatment Requirements).

Table 8-4 Summary of Monitoring Requirements for Water Quality Parameters [1]

Monitoring Period	Parameters [2]	Location	Frequency
Initial monitoring	pH, alkalinity, orthophosphate or silica[3], calcium, conductivity, temperature	Taps and at entry point(s) to the distribution system	Every 6 months
After installation of optimal corrosion control	pH, alkalinity, orthophosphate or silica[3], calcium[4]	Taps	Every 6 months
	pH, alkalinity, dosage rate and concentration (if alkalinity adjusted as part of corrosion control), inhibitor dosage rate and inhibitor residual[5]	Entry point(s) to the distribution system[6]	No less frequently than every two weeks
After Department specifies parameter values for optimal corrosion control	pH, alkalinity, orthophosphate or silica[3], calcium[4]	Taps	Every 6 months
	pH, alkalinity, dosage rate and concentration (if alkalinity adjusted as part of corrosion control), inhibitor dosage rate and inhibitor residual[5]	Entry point(s) to the distribution system[6]	No less frequently than every two weeks
Reduced Monitoring	pH, alkalinity, orthophosphate or silica[3], calcium[4]	Taps	Every 6 months, annually[7] or every 3 years[8]; reduced number of sites
	pH, alkalinity, dosage rate and concentration (if alkalinity adjusted as part of corrosion control), inhibitor dosage rate and inhibitor residual[5]	Entry point(s) to the distribution system[6]	No less frequently than every two weeks

1 Table is for illustrative purposes; consult the text of Article 8 for precise regulatory requirements.

2 Systems serving a population of less than or equal to (≤) 50,000 have to monitor for water quality parameters only during monitoring periods in which the system exceeds the lead or copper action level.

3 Orthophosphate must be measured only when an inhibitor containing a phosphate compound is used. Silica must be measured only when an inhibitor containing silicate compound is used.

4 Calcium must be measured only when calcium carbonate stabilization is used as part of corrosion control.

5 Inhibitor dosage rates and inhibitor residual concentrations (orthophosphate or silica) must be measured only when an inhibitor is used.

6 Groundwater systems may limit monitoring to representative locations throughout the system.

7 Water systems may reduce frequency of monitoring for water quality parameters at the tap from every six months to annually if they have maintained the range of values for water quality parameters reflecting optimal corrosion control during 3 consecutive years of monitoring.

8 Water systems may further reduce the frequency of monitoring for water quality parameters at the tap from annually to once every 3 years if they have maintained the range of values for water quality parameters reflecting optimal corrosion control during 3 consecutive years of annual monitoring. Water systems may accelerate to triennial monitoring for water quality parameters at the tap if they have maintained 90th percentile lead levels less than or equal to (≤) 0.005 mg/L, 90th percentile copper levels less than or equal to (≤) 0.65 mg/L, and the range of water quality parameters designated by the Department under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters) as representing optimal corrosion control during two consecutive six-month monitoring periods.

8.4 Monitoring Requirements for Lead and Copper in Source Water

(a) Sample location, collection methods, and number of samples.

(1) A water system that fails to meet the lead or copper action level on the basis of tap samples collected in accordance with section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) shall collect lead and copper source water samples in accordance with the following requirements regarding sample location, number of samples, and collection methods:

(i) Groundwater systems shall take a minimum of one sample at every entry point to the distribution system that is representative of each well after treatment (hereafter called a sampling point). The system shall take one sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

(ii) Surface water systems[8-3] shall take a minimum of one sample at every entry point to the distribution system after any application of treatment or in the distribution system at a point that is representative of each source after treatment (hereafter called a sampling point). The system shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

8-3 For the purposes of Article 8, surface water systems include systems with a combination of surface and groundwater sources.

(iii) If a system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water is representative of all sources being used).

(iv) The Department 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. Composite samples from a maximum of five samples are allowed, provided that, if the lead concentration in the composite

sample is greater than or equal to (≤) 0.001 mg/L or the copper concentration is greater than or equal to (≤) 0.160 mg/L, then either:

(A) A follow-up sample shall be taken and analyzed within 14 days at each sampling point included in the composite; or

(B) If duplicates of or sufficient quantities from the original samples from each sampling point used in the composite are available, the system may use these instead of re-sampling.

(2) Where the results of sampling indicate an exceedance of maximum permissible source water levels established under section 8.7(b)(4) (Department review of source water treatment and specification of maximum permissible source water levels), the Department may require that one additional sample be collected as soon as possible after the initial sample was taken (but not to exceed two weeks) at the same sampling point. If a Department-required confirmation sample is taken for lead or copper, then the results of the initial and confirmation sample shall be averaged in determining compliance with the Department-specified maximum permissible levels. Any sample value below the detection limit shall be considered to be zero. Any value above the detection limit but below the PQL shall either be considered as the measured value or be considered one-half the PQL.

(b) Monitoring frequency after system exceeds tap water action level. Any system that exceeds the lead or copper action level at the tap shall collect one source water sample from each entry point to the distribution system no later than six months after the end of the monitoring period during which the lead or copper action level was exceeded. For monitoring periods that are annual or less frequent, the end of the monitoring period is September 30 of the calendar year in which the sampling occurs, or if the Department has established an alternative monitoring period, the last day of that period.

(c) Monitoring frequency after installation of source water treatment. Any system that installs source water treatment pursuant to section 8.7(a)(3) (Deadlines for completing source water treatment steps) shall collect an additional source water sample from each entry point to the distribution system during two consecutive six-month monitoring periods by the deadline specified in section 8.7(a)(4) (Deadlines for completing source water treatment steps).

(d) Monitoring frequency after Department specifies maximum permissible source water levels or determines that source water treatment is not needed.

(1) Source water monitoring frequency. A system shall monitor at the frequency specified below in cases where the Department specifies maximum permissible source water levels under section 8.7(b)(4) (Department review of source water treatment and specification of maximum permissible source water levels) or determines that the system is not required to install source water treatment under section 8.7(b)(2) (Department determination regarding source water treatment).

(i) A water system using only groundwater shall collect samples once during the three-year compliance period, as that term is defined in section 1.5.2, in effect when the applicable Department determination under this section 8.4(d)(1) is made. Such systems shall collect samples once during each subsequent compliance period. Triennial samples shall be collected every third calendar year.

(ii) A water system using surface water (or a combination of surface and groundwater) shall collect samples once during each year, the first annual

monitoring period to begin during the year in which the applicable Department determination is made under this section 8.4(d)(1).

(2) A system is not required to conduct source water sampling for lead and/or copper if the system meets the action level for the specific contaminant in tap water samples during the entire source water sampling period applicable to the system under section 8.4(d)(1)(i) or 8.4(d)(1)(ii) (Source water monitoring frequency).

(e) Reduced source water monitoring frequency.

(1) A water system using only groundwater may reduce the monitoring frequency for lead and copper in source water to once during each nine-year compliance cycle, as defined in section 1.5.2, provided that the samples are collected no later than every ninth calendar year and if the system meets one of the following criteria:

(i) The system demonstrates that finished drinking water entering the distribution system has been maintained below the maximum permissible lead and copper concentrations specified by the Department in section 8.7(b)(4) (Department review of source water treatment and specification of maximum permissible source water levels) during at least three consecutive compliance periods under section 8.4(d)(1) (Source water monitoring frequency); or

(ii) The Department has determined that source water treatment is not needed and the system demonstrates that, during at least three consecutive compliance periods in which sampling was conducted under section 8.4(d)(1) (Source water monitoring frequency), the concentration of lead in source water was less than or equal to 0.005 mg/L and the concentration of copper in source water was less than or equal to 0.65 mg/L.

(2) A water system using surface water (or a combination of surface water and groundwater) may reduce the monitoring frequency in section 8.4(d)(1) (Source water monitoring frequency) to once during each nine-year compliance cycle, as that term is defined in section 1.5.2, provided that the samples are collected no later than every ninth calendar year and if the system meets one of the following criteria:

(i) The system demonstrates that finished drinking water entering the distribution system has been maintained below the maximum permissible lead and copper concentrations specified by the Department in section 8.7(b)(4) (Department review of source water treatment and specification of maximum permissible source water levels) for at least three consecutive years; or

(ii) The Department has determined that source water treatment is not needed and the system demonstrates that, during at least three consecutive years, the concentration of lead in source water was less than or equal to (≤) 0.005 mg/L and the concentration of copper in source water was less than or equal to (≤) 0.65 mg/L.

(3) A water system that uses a new source of water is not eligible for reduced monitoring for lead and/or copper until concentrations in samples collected from the new source during three consecutive monitoring periods are below the maximum permissible lead and copper concentrations specified by the Department in section 8.7(a)(5) (Deadlines for completing source water treatment steps).

8.5 Corrosion Control Treatment Steps

8.5 Corrosion Control Treatment Steps

(a) Systems shall complete the applicable corrosion control treatment requirements described in section 8.6 (Description of Corrosion Control Treatment Requirements) by the deadlines established in this section 8.5.

(1) A system serving a population of greater than (>) 50,000 shall complete the corrosion control treatment steps specified in section 8.5(d) (Treatment steps and timelines), unless it is deemed to have optimized corrosion control under section 8.5(b)(2) (Deemed to have optimized corrosion control by the Department) or 8.5(b)(3) (Deemed to have optimized corrosion control based upon tap water and source water monitoring results).

(2) Systems serving a population of less than or equal to (≤) 50,000 shall complete the corrosion control treatment steps specified in section 8.5(d) (Treatment steps and timelines), unless it is deemed to have optimized corrosion control under section 8.5(b) (Deemed optimized corrosion control).

(b) Deemed optimized corrosion control. A system is deemed to have optimized corrosion control and is not required to complete the applicable corrosion control treatment steps identified in Article 8 if the system satisfies one of the criteria specified below in sections 8.5(b)(1)-(3). Any such system deemed to have optimized corrosion control under Article 8, and which has treatment in place, shall continue to operate and maintain optimal corrosion control treatment and meet any requirements that the Department determines appropriate to ensure optimal corrosion control treatment is maintained.

(1) Deemed to have optimized corrosion control by meeting lead and copper action levels. A system serving a population of less than or equal to (≤) 50,000 is deemed to have optimized corrosion control if the system meets the lead and copper action levels during each of two consecutive six-month monitoring periods conducted in accordance with section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water).

(2) Deemed to have optimized corrosion control by the Department. Any water system may be deemed by the Department to have optimized corrosion control treatment if the system demonstrates to the satisfaction of the Department that it has conducted activities equivalent to the corrosion control steps applicable to such system under section 8.5 (Corrosion Control Treatment Steps). If the Department makes this determination, it shall provide the system with written notice explaining the basis for its decision and shall specify the water quality control parameters representing optimal corrosion control in accordance with section 8.6(f) (Department review of treatment and designation of optimal water quality parameters). Water systems deemed to have optimized corrosion control under Article 8 shall operate in compliance with the Department-designated optimal water quality control parameters in accordance with section 8.6(g) (Continued operation and monitoring) and continue to conduct lead and copper tap and water quality parameter sampling in accordance with section 8.2(d)(3) (Timing of monitoring for water quality control parameters) and section 8.3(d) (Monitoring after Department specifies water quality parameter values for optimal corrosion control), respectively. A system shall provide the Department with the following information in order to support a determination under this section 8.5(b)(2):

(i) The results of all test samples collected for each of the water quality parameters in section 8.6(c)(3).

(ii) A report explaining the test methods used by the water system to evaluate the corrosion control treatments listed in section 8.6(c)(1), the results of all tests conducted, and the basis for the system's selection of optimal corrosion control treatment;

(iii) A report explaining how corrosion control has been installed and how it is being maintained to insure minimal lead and copper concentrations at consumers' taps; and

(iv) The results of tap water samples collected in accordance with section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) at least once every six months for one year after corrosion control has been installed.

(3) Deemed to have optimized corrosion control based upon tap water and source water monitoring results. Any water system is deemed to have optimized corrosion control if it submits results of tap water monitoring conducted in accordance with section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) and source water monitoring conducted in accordance with section 8.4 (Monitoring Requirements for Lead and Copper in Source Water) that demonstrates for two consecutive 6-month monitoring periods that the difference between the 90th percentile tap water lead level computed under section 8.1(a)(3) (90th percentile computation), and the highest source water lead concentration is less than the Practical Quantitation Level for lead specified in section 10.8.1(a)(1)(ii) (Achieve quantitative acceptance limits as follows).

(i) Those systems whose highest source water lead level is below the Method Detection Limit may also be deemed to have optimized corrosion control under Article 8 if the 90th percentile tap water lead level is less than or equal to the Practical Quantitation Level for lead for two consecutive 6-month monitoring periods.

(4) Any water system deemed to have optimized corrosion control in accordance with Article 8 shall continue monitoring for lead and copper at the tap no less frequently than once every three calendar years using the reduced number of sites specified in section 8.2(c) (Number of lead and copper tap samples) and collecting the samples at times and locations specified in section 8.2(d)(4)(iv) (Reduced monitoring for lead and copper in tap water).

(5) Any water system deemed to have optimized corrosion control under section 8.5(b) (Deemed optimized corrosion control) must notify the Department in writing, as required by section 8.10(a)(3) (Reporting requirements for a new source or long term change in water treatment) of any upcoming long-term change in treatment or the addition of a new source as described in that section. The Department must review and approve the addition of a new source or long-term change in water treatment before it is implemented by the water system. The Department may require any such system to conduct additional monitoring or to take other action the Department determines appropriate to ensure that such systems maintain minimal levels of corrosion in the distribution system.

(6) A system is not deemed to have optimized corrosion control under section 8.5(b) (Deemed optimized corrosion control), and shall implement corrosion control treatment pursuant to section 8.5(b)(7), unless it meets the copper action level.

(7) Any system triggered into corrosion control because it is no longer deemed to have optimized corrosion control under section 8.5(b) (Deemed optimized corrosion control), shall implement corrosion control treatment in accordance with the deadlines in section 8.5(d) (Treatment steps and timelines). The time periods for completing each step are triggered by the date the system is no longer deemed to have optimized corrosion control under section 8.5(b) (Deemed optimized corrosion control).

(c) Any system serving a population of ≤ 50,000 that is required to complete the corrosion control steps due to its exceedance of the lead or copper action level may cease completing the treatment steps whenever the system meets both action levels during each of two consecutive

monitoring periods conducted pursuant to section 8.2(Monitoring Requirements for Lead and Copper in Tap Water) and submits the results to the Department. If any such water system thereafter exceeds the lead or copper action level during any monitoring period, the system shall recommence completion of the applicable treatment steps, beginning with the first treatment step that was not previously completed in its entirety. The Department may require a system to repeat treatment steps previously completed by the system where the Department determines that this is necessary to implement properly the treatment requirements of section 8.5 (Corrosion Control Treatment Steps). The Department shall notify the system in writing of such a determination and explain the basis for its decision. The requirement for any system serving a population of ≤ 50,000 to implement corrosion control treatment steps in accordance with section 8.5(d) (Treatment steps and timelines), including systems deemed to have optimized corrosion control under section 8.5(b)(1) (Deemed to have optimized corrosion control by meeting lead and copper action levels), is triggered whenever any system serving a population of less than or equal to (≤) 50,000 exceeds the lead or copper action level.

(d) Treatment steps and timelines. Except as provided in section 8.5(b) (Deemed optimized corrosion control), systems shall complete the following corrosion control treatment steps (described in the referenced portions of section 8.6 (Description of Corrosion Control Treatment Requirements), section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) and section 8.3 (Monitoring Requirements for Water Quality Parameters)) by the indicated time periods.

(1) Step 1: The system shall conduct initial tap sampling (section 8.2(d)(1) (Initial tap sampling) and section 8.3(b) (Initial sampling for water quality parameters)) until the system either exceeds the lead or copper action level or becomes eligible for reduced monitoring under section 8.2(d)(4) (Reduced monitoring for lead and copper in tap water). A system exceeding the lead or copper action level shall recommend optimal corrosion control treatment (section 8.6(a) (System recommendation regarding corrosion control treatment)) within six months after the end of the monitoring period during which it exceeds one of the action levels.

(2) Step 2: Within 12 months after the end of the monitoring period during which a system exceeds the lead or copper action level, the Department may require the system to perform corrosion control studies (section 8.6(b) (Department decision to require studies of corrosion control treatment)). If the Department does not require the system to perform such studies, the Department shall specify optimal corrosion control treatment (section 8.6(d) (Department designation of optimal corrosion control treatment)) within the following timeframes:

(i) For systems serving a population greater than (>) 50,000, within 6 months after the end of the monitoring period during which such system exceeds the lead or copper action level,

(ii) For systems serving a population of greater than (>) 3,300 but less than or equal to (≤) 50,000, within 18 months after the end of the monitoring period during which such system exceeds the lead or copper action level,

(iii) For systems serving a population of less than or equal to (≤) 3,300, within 24 months after the end of the monitoring period during which such system exceeds the lead or copper action level.

(3) Step 3: If the Department requires a system to perform corrosion control studies under step 2, the system shall complete the studies (section 8.6(c) (Performance of corrosion control studies)) within 18 months after the Department requires that such studies be conducted.

(4) Step 4: If the system has performed corrosion control studies under step 2, the Department shall designate optimal corrosion control treatment (section 8.6(d) (Department designation of optimal corrosion control treatment)) within 6 months after completion of step 3.

(5) Step 5: The system shall install optimal corrosion control treatment (section 8.6(e) (Installation of optimal corrosion control)) within 24 months after the Department designates such treatment.

(6) Step 6: The system shall complete follow-up sampling (section 8.2(d)(2) (Monitoring after installation of corrosion control and source water treatment) and section 8.3(c) (Monitoring for water quality parameters after installation of corrosion control)) within 36 months after the Department designates optimal corrosion control treatment.

(7) Step 7: The Department shall review the system's installation of treatment and designate optimal water quality control parameters (section 8.6(f) (Department review of treatment and designation of optimal water quality parameters)) within 6 months after completion of step 6.

(8) Step 8: The system shall operate in compliance with the Department-designated optimal water quality control parameters (section 8.6(g) (Continued operation and monitoring)) and continue to conduct tap sampling (section 8.2(d)(3) (Timing of monitoring for water quality control parameters) and section 8.3(d) (Monitoring after Department specifies water quality parameter values for optimal corrosion control)).

8.6 Description of Corrosion Control Treatment Requirements

Each system shall complete the corrosion control treatment requirements described below which are applicable to such system under section 8.5 (Corrosion Control Treatment Steps).

(a) System recommendation regarding corrosion control treatment. Based upon the results of lead and copper tap monitoring and water quality parameter monitoring, systems serving a population of less than or equal to (≤) 50,000 exceeding the lead or copper action level shall recommend installation of one or more of the corrosion control treatments listed in section 8.6(c)(1) (Corrosion control treatments) which the system believes constitutes optimal corrosion control for that system. The Department may require the system to conduct additional water quality parameter monitoring in accordance with section 8.3(b) (Initial sampling for water quality parameters) to assist the Department in reviewing the system's recommendation.

(b) Department decision to require studies of corrosion control treatment. The Department may require any system serving a population of less than or equal to (≤) 50,000 that exceeds the lead or copper action level to perform corrosion control studies under section 8.6(c) (Performance of corrosion control studies) to identify optimal corrosion control treatment for the system.

(c) Performance of corrosion control studies.

(1) Corrosion control treatments. Any public water system performing corrosion control studies shall evaluate the effectiveness of each of the following treatments, and, if appropriate, combinations of the following treatments to identify the optimal corrosion control treatment for that system:

(i) Alkalinity and pH adjustment;

(ii) Calcium hardness adjustment; and

(iii) The addition of a phosphate or silicate based corrosion inhibitor at a concentration sufficient to maintain an effective residual concentration in all test tap samples.

(2) The water system shall evaluate each of the corrosion control treatments using either pipe rig/loop tests, metal coupon tests, partial-system tests, or analyses based on documented analogous treatments with other systems of similar size, water chemistry and distribution system configuration.

(3) The water system shall measure the following water quality parameters in any tests conducted under section 8.6(c) (Performance of corrosion control studies) before and after evaluating the corrosion control treatments listed above:

(i) Lead;

(ii) Copper;

(iii) pH;

(iv) Alkalinity;

(v) Calcium;

(vi) Conductivity;

(vii) Orthophosphate (when an inhibitor containing a phosphate compound is used);

(viii) Silicate (when an inhibitor containing a silicate compound is used); and

(ix) Water temperature.

(4) The water system shall identify all chemical or physical constraints that limit or prohibit the use of a particular corrosion control treatment and document such constraints with at least one of the following:

(i) Data and documentation showing that a particular corrosion control treatment has adversely affected other water treatment processes when used by another water system with comparable water quality characteristics; and/or

(ii) Data and documentation demonstrating that the water system has previously attempted to evaluate a particular corrosion control treatment and has found that the treatment is ineffective or adversely affects other water quality treatment processes.

(5) The water system shall evaluate the effect of the chemicals used for corrosion control treatment on other water quality treatment processes.

(6) On the basis of an analysis of the data generated during each evaluation, the water system shall recommend to the Department in writing the treatment option that the corrosion control studies indicate constitutes optimal corrosion control treatment for that system. The water system shall provide a rationale for its recommendation along with all supporting documentation specified in sections 8.6(c)(1)-(5) (Performance of corrosion control studies).

(d) Department designation of optimal corrosion control treatment.

(1) Based upon consideration of available information including, where applicable, studies performed under section 8.6(c) (Performance of corrosion control studies) and a system's recommended treatment alternative, the Department shall either approve the corrosion control treatment option recommended by the system or designate alternative corrosion control treatment(s) from among those listed in section 8.6(c)(1) (Corrosion control treatments). When designating optimal treatment the Department shall consider the effects that additional corrosion control treatment will have on water quality parameters and on other water quality treatment processes.

(2) The Department shall notify the system of its decision on optimal corrosion control treatment in writing and explain the basis for this determination. If the Department requests additional information to aid its review, the water system shall provide the information.

(e) Installation of optimal corrosion control. Each system shall properly install and operate throughout its distribution system the optimal corrosion control treatment designated by the Department under section 8.6(d) (Department designation of optimal corrosion control treatment).

(f) Department review of treatment and designation of optimal water quality parameters. The Department shall evaluate the results of all lead and copper tap samples and water quality parameter samples submitted by the water system and determine whether the system has properly installed and operated the optimal corrosion control treatment designated by the Department in section 8.6(d) (Department designation of optimal corrosion control treatment). Upon reviewing the results of tap water and water quality parameter monitoring by the system, both before and after the system installs optimal corrosion control treatment, the Department shall designate:

(1) A minimum value or a range of values for pH measured at each entry point to the distribution system;

(2) A minimum pH value, measured in all tap samples. Such value shall be equal to or greater than 7.0, unless the Department determines that meeting a pH level of 7.0 is not technologically feasible or is not necessary for the system to optimize corrosion control;

(3) If a corrosion inhibitor is used, a minimum concentration or a range of concentrations for the inhibitor, measured at each entry point to the distribution system and in all tap samples required by section 8.3(a) (General requirements for water quality parameters), that the Department determines is necessary to form a passivating film on the interior walls of the pipes of the distribution system;

(4) If alkalinity is adjusted as part of optimal corrosion control treatment, a minimum concentration or a range of concentrations for alkalinity, measured at each entry point to the distribution system and in all tap samples;

(5) If calcium carbonate stabilization is used as part of corrosion control, a minimum concentration or a range of concentrations for calcium, measured in all tap samples.

The values for the applicable water quality control parameters listed above shall be those that the Department determines to reflect optimal corrosion control treatment for the system. The Department may designate values for additional water quality control parameters determined by the Department to reflect optimal corrosion control for the system. The Department shall notify the system in writing of these determinations and explain the basis for its decisions.

(g) Continued operation and monitoring. All systems optimizing corrosion control shall continue to operate and maintain optimal corrosion control treatment, including maintaining water quality

parameters at or above minimum values or within ranges designated by the Department under section 8.6(f) (Department review of treatment and designation of optimal water quality parameters), in accordance with this paragraph for all samples collected under section 8.3(d)-(f) (Monitoring after Department specifies water quality parameter values for optimal corrosion control-Additional monitoring by systems). Compliance with the requirements of this section 8.6(g) shall be determined every six months, as specified under section 8.3(d) (Monitoring after Department specifies water quality parameter values for optimal corrosion control). A water system is out of compliance with the requirements of this section 8.6(g) for a six-month period if it has excursions for any Department-specified parameter on more than nine days during the period. An excursion occurs whenever the daily value for one or more of the water quality parameters measured at a sampling location is below the minimum value or outside the range designated by the Department. Daily values are calculated as follows. The Department has the discretion to delete results of sampling or analytic errors from this calculation.

(1) On days when more than one measurement for the water quality parameter is collected at the sampling location, the daily value shall be the average of all results collected during the day regardless of whether they are collected through continuous monitoring, grab sampling, or a combination of both.

(2) On days when only one measurement for the water quality parameter is collected at the sampling location, the daily value shall be the result of that measurement.

(3) On days when no measurement is collected for the water quality parameter at the sampling location, the daily value shall be the daily value calculated on the most recent day on which the water quality parameter was measured at the sample site.

(h) Modification of Department treatment decisions. Upon its own initiative or in response to a request by a water system or other interested party, the Department may modify its determination of the optimal corrosion control treatment under section 8.6(d)(Department determined water quality control parameter values) or optimal water quality control parameters under section 8.6(f)(Department review of treatment and designation of optimal water quality parameters). A request for modification by a system or other interested party shall be in writing, explain why the modification is appropriate, and provide supporting documentation. The Department may modify its determination where it concludes that such change is necessary to ensure that the system continues to optimize corrosion control treatment. A revised determination shall be made in writing, set forth the new treatment requirements, explain the basis for the Department's decision, and provide an implementation schedule for completing the treatment modifications.

8.7 Source Water Treatment Requirements

Systems shall complete the applicable source water monitoring and treatment requirements (described in the referenced portions of sections 8.7(b) (Description of source water treatment requirements), 8.2 (Monitoring Requirements for Lead and Copper in Tap Water), and 8.4 (Monitoring Requirements for Lead and Copper in Source Water)) if determined by the Department to be appropriate, by the following deadlines.

(a) Deadlines for completing source water treatment steps:

(1) Step 1: A system exceeding the lead or copper action level shall complete lead and copper source water monitoring (section 8.4(b) (Monitoring frequency after system exceeds tap water action level)) and make a treatment recommendation to the Department (section 8.7(b)(1) (System treatment recommendation)) no later than 180 days after the end of the monitoring period during which the lead or copper action level was exceeded.

(2) Step 2: The Department shall make a determination regarding source water treatment (section 8.7(b)(2) (Department determination regarding source water treatment)) within 6 months after submission of monitoring results under Step 1.

(3) Step 3: If the Department requires installation of source water treatment, the system shall install the treatment (section 8.7(b)(3) (Installation of source water treatment)) within 24 months after completion of Step 2.

(4) Step 4: The system shall complete follow-up tap water monitoring (section 8.2(d)(2) (Monitoring after installation of corrosion control and source water treatment) and source water monitoring (section 8.4(c) (Monitoring frequency after installation of source water treatment)) within 36 months after completion of Step 2.

(5) Step 5: The Department shall review the system's installation and operation of source water treatment and specify maximum permissible source water levels (section 8.7(b)(4) (Department review of source water treatment and specification of maximum permissible source water levels)) within 6 months after completion of Step 4.

(6) Step 6: The system shall operate in compliance with the Department-specified maximum permissible lead and copper source water levels (section 8.7(b)(4) (Department review of source water treatment and specification of maximum permissible source water levels)) and continue source water monitoring (section 8.4(d) (Monitoring frequency after Department specifies maximum permissible source water levels or determines that source water treatment is not needed)).

(b) Description of source water treatment requirements:

(1) System treatment recommendation. Any system which exceeds the lead or copper action level shall recommend in writing to the Department the installation and operation of one of the source water treatments listed in section 8.7(b)(2) (Department determination regarding source water treatment). A system may recommend that no treatment be installed based upon a demonstration that source water treatment is not necessary to minimize lead and copper levels at users' taps.

(2) Department determination regarding source water treatment. The Department shall complete an evaluation of the results of all source water samples submitted by the water system to determine whether source water treatment is necessary to minimize lead or copper levels in water delivered to users' taps. If the Department determines that treatment is needed, the Department shall either require installation and operation of the source water treatment recommended by the system (if any) or require the installation and operation of another source water treatment from among the following: Ion exchange, reverse osmosis, lime softening or coagulation/filtration. If the Department requests additional information to aid in its review, the water system shall provide the information by the date specified by the Department in its request. The Department shall notify the system in writing of its determination and set forth the basis for its decision.

(3) Installation of source water treatment. Each system shall properly install and operate the source water treatment designated by the Department under section 8.7(b)(2) (Department determination regarding source water treatment).

(4) Department review of source water treatment and specification of maximum permissible source water levels. The Department shall review the source water samples taken by the water system both before and after the system installs source water treatment, and determine whether the system has properly installed and operated the source water treatment designated by the Department. Based upon its review, the Department shall

designate the maximum permissible lead and copper concentrations for finished water entering the distribution system. Such levels shall reflect the contaminant removal capability of the treatment properly operated and maintained. The Department shall notify the system in writing and explain the basis for its decision.

(5) Continued operation and maintenance. Each water system shall maintain lead and copper levels below the maximum permissible concentrations designated by the Department at each sampling point monitored in accordance with section 8.4 (Monitoring Requirements for Lead and Copper in Source Water). The system is out of compliance with this section 8.7(b)(5) (Continued operation and maintenance) if the level of lead or copper at any sampling point is greater than the maximum permissible concentration designated by the Department.

(6) Modification of Department treatment decisions. Upon the Department's initiative or in response to a request by a water system or other interested party, the Department may modify its determination of the source water treatment under section 8.7(b)(2) (Department determination regarding source water treatment), or maximum permissible lead and copper concentrations for finished water entering the distribution system under section 8.7(b)(4) (Department review of source water treatment and specification of maximum permissible source water levels). A request for modification by a system or other interested party shall be in writing, explain why the modification is appropriate, and provide supporting documentation. The Department may modify its determination where it concludes that such change is necessary to ensure that the system continues to minimize lead and copper concentrations in source water. A revised determination shall be made in writing, set forth the new treatment requirements, explain the basis for the Department's decision, and provide an implementation schedule for completing the treatment modifications.

8.8 Lead Service Line Replacement Requirements

(a) When lead service line replacement is required. Systems that fail to meet the lead action level in tap samples taken pursuant to section 8.2(d)(2) (Monitoring after installation of corrosion control and source water treatment), after installing corrosion control and/or source water treatment (whichever sampling occurs later), shall replace lead service lines in accordance with the requirements of section 8.8 (Lead Service Line Replacement Requirements). If a system is in violation of section 8.7 (Source Water Treatment Requirements) for failure to install source water treatment or in violation of section 8.5 (Corrosion Control Treatment Steps) for failure to install corrosion control treatment, the Department may require the system to commence lead service line replacement under section 8.8 (Lead Service Line Replacement Requirements) after the date by which the system was required to conduct monitoring under section 8.2(d)(2) (Monitoring after installation of corrosion control and source water treatment) has passed.

(b) Annual Lead Line Replacement

(1) A water system shall replace annually at least 7 percent of the initial number of lead service lines in its distribution system. The initial number of lead service lines is the number of lead lines in place at the time the replacement program begins. The system shall identify the initial number of lead service lines in its distribution system, including an identification of the portion(s) owned by the system, based on a materials evaluation, including the evaluation required under section 8.2(a) (Sample site location) and relevant legal authorities (e.g., contracts, local ordinances) regarding the portion owned by the system. The first year of lead service line replacement shall begin on the first day following the end of the monitoring period in which the action level was exceeded under section 8.8(a) (When lead service line replacement is required). If monitoring is required annually or less frequently, the end of the monitoring period is September 30 of the calendar year in which the sampling occurs. If the Department has established an

alternative monitoring period, then the end of the monitoring period will be the last day of that period.

(2) Resuming lead service line replacement after cessation. Any water system resuming a lead service line replacement program after the cessation of its lead service line replacement program as allowed by section 8.8(f) (Lead service line replacement may cease based on first draw samples) shall update its inventory of lead service lines to include those sites that were previously determined not to require replacement through the sampling provision under section 8.8(c) (Individual Lead Service Line Replacement Not Required). The system will then divide the updated number of remaining lead service lines by the number of remaining years in the program to determine the number of lines that must be replaced per year (7 percent lead service line replacement is based on a 15-year replacement program, so, for example, systems resuming lead service line replacement after previously conducting two years of replacement would divide the updated inventory by 13). For those systems that have completed a 15-year lead service line replacement program, the Department will determine a schedule for replacing or retesting lines that were previously tested out under the replacement program when the system re-exceeds the action level.

(c) Individual Lead Service Line Replacement Not Required. A system is not required to replace an individual lead service line if the lead concentration in all service line samples from that line, taken pursuant to section 8.2(b)(3) (Lead service line samples), is less than or equal to 0.015 mg/L.

(d) A water system shall replace that portion of the lead service line that it owns. In cases where the system does not own the entire lead service line, the system shall notify the owner of the line, or the owner's authorized agent, that the system will replace the portion of the service line that it owns and shall offer to replace the owner's portion of the line. A system is not required to bear the cost of replacing the privately-owned portion of the line, nor is it required to replace the privately-owned portion where the owner chooses not to pay the cost of replacing the privately-owned portion of the line, or where replacing the privately-owned portion would be precluded by Department, local or common law. A water system that does not replace the entire length of the service line also shall complete the following tasks.

(1) Notice to residents served. At least 45 days prior to commencing with the partial replacement of a lead service line, the water system shall provide notice to the resident(s) of all buildings served by the line explaining that they may experience a temporary increase of lead levels in their drinking water, along with guidance on measures consumers can take to minimize their exposure to lead. The Department may allow the water system to provide notice under the previous sentence less than 45 days prior to commencing partial lead service line replacement where such replacement is in conjunction with emergency repairs. In addition, the water system shall inform the resident(s) served by the line that the system will, at the system's expense, collect a sample from each partially-replaced lead service line that is representative of the water in the service line for analysis of lead content, as prescribed under section 8.2(b)(3) (Lead service line samples), within 72 hours after the completion of the partial replacement of the service line. The system shall collect the sample and report the results of the analysis to the owner and the resident(s) served by the line within three business days of receiving the results. Mailed notices post-marked within three business days of receiving the results shall be considered "on time."

(2) The water system shall provide the information required by section 8.8(d)(1) (Notice to residents served) to the residents of individual dwellings by mail or by other methods approved by the Department. In instances where multi-family dwellings are served by the line, the water system shall have the option to post the information at a conspicuous location.

(e) Department required shorter lead service line replacement schedule. The Department shall require a system to replace lead service lines on a shorter schedule than that required by section 8.8 (Lead Service Line Replacement Requirements), taking into account the number of lead service lines in the system, where such a shorter replacement schedule is feasible. The Department shall make this determination in writing and notify the system of its finding within 6 months after the system is triggered into lead service line replacement based on monitoring referenced in section 8.8(a) (When lead service line replacement is required).

(f) Lead service line replacement may cease based on first draw samples. Any system may cease replacing lead service lines whenever first draw samples collected pursuant to section 8.2(b)(2) (First draw samples) meet the lead action level during each of two consecutive monitoring periods and the system submits the results to the Department. If first draw tap samples collected in any such system thereafter exceeds the lead action level, the system shall recommence replacing lead service lines pursuant to section 8.8(b)(2) (Resuming lead service line replacement after cessation).

(g) To demonstrate compliance with section 8.8(a)-(d) (When lead service line replacement is required-A water system shall replace that portion of the lead service line that it owns), a system shall report to the Department the information specified in section 8.10(e) (Lead service line replacement reporting requirements).

8.9 Public Education and Supplemental Monitoring Requirements

All water systems must deliver a consumer notice of lead tap water monitoring results to persons served by the water system at sites that are tested, as specified in section 8.9(d) (Notification of results). A water system that exceeds the lead action level based on tap water samples collected in accordance with section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) shall deliver the public education materials contained in section 8.9(a) (Content of written public education materials) in accordance with the requirements in section 8.9(b) (Delivery of public education materials). Water systems that exceed the lead action level must sample the tap water of any customer who requests it in accordance with section 8.9(c) (Supplemental monitoring and notification of results).

(a) Content of written public education materials.

(1) Content of materials for Community water systems and Non-transient non-community water systems. Water systems must include the following elements in printed materials (e.g., brochures and pamphlets) in the same order as listed below. In addition, the following language in sections 8.9(a)(1)(i) through 8.9(a)(1)(ii) and section 8.9(a)(1)(vi) must be included in the material, exactly written, except for text in brackets in these paragraphs for which the water system must include specific information. Any additional information presented by a water system must be consistent with the information below and be in plain language that can be understood by the general public. Water systems must submit all written public education materials to the Department prior to delivery. If the Department requires the system to obtain approval of the content of written public education materials prior to delivery, the Department will notify the system of such requirement within 15 days of receiving the tap water monitoring results reported pursuant to Section 8.10.

(i) IMPORTANT INFORMATION ABOUT LEAD IN YOUR DRINKING WATER. [INSERT NAME OF WATER SYSTEM] found elevated levels of lead in drinking water in some homes/buildings. Lead can cause serious health problems, especially for pregnant women and young children. Please read this information closely to see what you can do to reduce lead in your drinking water.

(ii) Health effects of lead. Lead can cause serious health problems if too much enters your body from drinking water or other sources. It can cause damage to

the brain and kidneys, and can interfere with the production of red blood cells that carry oxygen to all parts of your body. The greatest risk of lead exposure is to infants, young children, and pregnant women. Scientists have linked the effects of lead on the brain with lowered IQ in children. Adults with kidney problems and high blood pressure can be affected by low levels of lead more than healthy adults. Lead is stored in the bones, and it can be released later in life. During pregnancy, the child receives lead from the mother's bones, which may affect brain development.

(iii) Sources of lead.

(A) Explain what lead is.

(B) Explain possible sources of lead in drinking water and how lead enters drinking water. Include information on home/building plumbing materials and service lines that may contain lead.

(C) Discuss other important sources of lead exposure in addition to drinking water (e.g., paint).

(iv) Discuss the steps the consumer can take to reduce their exposure to lead in drinking water.

(A) Encourage running the water to flush out the lead.

(B) Explain concerns with using hot water from the tap and specifically caution against the use of hot water for preparing baby formula.

(C) Explain that boiling water does not reduce lead levels.

(D) Discuss other options consumers can take to reduce exposure to lead in drinking water, such as alternative sources or treatment of water.

(E) Suggest that parents consult a medical professional for advice about whether to have their child's blood tested for lead.

(v) Explain why there are elevated levels of lead in the system's drinking water (if known) and what the water system is doing to reduce the levels in home/buildings in this area.

(vi) For more information call us at [INSERT YOU NUMBER] [(IF APPLICABLE), visit our Web site at [INSERT YOUR WEB SITE HERE]]. For more information on reducing lead exposure around your home/building and the health effects of lead, visit EPA's Web site at http://www.epa.gov/lead or contact your health care provider.

(2) Additional content for Community water systems. In addition to including the elements specified in section 8.9(a)(1)(Content of materials for Community water systems and Non-transient non-community water systems), community water systems must:

(i) Tell consumers how to get their water tested.

(ii) Discuss lead in plumbing components and the difference between low lead and lead free.

(b) Delivery of public education materials.

(1) For public water systems serving a large proportion of non-English speaking consumers, as determined by the Department, the public education materials must contain information in the appropriate languages regarding the importance of the notice or contain a telephone number or address where persons served may contact the water system to obtain a translated copy of the public education materials or to request assistance in the appropriate language.

(2) Public education tasks when a community water system exceeds the lead action level. A community water system that exceeds the lead action level on the basis of tap water samples collected in accordance with section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water), and that is not already conducting public education tasks under this section 8.9, must conduct the public education tasks under this section, within 60 days after the end of the monitoring period in which the exceedance occurred:

(i) Deliver printed materials meeting the content requirements of section 8.9(a) (Content of written public education materials) to all bill paying customers.

(ii)

(A) Contact customers who are most at risk by delivering education materials that meet the content requirements of section 8.9(a) (Content of written public education materials) to local public health agencies even if they are not located within the water system's service area, along with an informational notice that encourages distribution to all the organization's potentially affected customers or community water system's users. The water system must contact the local public health agencies directly by phone or in person. The local public health agencies may provide a specific list of additional community based organizations serving target populations, which may include organizations outside the service area of the water system. If such lists are provided, systems must deliver education materials that meet the content requirements of section 8.9(a) (Content of written public education materials) to all organizations on the provided lists.

(B) Contact customers who are most at risk by delivering materials that meet the content requirements of section 8.9(a) (Content of written public education materials) to the following organizations listed in 1 through 6 that are located within the water system's service area, along with an informational notice that encourages distribution to all the organization's potentially affected customers or community water system's users:

(I) Public and private schools and school boards.

(II) Women, Infants and Children (WIC) and Head Start programs.

(III) Public and private hospitals and medical clinics.

(IV) Pediatricians.

(V) Family planning clinics.

(VI) Local welfare agencies.

(C) Make a good faith effort to locate the following organizations within the service area and deliver materials that meet the content requirements of 8.9(a) (Content of written public education materials) to them, along with an informational notice that encourages distribution to all potentially affected customers and users. The good faith effort to contact at-risk customers may include requesting a specific contact list of these organizations from the local public health agencies, even if the agencies are not located within the water system's service area:

(I) Licensed childcare centers.

(II) Public and private preschools.

(III) Obstetricians-Gynecologists and Midwives.

(iii) No less often than quarterly, provide information on or in each water bill as long as the system exceeds the action level for lead. The message on the water bill must include the following statement exactly as written except for the text in brackets for which the water system must include system-specific information: [INSERT NAME OF WATER SYSTEM] found high levels of lead in drinking water in some homes. Lead can cause serious health problems. For more information please call [INSERT NAME OF WATER SYSTEM] [or visit (INSERT YOUR WEB SITE HERE)]. The message or delivery mechanism can be modified in consultation with the Department; specifically, the Department may allow a separate mailing of public education materials to customers if the water system cannot place the information on water bills.

(iv) Post material meeting the content requirements section 8.9(a) (Content of written public education materials) on the water system's Web site if the system serves a population greater than 100,000.

(v) Submit a press release to newspaper, television and radio stations.

(vi) In addition to sections 8.9(b)(2)(i) through 8.9(b)(2)(v)(above), systems must implement at least three activities from one or more categories listed below. The educational content and selection of these activities must be determined in consultation with the Department.

(A) Public Service Announcements.

(B) Paid advertisements.

(C) Public area Informational Displays.

(D) E-mails to customers.

(E) Public Meetings.

(F) Household Deliveries.

(G) Targeted Individual Customer Contact.

(H) Direct material distribution to all multi-family homes and institutions.

(I) Other methods approved by the Department.

(vii) For systems that are required to conduct monitoring annually or less frequently, the end of the monitoring period is September 30 of the calendar year in which the sampling occurs, or, if the Department has established an alternate monitoring period, the last day of that period.

(3) Repeating public education tasks each year a community water system exceeds lead action level. As long as a community water system exceeds the action level, it must repeat the activities pursuant to section 8.9(b)(2) (Public education tasks when a community water system exceeds the lead action level) as described in sections 8.9(b)(3)(i) through 8.9(b)(3)(iv) (below).

(i) A community water system shall repeat the tasks contained in sections 8.9(b)(2)(i), (ii) and (vi) (Public education tasks when a community water system exceeds the lead action level) every 12 months.

(ii) A community water system shall repeat tasks contained in section 8.9(b)(2)(iii) (Public education tasks when a community water system exceeds the lead action level) with each billing cycle.

(iii) A community water system serving a population greater than 100,000 shall post and retain material on a publicly accessible Web site pursuant to section 8.9(b)(2)(iv) (Public education tasks when a community water system exceeds the lead action level).

(iv) The community water system shall repeat the task in section 8.9(b)(2)(v) (Public education tasks when a community water system exceeds the lead action level) twice every 12 months on a schedule agreed upon with the Department. The Department can allow activities in section 8.9(b)(2) (Public education tasks when a community water system exceeds the lead action level) to extend beyond the 60-day requirement if needed for implementation purposes on a case-by-case basis; however, this extension must be approved in writing by the Department in advance of the 60-day deadline.

(4) Public education tasks when a non-transient, non-community water system exceeds the lead action level. Within 60 days after the end of the monitoring period in which the exceedance occurred (unless it already is repeating public education tasks pursuant to section 8.9(b)(5) (Repeating public education tasks each year a non-transient, non-community water system exceeds lead action level)), a non-transient, non-community water system shall deliver the public education materials specified by section 8.9(a)(1) (Content of materials for Community water systems and Non-transient non-community water systems) as follows:

(i) Post informational posters on lead in drinking water in a public place or common area in each of the buildings served by the system; and

(ii) Distribute informational pamphlets and/or brochures on lead in drinking water to each individual served by the non-transient, non-community water system. The Department may allow the system to utilize electronic transmission in lieu of or combined with printed materials as long as it achieves at least the same coverage.

(iii) For systems that are required to conduct monitoring annually or less frequently, the end of the monitoring period is September 30 of the calendar year in which the sampling occurs, or, if the Department has established an alternate monitoring period, the last day of that period.

(5) Repeating public education tasks each year a non-transient, non-community water system exceeds lead action level. A non-transient, non-community water system shall repeat the tasks contained in section 8.9(b)(4) (Public education tasks when a non-transient, non-community water system exceeds the lead action level) at least once during each calendar year in which the system exceeds the lead action level. The Department can allow activities in section 8.9(b)(4)(Public education tasks when a non-transient, non-community water system exceeds the lead action level) to extend beyond the 60-day requirement if needed for implementation purposes on a case-by-case basis; however, this extension must be approved in writing by the Department in advance of the 60-day deadline.

(6) A water system may discontinue delivery of public education materials if the system has met the lead action level during the most recent six-month monitoring period conducted pursuant to section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water). Such a system shall recommence public education in accordance with section 8.9 (Public Education and Supplemental Monitoring Requirements) if it subsequently exceeds the lead action level during any monitoring period.

(7) Alternative public education for community water systems. A community water system may apply to the Department, in writing, to use only the text specified in section 8.9(a)(1) in lieu of the text in sections 8.9(a)(1) and 8.9(a)(2) and to perform the tasks listed in sections 8.9(b)(4) and 8.9(b)(5) in lieu of the tasks in sections 8.9(b)(2) and 8.9(b)(3) if:

(i) The system is a facility, such as a prison or a hospital, where the population served is not capable of or is prevented from making improvements to plumbing or installing point of use treatment devices; and

(ii) The system provides water as part of the cost of services provided and does not separately charge for water consumption.

(8) A community water system serving a population of less than or equal to (≤) 3,300 may limit certain aspects of their public education programs as follows:

(i) With respect to the requirements of section 8.9(b)(2)(vi) (Public education tasks when a community water system exceeds the lead action level), a system serving a population of less than or equal to (≤)3,300 must implement at least one of the activities listed in that section.

(ii) With respect to requirements of section 8.9(b)(2)(ii) (Public education tasks when a community water system exceeds the lead action level), a system serving a population less than or equal to (≤)3,300 may limit the distribution of the public education materials required under that paragraph to facilities and organizations served by the system that are most likely to be visited regularly by pregnant women and children.

(iii) With respect to the requirements of section 8.9(b)(2)(v) (Public education tasks when a community water system exceeds the lead action level), the Department may waive these requirements for systems serving a population less than or equal to (≤)3,300 as long as a system distributes notice to every household served by the system.

(c) Supplemental monitoring and notification of results. A water system that fails to meet the lead action level on the basis of tap samples collected in accordance with section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) shall offer to sample the tap water of any

customer who requests it. The system is not required to pay for collecting or analyzing the sample, nor is the system required to collect and analyze the sample itself.

(d) Notification of results.

(1) Reporting requirement. All water systems must provide a notice of the individual tap results from lead tap water monitoring carried out under the requirements of section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) to the persons served by the water system at the specific sample site from which the sample was taken (e.g., the occupants of the residence where the tap was tested).

(2) Timing of notification. A water system must provide the consumer notice as soon as practical, but no later than 30 days after the system learns of the tap monitoring results.

(3) Content. The consumer notice must include the results of the lead tap water monitoring for the tap that was tested, an explanation of the health effects of lead, list steps consumers can take to reduce exposure to lead in drinking water and contact information for the water utility. The notice must also provide the maximum contaminant level goal and action level for lead and definitions for these two terms from section 1.5.2.

(4) Delivery. The consumer notice must be provided to persons served at the tap that was tested, either by mail or by another method approved by the Department. For example, upon approval by the Department, a non-transient non-community water system could post the results on a bulletin board in the facility to allow users to review the information. The system must provide the notice to the customers at sample taps tested, including consumers who do not receive water bills.

8.10 Reporting Requirements

All water systems shall report all of the following information to the Department in accordance with section 8.10.

(a) Reporting requirements for tap water monitoring for lead and copper and for water quality parameter monitoring.

(1) Except as provided in section 8.10(a)(1)(viii) (below), a water system shall report the information specified below for all tap water samples specified in section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) and for all water quality parameter samples specified in section 8.3 (Monitoring Requirements for Water Quality Parameters) within the first 10 days following the end of each applicable monitoring period specified in section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) and section 8.3 (Monitoring Requirements for Water Quality Parameters) (i.e., every six months, annually, every 3 years, or every 9 years). For monitoring periods with a duration less than six months, the end of the monitoring period is that last date samples can be collected during that period as specified in section 8.2 (Monitoring Requirements for Lead and Copper in Tap Water) and 8.3 (Monitoring Requirements for Water Quality Parameters).

(i) The results of all tap samples for lead and copper including the location of each site and the criteria under section 8.2(a)(3), (4), (5), (6), and/or (7) under which the site was selected for the system's sampling pool;

(ii) Documentation for each tap water lead or copper sample for which the water system requests invalidation pursuant to section 8.2(f)(2) (Invalidation of lead or copper tap water samples);

(iii) [Reserved]

(iv) The 90th percentile lead and copper concentrations measured from among all lead and copper tap water samples collected during each monitoring period (calculated in accordance with section 8.1(a)(3) (90th percentile computation)), unless the Department calculates the system's 90th percentile lead and copper levels under section 8.10(h) (Reporting of 90th percentile lead and copper concentration where the Department calculates a system's 90th percentile concentrations);

(v) With the exception of initial tap sampling conducted pursuant to section 8.2(d)(1) (Initial tap sampling), the system shall designate any site which was not sampled during previous monitoring periods, and include an explanation of why sampling sites have changed;

(vi) The results of all tap samples for pH, and where applicable, alkalinity, calcium, conductivity, temperature, and orthophosphate or silica collected under section 8.3(b)-(e) (Initial sampling for water quality parameters-Reduced monitoring for water quality parameters);

(vii) The results of all samples collected at the entry point(s) to the distribution system for applicable water quality parameters under section 8.3(b)-(e) (Initial sampling for water quality parameters-Reduced monitoring for water quality parameters);

(viii) A water system shall report the results of all water quality parameter samples collected under sections 8.3(c)-(f) (Monitoring for water quality parameters after installation of corrosion control-Additional monitoring by systems) during each six-month monitoring period specified in section 8.3(d) (Monitoring after Department specifies water quality parameter values for optimal corrosion control) within the first 10 days following the end of the monitoring period unless the Department has specified a more frequent reporting requirement.

(2) For a non-transient, non-community water system, or a community water system meeting the criteria of sections 8.9(b)(7) (Alternative public education for community water systems), that does not have enough taps that can provide first-draw samples, the system must provide written documentation to the Department identifying standing times and locations for enough non-first-draw samples to make up its sampling pool under section 8.2(b)(5) (Substituting non-first-draw samples) by the start of the first applicable monitoring period under section 8.2(d) (Timing of monitoring).

(3) Reporting requirements for a new source or long term change in water treatment. At a time specified by the Department, or if no specific time is designated by the Department, then as early as possible prior to the addition of a new source or any long-term change in water treatment a water system deemed to have optimized corrosion control under section 8.5(b)(3) (Deemed to have optimized corrosion control based upon tap water and source water monitoring results), a water system subject to reduced monitoring pursuant to section 8.2(d)(4) (Reduced monitoring for lead and copper in tap water), or a water system subject to a monitoring waiver pursuant to section 8.2(g) (Monitoring waivers for small systems), shall submit written documentation to the Department describing the change or addition. The Department must review and approve the addition of a new source or long-term change in treatment before it is implemented by the water system. Examples of long-term treatment changes include the addition of a new treatment process or modification of an existing treatment process. Examples of modifications include switching secondary disinfectants, switching coagulants (e.g., alum to ferric chloride), and switching corrosion inhibitor products (e.g., orthophosphate to blended phosphate). Long-term changes can include dose changes to existing chemicals if the

system is planning long-term changes to its finished water pH or residual inhibitor concentration. Long-term treatment changes would not include chemical dose fluctuations associated with daily raw water quality changes.

(4) Any system serving a population of less than or equal to (≤) 3,300 applying for a monitoring waiver under section 8.2(g) (Monitoring waivers for small systems), or subject to a waiver granted pursuant to section 8.2(g)(3) (Department approval of waiver application), shall provide the following information to the Department in writing by the specified deadline:

(i) By the start of the first applicable monitoring period under section 8.2(d) (Timing of monitoring), any system serving a population of less than or equal to (≤) 3,300 applying for a monitoring waiver shall provide the documentation required to demonstrate that it meets the waiver criteria of sections 8.2(g)(1) (Materials criteria) and 8.2(g)(2) (Monitoring criteria for waiver issuance).

(ii) No later than nine years after the monitoring previously conducted pursuant to section 8.2(g)(2) (Monitoring criteria for waiver issuance) or section 8.2(g)(4)(i) (Monitoring frequency for systems with waivers), each system serving a population of less than or equal to (≤) 3,300 desiring to maintain its monitoring waiver shall provide the information required by section 8.2(g)(4)(i) and (ii) (Monitoring frequency for systems with waivers).

(iii) No later than 60 days after it becomes aware that it is no longer free of lead-containing and/or copper-containing material, as appropriate, each system serving a population of less than or equal to (≤) 3,300 with a monitoring waiver shall provide written notification to the Department, setting forth the circumstances resulting in the lead-containing and/or copper-containing materials being introduced into the system and what corrective action, if any, the system plans to remove these materials.

(5) Each groundwater system that limits water quality parameter monitoring to a subset of entry points under section 8.3(c)(3) (Limited entry point water quality parameter sampling for groundwater systems) shall provide, by the commencement of such monitoring, written correspondence to the Department that identifies the selected entry points and includes information sufficient to demonstrate that the sites are representative of water quality and treatment conditions throughout the system.

(b) Source water monitoring reporting requirements.

(1) A water system shall report the sampling results for all source water samples collected in accordance with section 8.4 (Monitoring Requirements for Lead and Copper in Source Water) within the first 10 days following the end of each source water monitoring period (i.e., annually, per compliance period, per compliance cycle) specified in section 8.4 (Monitoring Requirements for Lead and Copper in Source Water).

(2) With the exception of the first round of source water sampling conducted pursuant to section 8.4(b) (Monitoring frequency after system exceeds tap water action level), the system shall specify any site that was not sampled during previous monitoring periods, and include an explanation of why the sampling point has changed.

(c) Corrosion control treatment reporting requirements. By the applicable deadlines under section 8.5 (Corrosion Control Treatment Steps), systems shall report the following information:

(1) For systems demonstrating that they have already optimized corrosion control, information required in section 8.5(b)(2) (Deemed to have optimized corrosion control by the Department) or (3) (Deemed to have optimized corrosion control based upon tap water and source water monitoring results).

(2) For systems required to optimize corrosion control, their recommendation regarding optimal corrosion control treatment under section 8.6(a) (System recommendation regarding corrosion control treatment).

(3) For systems required to evaluate the effectiveness of corrosion control treatments under section 8.6(c) (Performance of corrosion control studies), the information required by section 8.6(c) (Performance of corrosion control studies).

(4) For systems required to install optimal corrosion control designated by the Department under section 8.6(d) (Department designation of optimal corrosion control treatment), a letter certifying that the system has completed installing that treatment.

(d) Source water treatment reporting requirements. By the applicable deadlines in section 8.7 (Source Water Treatment Requirements), systems shall provide the following information to the Department:

(1) If required under section 8.7(b)(1) (System treatment recommendation), their recommendation regarding source water treatment;

(2) For systems required to install source water treatment under section 8.7(b)(2) (Department determination regarding source water treatment), a letter certifying that the system has completed installing the treatment designated by the Department within 24 months after the Department designated the treatment.

(e) Lead service line replacement reporting requirements. Systems shall report the following information to the Department to demonstrate compliance with the requirements of section 8.8 (Lead Service Line Replacement Requirements):

(1) No later than 12 months after the end of a monitoring period in which a system exceeds the lead action level in sampling referred to in section 8.8(a) (When lead service line replacement is required), the system must submit written documentation to the Department of the material evaluation conducted as required in section 8.2(a) (Sample site location), identify the initial number of lead service lines in its distribution system at the time the system exceeds the lead action level, and provide the system's schedule for annually replacing at least 7 percent of the initial number of lead service lines in its distribution system.

(2) No later than12 months after the end of a monitoring period in which a system exceeds the lead action level in sampling referred to in section 8.8(a) (When lead service line replacement is required), and every 12 months thereafter, the system shall demonstrate to the Department in writing that the system has either:

(i) Replaced in the previous 12 months at least 7 percent of the initial lead service lines (or a greater number of lines specified by the Department under section 8.8(e) (Department required shorter lead service line replacement schedule)) in its distribution system, or

(ii) Conducted sampling which demonstrates that the lead concentration in all service line samples from an individual line(s), taken pursuant to section 8.2(b)(3) (Lead service line samples), is less than or equal to 0.015 mg/L. In such cases,

the total number of lines replaced and/or which meet the criteria in section 8.8(c) (Individual Lead Service Line Replacement Not Required) shall equal at least 7 percent of the initial number of lead lines identified under section 8.10(e)(1) (above) (or the percentage specified by the Department under section 8.8(e) (Department required shorter lead service line replacement schedule)).

(3) The annual letter submitted to the Department under section 8.10(e)(2) (above) shall contain the following information:

(i) The number of lead service lines scheduled to be replaced during the previous year of the system's replacement schedule;

(ii) The number and location of each lead service line replaced during the previous year of the system's replacement schedule;

(iii) If measured, the water lead concentration and location of each lead service line sampled, the sampling method, and the date of sampling.

(4) Any system which collects lead service line samples following partial lead service line replacement required by section 8.8 (Lead Service Line Replacement Requirements) shall report the results to the Department within the first ten days of the month following the month in which the system receives the laboratory results, or as specified by the Department. Departments, at their discretion may eliminate this requirement to report these monitoring results. Systems shall also report any additional information as specified by the Department, and in a time and manner prescribed by the Department, to verify that all partial lead service line replacement activities have taken place.

(f) Public education program reporting requirements.

(1) Any water system that is subject to the public education requirements in section 8.9 (Public Education and Supplemental Monitoring Requirements) shall, within ten days after the end of each period in which the system is required to perform public education tasks in accordance with section 8.9(b) (Delivery of public education materials), send written documentation to the Department that contains:

(i) A demonstration that the system has delivered the public education materials that meet the content requirements in sections 8.9(a) (Content of written public education materials) and the delivery requirements in section 8.9(b) (Delivery of public education materials); and

(ii) A list of all the newspapers, radio stations, television stations, and facilities and organizations to which the system delivered public education materials during the period in which the system was required to perform public education tasks.

(2) Unless required by the Department, a system that previously has submitted the information required by section 8.10(f)(1)(ii) (Public education program reporting requirements) need not resubmit the information, as long as there have been no changes in the distribution list and the system certifies that the public education materials were distributed to the same list submitted previously.

(3) No later than 3 months following the end of the monitoring period, each system must mail a sample copy of the consumer notification of tap results to the Department along with a certification that the notification has been distributed in a manner consistent with the requirements of 8.9(d)(Notification of results).

(g) Reporting of additional monitoring data. Any system which collects sampling data in addition to that required by Article 8 shall report the results to the Department within the first ten days following the end of the applicable monitoring period under sections 8.2 (Monitoring Requirements for Lead and Copper in Tap Water), 8.3 (Monitoring Requirements for Water Quality Parameters) and 8.4 (Monitoring Requirements for Lead and Copper in Source Water) during which the samples are collected.

(h) Reporting of 90th percentile lead and copper concentration where the Department calculates a system's 90th percentile concentrations. A water system is not required to report the 90th percentile lead and copper concentrations measured from among all lead and copper tap water samples collected during each monitoring period, as required by section 8.10(a)(1)(iv) (Reporting requirements for tap water monitoring for lead and copper and for water quality parameter monitoring) if:

(1) The Department has previously notified the water system that it will calculate the water system's 90th percentile lead and copper concentrations, based on the lead and copper tap results submitted pursuant to section 8.10(h)(2)(i) (Reporting of 90th percentile lead and copper concentration where the Department calculates a system's 90th percentile concentrations), and has specified a date before the end of the applicable monitoring period by which the system must provide the results of lead and copper tap water samples;

(2) The system has provided the following information to the Department by the date specified in section 8.10(h)(1) (Reporting of 90th percentile lead and copper concentration where the Department calculates a system's 90th percentile concentrations):

(i) The results of all tap samples for lead and copper including the location of each site and the criteria under section 8.2(a)(3) (Community water system tier 1 sampling sites), (4) (Community water system tier 2 sampling sites), (5) (Community water system tier 3 or representative sampling sites), (6) (Non-transient, non-community water system tier 1 sampling sites), and/or (7) (Non-transient, non-community water system non-tier 1 or representative sampling sites) under which the site was selected for the system's sampling pool, pursuant to section 8.10(a)(1)(i) (Reporting requirements for tap water monitoring for lead and copper and for water quality parameter monitoring); and

(ii) An identification of sampling sites utilized during the current monitoring period that were not sampled during previous monitoring periods, and an explanation why sampling sites have changed; and

(3) The Department has provided the results of the 90th percentile lead and copper calculations, in writing, to the water system before the end of the monitoring period.

8.11 Recordkeeping Requirements

Any system subject to the requirements of Article 8 shall retain on its premises original records of all sampling data and analyses, reports, surveys, letters, evaluations, schedules, Department determinations, and any other information required by Article 8. Each water system shall retain the records required by Article 8 for no fewer than 12 years.

8.12 Prohibition on Use of Lead Pipes, Solder, and Flux

In general any pipe, solder, or flux, which is used after June 19, 1986, in the installation or repair of any public water system, or any plumbing in a residential or nonresidential facility providing water for human

consumption that is connected to a public water system shall be lead free as defined in section 1.5.2 This prohibition shall not apply to leaded joints necessary for the repair of cast iron pipes.

Article 9 Consumer Notification

9.1 Consumer Confidence Reports

9.1.1 Introduction

(a) Section 9.1 establishes the minimum requirements for the content of annual reports that community water systems must deliver to their customers. These reports must contain information on the quality of the water delivered by the systems and characterize the risks (if any) from exposure to contaminants detected in the drinking water in an accurate and understandable manner.

(b) Notwithstanding the provisions of section 1.2, section 9.1 applies only to community water systems.

(c) For the purpose of this subpart, customers are defined as billing units or service connections to which water is delivered by a community water system.

(d) For the purpose of this subpart, detected means: at or above the levels prescribed by section 10.2.1 for inorganic contaminants, at or above the levels prescribed by section 6.2.5(a)(7) for the contaminants listed in section 2.1(a), at or above the levels prescribed by sections 10.3.2 and 10.3.3 for the contaminants listed in section 2.1(c), at or above the levels prescribed by section 10.7.2(b)(3)(iv) for the contaminants or contaminant groups listed in sections 2.4, 7.6, 7.7, and 7.8, and at or above the levels prescribed by section 10.4.1(c) for radioactive contaminants.

9.1.2 Important Dates

(a) Each existing community water system must deliver reports by July 1 every year. Each report must contain data, as prescribed in section 9.1.3(d)(3), collected during, or prior to, the previous calendar year.

(b) A new community water system must deliver its first report by July 1 of the year after its first full calendar year in operation and annually thereafter.

(c) A community water system that delivers water to another community water system must deliver the applicable information required in section 9.1.3 to the consecutive system:

(1) No later than April 1 annually or

(2) On a date mutually agreed upon by the wholesale system and the consecutive system, and specifically included in a contract between the parties.

(d) The Certification of Delivery must be delivered to the division by July 1 of each year. The certification must contain information as prescribed in section 9.1.5(c).

9.1.3 Content of the Reports

(a) Each community water system must provide to its customers an annual report that contains the information specified in sections 9.1.3 and 9.1.4.

(b) Information on the source of the water delivered:

(1) Each report must identify the source(s) of the water delivered by the community water system by providing information on:

(i) The type of the water: e.g., surface water, groundwater; and

(ii) The commonly used name (if any) and general location of the body (or bodies) of water.

(2) If a source water assessment has been completed, the report must notify consumers of the availability of this information and the means to obtain it. In addition, systems are encouraged to highlight in the report significant sources of contamination in the source water area if they have readily available information. Where a system has received a source water assessment from the Department, the report must include a brief summary of the system's susceptibility to potential sources of contamination, using language provided by the Department or written by the operator.

(c) Definitions.

(1) Each report must include the following definitions:

(i) Maximum Contaminant Level Goal or MCLG: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

(ii) Maximum Contaminant Level or MCL: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

(2) A report for a community water system operating under a variance or an exemption issued under Article 4 –Variances and Exemptions must include the following definition: Variances and Exemptions: Department permission not to meet an MCL or a treatment technique under certain conditions.

(3) A report that contains data on contaminants that the Department regulates using any of the following terms must include the applicable definitions:

(i) Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

(ii) Action Level: The concentration of a contaminant, which if exceeded, triggers treatment or other requirements that a water system must follow.

(iii) Maximum residual disinfectant level goal or MRDLG: The level of a drinking water disinfectant below which, there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

(iv) Maximum residual disinfectant level or MRDL: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

(d) Information on Detected Contaminants.

(1) This section 9.1.3(d) specifies the requirements for information to be included in each report for contaminants subject to mandatory monitoring (except Cryptosporidium). It applies to:

(i) Contaminants subject to a MCL, action level, maximum residual disinfectant level, or treatment technique (regulated contaminants).

(ii) Unregulated contaminants for which monitoring is required by section 6.4; and

(2) The data relating to these contaminants must be displayed in one table or in several adjacent tables. Any additional monitoring results, which a community water system chooses to include in its report, must be displayed separately.

(3) The data must be derived from data collected to comply with EPA and Department monitoring and analytical requirements during the previous calendar year except that:

(i) Where a system is allowed to monitor for regulated contaminants less often than once a year, the table(s) must include the date and results of the most recent sampling and the report must include a brief statement indicating that the data presented in the report are from the most recent testing done in accordance with the regulations. No data older than 5 years need be included.

(ii) Results of monitoring in compliance with the Information Collection Rule[9-1] (ICR)(40 CFR 141.142, July 1, 2000 and 40 CFR 141.143, July 1, 1996) need only be included for 5 years from the date of last sample or until any of the detected contaminants becomes regulated and subject to routine monitoring requirements, whichever comes first.

9-1 The Information Collection Rule was effective from August 14, 1996 until December 31, 2000.

(4) For detected regulated contaminants (listed in Table 9-1), the table(s) must contain:

(i) The MCL for that contaminant expressed as a number equal to or greater than 1.0 (as provided in Table 9-1);

(ii) The MCLG for that contaminant expressed in the same units as the MCL;

(iii) If there is no MCL for a detected contaminant, the table must indicate that there is a treatment technique, or specify the action level, applicable to that contaminant, and the report must include the definitions for treatment technique and/or action level, as appropriate, specified in section 9.1.3(c)(3);

(iv) For contaminants subject to an MCL, except turbidity and total coliforms, the highest contaminant level used to determine compliance with a CPDWR and the range of detected levels, as follows:

(A) When compliance with the MCL is determined annually or less frequently: The highest detected level at any sampling point and the range of detected levels expressed in the same units as the MCL.

(B) When compliance with the MCL is determined by calculating a running annual average[9-2] of all samples taken at a monitoring location: the highest average of any of the monitoring locations and the range of all monitoring locations expressed in the same units as the MCL. For the MCLs for TTHM and HAA5 in section 2.4, systems must include the highest locational running annual average for TTHM and HAA5 and the

range of individual sample results for all monitoring locations expressed in the same units as the MCL. If more than one (1) location exceeds the TTHM or HAA5 MCL, the system must include the locational running annual averages for all locations that exceed the MCL.

9-2 When the regulations allow rounding of results to determine compliance with the MCL, rounding should be done prior to multiplying the results by the factor listed in Table 9-1.

(C) When compliance with the MCL is determined on a system-wide basis by calculating a running annual average of all samples at all monitoring locations: the average and range of detection expressed in the same units as the MCL. The system is required to include individual sample results for the IDSE conducted under section 7.7 when determining the range of TTHM and HAA5 results to be reported in the annual Consumer Confidence Report for the calendar year that the IDSE samples were taken.

(v) For turbidity. When it is reported pursuant to Article 7: The highest single measurement and the lowest monthly percentage of samples meeting the turbidity limits specified in Article 7 for the filtration technology being used. The report should include an explanation of the reasons for measuring turbidity;

(vi) For lead and copper: the 90th percentile value of the most recent round of sampling and the number of sampling sites exceeding the action level;

(vii) For total coliform:

(A) The highest monthly number of positive samples for systems collecting fewer than 40 samples per month; or

(B) The highest monthly percentage of positive samples for systems collecting at least 40 samples per month;

(viii) For fecal coliform: The total number of positive samples; and

(ix) The likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information regarding contaminants may be available in sanitary surveys and source water assessments, and should be used when available to the operator. If the operator lacks specific information on the likely source, the report must include one or more of the typical sources for that contaminant listed in Table 9-1 that is most applicable to the system.

(5) If a community water system distributes water to its customers from multiple hydraulically independent distribution systems that are fed by different raw water sources, the table should contain a separate column for each service area and the report should identify each separate distribution system. Alternatively, systems could produce separate reports tailored to include data for each service area.

(6) The table(s) must clearly identify any data indicating violations of MCLs, MRDLs, or treatment techniques, and the report must contain a clear and readily understandable explanation of the violation including: the length of the violation, the potential adverse health effects, and actions taken by the system to address the violation. To describe the potential health effects, the system must use the relevant language of Table 9-1.

(7) For detected unregulated contaminants for which monitoring is required (except Cryptosporidium), the table(s) must contain the average and range at which the

contaminant was detected. The report may include a brief explanation of the reasons for monitoring for unregulated contaminants.

(e) Information on Cryptosporidium, radon, and other contaminants:

(1) If the system has performed any monitoring for Cryptosporidium, including monitoring performed to satisfy the requirements of the Information Collection Rule[9-3] (ICR) (40 CFR 141.143, July 1, 1996), which indicates that Cryptosporidium may be present in the source water or the finished water, the report must include:

9-3 See Article 9.3(d)(3)(ii) for reporting requirements under the ICR.

(i) A summary of the results of the monitoring; and

(ii) An explanation of the significance of the results.

(2) If the system has performed any monitoring for radon which indicates that radon may be present in the finished water, the report must include:

(i) The results of the monitoring; and

(ii) An explanation of the significance of the results.

(3) If the system has performed additional monitoring which indicates the presence of other contaminants in the finished water, the Department strongly encourages systems to report any results, which may indicate a health concern. To determine if results may indicate a health concern, the Department recommends that systems find out if the EPA has proposed a National Primary Drinking Water Regulation or issued a health advisory for that contaminant by calling the Safe Drinking Water Hotline (800-426-4791). The Department considers detects above a proposed MCL or health advisory level to indicate possible health concerns. For such contaminants, the Department recommends that the report include:

(i) The results of the monitoring; and

(ii) An explanation of the significance of the results noting the existence of a health advisory or a proposed regulation.

(f) In addition to the requirements of section 9.1.3(d)(6), the report must note any violation of the *Colorado Primary Drinking Water Regulations* that occurred during the year covered by the report of a requirement listed below, and include a clear and readily understandable explanation of the violation, any potential adverse health effects, and the steps the system has taken to correct the violation.

(1) Monitoring and reporting of compliance data;

(2) Filtration and disinfection prescribed by Article 7. For systems which have failed to install adequate filtration or disinfection equipment or processes, or have had a failure of such equipment or processes which constitutes a violation, the report must include the following language as part of the explanation of potential adverse health effects:

"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."

(3) For systems that fail to take one or more actions for lead and copper control prescribed by Article 8, the report must include the applicable language of Table 9-1 for lead, copper, or both;

(4) For systems that violate the requirements of section 6.2.2 for acrylamide and epichlorohydrin certification, the report must include the relevant language from Table 9-1;

(5) Recordkeeping of compliance data;

(6) Special monitoring requirements prescribed by section 6.4, Unregulated Contaminant Monitoring, and section 6.1.6(m), Special Monitoring for Sodium; and

(7) Violation of the terms of a variance, an exemption, or an administrative or judicial order.

(g) If a system is operating under the terms of a variance or an exemption issued under Article 4, the report must contain:

(1) An explanation of the reasons for the variance or exemption;

(2) The date on which the variance or exemption was issued;

(3) A brief status report on the steps the system is taking to install treatment, find alternative sources of water, or otherwise comply with the terms and schedules of the variance or exemption; and

(4) A notice of any opportunity for public input in the review, or renewal, of the variance or exemption.

(h) Systems required to comply with Article 13 Groundwater Rule.

(1) Any groundwater system that receives notice from the Department of a significant deficiency or notice from a laboratory of a fecal indicator-positive groundwater source sample that is not invalidated by the Department under section 13.3(d) must inform its customers of any significant deficiency that is uncorrected at the time of the next report or of any fecal indicator-positive groundwater source sample in the next report. The system must continue to inform the public annually until the Department determines that particular significant deficiency is corrected or the fecal contamination in the groundwater source is addressed under section 11.4 or 13.4(a). Each report must include the following elements.

(i) The nature of the particular significant deficiency or the source of the fecal contamination (if the source is known) and the date the significant deficiency was identified by the Department or the dates of the fecal indicator-positive groundwater source samples;

(ii) If the fecal contamination in the groundwater source has been addressed under section 13.4(a) and the date of such action;

(iii) For each significant deficiency or fecal contamination in the groundwater source that has not been addressed under section 11.4 or 13.4(a), the Department-approved plan and schedule for correction, including interim measures, progress to date, and any interim measures completed; and

(iv) If the system receives notice of a fecal indicator-positive groundwater source sample that is not invalidated by the Department under section 13.3(d), the potential health effects using the health effects language of Table 9-1.

(2) If directed by the Department, a system with significant deficiencies that have been corrected before the next report is issued must inform its customers of the significant deficiency, how the deficiency was corrected, and the date of correction under section 9.1.3(h)(1).

(i) Additional Information

(1) The report must contain a brief explanation regarding contaminants which may reasonably be expected to be found in drinking water including bottled water. This explanation may include the language of Sections 9.1.3(h)(1) (i) through (iii), or systems may use their own comparable language. The report also must include the language of section 9.1.3(i)(1)(iv).

(i) The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

(ii) Contaminants that may be present in source water include:

(A) Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

(B) Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.

(C) Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.

(D) Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and also may come from gas stations, urban storm water runoff, and septic systems.

(E) Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

(iii) In order to ensure that tap water is safe to drink, the Department prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. The Food and Drug Administration regulations establish limits for contaminants in bottled water that must provide the same protection for public health.

(iv) Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about

contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

(2) The report must include the telephone number of the owner, operator, or designee of the community water system as a source of additional information concerning the report.

(3) In communities with a large proportion of non-English speaking residents, as determined by the Department, the report must contain information in the appropriate language(s) regarding the importance of the report or contain a telephone number or address where such residents may contact the system to obtain a translated copy of the report or assistance in the appropriate language.

(4) The report must include information (e.g., time and place of regularly scheduled board meetings) about opportunities for public participation in decisions that may affect the quality of the water.

(5) The systems may include such additional information, as they deem necessary for public education consistent with, and not detracting from, the purpose of the report.

9.1.4 Required Additional Health Information

(a) All reports must prominently display the following language: Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

(b) Beginning in the report due by July 1, 2002, a system that detects arsenic above 0.005 mg/L and up to and including 0.010 mg/L:

(1) Must include in its report a short informational statement about arsenic, using language such as: While your drinking water meets the EPA's standard for arsenic, it does contain low levels of arsenic. The EPA's standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The EPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

(2) May write its own educational statement, but only in consultation with the Department.

(c) A system which detects nitrate at levels above 5 mg/L, but below the MCL:

(1) Must include a short informational statement about the impacts of nitrate on children using language such as: Nitrate in drinking water at levels above 10 ppm is a health risk for infants of less than six months of age. High nitrate levels in drinking water can cause blue baby syndrome. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. If you are caring for an infant you should ask advice from your health care provider.

(2) May write its own educational statement, but only in consultation with the Department.

(d) Every report must include the following lead-specific information:

(1) A short informational statement about lead in drinking water and its effects on children. The statement must include the following information: If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. [NAME OF UTILITY] is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at *http://www.epa.gov/safewater/lead*.

(2) A system may write its own educational statement, but only in consultation with the Department.

9.1.5 Report Delivery and Recordkeeping

(a) Except as provided in section 9.1.5(g), each community water system must mail or otherwise directly deliver one copy of the report to each customer.

(b) The system must make a good faith effort to reach consumers who do not get water bills, using means recommended by the Department. The Department expects that an adequate good faith effort will be tailored to the consumers who are served by the system but are not bill-paying customers, such as renters or workers. A good faith effort to reach consumers would include a mix of methods appropriate to the particular system such as: Posting the reports on the Internet; mailing to postal patrons in metropolitan areas; advertising the availability of the report in the news media; publication in a local newspaper; posting in public places such as cafeterias or lunch rooms of public buildings; delivery of multiple copies for distribution by single-billed customers such as apartment buildings or large private employers; or delivery to community organizations.

(c) No later than the date the system is required to distribute the report to its customers (April 1 for wholesale customers and July 1 for retail customers), each community water system must mail a copy of the report to the Department with a certification that the report has been distributed to customers, and that the information is correct and consistent with the compliance monitoring data previously submitted to the Department.

(d) No later than the date the system is required to distribute the report to its customers, each community water system must deliver the report to any other agency or clearinghouse identified by the Department.

(e) Each community water system must make its reports available to the public upon request.

(f) Each community water system serving 100,000 or more persons must post its current year's report to a publicly accessible site on the Internet.

(g) The requirement of section 9.1.5(a) for community water systems serving fewer than 10,000 persons may be waived if the system complies with all the requirements of 9.1.5(g)(1)(i)-(iii).

(1) Such systems must:

(i) Publish the reports in one or more local newspapers serving the area in which the system is located; and

(ii) Inform the customers that the reports will not be mailed, either in the newspapers in which the reports are published or by other means approved by the Department; and

(iii) Make the reports available to the public upon request.

(2) Systems serving 500 or fewer persons may forego the requirements of Sections 9.1.5(g)(1)(i) and (ii) if they provide notice at least once per year to their customers by mail, door-to-door delivery or by posting in an appropriate location that the report is available upon request.

(h) Any system subject to section 9.1 must retain copies of its Consumer Confidence Report for no less than 3 years.

Table 9-1 Table of Regulated Contaminants

Contaminant (units)	**Traditional MCL in mg/L**	**To convert for CCR, multiply by**	**MCL in CCR units**	**MCLG**	**Major sources in drinking water**	**Health effects language**
Microbiological Contaminants:						
Total coliform bacteria	(Systems that collect greater than or equal to (>) 40 samples/ month) 5% of monthly samples are positive		(Systems that collect greater than or equal to (>) 40 samples/ month) 5% of monthly samples are positive	0	Naturally present in the environment.	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.
	(Systems that collect less than (<) 40 samples/ month) 1 positive monthly sample.		(Systems that collect less than (<) 40 samples/ month) 1 positive monthly sample.			
Fecal Indicators (E. coli, enterococci or coliphage)	TT		TT	N/A	Human and animal fecal waste	Fecal indicators are microbes whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short- term health 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.

Fecal coliform and E. coli	0		0	0	Human and animal fecal waste.	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.
Total organic carbon (ppm)	TT		TT	N/A	Naturally present in the environment.	Total organic carbon (TOC) has no health effects. However, total organic carbon provides a medium for the formation of disinfection by products. These byproducts include trihalomethanes (THMs) and haloacetic acids (HAAs). Drinking water containing these byproducts 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.
Turbidity (NTU)	TT		TT	N/A	Soil runoff.	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.
Radioactive Contaminants:						

Beta/photon emitters (mrem/yr)	4 mrem/yr		4	0	Decay of natural and man-made deposits.	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.
Alpha emitters (pCi/L)	15 pCi/L		15	0	Erosion of natural deposits.	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 (pCi/L)	5 pCi/L		5	0	Erosion of natural deposits.	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 (µg/L)	30 µg/L		30	0	Erosion of natural deposits.	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.
Inorganic Chemical Contaminants:						
Antimony (ppb)	0.006	1000	6	6	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder.	Some people who drink water containing antimony well in excess of the MCL over many years could experience increases in blood cholesterol and decreases in blood sugar.
Arsenic (ppb)	0.010[1]	1000	10[4]	0[4]	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes.	Some people who drink water containing 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.

Asbestos (MFL)	7 MFL		7	7	Decay of asbestos cement water mains; Erosion of natural deposits.	Some people who drink water containing asbestos in excess of the MCL over many years may have an increased risk of developing benign intestinal polyps.
Barium (ppm)	2		2	2	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.	Some people who drink water containing barium in excess of the MCL over many years could experience an increase in their blood pressure.
Beryllium (ppb)	0.004	1000	4	4	Discharge from metal refineries and coal burning factories; Discharge from electrical, aerospace, and defense industries.	Some people who drink water containing beryllium well in excess of the MCL over many years could develop intestinal lesions.
Bromate (ppb)	0.010	1000	10	0	By-product of drinking water disinfection.	Some people who drink water containing bromate in excess of the MCL over many years may have an increased risk of getting cancer.
Cadmium (ppb)	0.005	1000	5	5	Corrosion of galvanized pipes; Erosion of natural deposits; Discharge from metal refineries; Runoff from waste batteries and paints.	Some people who drink water containing cadmium in excess of the MCL over many years could experience kidney damage.
Chloramines (ppm)	MRDL = 4		MRDL = 4	MRDL G = 4	Water additive used to control microbes.	Some people who use water containing chloramines well in excess of the MRDL could experience irritating effects to their eyes and nose. Some people who drink water containing chloramines well in excess of the MRDL could experience stomach discomfort or anemia.
Chlorine (ppm)	MRDL = 4		MRDL = 4	MRDL G = 4	Water additive used to control microbes.	Some people who use water containing chlorine well in excess of the MRDL could experience irritating effects to their eyes and nose. Some people who drink water containing chlorine well in excess of the MRDL could experience stomach discomfort.

Chlorine dioxide (ppb)	MRDL = 0.8	1000	MRDL = 800	MRDLG = 800	Water additive used to control microbes.	Some infants and young children who drink water containing chlorine dioxide in excess of the MRDL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water containing chlorine dioxide in excess of the MRDL. Some people may experience anemia.
Chlorite (ppm)	1		1	0.8	By-product of drinking water disinfection.	Some infants and young children who drink water containing chlorite in excess of the MCL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water containing chlorite in excess of the MCL. Some people may experience anemia.
Chromium (ppb)	0.1	1000	100	100	Discharge from steel and pulp mills; Erosion of natural deposits.	Some people who use water containing chromium well in excess of the MCL over many years could experience allergic dermatitis.
Copper (ppm)	AL=1.3		AL=1.3	1.3	Corrosion of household plumbing systems; Erosion of natural deposits.	Copper is an essential nutrient, but some people who drink water containing copper in excess of the action level over a relatively short amount of time could experience gastrointestinal distress. Some people who drink water containing 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.
Cyanide (ppb)	0.2	1000	200	200	Discharge from steel/metal factories; Discharge from plastic and fertilizer factories.	Some people who drink water containing cyanide well in excess of the MCL over many years could experience nerve damage or problems with their thyroid.

Fluoride (ppm)	4.0		4.0	4.0	Erosion of natural deposits; Water additive that promotes strong teeth; Discharge from fertilizer and aluminum factories.	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.
Lead (ppb)	AL=0.015	1000	AL=15	0	Corrosion of household plumbing systems; Erosion of natural deposits.	Infants and children who drink water containing 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.
Mercury [inorganic] (ppb)	0.002	1000	2	2	Erosion of natural deposits; Discharge from refineries and factories; Runoff from landfills; Runoff from cropland.	Some people who drink water containing inorganic mercury well in excess of the MCL over many years could experience kidney damage.
Nitrate (ppm)	10		10	10	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits.	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.
Nitrite (ppm)	1		1	1	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits.	Infants below the age of six 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.

Selenium (ppb)	0.05	1000	50	50	Discharge from petroleum and metal refineries; Erosion of natural deposits; Discharge from mines.	Selenium is an essential nutrient. However, some people who drink water containing 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.
Thallium (ppb)	0.002	1000	2	0.5	Leaching from ore-processing sites; Discharge from electronics, glass, and drug factories.	Some people who drink water containing 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.
Synthetic Organic Chemical Contaminants including Pesticides and Herbicides:						
2,4-D (ppb)	0.07	1000	70	70	Runoff from herbicide used on row crops.	Some people who drink water containing 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.
2,4,5-TP [Silvex](ppb)	0.05	1000	50	50	Residue of banned herbicide.	Some people who drink water containing silvex in excess of the MCL over many years could experience liver problems.
Acrylamide			TT	0	Added to water during sewage/wastewater treatment.	Some people who drink water containing 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.
Alachlor (ppb)	0.002	1000	2	0	Runoff from herbicide used on row crops.	Some people who drink water containing 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.
Atrazine (ppb)	0.003	1000	3	3	Runoff from herbicide used on row crops.	Some people who drink water containing atrazine well in excess of the MCL over many years could experience problems with their cardiovascular system or reproductive difficulties.

Benzo(a)pyrene [PAH] (nanograms/L).	0.0002	1,000,000	200	0	Leaching from linings of water storage tanks and distribution lines.	Some people who drink water containing benzo(a)pyrene in excess of the MCL over many years may experience reproductive difficulties and may have an increased risk of getting cancer.
Carbofuran (ppb)	0.04	1000	40	40	Leaching of soil fumigant used on rice and alfalfa.	Some people who drink water containing carbofuran in excess of the MCL over many years could experience problems with their blood, or nervous or reproductive systems.
Chlordane (ppb)	0.002	1000	2	0	Residue of banned termiticide.	Some people who drink water containing 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.
Dalapon (ppb)	0.2	1000	200	200	Runoff from herbicide used on rights of way.	Some people who drink water containing dalapon well in excess of the MCL over many years could experience minor kidney changes.
Di(2-ethylhexyl) adipate (ppb)	0.4	1000	400	400	Discharge from chemical factories.	Some people who drink water containing di(2-ethylhexyl) adipate well in excess of the MCL over many years could experience toxic effects, such as weight loss, liver enlargement or possible reproductive difficulties.
Di(2-ethylhexyl) phthalate (ppb)	0.006	1000	6	0	Discharge from rubber and chemical factories.	Some people who drink water containing 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.

Dibromochloro-propane (ppt)	0.0002	1,000,000	200	0	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards.	Some people who drink water containing DBCP in excess of the MCL over many years could experience reproductive problems and may have an increased risk of getting cancer.
Dinoseb (ppb)	0.007	1000	7	7	Runoff from herbicide used on soybeans and vegetables.	Some people who drink water containing dinoseb well in excess of the MCL over many years could experience reproductive difficulties.
Diquat (ppb)	0.02	1000	20	20	Runoff from herbicide use.	Some people who drink water containing diquat in excess of the MCL over many years could get cataracts.
Dioxin [2,3,7,8-TCDD] (ppq)	0.00000003	1,000,000,000	30	0	Emissions from waste incineration and other combustion; discharge from chemical factories.	Some people who drink water containing dioxin in excess of the MCL over many years could experience reproductive difficulties and may have an increased risk of getting cancer.
Endothall (ppb)	0.1	1000	100	100	Runoff from herbicide use	Some people who drink water containing endothall in excess of the MCL over many years could experience problems with their stomach or intestines.
Endrin (ppb)	0.002	1000	2	2	Residue of banned insecticide	Some people who drink water containing endrin in excess of the MCL over many years could experience liver problems.
Epichlorohydrin	TT		TT	0	Discharge from industrial chemical factories; an impurity of some water treatment chemicals.	Some people who drink water containing high levels of epichlorohydrin over a long period of time could experience stomach problems, and may have an increased risk of getting cancer.

Ethylene dibromide (ppt)	0.00005	1,000,000	50	0	Discharge from petroleum refineries.	Some people who drink water containing 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.
Glyphosate (ppb)	0.7	1000	700	700	Runoff from herbicide use.	Some people who drink water containing glyphosate in excess of the MCL over many years could experience problems with their kidneys or reproductive difficulties.
Heptachlor (ppt)	0.0004	1,000,000	400	0	Residue of banned pesticide.	Some people who drink water containing heptachlor in excess of the MCL over many years could experience liver damage and may have an increased risk of getting cancer.
Heptachlor epoxide (ppt)	0.0002	1,000,000	200	0	Breakdown of heptachlor.	Some people who drink water containing heptachlor epoxide in excess of the MCL over many years could experience liver damage, and may have an increased risk of getting cancer.
Hexachlorobenzene (ppb)	0.001	1000	1	0	Discharge from metal refineries and agricultural chemical factories.	Some people who drink water containing 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.
Hexachloro-cyclopentadiene (ppb)	0.05	1000	50	50	Discharge from chemical factories.	Some people who drink water containing hexachlorocyclopentadiene well in excess of the MCL over many years could experience problems with their kidneys or stomach.
Lindane (ppt)	0.0002	1,000,000	200	200	Runoff/leaching from insecticide used on cattle, lumber, gardens.	Some people who drink water containing lindane in excess of the MCL over many years could experience problems with their kidneys or liver.

Methoxychlor (ppb)	0.04	1000	40	40	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock.	Some people who drink water containing methoxychlor in excess of the MCL over many years could experience reproductive difficulties.
Oxamyl [Vydate] (ppb)	0.2	1000	200	200	Runoff/leaching from insecticide used on apples, potatoes and tomatoes.	Some people who drink water containing oxamyl in excess of the MCL over many years could experience slight nervous system effects.
PCBs [Polychlorinated biphenyls] (ppt).	0.0005	1,000,000	500	0	Runoff from landfills; discharge of waste chemicals.	Some people who drink water containing 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.
Pentachloro-phenol (ppb)	0.001	1000	1	0	Discharge from wood preserving factories.	Some people who drink water containing 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.
Picloram (ppb)	0.5	1000	500	500	Herbicide runoff.	Some people who drink water containing picloram in excess of the MCL over many years could experience problems with their liver.
Simazine (ppb)	0.004	1000	4	4	Herbicide runoff.	Some people who drink water containing simazine in excess of the MCL over many years could experience problems with their blood.
Toxaphene (ppb)	0.003	1000	3	0	Runoff/leaching from insecticide used on cotton and cattle.	Some people who drink water containing 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.
Volatile Organic Chemical Contaminants:						

Benzene (ppb)	0.005	1000	5	0	Discharge from factories; leaching from gas storage tanks and landfills.	Some people who drink water containing 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.
Carbon tetrachloride (ppb)	0.005	1000	5	0	Discharge from chemical plants and other industrial activities.	Some people who drink water containing 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.
Chlorobenzene (ppb)	0.1	1000	100	100	Discharge from chemical and agricultural chemical factories.	Some people who drink water containing chlorobenzene in excess of the MCL over many years could experience problems with their liver or kidneys.
o-Dichlorobenzene (ppb)	0.6	1000	600	600	Discharge from industrial chemical factories.	Some people who drink water containing o-dichlorobenzene well in excess of the MCL over many years could experience problems with their liver, kidneys, or circulatory systems.
p-Dichlorobenzene (ppb)	0.075	1000	75	75	Discharge from industrial chemical factories.	Some people who drink water containing 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.
1,2-Dichloroethane (ppb)	0.005	1000	5	0	Discharge from Industrial chemical factories.	Some people who drink water containing 1,2-dichloroethane in excess of the MCL over many years may have an increased risk of getting cancer.
1,1-Dichloroethylene (ppb).	0.007	1000	7	7	Discharge from industrial chemical factories.	Some people who drink water containing 1,1-dichloroethylene in excess of the MCL over many years could experience problems with their liver.

cis-1,2-Dichloroethylene (ppb)	0.07	1000	70	70	Discharge from industrial chemical factories.	Some people who drink water containing cis-1,2-dichloroethylene in excess of the MCL over many years could experience problems with their liver.
trans-1,2-Dichloroethylene (ppb)	0.1	1000	100	100	Discharge from industrial chemical factories.	Some people who drink water containing trans-1,2-dichloroethylene well in excess of the MCL over many years could experience problems with their liver.
Dichloromethane (ppb)	0.005	1000	5	0	Discharge from pharmaceutical and chemical factories.	Some people who drink water containing dichloromethane in excess of the MCL over many years could have liver problems and may have an increased risk of getting cancer.
1,2-Dichloropropane (ppb)	0.005	1000	5	0	Discharge from industrial chemical factories.	Some people who drink water containing 1,2-dichloropropane in excess of the MCL over many years may have an increased risk of getting cancer.
Ethylbenzene (ppb)	0.7	1000	700	700	Discharge from petroleum refineries.	Some people who drink water containing ethylbenzene well in excess of the MCL over many years could experience problems with their liver or kidneys.
Haloacetic Acids (HAA) (ppb)	0.060	1000	60	N/A	By-product of drinking water disinfection.	Some people who drink water containing haloacetic acids in excess of the MCL over many years may have an increased risk of getting cancer.
Styrene (ppb)	0.1	1000	100	100	Discharge from rubber and plastic factories; leaching from landfills.	Some people who drink water containing styrene well in excess of the MCL over many years could have problems with their liver, kidneys, or circulatory system.
Tetrachloro-ethylene (ppb)	0.005	1000	5	0	Discharge from factories and dry cleaners.	Some people who drink water containing tetrachloroethylene in excess of the MCL over many years could have problems with their liver, and may have an increased risk of getting cancer.

1,2,4-Trichloro-benzene (ppb)	0.07	1000	70	70	Discharge from textile-finishing factories.	Some people who drink water containing 1,2,4-trichlorobenzene well in excess of the MCL over many years could experience changes in their adrenal glands.
1,1,1-Trichloroethane (ppb)	0.2	1000	200	200	Discharge from metal degreasing sites and other factories.	Some people who drink water containing 1,1,1-trichloroethane in excess of the MCL over many years could experience problems with their liver, nervous system, or circulatory system.
1,1,2-Trichloroethane (ppb)	0.005	1000	5	3	Discharge from industrial chemical factories.	Some people who drink water containing 1,1,2-trichloroethane well in excess of the MCL over many years could have problems with their liver, kidneys, or immune systems.
Trichloro-ethylene (ppb)	0.005	1000	5	0	Discharge from metal degreasing sites and other factories.	Some people who drink water containing trichloroethylene in excess of the MCL over many years could experience problems with their liver and may have an increased risk of getting cancer.
TTHMs [Total trihalomethanes] (ppb)	0.080[2]	1000	80	N/A	Byproduct of drinking water disinfection.	Some people who drink water containing trihalomethanes in excess of the MCL over many years may experience problems with their liver, kidneys, or central nervous systems, and may have an increased risk of getting cancer.
Toluene (ppm)	1		1	1	Discharge from petroleum factories.	Some people who drink water containing toluene well in excess of the MCL over many years could have problems with their nervous system, kidneys, or liver.
Vinyl Chloride (ppb)	0.002	1000	2	0	Leaching from PVC piping; discharge from plastics factories.	Some people who drink water containing vinyl chloride in excess of the MCL over many years may have an increased risk of getting cancer.

Xylenes (ppm)	10		10	10	Discharge from petroleum factories; discharge from chemical factories.	Some people who drink water containing xylenes in excess of the MCL over many years could experience damage to their nervous system.

1 These arsenic values are effective January 23, 2006. Until then, the MCL is 0.05 mg/L and there is no MCLG.

2 The MCL = 0.10 for samples collected by public water systems using surface water serving > 10,000 prior to January 1, 2002 and for samples collected by public water systems using groundwater serving >10,000 prior to January 1, 2004.

KEY to Table 9-1:

AL Action Level

MCL Maximum Contaminant Level

MCLG Maximum Contaminant Level Goal

MFL Million fibers per liter

MRDL Maximum Residual Disinfectant Level

MRDLG Maximum Residual Disinfectant Level Goal

mrem/year millirems per year (a measure of radiation absorbed by the body)

NTU Nephelometric Turbidity Units (a measure of water clarity)

TT Treatment Technique

N/A Not Applicable

pCi/L picocuries per liter (a measure of radioactivity)

ppb Parts per billion, or micrograms (10^{-6}) per liter (µg/L)

ppm Parts per million, or milligrams (10^{-3}) per liter (mg/L)

ppq Parts per quadrillion, or picograms (10^{-12}) per liter (pg/L)

ppt Parts per trillion, or nanograms (10^{-9}) per liter (ng/L)

9.2 Public Notification

9.2.1 Introduction

Public water systems must comply with the requirements in section 9.2 in accordance with section 1.6.4, unless otherwise noted.

(a) Each owner or operator of a public water system (community water systems, non-transient non-community water systems, and transient non-community water systems) must give notice for all violations of the *Colorado Primary Drinking Water Regulations* (CPDWR) and for other situations, as listed in Table 9-2. The term “CPDWR violations” is used in section 9.2 to include violations of the maximum contaminant level (MCL), maximum residual disinfection level (MRDL), treatment

technique (TT), monitoring requirements, and testing procedures. Table 9-7 identifies the tier assignment for each specific violation or situation requiring a public notice.

Table 9-2 Violation Categories and Other Situations Requiring a Public Notice

(1)	CPDWR violations:	(i) Failure to comply with an applicable maximum contaminant level (MCL) or maximum residual disinfectant level (MRDL).
		(ii) Failure to comply with a prescribed treatment technique (TT).
		(iii) Failure to perform water quality monitoring, as required by the drinking water regulations.
		(iv) Failure to comply with testing procedures as prescribed by a drinking water regulation.
(2)	Variance or exemption under Article 4	(i) Operation under a variance or an exemption.
		(ii) Failure to comply with the requirements of any schedule that has been set under a variance or exemption.
(3)	Special public notices:	(i) Occurrence of a waterborne disease outbreak or other waterborne emergency.
		(ii) Exceedance of the nitrate MCL by non-community water systems, where granted permission by the Department under 6.1.1(c).
		(iii) Exceedance of the secondary maximum contaminant level (SMCL) for fluoride.
		(iv) Availability of unregulated contaminant monitoring data.
		(v) Repeated failure to conduct monitoring of the source water for *Cryptosporidium* and for failure to determine bin classification.
		(vi) Groundwater systems with a waiver from disinfection requirements covered under section 13.2(d).
		(vii) Significant deficiencies identified at non-community groundwater systems.
		(viii) Other violations and situations determined by the Department to require a public notice under section 9.2.

(b) Public notice requirements are divided into three tiers, to take into account the seriousness of the violation or situation and any potential adverse health effects that may be involved. The tier to which it is assigned determines the public notice requirements for each violation or situation listed in Table 9-2. Table 9-3 provides the definition of each tier. Table 9-7 identifies the tier assignment for each specific violation or situation.

Table 9-3 Definition of Public Notice Tiers

(1)	Tier 1 public notice	Required for CPDWR violations and situations with significant potential to have serious adverse effects on human health as a result of short-term exposure.

(2)	Tier 2 public notice	Required for all other CPDWR violations and situations with potential to have serious adverse effects on human health.
(3)	Tier 3 public notice	Required for all other CPDWR violations and situations not included in Tier 1 and Tier 2.

(c) Customer Notification.

(1) Each public water system must provide public notice to persons served by the water system, in accordance with this section 9.2. Public water systems that sell or otherwise provide drinking water to other public water systems (i.e., to consecutive systems) are required to give public notice to the owner or operator of the consecutive system; the consecutive system is responsible for providing public notice to the persons it serves.

(2) If a public water 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 Department may allow the system to limit distribution of the public notice to only persons served by that portion of the system which is out of compliance. Permission by the Department for limiting distribution of the notice must be granted in writing.

(3) A copy of the notice must also be sent to the Department, in accordance with the requirements under section 1.6.4(d).

9.2.2 Tier 1 Public Notice Form, Manner, and Frequency of Notice

(a) Table 9-4 lists the violation categories and other situations requiring a Tier 1 public notice. Table 9-7 identifies the tier assignment for each specific violation or situation.

Table 9-4 Violation Categories and Other Situations Requiring a Tier 1 Public Notice

(1)	Violation of the MCL for total coliforms when fecal coliform or E. coli are present in the water distribution system (as specified in Table 2-4(4)(b)), or when the water system fails to test for fecal coliforms or E. coli when any repeat sample tests positive for coliform (as specified in section 5.1.2(a));
(2)	Violation of the MCL for nitrate, nitrite, or total nitrate and nitrite, as listed in Table 2-3, or when the water system fails to take a confirmation sample within 24 hours of the system's receipt of the first sample showing an exceedance of the nitrate or nitrite MCL, as specified in section _6.1.3(b)
(3)	Exceedance of the nitrate MCL by non-community water systems, where permitted to exceed the MCL by the Department under section 6.1.1(c) as required by 9.2.9.
(4)	Violation of the MRDL for chlorine dioxide, as listed in Table 2-6(3) when one 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 water system does not take the required samples in the distribution system, as specified in section 7.5.3(c)(2)(i)-(ii);
(5)	[Reserved];

(6)	Violation of the Surface Water Treatment Rule (SWTR – section 7.1), or Enhanced Surface Water Treatment Rule (ESWTR – section 7.2), or Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR – section 7.3) treatment technique requirement resulting from a single exceedance of the maximum allowable turbidity limit (as identified in Table 9-7), where the Department 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;
(7)	Occurrence of a waterborne disease outbreak, as defined in section 1.5.2, or other waterborne emergency (such as a failure or significant interruption in key water treatment processes, a natural disaster that disrupts the water supply or distribution system, or a chemical spill or unexpected loading of possible pathogens into the source water that significantly increases the potential for drinking water contamination);
(8)	Detection of E. coli, enterococci, or coliphage in source water samples as specified in section 13.3(a) and section 13.3(b).
(9)	Other violations or situations with significant potential to have serious adverse effects on human health as a result of short-term exposure, as determined by the Department either in *Colorado Primary Drinking Water Regulations* or on a case-by-case basis.

(b) For a Tier 1 public notice public water systems must:

(1) Provide a public notice as soon as practical but no later than 24 hours after the system learns of the violation;

(2) Initiate consultation with the Department as soon as practical, but no later than 24 hours after the public water system learns of the violation or situation, to determine additional public notice requirements; and

(3) Comply with any additional public notification requirements (including any repeat notices or direction on the duration of the posted notices) that are established as a result of the consultation with the Department. Such requirements may include the timing, form, manner, frequency, and content of repeat notices (if any) and other actions designed to reach all persons served.

(c) Public water systems must provide the notice within 24 hours in a form and manner reasonably calculated to reach all persons served. The form and manner used by the public water system are to fit the specific situation, but must be designed to reach residential, transient, and non-transient users of the water system. In order to reach all persons served, water systems are to use one or more of the following forms of direct delivery:

(1) Appropriate broadcast media, including radio, television and a phone call to each customer using a reverse 911 system, where available;

(2) Hand delivery of the notice to persons served by the water system; or

(3) Another direct delivery method approved in writing by the Department.

(d) In addition, the Department may require posting of the notice in conspicuous locations throughout the area served by the water system.

9.2.3 Tier 2 Public Notice Form, Manner, and Frequency of Notice

(a) Table 9-5 lists the violation categories and other situations requiring a Tier 2 public notice. Table 9-7 identifies the tier assignment for each specific violation or situation.

Table 9-5 Violation Categories and Other Situations Requiring a Tier 2 Public Notice

(1)	All violations of the MCL, MRDL, and treatment technique requirements, except where a Tier 1 notice is required under section 9.2.2(a) or where the Department determines that a Tier 1 notice is required;
(2)	Violations of the monitoring and testing procedure requirements, where the Department determines that a Tier 2 rather than a Tier 3 public notice is required, taking into account potential health impacts and persistence of the violation; and
(3)	Failure to comply with the terms and conditions of any variance or exemption in place.
(4)	Failure to take corrective action or failure to maintain at least 4-log treatment of viruses before or at the first customer under sections 11.4, 13.4(a) or 13.4(b).

(b) Tier 2 public notice requirements.

(1) Public water systems must provide the public notice as soon as practical, but no later than 30 days after the system learns of the violation. If the public notice is posted, the notice must remain in place for as long as the violation or situation persists, but in no case for less than seven days, even if the violation or situation is resolved. The Department may, in appropriate circumstances, allow additional time for the initial notice of up to three months from the date the system learns of the violation. It is not appropriate for the Department to grant an extension to the 30-day deadline for any unresolved violation or to allow across-the-board extensions by rule or policy for other violations or situations requiring a Tier 2 public notice. Extensions granted by the Department must be in writing.

(2) The public water system must repeat the notice every three months as long as the violation or situation persists, unless the Department determines that appropriate circumstances warrant a different repeat notice frequency. In no circumstance may the repeat notice be given less frequently than once per year. Less frequent repeat notice for an MCL violation under Article 5 or a treatment technique violation under sections 7.1, 7.2 or 7.3, or across-the-board reductions in the repeat notice frequency for other ongoing violations requiring a Tier 2 repeat notice, is prohibited. Any determination allowing repeat notices to be given less frequently than once every three months must be in writing by the Department.

(3) For the turbidity violations specified in this section 9.2.3(b)(3), public water systems must consult with the Department as soon as practical but no later than 24 hours after the public water system learns of the violation, to determine whether a Tier 1 public notice under section 9.2.2(a) is required to protect public health. When consultation does not take place within the 24-hour period, the water system must distribute a Tier 1 notice of the violation within the next 24 hours (i.e., no later than 48 hours after the system learns of the violation), following the requirements under section 9.2.2(b) and (c). Consultation with the Department is required for a violation of an Article 7 treatment technique requirement resulting from a single exceedance of the maximum allowable turbidity limit.

(c) Public water systems must provide the initial public notice and any repeat notices in a form and manner that is reasonably calculated to reach persons served in the required time period. The form and manner of the public notice may vary based on the specific situation and type of water system, but it must at a minimum meet the following requirements:

(1) Unless directed otherwise by the Department in writing, community water systems must provide notice by:

(i) Mail or other direct delivery to each customer receiving a bill and to other service connections to which water is delivered by the public water system; and

(ii) Any other method reasonably calculated to reach other persons, regularly served by the system, if they would not normally be reached by the notice required in section 9.2.3(c)(1)(i). Such persons may include those who do not pay water bills or do not have service connection addresses (e.g., house renters, apartment dwellers, university students, nursing home patients, prison inmates, etc.). Other methods may include: Publication in a local newspaper; delivery of multiple copies for distribution by customers that provide their drinking water to others (e.g., apartment building owners or large private employers); posting in public places served by the system or on the Internet; or delivery to community organizations.

(2) Unless directed otherwise by the Department in writing, non-community water systems must provide notice by:

(i) Posting the notice in conspicuous locations throughout the distribution system frequented by persons served by the system, or by mail or direct delivery to each customer and service connection (where known); and

(ii) Any other method reasonably calculated to reach other persons served by the system if they would not normally be reached by the notice, required in section 9.2.3(c)(2)(i). Such persons may include those served who may not see a posted notice because the posted notice is not in a location they routinely pass by. Other methods may include: publication in a local newspaper or newsletter distributed to customers; use of E-mail to notify employees or students; or, delivery of multiple copies in central locations (e.g., community centers).

9.2.4 Tier 3 Public Notice Form, Manner, and Frequency of Notice

(a) Table 9-6 lists the violation categories and other situations requiring a Tier 3 public notice. Table 9-7 identifies the tier assignment for each specific violation or situation.

Table 9-6 Violation Categories and Other Situations Requiring a Tier 3 Public Notice

(1)	Monitoring violations under the Colorado Primary Drinking Water Regulations, except where a Tier 1 notice is required under section 9.2.2(a) or where the Department determines that a Tier 2 notice is required;
(2)	Failure to comply with a testing procedure established in the Colorado Primary Drinking Water Regulations, except where a Tier 1 notice is required under section 9.2.2(a)) or where the Department determines that a Tier 2 notice is required;
(3)	Operation under a variance or exemption granted under Article 4;
(4)	Availability of unregulated contaminant monitoring results, as required under section 9.2.7; and
(5)	Exceedance of the fluoride secondary maximum contaminant level (SMCL), as required under section 9.2.8.
(6)	Failure to meet the monitoring requirements of sections 13.2(b), 13.3(a)-(f), 13.4 or 11.4.

(b) Tier 3 public notice requirements.

(1) Public water systems must provide the public notice not later than one year after the public water system learns of the violation or situation or begins operating under a variance or exemption. Following the initial notice, the public water system must repeat the notice annually for as long as the violation, variance, exemption, or other situation persists. If the public notice is posted, the notice must remain in place for as long as the violation, variance, exemption, or other situation persists, but in no case less than seven days (even if the violation or situation is resolved).

(2) Instead of individual Tier 3 public notices, a public water system may use an annual report detailing all violations and situations that occurred during the previous twelve months, as long as the timing requirements of section 9.2.4(b)(1) are met.

(c) Public water systems must provide the initial notice and any repeat notices in a form and manner that is reasonably calculated to reach persons served in the required time period. The form and manner of the public notice may vary based on the specific situation and type of water system, but it must at a minimum meet the following requirements:

(1) Unless directed otherwise by the Department in writing, community water systems must provide notice by:

(i) Mail or other direct delivery to each customer receiving a bill and to other service connections to which water is delivered by the public water system; and

(ii) Any other method reasonably calculated to reach other persons regularly served by the system if they would not normally be reached by the notice required in section 9.2.4(c)(1)(i). Such persons may include those who do not pay water bills or do not have service connection addresses (e.g., house renters, apartment dwellers, university students, nursing home patients, prison inmates, etc.). Other methods may include: Publication in a local newspaper; delivery of multiple copies for distribution by customers that provide their drinking water to others (e.g., apartment building owners or large private employers); posting in public places or on the Internet; or delivery to community organizations.

(2) Unless directed otherwise by the Department in writing, non-community water systems must provide notice by:

(i) Posting the notice in conspicuous locations throughout the distribution system frequented by persons served by the system, or by mail or direct delivery to each customer and service connection (where known); and

(ii) Any other method reasonably calculated to reach other persons served by the system if they would not normally be reached by the notice required in section 9.2.4(c)(2)(i). Such persons may include those who may not see a posted notice because the notice is not in a location they routinely pass by. Other methods may include: Publication in a local newspaper or newsletter distributed to customers; use of E-mail to notify employees or students; or, delivery of multiple copies in central locations (e.g., community centers).

(d) For community water systems, the Consumer Confidence Report (CCR) required under section 9.1 may be used as a vehicle for the initial Tier 3 public notice and all required repeat notices, as long as:

(1) The CCR is provided to persons served, no later than 12 months after the system learns of the violation or situation as required under section 9.2.4(b);

(2) The Tier 3 notice contained in the CCR follows the content requirements under section 9.2.5; and

(3) The CCR is distributed following the delivery requirements under section 9.2.4(c).

9.2.5 Content of the Public Notice

(a) When a public water system violates a CPDWR or has a situation requiring public notification, each public notice must include the following elements:

(1) A description of the violation or situation, including the contaminant(s) of concern, and (as applicable) the contaminant level(s);

(2) When the violation or situation occurred;

(3) Any potential adverse health effects from the violation or situation, including the standard language under section 9.2.5(d)(1) or (d)(2), whichever is applicable;

(4) The population at risk, including sub-populations particularly vulnerable if exposed to the contaminant in their drinking water;

(5) Whether alternative water supplies should be used;

(6) What actions consumers should take, including when they should seek medical help, if known;

(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, operator, or designee of the public water system as a source of additional information concerning the notice; and

(10) A statement to encourage the notice recipient to distribute the public notice to other persons served, using the standard language under section 9.2.5(d)(3), where applicable.

(b) When a public water system is operating under a variance or exemption each public notice must include the following elements:

(1) If a public water system has been granted a variance or an exemption, the public notice must contain:

(i) An explanation of the reasons for the variance or exemption;

(ii) The date on which the variance or exemption was issued;

(iii) A brief status report on the steps the system is taking to install treatment, find alternative sources of water, or otherwise comply with the terms and schedules of the variance or exemption; and

(iv) A notice of any opportunity for public input in the review of the variance or exemption.

(2) If a public water system violates the conditions of a variance or exemption, the public notice must contain the ten elements listed in section 9.2.5(a).

(c) Presentation of the public notice.

(1) Each public notice required by section 9.2:

(i) Must be displayed in a conspicuous way when printed or posted;

(ii) Must not contain overly technical language or very small print;

(iii) Must not be formatted in a way that defeats the purpose of the notice;

(iv) Must not contain language that nullifies the purpose of the notice.

(2) Each public notice required by section 9.2 must comply with multilingual requirements, as follows:

(i) For public water systems serving a large proportion of non-English speaking consumers, as determined by the Department, the public notice must contain information in the appropriate language(s) regarding the importance of the notice or contain a telephone number or address where persons served may contact the water system to obtain a translated copy of the notice or to request assistance in the appropriate language.

(ii) In cases where the Department has not determined what constitutes a large proportion of non-English speaking consumers, the public water system must include in the public notice the same information as in section 9.2.5(c)(2)(i), where appropriate to reach a large proportion of non-English speaking persons served by the water system.

(d) Public water systems are required to include the following standard language in their public notice:

(1) Public water systems must include in each public notice the health effects language specified in Table 9-8 corresponding to each MCL, MRDL, and treatment technique violation listed in Table 9-7, and for each violation of a condition of a variance or exemption.

(2) Public water systems must include the following language in their notice, including the language necessary to fill in the blanks, for all monitoring and testing procedure violations listed in Table 9-7:

(3) The statement: 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.

(4) Public water systems must include in their notice the following language (where applicable): 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.

9.2.6 Notice to New Billing Units or New Customers

(a) Community water systems must give a copy of the most recent public notice for any continuing violation, the existence of a variance or exemption, or other ongoing situations requiring a public notice to all new billing units or new customers prior to or at the time service begins.

(b) Non-community water systems must continuously post the public notice in conspicuous locations in order to inform new consumers of any continuing violation, variance or exemption, or other situation requiring a public notice for as long as the violation, variance, exemption, or other situation persists.

9.2.7 Special Notice of the Availability of Unregulated Contaminant Monitoring Results

(a) The owner or operator of a community water system or non-transient, non-community water system required to monitor under section 6.4, must notify persons served by the system of the availability of the results of such sampling no later than 12 months after the monitoring results are known.

(b) The form and manner of the public notice must follow the requirements for a Tier 3 public notice prescribed in Sections 9.2.4(c), (d)(1), and (d)(3). The notice must also identify a person and provide the telephone number to contact for information on the monitoring results.

9.2.8 Special Notice for Exceedance of the SMCL for Fluoride

(a) Community water systems that exceed the fluoride secondary maximum contaminant level (SMCL) of 2.0 mg/L as specified in Table 3-1 (determined by the last single sample taken in accordance with section6.1.5), but do not exceed the maximum contaminant level (MCL) of 4.0 mg/L for fluoride (as specified in Table 2-3), must provide the public notice in section 9.2.8(c) to persons served. Public notice must be provided as soon as practical but no later than 12 months from the day the water system learns of the exceedance. A copy of the notice must also be sent to all new billing units and new customers at the time service begins and to the Department public health officer. The public water system must repeat the notice at least annually for as long as the SMCL is exceeded. If the public notice is posted, the notice must remain in place for as long as the SMCL is exceeded, but in no case less than seven days (even if the exceedance is eliminated). On a case-by-case basis, the Department may require an initial notice sooner than 12 months and repeat notices more frequently than annually.

(b) The form and manner of the public notice (including repeat notices) must follow the requirements for a Tier 3 public notice in section 9.2.4(c) and (d)(1) and (d)(3).

(c) The notice must contain the following mandatory language, including the language necessary to fill in the blanks:

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."

9.2.9 Special Notice for Nitrate

A special notice is required for nitrate exceedances above the MCL by non-community water systems when granted permission by the Department under section 6.1.1(c).

(a) The owner or operator of a non-community water system granted permission by the Department under section 6.1.1(c) to exceed the nitrate MCL must provide notice to persons served according to the requirements for a Tier 1 notice under section 9.2.2(a) and (b).

(b) Non-community water systems granted permission by the Department to exceed the nitrate MCL under section 6.1(b)(2) must provide continuous posting of the fact that nitrate levels exceed 10 mg/L and the potential health effects of exposure, according to the requirements for Tier 1 notice delivery under section 9.2.2(c) and the content requirements under section 9.2.5.

9.2.10 Notice by the Department on Behalf of the Public Water System

(a) The Department may give the notice required by section 9.2 on behalf of the owner and operator of the public water system in accordance with the requirements of section 9.2.

(b) Notwithstanding section 9.2.10(a), the owner or operator of the public water system remains responsible for ensuring that the requirements of section 9.2 are met.

9.2.11 Special notice for repeated failure to conduct monitoring of the source water for *Cryptosporidium* and for failure to determine bin classification

(a) *When is the special notice for repeated failure to monitor to be given?* The owner or operator of a community or non-community water system that is required to monitor source water under section 7.4.2 must notify persons served by the water system that monitoring has not been completed as specified no later than 30 days after the system has failed to collect any 3 months of monitoring as specified in section 7.4.2(c). The notice must be repeated as specified in section 9.2.3.

(b) *When is the special notice for failure to determine bin classification to be given?* The owner or operator of a community or non-community water system that is required to determine a bin classification under section 7.4.9 must notify persons served by the water system that the determination has not been made as required no later than 30 days after the system has failed report the determination as specified in section 7.4.9(e). The notice must be repeated as specified in section 9.2.3. The notice is not required if the system is complying with a Department-approved schedule to address the violation.

(c) *What is the form and manner of the special notice?* The form and manner of the public notice must follow the requirements for a Tier 2 public notice prescribed in section 9.2.3. The public notice must be presented as required in section 9.2.5.

(d) *What mandatory language must be contained in the special notice?* The notice must contain the following language, including the language necessary to fill in the blanks.

(1) The special notice for repeated failure to conduct monitoring must contain the following language:

We are required to monitor the source of your drinking water for *Cryptosporidium*. Results of the monitoring are to be used to determine whether water treatment at the (treatment plant name) is sufficient to adequately remove *Cryptosporidium* from your drinking water. We are required to complete this monitoring and make this determination by (required bin determination date). We "did not monitor or test" or "did not complete all monitoring or testing" on schedule and, therefore, we may not be able to determine by he required date what treatment modifications, if any, must be made to ensure adequate *Cryptosporidium* removal. Missing this deadline may, in turn, jeopardize our ability to have the required treatment modifications, if any, completed by the deadline required, (date).

For more information, please call (name of water system contact) of (name of water system) at (phone number).

(2) The special notice for failure to determine bin classification must contain the following language:

We are required to monitor the source of your drinking water for *Cryptosporidium* in order to determine by (date) whether water treatment at the (treatment plant name) is sufficient to adequately remove *Cryptosporidium* from your drinking water. We have not made this determination by the required date. Our failure to do this may jeopardize our ability to have the required treatment modifications, if any, completed by the required deadline of (date). For more information, please call (name of water system contact) of (name of water system) at (phone number).

(3) Each special notice must also include a description of what the system is doing to correct the violation and when the system expects to return to compliance or resolve the situation.

9.2.12 Special notice for groundwater systems with a waiver from disinfection requirements covered under section 13.2(d)

(a) Community water systems must provide annual public notice in order to inform consumers of the disinfection waiver. The Consumer Confidence Report (CCR) required under section 9.1 may be used as a vehicle for public notice.

(b) Non-community water systems must continuously post the public notice in conspicuous locations in order to inform consumers of the disinfection waiver.

(c) The public notice must contain the following language:

(1) [Name of groundwater system] has a waiver from disinfection requirements and serves well water that has not been chlorinated.

(d) The groundwater system must present the notice in accordance with the requirements under section 9.2.5(c).

(e) The Department may require the groundwater system to provide notice to new billing units or new customers in accordance with the requirements under section 9.2.6.

9.2.13 Special notice to the public of significant deficiencies identified at non-community groundwater systems

(a) Non-community ground water systems that receive notice from the Department of a significant deficiency must inform the public served by the water system in a manner approved by the Department of any significant deficiency that has not been corrected within 12 months of being notified by the Department, or earlier if directed by the Department. The system must continue to inform the public annually until the significant deficiency is corrected. The information must include:

(1) The nature of the significant deficiency and the date the significant deficiency was identified by the Department;

(2) The Department-approved plan and schedule for correction of the significant deficiency, including interim measures, progress to date, and any interim measures completed; and

(3) For systems with a large proportion of non-English speaking consumers, as determined by the Department, information in the appropriate language(s) regarding the importance of the notice or a telephone number or address where consumers may contact the system to obtain a translated copy of the notice or assistance in the appropriate language.

(b) If directed by the Department, a non-community water system with significant deficiencies that have been corrected must inform its customers of the significant deficiencies, how the deficiencies were corrected, and the dates of correction.

9.2.14 Special notice to the public for groundwater systems with hand pumped wells subject to section 13.2(e)

(a) The groundwater system must post notice on or within sight of the hand pumped well whenever the well is available for use to serve water to the public.

(b) The notice must contain the following language:

(1) This hand pump serves unchlorinated well water. For more information, please contact [phone number of public water system owner, operator, or designee of the public water system].

(c) The groundwater system must present the notice in accordance with the requirements in section 9.2.5(c)

9.2.15 List of Acronyms Used in Public Notification Regulation

CCR	Consumer Confidence Report
CPDWR	Colorado Primary Drinking Water Regulation
CWS	Community Water System
DBP	Disinfection Byproduct
ESWTR	Enhanced Surface Water Treatment Rule
GWR	Groundwater Rule
HPC	Heterotrophic Plate Count

IOC	Inorganic Chemical
LCR	Lead and Copper Rule
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MRDL	Maximum Residual Disinfectant Level
MRDLG	Maximum Residual Disinfectant Level Goal
NCWS	Non-Community Water System
NTNCWS	Non-transient, Non-Community Water System
NTU	Nephelometric Turbidity Unit
PN	Public Notification
PWS	Public Water System
SDWA	U.S. Safe Drinking Water Act
SMCL	Secondary Maximum Contaminant Level
SOC	Synthetic Organic Chemical
SWTR	Surface Water Treatment Rule
TCR	Total Coliform Rule
TT	Treatment Technique
TNCWS	Transient, Non-Community Water System
VOC	Volatile Organic Chemical

Table 9-7 Table of CPDWR Violations and Other Situations Requiring Public Notice [1]

Contaminant	MCL/MRDL/TT violations [2]		Monitoring & testing procedure violations	
	Tier of public notice required	Citation	Tier of public notice required	Citation
I. Violations of *Colorado Primary Drinking Water Regulations* (CPDWR): [3]				
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[4], 3	5.1.4
3 Turbidity MCL	2	2.8	3	7.1.4
4. Turbidity MCL (average of two days' samples greater than 5 NTU)	2, 1[5]	2.8	3.	7.1.4
5. Turbidity (for TT violations resulting from a single exceedance of maximum allowable turbidity level)	2, 1[6]	2.8	3	7.1.4, 7.2.4, 7.3.5 & 10.5.1
6. Surface Water Treatment Rule violations, other than violations resulting from single exceedance of max. allowable turbidity level (TT)	2	7.1.1 – 7.1.3 & 2.8	3	7.1.4 & 10.5.1
7. Enhanced Surface Water Treatment Rule violations, other than violations resulting from single exceedance of max. turbidity level (TT)	2	7.2.1 – 7.2.3 & 2.8	3	7.2.2 & 7.2.4
8. Filter Backwash Recycling Rule violations	2	7.4 & 2.8	3	7.4
9. Long Term 1 Enhanced Surface Water Treatment Rule violations	2	7.3.1 – 7.3.4 & 2.8	3	7.3.2 – 7.3.3 & 7.3.5
10. LT2 ESWTR Violations	2	7.4	2, 3 [17]	7.4
11. Groundwater Rule violations	2	13.2(c), 13.4(a), 13.4(b), 11.4	3	11.4, 13.2(b), 13.3, 13.4
B. Inorganic Chemical Contaminants (IOCs)				
1. Antimony	2	2.2	3	6.1.5
2. Arsenic	2	2.2	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	6.1.5
10.	Mercury (inorganic)	2	2.2	3	6.1.5
11.	Nitrate	1	2.2	1[8], 3	6.1.5
12.	Nitrite	1	2.2	1[8], 3	6.1.5
13.	Total Nitrate and Nitrite	1	2.2	3	6.1.5
14.	Selenium	2	2.2	3	6.1.5
15.	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	2.7	3	8.2, 8.3, 8.4
D. Synthetic Organic Chemical Contaminants (SOCs)					
1.	2,4–D	2	2.1(b)	3	6.2.6(a)
2.	2,4,5–TP (Silvex)	2	2.1(b)	3	6.2.6(a)
3.	Alachlor	2	2.1(b)	3	6.2.6(a)
4.	Atrazine	2	2.1(b)	3	6.2.6(a)
5.	Benzo(a)pyrene (PAHs)	2	2.1(b)	3	6.2.6(a)
6.	Carbofuran	2	2.1(b)	3	6.2.6(a)
7.	Chlordane	2	2.1(b)	3	6.2.6(a)
8.	Dalapon	2	2.1(b)	3	6.2.6(a)
9.	Di (2-ethylhexyl) adipate	2	2.1(b)	3	6.2.6(a)
10.	Di (2-ethylhexyl) phthalate	2	2.1(b)	3	6.2.6(a)
11.	Dibromochloropropane	2	2.1(b)	3	6.2.6(a)
12.	Dinoseb	2	2.1(b)	3	6.2.6(a)
13.	Dioxin (2,3,7,8-TCDD)	2	2.1(b)	3	6.2.6(a)
14.	Diquat	2	2.1(b)	3	6.2.6(a)
15.	Endothall	2	2.1(b)	3	6.2.6(a)
16.	Endrin	2	2.1(b)	3	6.2.6(a)
17.	Ethylene dibromide	2	2.1(b)	3	6.2.6(a)
18.	Glyphosate	2	2.1(b)	3	6.2.6(a)
19.	Heptachlor	2	2.1(b)	3	6.2.6(a)
20.	Heptachlor epoxide	2	2.1(b)	3	6.2.6(a)
21.	Hexachlorobenzene	2	2.1(b)	3	6.2.6(a)
22.	Hexachlorocyclo-pentadiene	2	2.1(b)	3	6.2.6(a)
23.	Lindane	2	2.1(b)	3	6.2.6(a)
24.	Methoxychlor	2	2.1(b)	3	6.2.6(a)
25.	Oxamyl (Vydate)	2	2.1(b)	3	6.2.6(a)
26.	Pentachlorophenol	2	2.1(b)	3	6.2.6(a)
27.	Picloram	2	2.1(b)	3	6.2.6(a)

28. Polychlorinated biphenyls (PCBs)	2	2.1(b)	3	6.2.6(a)
29. Simazine	2	2.1(b)	3	6.2.6(a)
30. Toxaphene	2	2.1(b)	3	6.2.6(a)
E. Volatile Organic Chemical Contaminants (VOCs)				
1. Benzene	2	2.1(a)	3	6.2.5(a)
2. Carbon tetrachloride	2	2.1(a)	3	6.2.5(a)
3. Chlorobenzene (monochlorobenzene)	2	2.1(a)	3	6.2.5(a)
4. o-Dichlorobenzene	2	2.1(a)	3	6.2.5(a)
5. p-Dichlorobenzene	2	2.1(a)	3	6.2.5(a)
6. 1,2-Dichloroethane	2	2.1(a)	3	6.2.5(a)
7. 1,1-Dichloroethylene	2	2.1(a)	3	6.2.5(a)
8. cis-1,2-Dichloroethylene	2	2.1(a)	3	6.2.5(a)
9. trans-1,2-Dichloroethylene	2	2.1(a)	3	6.2.5(a)
10. Dichloromethane	2	2.1(a)	3	6.2.5(a)
11. 1,2-Dichloropropane	2	2.1(a)	3	6.2.5(a)
12. Ethylbenzene	2	2.1(a)	3	6.2.5(a)
13. Styrene	2	2.1(a)	3	6.2.5(a)
14. Tetrachloroethylene	2	2.1(a)	3	6.2.5(a)
15. Toluene	2	2.1(a)	3	6.2.5(a)
16. 1,2,4-Trichlorobenzene	2	2.1(a)	3	6.2.5(a)
17. 1,1,1-Trichloroethane	2	2.1(a)	3	6.2.5(a)
18. 1,1,2-Trichloroethane	2	2.1(a)	3	6.2.5(a)
19. Trichloroethylene	2	2.1(a)	3	6.2.5(a)
20. Vinyl chloride	2	2.1(a)	3	6.2.5(a)
21. Xylenes (total)	2	2.1(a)	3	6.2.5(a)
F. Radioactive Contaminants				
1. Beta/photon emitters	2	2.6	3	6.3.3
2. Alpha emitters	2	2.6	3	6.3.2
3. Combined radium (226 & 228)	2	2.6	3	6.3.2
4. Uranium	2	2.6	3	6.3.2
G. Disinfection Byproducts (DBPs), Byproduct Precursors, Disinfectant Residuals. Where disinfection is used in the treatment of drinking water, disinfectants combine with organic and inorganic matter present in water to form chemicals called disinfection byproducts (DBPs). The Department sets standards for controlling the levels of disinfectants and DBPs in drinking water, including trihalomethanes (THMs) and haloacetic acids (HAAs).				
1. Total trihalomethanes (TTHMs)	2	2.4[9]	3	7.6.3(a), 7.6.3(b)(1)
2. Haloacetic Acids (HAA5)	2	2.4	3	7.6.3(a), 7.6.3(b)(1)

3. Bromate	2	2.4	3	7.6.3(a), 7.6.3(b)(3)
4. Chlorite	2	2.4	3	7.6.3(a), 7.6.3(b)(2)
5. Chlorine (MRDL)	2	2.5	3	7.6.3(a), 7.6.3(c)(1)
6. Chloramine (MRDL)	2	2.5	3	7.6.3(a), 7.6.3(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 [10], 3	7.6.3(a), 7.6.3(c)(2)
8. Chlorine dioxide (MRDL), where sample(s) in distribution system the next day are also above MRDL	1[11]	2.5	1	7.6.3(a), 7.6.3(c)(2)
9. Control of DBP precursors—TOC (TT)	2	2.10	3	7.6.3 (a), (d)
10. Bench marking and disinfection profiling	N/A	N/A	3	7.2.2 & 7.3.2 – 7.3.3, 7.4.7 & 7.4.8
11. Development of monitoring plan	N/A	N/A	3	7.6.3 (f)
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. Unregulated Contaminant Monitoring:[12]				
A. Unregulated contaminants	N/A	N/A	3	6.4
B. Nickel	N/A	N/A	3	6.1.6
III. Public Notification for Variances and Exemptions:				
A. Operation under a variance or exemption	3	4.8(f) [13]	N/A	N/A
B. Violation of conditions of a variance or exemption	2	4.8(f)) [14]	N/A	N/A
IV. Other Situations Requiring Public Notification:				
A. Fluoride secondary maximum contaminant level (SMCL) exceedance	3	3.1	N/A	N/A
B. Exceedance of nitrate MCL for non-community systems, as allowed by the Department	1	6.1.(b)(2)	N/A	N/A

C. Availability of unregulated contaminant monitoring data	3	6.4	N/A	N/A
D. Waterborne disease outbreak	1	1.5.2	N/A	N/A
E. Other waterborne emergency [15]	1	N/A	N/A	N/A
F. Source Water Sample Positive for GWR Fecal indicators: E. coli, enterococci, or coliphage	1	13.3(g)	N/A	N/A
G Waiver of Disinfection	N/A	N/A	N/A	13.2(d)
H. Other situations as determined by the Department	1, 2, 3[16]	N/A	N/A	N/A

Endnotes to Table 9-7 - Table of CPDWR Violations and Other Situations Requiring Public Notice

1 Violations and other situations not listed in this table (e.g., failure to prepare Consumer Confidence Reports) do not require notice, unless otherwise determined by the Department. The Department may, at their option, 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 section 9.17, as authorized under section 9.8(a) and section 9.9(a).

2 MCL--Maximum contaminant level, MRDL--Maximum residual disinfectant level, TT--Treatment technique.

3 The term "Violations of *Colorado Primary Drinking Water Regulations* (CPDWR)" is used here to include violations of MCL, MRDL, treatment technique, monitoring, and testing procedure requirements.

4 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.

5. Systems that violate the turbidity MCL of 5 NTU based on an average of measurements over two consecutive days must consult with the primacy agency within 24 hours after learning of the violation. Based on this consultation, the primacy agency may subsequently decide to elevate the violation to Tier 1. If a system is unable to make contact with the primacy agency in the 24-hour period, the violation is automatically elevated to Tier 1.

6 Systems with treatment technique violations involving a single exceedance of a maximum turbidity limit under section 2.8 are required to consult with the Department within 24 hours after learning of the violation. Based on this consultation, the Department may subsequently decide to elevate the violation to Tier 1. If a system is unable to make contact with the Department in the 24-hour period, the violation is automatically elevated to Tier 1.

7 Sections 7.3 and 7.4 add additional requirements for surface water systems and groundwater systems under the direct influence of surface water serving at least 10,000 persons and do not in many cases supercede section 7.1.4.

8 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 are Tier 3.

9 Section 7.6.3(a)–(b) apply until sections 7.8.1-7.8.10 take effect under the schedule in Section 7.8.1(c).

10 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.

11 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.

12 Some water systems must monitor for certain unregulated contaminants listed in section 6.4.

13 This citation refers to §§1415 and 1416 of the Safe Drinking Water Act. §§1415 and 1416 require that "a schedule prescribed. . . for a public water system granted a variance [or exemption] shall require compliance by the system. . ."

14 In addition to §§1415 and 1416 of the Safe Drinking Water Act, Section 4.3 specifies the items and schedule milestones that must be included in a variance for small systems.

15 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 have serious adverse effects on health as a result of short-term exposure. These could include outbreaks not related to treatment deficiencies, as well as situations that have the potential to 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 unexpected loading of possible pathogens into the source water.

16 The Department may place other situations in any tier believed appropriate, based on threat to public health.

17 Failure to collect three or more samples for *Cryptosporidium* analysis is a Tier 2 violation requiring special notice as specified in section 9.2.11. All other monitoring and testing procedure violations are Tier 3.

Table 9-8 Table of Standard Health Effects Language for Public Notification

Contaminant	MCLG [1] mg/L	MCL [2] mg/L	Standard health effects language for public notification
***Colorado Primary Drinking Water Regulations* (CPDWR)**			
A. Microbiological Contaminants			
1a Total coliform	Zero	See footnote 3	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	Zero	Zero	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.
1c Fecal indicators (GWR):	Zero	TT	Fecal indicators are microbes whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health 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.
i. E. coli	None	TT	Fecal indicators are microbes whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health 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.

ii. enterococci	None	TT	Fecal indicators are microbes whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health 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.
iii. coliphage			Fecal indicators are microbes whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health 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.
1d. Groundwater Rule (GWR) TT violations	None	TT	Inadequately treated or inadequately protected water may contain disease-causing organisms. These organisms can cause symptoms such as diarrhea, nausea, cramps, and associated headaches.
2a Turbidity (MCL)[4]	None	1 NTU[5]/ 5 NTU	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 Turbidity (SWTR TT)[6]	None	TT [7]	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.
2c Turbidity (IESWTR TT and LT1ESWTR TT)[8]	None	TT	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.
B. Surface Water Treatment Rule (SWTR – Section 7.1), Interim Enhanced Surface Water Treatment Rule (IESWTR – Section 7.2), Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR – Section 7.3) and the Filter Backwash Recycling Rule (FBRR – Section 7.4) violations			
3 Giardia lamblia (7.1, 7.2, 7.3)	Zero	TT [10]	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.
4 Viruses (7.1, 7.2, 7.3)			
5 Heterotrophic plate count (HPC) bacteria (7.1, 7.2, 7.3)			

6 Legionella (7.1, 7.2, 7.3)			
7 Cryptosporidium (7.2, 7.3, 7.4)			
C. Inorganic Chemical Contaminants (IOCs)			
8 Antimony	0.006	0.006	Some people who drink water containing antimony well in excess of the MCL over many years could experience increases in blood cholesterol and decreases in blood sugar.
9 Arsenic [11]	0	0.010	Some people who drink water containing 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.
10 Asbestos (10 µm)	7 MFL [12]	7 MFL	Some people who drink water containing asbestos in excess of the MCL over many years may have an increased risk of developing benign intestinal polyps.
11 Barium	2	2	Some people who drink water containing barium in excess of the MCL over many years could experience an increase in their blood pressure.
12 Beryllium	0.004	0.004	Some people who drink water containing beryllium well in excess of the MCL over many years could develop intestinal lesions.
13 Cadmium	0.005	0.005	Some people who drink water containing cadmium in excess of the MCL over many years could experience kidney damage.
14 Chromium (total)	0.1	0.1	Some people who use water containing chromium well in excess of the MCL over many years could experience allergic dermatitis.
15 Cyanide	0.2	0.2	Some people who drink water containing cyanide well in excess of the MCL over many years could experience nerve damage or problems with their thyroid.
16 Fluoride	4.0	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.
17 Mercury (inorganic)	0.002	0.002	Some people who drink water containing inorganic mercury well in excess of the MCL over many years could experience kidney damage.
18 Nitrate	10	10	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.
19 Nitrite	1	1	Infants below the age of six 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.

20 Total Nitrate and Nitrite	10	10	Infants below the age of six months who drink water containing nitrate and nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome.
21 Selenium	0.05	0.05	Selenium is an essential nutrient. However, some people who drink water containing 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.
22 Thallium	0.0005	0.002	Some people who drink water containing 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.
D. Lead and Copper Rule			
23 Lead	Zero	TT [13]	Infants and children who drink water containing 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.
24 Copper	1.3	TT [14]	Copper is an essential nutrient, but some people who drink water containing copper in excess of the action level over a relatively short amount of time could experience gastrointestinal distress. Some people who drink water containing 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.
E. Synthetic Organic Chemical Contaminants (SOCs)			
25 2,4–D	0.07	0.07	Some people who drink water containing 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.
26 2,4,5–TP (Silvex)	0.05	0.05	Some people who drink water containing silvex in excess of the MCL over many years could experience liver problems.
27 Alachlor	Zero	0.002	Some people who drink water containing 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.
28 Atrazine	0.003	0.003	Some people who drink water containing atrazine well in excess of the MCL over many years could experience problems with their cardiovascular system or reproductive difficulties.
29 Benzo(a)pyrene (PAHs)	Zero	0.0002	Some people who drink water containing benzo(a)pyrene in excess of the MCL over many years may experience reproductive difficulties and may have an increased risk of getting cancer.
30 Carbofuran	0.04	0.04	Some people who drink water containing carbofuran in excess of the MCL over many years could experience problems with their blood, or nervous or reproductive systems.
31 Chlordane	Zero	0.002	Some people who drink water containing 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.

32 Dalapon	0.2	0.2	Some people who drink water containing dalapon well in excess of the MCL over many years could experience minor kidney changes.
33 Di (2-ethylhexyl) adipate	0.4	0.4	Some people who drink water containing 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.
34 Di (2-ethylhexyl) phthalate	Zero	0.006	Some people who drink water containing 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.
35 Dibromochloro-propane (DBCP)	Zero	0.0002	Some people who drink water containing DBCP in excess of the MCL over many years could experience reproductive difficulties and may have an increased risk of getting cancer.
36 Dinoseb	0.007	0.007	Some people who drink water containing dinoseb well in excess of the MCL over many years could experience reproductive difficulties.
37 Dioxin (2,3,7,8-TCDD)	Zero	$3x10^{-8}$	Some people who drink water containing dioxin in excess of the MCL over many years could experience reproductive difficulties and may have an increased risk of getting cancer.
38 Diquat	0.02	0.02	Some people who drink water containing diquat in excess of the MCL over many years could get cataracts.
39 Endothall	0.1	0.1	Some people who drink water containing endothall in excess of the MCL over many years could experience problems with their stomach or intestines.
40 Endrin	0.002	0.002	Some people who drink water containing endrin in excess of the MCL over many years could experience liver problems.
41 Ethylene dibromide	Zero	0.00005	Some people who drink water containing 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.
42 Glyphosate	0.7	0.7	Some people who drink water containing glyphosate in excess of the MCL over many years could experience problems with their kidneys or reproductive difficulties.
43 Heptachlor	Zero	0.0004	Some people who drink water containing heptachlor in excess of the MCL over many years could experience liver damage and may have an increased risk of getting cancer.
44 Heptachlor epoxide	Zero	0.0002	Some people who drink water containing heptachlor epoxide in excess of the MCL over many years could experience liver damage, and may have an increased risk of getting cancer.
45 Hexachlorobenzene	Zero	0.001	Some people who drink water containing 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.
46 Hexachlorocyclo-pentadiene	0.05	0.05	Some people who drink water containing hexachlorocyclopentadiene well in excess of the MCL over many years could experience problems with their kidneys or stomach.

47 Lindane	0.0002	0.0002	Some people who drink water containing lindane in excess of the MCL over many years could experience problems with their kidneys or liver.
48 Methoxychlor	0.04	0.04	Some people who drink water containing methoxychlor in excess of the MCL over many years could experience reproductive difficulties.
49 Oxamyl (Vydate)	0.2	0.2	Some people who drink water containing oxamyl in excess of the MCL over many years could experience slight nervous system effects.
50 Pentachlorophenol	Zero	0.001	Some people who drink water containing 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.
51 Picloram	0.5	0.5	Some people who drink water containing picloram in excess of the MCL over many years could experience problems with their liver.
52 Polychlorinated biphenyls (PCBs)	Zero	0.0005	Some people who drink water containing 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.
53 Simazine	0.004	0.004	Some people who drink water containing simazine in excess of the MCL over many years could experience problems with their blood.
54 Toxaphene	Zero	0.003	Some people who drink water containing 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.
F. Volatile Organic Chemical Contaminants (VOCs)			
55 Benzene	Zero	0.005	Some people who drink water containing 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.
56 Carbon tetrachloride	Zero	0.005	Some people who drink water containing 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.
57 Chlorobenzene (monochloro- benzene)	0.1	0.1	Some people who drink water containing chlorobenzene in excess of the MCL over many years could experience problems with their liver or kidneys.
58 o-Dichlorobenzene	0.6	0.6	Some people who drink water containing o-dichlorobenzene well in excess of the MCL over many years could experience problems with their liver, kidneys, or circulatory systems.
59 p-Dichlorobenzene	0.075	0.075	Some people who drink water containing 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.
60 1,2-Dichloroethane	Zero	0.005	Some people who drink water containing 1,2-dichloroethane in excess of the MCL over many years may have an increased risk of getting cancer.
61 1,1-Dichloroethylene	0.007	0.007	Some people who drink water containing 1,1-dichloroethylene in excess of the MCL over many years could experience problems with their liver.

62 cis-1,2-Dichloroethylene	0.07	0.07	Some people who drink water containing cis-1,2-dichloroethylene in excess of the MCL over many years could experience problems with their liver.
63 trans-1,2-Dichloroethylene	0.1	0.1	Some people who drink water containing trans-1,2-dichloroethylene well in excess of the MCL over many years could experience problems with their liver.
64 Dichloromethane	Zero	0.005	Some people who drink water containing dichloromethane in excess of the MCL over many years could have liver problems and may have an increased risk of getting cancer.
65 1,2-Dichloropropane	Zero	0.005	Some people who drink water containing 1,2-dichloropropane in excess of the MCL over many years may have an increased risk of getting cancer.
66 Ethylbenzene	0.7	0.7	Some people who drink water containing ethylbenzene well in excess of the MCL over many years could experience problems with their liver or kidneys.
67 Styrene	0.1	0.1	Some people who drink water containing styrene well in excess of the MCL over many years could have problems with their liver, kidneys, or circulatory system.
68 Tetrachloroethylene	Zero	0.005	Some people who drink water containing tetrachloroethylene in excess of the MCL over many years could have problems with their liver, and may have an increased risk of getting cancer.
69 Toluene	1	1	Some people who drink water containing toluene well in excess of the MCL over many years could have problems with their nervous system, kidneys, or liver.
70 1,2,4-Trichlorobenzene	0.07	0.07	Some people who drink water containing 1,2,4-trichlorobenzene well in excess of the MCL over many years could experience changes in their adrenal glands.
71 1,1,1-Trichloroethane	0.2	0.2	Some people who drink water containing 1,1,1-trichloroethane in excess of the MCL over many years could experience problems with their liver, nervous system, or circulatory system.
72 1,1,2-Trichloroethane	0.003	0.005	Some people who drink water containing 1,1,2-trichloroethane well in excess of the MCL over many years could have problems with their liver, kidneys, or immune systems.
73 Trichloroethylene	Zero	0.005	Some people who drink water containing trichloroethylene in excess of the MCL over many years could experience problems with their liver and may have an increased risk of getting cancer.
74 Vinyl chloride	Zero	0.002	Some people who drink water containing vinyl chloride in excess of the MCL over many years may have an increased risk of getting cancer.
75 Xylenes (total)	10	10	Some people who drink water containing xylenes in excess of the MCL over many years could experience damage to their nervous system.
G. Radioactive Contaminants			
76 Beta/photon emitters	Zero	4 mrem/yr [15]	Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta and photon emitters in excess of the MCL over many years may have an increased risk of getting cancer.
77 Alpha emitters	Zero	15 pCi/L [17]	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.

78 Combined radium (226 & 228)	Zero	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.
79 Uranium[16]	Zero	30µg/L	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.
H. Disinfection Byproducts (DBPs), Byproduct Precursors, and Disinfectant Residuals: Where disinfection is used in the treatment of drinking water, disinfectants combine with organic and inorganic matter present in water to form chemicals called disinfection byproducts (DBPs). The Department sets standards for controlling the levels of disinfectants and DBPs in drinking water, including trihalomethanes (THMs) and haloacetic acids (HAAs).[18]			
80 Total trihalomethanes (TTHMs)	N/A	0.080[19, 20]	Some people who drink water containing 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.
81 Haloacetic Acids (HAA)	N/A	0.060 [21]	Some people who drink water containing haloacetic acids in excess of the MCL over many years may have an increased risk of getting cancer.
82 Bromate	Zero	0.010	Some people who drink water containing bromate in excess of the MCL over many years may have an increased risk of getting cancer.
83 Chlorite	0.08	1.0	Some infants and young children who drink water containing chlorite in excess of the MCL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water containing chlorite in excess of the MCL. Some people may experience anemia.
84 Chlorine	4 (MRDLG)[22]	4.0 (MRDL)[23]	Some people who use water containing chlorine well in excess of the MRDL could experience irritating effects to their eyes and nose. Some people who drink water containing chlorine well in excess of the MRDL could experience stomach discomfort.
85 Chloramines	4 (MRDLG)	4.0 (MRDL)	Some people who use water containing chloramines well in excess of the MRDL could experience irritating effects to their eyes and nose. Some people who drink water containing chloramines well in excess of the MRDL could experience stomach discomfort or anemia.
86a Chlorine dioxide, where any 2 consecutive daily samples taken at the entrance to the distribution system are above the MRDL.	0.8 (MRDLG)	0.8 (MRDL)	Some infants and young children who drink water containing chlorine dioxide in excess of the MRDL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water containing 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.

86b Chlorine dioxide, where one or more distribution system samples are above the MRDL.	0.8 (MRDLG)	0.8 (MRDL)	Some infants and young children who drink water containing chlorine dioxide in excess of the MRDL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water containing 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.
87 Control of DBP precursors (TOC)	None	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.
I. Other Treatment Techniques			
88 Acrylamide	Zero	TT	Some people who drink water containing 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.
89 Epichlorohydrin	Zero	TT	Some people who drink water containing high levels of epichlorohydrin over a long period of time could experience stomach problems, and may have an increased risk of getting cancer.

Endnotes to Table 9-8 - Table of Standard Health Effects Language for Public Notification

1 MCLG - Maximum contaminant level goal

2 MCL - Maximum contaminant level

3 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.

4 There are various regulations that set turbidity standards for different types of systems, see section 2.8. The MCL for the monthly turbidity average is 1 NTU; the MCL for the 2-day average is 5 NTU for systems that are required to filter but have not yet installed filtration.

5 NTU - Nephelometric turbidity unit

6 There are various regulations that set turbidity standards for different types of systems, see section 2.8. Systems subject to section 2.8 may not exceed 5 NTU. In addition, in filtered systems, 95 percent of samples each month must not exceed 0.5 NTU in systems using conventional or direct filtration and must not exceed 1 NTU in systems using slow sand or diatomaceous earth filtration or other filtration technologies approved by the Department.

7 TT - Treatment technique

8 There are various regulations that set turbidity standards for different types of systems, see section 2.8. For systems serving at least 10,000 people, using surface water or groundwater under the direct influence of surface water, that use conventional filtration or direct filtration, after January 1, 2002, the turbidity level of a system's combined filter effluent may not exceed 0.3 NTU in at least 95 percent of monthly measurements, and the turbidity level of a system's combined filter effluent must not exceed 1 NTU at any time. Systems serving at least 10,000 people, using surface water or groundwater under the direct influence of surface water, using technologies other than conventional, direct, slow sand, or diatomaceous earth filtration must meet turbidity limits set by the primacy agency. For systems serving fewer than 10,000 people, using surface water or groundwater under the direct influence of surface water, that use conventional filtration or direct filtration, after January 1, 2005, the turbidity level of a system's combined filter effluent may not exceed 0.3 NTU in at least 95 percent of monthly measurements, and the turbidity level of a system's combined filter effluent must not exceed 1 NTU at any time. Systems serving fewer than 10,000 people, using surface water or groundwater under the direct influence of surface water, using technologies other than conventional, direct, slow sand, or diatomaceous earth filtration must meet turbidity limits set by the Department.

9 The bacteria detected by heterotrophic plate count (HPC) are not necessarily harmful. HPC is simply an alternative method of determining disinfectant residual levels. The number of such bacteria is an indicator of whether there is enough disinfectant in the distribution system.

10 Article 7 treatment technique violations that involve turbidity exceedances may use the health effects language for turbidity instead.

11 These arsenic values are effective January 23, 2006. Until then, the MCL is 0.05 mg/L and there is no MCLG.

12 Millions fibers per liter

13 Action Level = 0.015 mg/L

14 Action Level = 1.3 mg/L

15 Millirems per years

16 The uranium MCL is effective December 8, 2003 for all community water systems.

17 Picocuries per liter

18 Surface Water and GWUDI community and non-transient non-community systems serving ≥10,000 must comply with DBP MCLs and disinfectant maximum residual disinfectant levels (MRDLs) beginning January 1, 2002. All other community and non-transient non-community systems must comply with DBP MCLs and disinfectant MRDLs beginning January 1, 2004. Surface Water and GWUDI transient non-community systems serving ≥10,000 that use chlorine dioxide as a disinfectant or oxidant must comply with the chlorine dioxide MRDL beginning January 1, 2002. All other transient non-community systems that use chlorine dioxide as a disinfectant or oxidant must comply with the chlorine dioxide MRDL beginning January 1, 2004.

19 Community and non-transient non-community systems must comply with section 2.8 TTHM and HAA5 MCLs of 0.080 mg/L and 0.060 mg/L, respectively (with compliance calculated as a locational running annual average) on the schedule in Section 7.8.

20 The MCL for total trihalomethanes is the sum of the concentrations of the individual trihalomethanes.

21 The MCL for haloacetic acids is the sum of the concentrations of the individual haloacetic acids.

22 MRDLG - Maximum residual disinfectant level goal.

23 MRDL - Maximum residual disinfectant level

Article 10 Analytical Requirements and Laboratory Certification

10.1 Bacteriological Analytical Requirements

10.1.1 Total Coliform Testing Requirements

(a) Public water systems must conduct total coliform analyses in accordance with one of the analytical methods in the following table or one of the alternative methods listed in Table 10-30.

Table 10-1 Total Coliform Analytical Methods

Organism	Methodology[12]	Citation[1]
Total Coliforms[2]	Total Coliform Fermentation Technique[3,4,5]	9221 A, B
	Total Coliform Membrane Filter Technique[6]	9222 A, B, C
	Presence-Absence (P-A) Coliform Test [5,7]	9221
	ONPG-MUG Test [8]	9223
	Colisure Test [9] E*Colite® Test [10] m-ColiBlue24® Test [11] Readycult® Coliforms 100 Presence/Absence Test[13] Membrane Filter Technique using Chromocult® Coliform Agar[14] Colitag® TEST[15]	

The procedures shall be done in accordance with the documents listed below. Copies of the documents incorporated by reference may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at 800-426-4791. Documents may be inspected at the Office of Federal Register, 800 North Capitol Street, NW, Suite 700, Washington, D.C. 20408.

1 Methods 9221 A, B; 9222 A, B, C; 9221 D and 9223 are contained in the American Public Health Association's "Standard Methods for the Examination of Water and Wastewater," 18th edition (1992), 19th edition (1995), and 20th edition (1998),. The cited methods published in any of these three editions may be used.

2 The time from sample collection to initiation of analysis may not exceed 30 hours. Systems are encouraged but not required to hold samples below 10 deg. C during transit.

3 Lactose broth, as commercially available, may be used in lieu of lauryl tryptose broth, if the system conducts at least 25 parallel tests between this medium and lauryl tryptose broth using the water normally tested, and this comparison demonstrates that the false-positive rate and false- negative rate for total coliform, using lactose broth, is less than 10 percent.

4 If inverted tubes are used to detect gas production, the media should cover these tubes at least one-half to two-thirds after the sample is added.

5 No requirement exists to run the completed phase on 10 percent of all total coliform-positive confirmed tubes.

6 MI agar also may be used. Preparation and use of MI agar is set forth in the article, "New Medium for the Simultaneous Detection of Total Coliform and Escherichia coli in Water," K.O. Brenner, et al. (1993), Applied and Environmental Microbiology, 59:3534-3544. 7 Six-times formulation strength may be used if the medium is filter-sterilized rather than autoclaved.

8 The ONPG-MUG Test is also known as the Autoanalysis Colilert System.

9 A description of the Colisure Test, February 28, 1994, is also available from IDEXX Laboratories, Inc. The Colisure Test may be read after an incubation time of 24 hours.

10 A description of the E*Colite® Test, "Presence/Absence for Coliforms and E. Coli in Water," December 21, 1997, is also available from Charm Sciences, Inc.

11 A description of the m-ColiBlue24® Test, August 17, 1999, is also available from the Hach Company.

12 EPA strongly recommends that laboratories evaluate the false-positive and negative rates for the method(s) they use for monitoring total coliforms. EPA also encourages laboratories to establish false-positive and false-negative rates within their own laboratory and sample matrix (drinking water or source water) with the intent that if the method they choose has an unacceptable false-positive or negative rate, another method can be used. EPA suggests that laboratories perform these studies on a minimum of 5% of all total coliform-positive samples, except for those methods where verification/confirmation is already required, e.g., the M-Endo and LES Endo Membrane Filter Tests, Standard Total Coliform Fermentation Technique, and Presence-Absence Coliform Test. Methods for establishing false-positive and negative-rates may be based on lactose fermentation, the rapid test for β-galactosidase and cytochrome oxidase, multi-test identification systems, or equivalent confirmation tests. False-positive and false-negative information is often available in published studies and/or from the manufacturer(s).

13 The Readycult® Coliforms 100 Presence/Absence Test is described in the document, "Readycult® Coliforms 100 Presence/Absence Test for Detection and Identification of Coliform Bacteria and Escherichia coli in Finished Waters", November 2000, Version 1.0, also available from EM Science (an affiliate of Merck KGgA, Darmstadt Germany).

14 Membrane Filter Technique using Chromocult® Coliform Agar is described in "Chromocult® Coliform Agar Presence/Absence Membrane Filter Test Method for Detection and Identification of Coliform Bacteria and Escherichia coli in finished Waters", November 2000, Version 1.0, available from EM Science (an affiliate of Merck KGgA, Darmstadt Germany).

15 Colitag® prodict for the determination of the presence/absence of total coliforms and E. coli is described in "Colitag® Prodict as a Test for Detection and Identification of Coliforms and E. coli Bacteria in Drinking Water and Source Water as Required in National Primary Drinking Water Regulation," August 2001, and is also available from CPI International, Inc.

10.1.2 Fecal Coliform Testing Requirements

(a) Public water systems must conduct fecal coliform analysis in accordance with the following procedure. When the MTF Technique or Presence-Absence (PA) Coliform Test is used to test for total coliforms, shake the lactose-positive presumptive tube or P-A vigorously and transfer the growth with a sterile 3-mm loop or sterile applicator stick into brilliant green lactose bile broth and EC Medium to determine the presence of total and fecal coliforms, respectively. For EPA-approved analytical methods which use a membrane filter, transfer the total coliform-positive culture by one of the following methods: remove the membrane containing the total coliform colonies from the substrate with a sterile forceps and carefully curl and insert the membrane into a tube of EC Medium (the laboratory may first remove a small portion of selected colonies for verification), swab the entire membrane filter surface with a sterile cotton swab and transfer the inoculum to EC Medium (do not leave the cotton swab in the EC Medium), or inoculate individual total coliform-positive colonies into EC Medium. Gently shake the inoculated tubes of EC Medium to insure adequate mixing and incubate in a water bath at 44.5 ± 0.2 °C for 24 ± 2 hours. Gas production of any amount in the inner fermentation tube of the EC Medium indicates a positive fecal coliform test. The preparation of EC Medium is described in method 9221e (paragraph 1a) in the American Public Health Association's "*Standard Methods For The Examination Of Water And Wastewater,*" 18th edition (1992), 19th edition (1995), and 20th edition (1998), The cited method in any one of these editions may be used. Public water systems need only determine the presence or absence of fecal coliforms; a determination of fecal coliform density is not required.

Table 10-2 Fecal Coliform Analytical Methods

Organism	**Methodology**	**Methods[1]**
Fecal Coliforms[2]	Fecal Coliform Procedure[3]	9221 E
.	Fecal Coliform Filter Procedure	9222 D

The procedures shall be done in accordance with the documents listed below. These documents can be obtained from the Department's Water Quality Control Division or the Laboratory Services Division.

1 Except where noted, all methods refer to the American Public Health Association's "Standard Methods for the Examination of Water and Wastewater," 18th edition (1992), 19th edition (1995), and 20th edition (1998). The cited method in any one of these editions may be used.

2 The time from sample collection to initiation of analysis may not exceed 8 hours. Systems must hold samples below 10 deg. C during transit.

3 A-1 Broth may be held up to three months in a tightly closed screw cap tube at 4 deg. C.

10.1.3 *Escherichia coli* Testing Requirements

(a) Public water systems must conduct analysis of *Escherichia coli* in accordance with one of the following analytical methods or one of the alternative methods listed in Table 10-30:

(1) EC Medium supplemented with 50 µg/ml of 4-methylumbelliferyl-beta-d-glucuronide (MUG) (final concentration), as described in Method 9222G in the American Public Health's "*Standard Methods For The Examination Of Water And Wastewater*," 19th edition (1995) and 20th edition (1998). Either edition may be used. Alternatively, the 18th edition (1992) may be used if at least 10 mL of EC Medium as described in section 10.1.2(a) is supplemented with 50 µg/mL before autoclaving. The inner inverted fermentation tube may be omitted. If the 18th edition is used apply the procedure in section 10.1.2(a) for transferring a total coliform-positive culture to EC Medium supplemented with MUG, incubate the tube at 44.5 ± 0.2°C for 24 ± 2 hours, and then observe fluorescence with an ultraviolet light (366 nm) in the dark. If fluorescence is visible, E. *coli* are present; or

(2) Nutrient agar supplemented with 100 µg/mL 4-methylumbelliferyl-beta-d-glucuronide (MUG) (final concentration), as described in Method 9222G in the American Public Health's "*Standard Methods For The Examination Of Water And Wastewater*," 19th edition (1995) and 20th edition (1998). Either edition may be used for determining if a total coliform-positive samples, as determined by a membrane filter technique, contains *E. coli*. Alternatively, the 18th edition (1992) may be used if the membrane filter containing a total coliform-positive colony(ies) is transferred to nutrient agar, as described in Method 9221B(paragraph 3) of "Standard Methods for the Examination of Water and Wastewater" (18th edition), supplemented with 100 µg/mL (final concentration) of MUG. If the 18th edition is used, incubate the agar plate at 35 °C for 4 hours and then observe the colony(ies) under ultraviolet light (366 nm) in the dark for fluorescence. If fluorescence is visible, *E. coli* are present.

(3) Minimal Medium ONPG-MUG (MMO-MUG) test, as set forth in the article "National Field Evaluation Of A Defined Substrate Method For The Simultaneous Detection Of Total Coliforms And *Escherichia coli* From Drinking Water: Comparison With Presence-Absence Techniques" (Edberg et al.), Applied and Environmental Microbiology, Vol. 55, pp. 1003-1008, April 1989. (Note: The Autoanalysis Colilert System is an MMO-MUG test). If the MMO-MUG test is total coliform-positive after a 24-hour incubation, test the medium for fluorescence with a 366-nm ultraviolet light (preferably with a 6-watt lamp) in the dark. If fluorescence is observed, the sample is *E. coli*-positive. If fluorescence is questionable (cannot be definitively read) after 24 hours incubation, incubate the culture for an additional four hours (but not to exceed 28 hours total), and again test the medium for fluorescence. The MMO-MUG Test with hepes buffer in lieu of phosphate buffer is the only approved formulation for the detection of *E. coli.*

(4) The Colisure Test, a description which is cited in footnote 9 to Table 10-1.

(5) The membrane filter method with MI agar adaptation, a description of which is cited in footnote 6 to Table 10-1.

(6) E*Colite® Test, a description of which is cited in footnote 10 to Table 10-1.

(7) M-Coliblue24® Test, a description of which is cited in footnote 11 to Table 10-1.

(8) Readycult® Coliforms 100 Presence/Absence test, a description of which is cited in footnote 13 to Table 10-1.

(9) Membrane Filter Technique using Chromocult Coliform Agar, a description of which is cited in footnote 14 to Table 10-1.

(10) Colitag®, a description of which is cited in footnote 15 to Table 10-1.

(b) As an option to section 10.1.3(a)(3), a system with a total coliform-positive, MUG-negative, MMO-MUG test may further analyze the culture for the presence of *E. coli* by transferring a 0.1 ml, 28-hour MMO-MUG culture to EC Medium + MUG with a pipet. The formulation and incubation conditions of EC Medium + MUG, and observation of the results are described in section 10.1.3(a)(1).

(c) E. coli in Source Water. Systems must use methods for enumeration of E. coli in source water approved in 40 CFR 136.3 (a) or alternative methods listed in Table 10-30.

(1) The time from sample collection to initiation of analysis may not exceed 30 hours.

(2) Systems must maintain samples between 0°C and 10°C during storage and transit to the laboratory.

(d) The Department may approve on a case by-case basis the holding of an E. coli sample for up to 48 hours between sample collection and initiation of analysis if the Department determines that analyzing an *E. coli* sample within 30 hours is not feasible. E. coli samples held between 30 to 48 hours must be analyzed by the Colilert reagent version of Standard Method 9223B as listed in 40 CFR 136.3 (a).

10.1.4 *Cryptosporidium* Testing Requirements

(a) *Cryptosporidium*. Systems must analyze for *Cryptosporidium* using either Method 1623: *Cryptosporidium* and Giardia in Water by Filtration/IMS/FA, 2005, United States Environmental Protection Agency, EPA-815-R-05-002 or Method 1622: *Cryptosporidium* in Water by Filtration/IMS/FA, 2005, United States Environmental Protection Agency, EPA-815-R-05-001, or alternative methods listed in Table 10-30.

(1) Systems must analyze at least a 10 L sample or a packed pellet volume of at least 2 mL as generated by the methods listed in paragraph (a) of this section. Systems unable to process a 10 L sample must analyze as much sample volume as can be filtered by two filters approved by EPA for the methods listed in paragraph (a) of this section, up to a packed pellet volume of at least 2 mL.

(2) Matrix spike (MS)

(A) Matrix spike (MS) samples, as required by the methods in paragraph (a)(1) of this section, must be spiked and filtered by a laboratory approved for *Cryptosporidium* analysis under Section 10.10.

(B) If the volume of the MS sample is greater than 10 L, the system may filter all but 10 L of the MS sample in the field, and ship the filtered sample and the remaining 10 L of source water to the laboratory. In this case, the laboratory must spike the remaining 10 L of water and filter it through the filter used to collect the balance of the sample in the field.

(3) Flow cytometer-counted spiking suspensions must be used for MS samples and ongoing precision and recovery (OPR) samples.

10.1.5 Groundwater Source Testing Requirements

(a) A groundwater system subject to the source water monitoring requirements of section 13.3(a) must collect a standard sample volume of at least 100 mL for fecal indicator analysis regardless of the fecal indicator or analytical method used.

(b) A groundwater system must analyze all groundwater source samples collected under section 13.3(a) using one of the analytical methods listed in Table 10-3 or one of the alternative methods listed in Table 10-30 for the presence of E. coli, enterococci, or coliphage.

Table 10-3 Analytical Methods for Source Water Monitoring

Fecal indicator [1]	Methodology	Method Citation
E. coli	Colilert [3]	9223 B [2]
	Colisure [3]	9223 B [2]
	Membrane Filter Method with MI Agar	EPA Method 1604 [4]
	m-ColiBlue24 Test [5]	
	E*Colite Test [6]	
	EC-MUG [7]	9221 F [2]
	NA-MUG [7]	9222 G [2]
Enterococci	Multiple-Tube Technique	9230B [2]
	Membrane Filter Technique	9230C [2]
	Membrane Filter Technique	EPA Method 1600 [8]
	Enterolert [9]	
Coliphage	Two-Step Enrichment Presence-Absence Procedure	EPA Method 1601 [10]
	Single Agar Layer Procedure	EPA Method 1602 [11]

Analyses must be conducted in accordance with the documents listed below.

1 The time from sample collection to initiation of analysis may not exceed 30 hours. The groundwater system is encouraged but is not required to hold samples below 10°C during transit.

2 Methods are described in Standard Methods for the Examination of Water and Wastewater 20th edition (1998) and copies may be obtained from the American Public Health Association, 1015 Fifteenth Street, NW., Washington, DC 20005-2605.

3 Medium is available through IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, Maine 04092.

4 EPA Method 1604: Total Coliforms and Escherichia coli in Water by Membrane Filtration Using a Simultaneous Detection Technique (MI Medium); September 2002, EPA 821-R-02-024. Method is available at http://www.epa.gov/nerlcwww/1604sp02.pdf or from EPA's Water Resource Center (RC-4100T), 1200 Pennsylvania Avenue, NW., Washington, DC 20460.

5 A description of the m-ColiBlue24 Test, "Total Coliforms and E. coli Membrane Filtration Method with m-ColiBlue24® Broth," Method No. 10029 Revision 2, August 17, 1999, is available from Hach Company, 100 Dayton Ave., Ames, IA 50010 or from EPA's Water Resource Center (RC-4100T), 1200 Pennsylvania Avenue, NW., Washington, DC 20460.

6 A description of the E*Colite Test, "Charm E*Colite Presence/Absence Test for Detection and Identification of Coliform Bacteria and Escherichia coli in Drinking Water", January 9, 1998, is available from Charm Sciences, Inc., 659 Andover St., Lawrence, MA 01843-1032 or from EPA's Water Resource Center (RC-4100T), 1200 Pennsylvania Avenue, NW., Washington, DC 20460.

7 EC-MUG (Method 9221F) or NA-MUG (Method 9222G) can be used for E. coli testing step as described in §141.21(f)(6)(i) or (ii) after use of Standard Methods 9221 B, 9221 D, 9222 B, or 9222 C.

8 EPA Method 1600: Enterococci in Water by Membrane Filtration Using membrane-Enterococcus Indoxyl-β-D-Glucoside Agar (mEI) EPA 821-R-02-022 (September 2002) is an approved variation of Standard Method 9230C. The method is available at http://www.epa.gov/nerlcwww/1600sp02.pdf or from EPA's Water Resource Center (RC-4100T), 1200 Pennsylvania Avenue, NW., Washington, DC 20460. The holding time and temperature for groundwater samples are specified in footnote 1 above, rather than as specified in Section 8 of EPA Method 1600.

9 Medium is available through IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, Maine 04092. Preparation and use of the medium is set forth in the article "Evaluation of Enterolert for Enumeration of Enterococci in Recreational Waters," by Budnick, G.E., Howard, R.T., and Mayo, D.R., 1996, Applied and Environmental Microbiology, 62:3881-3884.

10 EPA Method 1601: Male-specific (F+) and Somatic Coliphage in Water by Two-step Enrichment Procedure; April 2001, EPA 821-R-01-030. Method is available at http://www.epa.gov/nerlcwww/1601ap01.pdf or from EPA's Water Resource Center (RC-4100T), 1200 Pennsylvania Avenue, NW., Washington, DC 20460.

11 EPA Method 1602: Male-specific (F+) and Somatic Coliphage in Water by Single Agar Layer (SAL) Procedure; April 2001, EPA 821-R-01-029. Method is available at http://www.epa.gov/nerlcwww/1602ap01.pdf or from EPA's Water Resource Center (RC-4100T), 1200 Pennsylvania Avenue, NW., Washington, DC 20460.

10.2 Inorganic Chemical Contaminants Analytical Requirements

10.2.1 Cited Detection Limits for Inorganic Chemical Contaminants

Cited detection limits for each analytical method and MCLs for each inorganic chemical contaminant are the following:

Table 10-4 Cited Detection Limits For Inorganic Chemical Contaminant Analytical Methods

Contaminant	MCL (mg/L)	Methodology	Cited Detection limit (mg/L)
Antimony	0.006	Atomic Absorption; Furnace	0.003
		Atomic Absorption; Platform	0.0008 [5]
		ICP-Mass Spectrometry	0.0004
		Hydride-Atomic Absorption	0.001
Arsenic	0.010 [6]	Atomic Absorption; Furnace	0.001
		Atomic Absorption; Platform-Stabilized Temperature	0.0005 [7]
		Atomic Absorption; Gaseous Hydride	0.001
		ICP-Mass Spectrometry	0.0014 [8]
Asbestos	7 MFL [1]	Transmission Electron Microscopy	0.01 MFL
Barium	2	Atomic Absorption; furnace technique	0.002
		Atomic Absorption; direct aspiration	0.1
		Inductively Coupled Plasma	0.002 (0.001)
Beryllium	0.004	Atomic Absorption; Furnace	0.0002
		Atomic Absorption; Platform	0.00002 [5]
		Inductively Coupled Plasma [2]	0.0003
		ICP-Mass Spectrometry	0.0003
Cadmium	0.005	Atomic Absorption; furnace technique	0.0001

		Inductively Coupled Plasma	0.001
Chromium	0.1	Atomic Absorption; furnace technique	0.001
		Inductively Coupled Plasma	0.007 (0.001)
Cyanide	0.2	Distillation, Spectrophotometric	0.02
		Distillation, Automated, Spectrophotometric	0.005
		Distillation, Selective Electrode [3]	0.05
		Distillation, Amenable, Spectrophotometric [4]	0.02
		UV, Distillation, Spectrophotometric	0.0005
		Distillation, Spectrophotometric	0.0006
Mercury	0.002	Manual Cold Vapor Technique	0.0002
		Automated Cold Vapor Technique	0.0002
Nickel	MCL withdrawn	Atomic Absorption; Furnace	0.001
		Atomic Absorption; Platform	0.0006 [5]
		Inductively Coupled Plasma [2]	0.005
		ICP-Mass Spectrometry	0.0005
Nitrate	10 (as N)	Manual Cadmium Reduction	0.01
		Automated Hydrazine Reduction	0.01
		Automated Cadmium Reduction	0.05
		Ion Selective Electrode	1
		Ion Chromatography	0.01
Nitrite	1 (as N)	Spectrophotometric	0.01
		Automated Cadmium Reduction	0.05
		Manual Cadmium Reduction	0.01
		Ion Chromatography	0.004
Selenium	0.05	Atomic Absorption; furnace	0.002
		Atomic Absorption; gaseous hydride	0.002
Thallium	0.002	Atomic Absorption; Furnace	0.001
		Atomic Absorption; Platform	0.0007 [5]
		ICP-Mass Spectrometry	0.0003

1 MFL = million fibers per liter >10 µm.

2 Using a 2X pre-concentration step as noted in Method 200.7. Lower MDLs may be achieved when using a 4X pre-concentration.

3 Screening method for total cyanides.

4 Measures ‘‘free’’ cyanides.

5 Lower MDLs are reported using stabilized temperature graphite furnace atomic absorption.

6 The value for arsenic is effective January 23, 2006. Until then, the MCL is 0.05 mg/L.

7 The MDL reported for EPA method 200.9 (Atomic Absorption; Platform—Stabilized Temperature) was determined using a 2x concentration step during sample digestion. The MDL determined for samples analyzed using direct analyses (i.e., no sample digestion) will be higher. Using multiple depositions, EPA 200.9 is capable of obtaining MDL of 0.0001 mg/L.

8 Using selective ion monitoring, EPA Method 200.8 (ICP–MS) is capable of obtaining a MDL of 0.0001 mg/L.

10.2.2 Inorganic Chemical Contaminants Analysis

(a) Analysis for the following contaminants shall be conducted in accordance with the methods in the following table, or the alternative methods listed in Table 10-30. Criteria for analyzing arsenic, barium, beryllium, cadmium, calcium, chromium, copper, lead, nickel, selenium, sodium, and thallium with digestion or directly without digestion, and other analytical test procedures are contained in “Technical Notes on Drinking Water Methods,” EPA-600/R-94-173, October 1994.

Table 10-5 Inorganic Chemical Contaminant Analytical Methods

10.2 Inorganic Chemical Contaminants Analytical Requirements

Contaminant and Methodology[13]	EPA	ASTM [3]	SM [4] (18th, 19th ed.)	SM [4] (20th ed.)	Other
1. Alkalinity:					
Titrimetric		D1067—92B	2320 B	2320 B	
Electrometric titration					I–1030–85 [5]
2. Antimony:					
Inductively Coupled Plasma (ICP)—Mass Spectrometry	200.8 [2]				
Hydride-Atomic Absorption		D3697–92			
Atomic Absorption; Platform	200.9 [2]				
Atomic Absorption; Furnace			3113 B		
3. Arsenic: [14]					
Inductively Coupled Plasma [15]	200.7 [2]		3120 B	3120 B	
ICP-Mass Spectrometry	200.8 [2]				
Atomic Absorption; Platform	200.9 [2]				
Atomic Absorption; Furnace		D2972–97C	3113 B		
Hydride Atomic Absorption		D2972–97B	3114 B		
4. Asbestos:					
Transmission Electron Microscopy	100.1 [9]				
Transmission Electron Microscopy	100.2 [10]				
5. Barium:					
Inductively Coupled Plasma	200.7 [2]		3120 B	3120 B	
ICP-Mass Spectrometry	200.8 [2]				
Atomic Absorption; Direct			3111 D		
Atomic Absorption; Furnace			3113 B		
6. Beryllium:					
Inductively Coupled Plasma	200.7 [2]		3120 B	3120 B	
ICP-Mass Spectrometry	200.8 [2]				
Atomic Absorption; Platform	200.9 [2]				
Atomic Absorption; Furnace		D3645—97B	3113 B		
7. Cadmium:					
Inductively Coupled Plasma	200.7 [2]				
ICP-Mass Spectrometry	200.8 [2]				
Atomic Absorption; Platform	200.9 [2]				
Atomic Absorption; Furnace			3113 B		
8. Calcium:					
EDTA titrimetric		D511—93A	3500–Ca D	3500–Ca B	
Atomic Absorption; Direct Aspiration		D511—93B	3111 B		
Inductively Coupled Plasma	200.7 [2]		3120 B	3120 B	
9. Chromium:					
Inductively Coupled Plasma	200.7 [2]		3120 B	3120 B	
ICP-Mass Spectrometry	200.8 [2]				
Atomic Absorption; Platform	200.9 [2]				
Atomic Absorption; Furnace			3113 B		
10. Copper:					
Atomic Absorption; Furnace		D1688–95C	3113 B		
Atomic Absorption; Direct Aspiration		D1688–95A	3111 B		
Inductively Coupled Plasma	200.7 [2]		3120 B	3120 B	
ICP-Mass spectrometry	200.8 [2]				
Atomic Absorption; Platform	200.9 [2]				
11. Conductivity:					

Conductance		D1125–95A	2510 B	2510 B	
12. Cyanide:					
Manual Distillation followed by		D2036–98A	4500–CN^- C	4500–CN^- C	
Spectrophotometric, Amenable		D2036–98B	4500–CN^- G	4500–CN^- G	
Spectrophotometric Manual		D2036–98A	4500–CN^- E	4500–CN^- E	I–3300–85 [5]
Spectrophotometric Semi-automated	335.4 [6]				
Selective Electrode			4500–CN^- F	4500–CN^- F	
UV/ Distillation/ Spectrophotometric					Kelada 01 [17]
Distillation/ Spectrophotometric					QuikChem 10-204-00-1-X [18]
13. Fluoride:					
Ion Chromatography	300.0 [6]	D4327–97	4110 B	4110 B	
Manual Distill.; Color. SPADNS			4500–F^- B,D	4500–F^- B,D	
Manual Electrode		D1179–93B	4500–F^- C	4500–F^- C	
Automated Electrode					380–75WE [11]
Automated Alizarin			4500–F^- E	4500–F^- E	29–71W [11]
14. Lead:					
Atomic Absorption; Furnace		D3559–96D	3113 B		
ICP-Mass spectrometry	200.8 [2]				
Atomic Absorption; Platform	200.9 [2]				
Differential Pulse Anodic Stripping Voltammetry					Method 1001 [16]
15. Magnesium:					
Atomic Absorption		D511–93 B	3111 B		
ICP	200.7 [2]		3120 B	3120 B	
Complexation Titrimetric Methods		D511–93 A	3500–Mg E	3500–Mg B	
16. Mercury:					
Manual, Cold Vapor	245.1 [2]	D3223–97	3112 B		
Automated, Cold Vapor	245.2 [1]				
ICP-Mass Spectrometry	200.8 [2]				
17. Nickel:					
Inductively Coupled Plasma	200.7 [2]		3120 B	3120 B	
ICP-Mass Spectrometry	200.8 [2]				
Atomic Absorption; Platform	200.9 [2]				
Atomic Absorption; Direct			3111 B		
Atomic Absorption; Furnace			3113 B		
18. Nitrate:					
Ion Chromatography	300.0 [6]	D4327–97	4110 B	4110 B	B–1011 [8]
Automated Cadmium Reduction	353.2 [6]	D3867–90A	4500–NO_3^- F	4500–NO_3^- F	
Ion Selective Electrode			4500–NO_3^- D	4500–NO_3^- D	601 [7]
Manual Cadmium Reduction		D3867–90B	4500–NO_3^- E	4500–NO_3^- E	
19. Nitrite:					
Ion Chromatography	300.0 [6]	D4327–97	4110 B	4110 B	B–1011 [8]
Automated Cadmium Reduction	353.2 [6]	D3867–90A	4500–NO_3^-	4500–NO_3^- F	
Manual Cadmium Reduction		D3867–90B	4500–NO_3^- E	4500–NO_3^- E	
Spectrophotometric			4500–NO_2^- B	4500_ NO_2^- B	
20. Ortho-phosphate: [12]					
Colorimetric, Automated, Ascorbic Acid	365.1 [6]		4500–P F	4500–P F	

Colorimetric, ascorbic acid, single reagent		D515–88A	4500–P E	4500–P E	
Colorimetric					I–1601–85 [5]
Phosphomolybdate; Automated-segmented Flow;					I–2601–90 [5]
Automated Discrete					I–2598–85 [5]
Ion Chromatography	300.0 [6]	D4327–97	4110 B	4110 B	
21. pH:					
Electrometric	150.1 [1] 150.2 [1]	D1293–95	4500–H^+B	4500–H^+ B	
22. Selenium:					
Hydride-Atomic Absorption		D3859–98A	3114 B		
ICP-Mass Spectrometry	200.8 [2]				
Atomic Absorption; Platform	200.9 [2]				
Atomic Absorption; Furnace		D3859–98B	3113 B		
23. Silica:					
Colorimetric, Molybdate Blue;					I–1700–85 [5]
Automated-segmented Flow					I–2700–85 [5]
Colorimetric		D859–95			
Molybdosilicate			4500–Si D	4500–SiO_2 C	
Heteropoly Blue			4500–Si E	4500–SiO_2 D	
Automated for Molybdate-reactive Silica			4500–Si F	4500–SiO_2 E	
Inductively Coupled Plasma	200.7 [2]		3120 B	3120 B	
24. Sodium:					
Inductively Coupled Plasma	200.7 [2]				
Atomic Absorption; Direct Aspiration			3111 B		
25. Temperature:					
Thermometric			2550	2550	
26. Thallium:					
ICP-Mass Spectrometry	200.8 [2]				
Atomic Absorption; Platform	200.9 [2]				

The procedures shall be done in accordance with the documents listed below. Copies of the documents may be obtained from the Department's Water Quality Control Division or the Laboratory Services Division.

1 ''Methods for Chemical Analysis of Water and Wastes'', EPA/600/4–79/020, March 1983.

2 ''Methods for the Determination of Metals in Environmental Samples—Supplement I'', EPA/600/R–94/111, May 1994.

3 *Annual Book of ASTM Standards*, 1994, 1996, or 1999, Vols. 11.01 and 11.02, ASTM International; any year containing the cited version of the method may be used. The previous versions of D1688–95A, D1688–95C (copper), D3559–95D (lead), D1293–95 (pH), D1125–91A (conductivity) and D859–94 (silica) are also approved. These previous versions D1688–90A, C; D3559–90D, D1293–84, D1125–91A and D859–88, respectively are located in the Annual Book of ASTM Standards, 1994, Vol. 11.01. Copies are also available from ASTM International.

4 The American Public Health Association's "*Standard Methods for the Examination of Water and Wastewater*," 18th edition (1992), 19th edition (1995), and 20th edition (1998). The cited methods published in any of these three editions may be used, except that the versions of 3111B, 3111D, 3113B and 3114B in the 20th edition may not be used.

5 Method I–2601–90, "Methods for Analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of Inorganic and Organic Constituents in Water and Fluvial Sediments," Open File Report 93–125, 1993. For Methods I–1030–85; I–1601–85; I–1700–85; I–2598–85; I–2700–85; and I–3300–85, see "Techniques of Water Resources Investigation of the U.S. Geological Survey,' Book 5, Chapter A–1, 3rd ed.,1989.

6 ''Methods for the Determination of Inorganic Substances in Environmental Samples,'' EPA/600/R–93/100, August 1993.

7 The procedure shall be done in accordance with the Technical Bulletin 601 ''Standard Method of Test for Nitrate in Drinking Water'', July 1994, PN 221890–001, Analytical Technology, Inc. Copies are also available from ATI Orion.

8 Method B–1011, ‘‘Waters Test Method for Determination of Nitrite/Nitrate in Water Using Single Column Ion Chromatography,’’ August 1987. Copies are also available from Waters Corporation, Technical Services Division.

9 EPA Method 100.1, ‘‘Analytical Method For Determination of Asbestos Fibers in Water,’’ EPA/600/4–83/043, September 1983.

10 EPA Method 100.2, ‘‘Determination of Asbestos Structure Over 10µm In Length In Drinking Water,’’ EPA/600/R–94/134, June 1994.

11 Industrial Method No. 129–71W, ‘‘Fluoride in Water and Wastewater,’’ December 1972, and Method No. 380–75WE, ‘‘Fluoride in Water and Wastewater,’’ February 1976, Technicon Industrial Systems. Copies are also available from Bran & Luebbe.

12 Unfiltered, no digestion or hydrolysis.

13 Because MDLs reported in EPA Methods 200.7 and 200.9 were determined using a 2X pre-concentration step during sample digestion, MDLs determined when samples are analyzed by direct analysis (i.e., no sample digestion) will be higher. For direct analysis of cadmium and arsenic by Method 200.7, and arsenic by Method 3120 B sample pre-concentration using pneumatic nebulization may be required to achieve lower detection limits. Pre-concentration may also be required for direct analysis of antimony, lead, and thallium by Method 200.9; antimony and lead by Method 3113 B; and lead by Method D3559–90D, unless multiple in-furnace depositions are made.

14 If ultrasonic nebulization is used in the determination of arsenic by EPA Methods 200.7, 200.8, or SM 3120 B, the arsenic must be in the penta-valent state to provide uniform signal response. For methods 200.7 and 3120 B, both samples and standards must be diluted in the same mixed acid matrix concentration of nitric and hydrochloric acid with the addition of 100 µL of 30% hydrogen peroxide per 100 ml of solution. For direct analysis of arsenic with EPA Method 200.8 using ultrasonic nebulization, samples and standards must contain one mg/L of sodium hypochlorite.

15 After January 23, 2006 analytical methods using the ICP–AES technology, may not be used because the detection limits for these methods are 0.008 mg/L or higher. This restriction means that the two ICP–AES methods (EPA Method 200.7 and SM 3120 B) approved for use for the MCL of 0.05 mg/L may not be used for compliance determinations for the revised MCL of 0.010 mg/L.

16 The description for Method Number 1001 for lead is also available from Palintest, LTD or from the Hach Company.

17 The description for the Kelada 01 Method, ‘‘Kelada Automated Test Methods for Total Cyanide, Acid Dissociable Cyanide, and Thiocyanate,’’ Revision 1.2, August 2001, EPA # 821–B–01–009.

18 The description for the QuikChem Method 10–204–00–1-X, ‘‘Digestion and distillation of total cyanide in drinking and wastewaters using MICRO DIST and determination of cyanide by flow injection analysis,’’ Revision 2.1, November 30, 2000, is also available from Lachat Instruments.

(b) Sample collection for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, nitrate, nitrite, selenium, and thallium under this section shall be conducted using the sample preservation, container, and maximum holding time procedures specified in the table below:

Table 10-6 Sample Collection Requirements for Inorganic Chemical Contaminants

Contaminant	**Preservative** [1]	**Container** [2]	**Time** [3]
Antimony	HNO_3	P or G	6 months
Arsenic	Conc HNO_3 to pH <2.	P or G	6 months
Asbestos	4^oC	P or G	48 hours [4]
Barium	HNO_3	P or G	6 months
Beryllium	HNO_3	P or G	6 months
Cadmium	HNO_3	P or G	6 months
Chromium	HNO_3	P or G	6 months
Cyanide	4^oC, NaOH	P or G	14 days

Fluoride	None	P or G	1 month
Mercury	HNO_3	P or G	28 days
Nickel	HNO_3	P or G	6 months
Nitrate	4^oC	P or G	48 hours [5]
Nitrate-Nitrite [6]	H_2SO_4	P or G	28 days
Nitrite	4^oC	P or G	48 hours
Selenium	HNO_3	P or G	6 months
Thallium	HNO_3	P or G	6 months

1 For cyanide determinations samples must be adjusted with sodium hydroxide to pH 12 at the time off collection. When chilling is indicated the sample must be shipped and stored at 4 °C or less. Acidification of nitrate or metals samples may be with a concentrated acid or a dilute (50% by volume) solution of the applicable concentrated acid. Acidification of samples for metals analysis is encouraged and allowed at the laboratory rather than at the time of sampling provided the shipping time and other instructions in section 8.3 of EPA Methods 200.7 or 200.8 or 200.9 are followed.

2 P = plastic, hard or soft; G = glass, hard or soft.

3 In all cases samples should be analyzed as soon after collection as possible. Follow additional (if any) information on preservation, containers or holding times that is specified in method.

4 Instructions for containers, preservation procedures and holding times as specified in EPA Method 100.2 must be adhered to for all compliance analyses including those conducted with EPA Method 100.1.

5 If the sample is chlorinated, the holding time for an unacidified sample kept at 4 °C is extended to 14 days.

6 Nitrate-Nitrite refers to a measurement of total nitrate.

10.3 Organic Chemical Analytical Requirements

Analyses for the organic chemical contaminants in this section shall be conducted using the following EPA methods, or the alternative methods listed in Table 10-30 or their equivalent as approved by EPA.

10.3.1 Organic Chemical Contaminants Analysis

(a) Analysis for organic chemical contaminants shall be conducted using the following methods, as further specified in Table 10-7.

EPA Method 508A and 515.1 are in “Methods for the Determination of Organic Compounds in Drinking Water,” EPA/600/4-88-039, December 1988, Revised, July 1991.

EPA Methods 547, 550 and 550.1 are in “Methods for the Determination of Organic Compounds in Drinking Water -- Supplement I,” EPA/600-4-90-020, July 1990.

EPA Methods 548.1, 549.1, 552.1 and 555 are in “Methods for the Determination of Organic Compounds in Drinking Water -- Supplement II,” EPA/600/R-92-129, August 1992.

EPA Methods 502.2, 504.1, 505, 506, 507, 508, 508.1, 515.2, 524.2, 525.2, 531.1, 551.1 and 552.2 are in “Methods for the Determination of Organic Compounds in Drinking Water -- Supplement III,” EPA/600/R-95-131, August 1995.

EPA Method 1613 is titled "Tetra-through Octa-Chlorinated Dioxins and Furans by Isotope-Dilution HRGC/HRMS," EPA/821-B-94-005, October 1994.

Method 6651 shall be followed in accordance with the American Public Health Association's "Standard Methods for the Examination of Water and Wastewater," 18th edition (1992), 19th edition (1995), and 20th edition (1998). Any of these three editions may be used.

Method 6610 shall be followed in accordance with the American Public Health Association's "Standard Methods for the Examination of Water and Wastewater," (18th Edition Supplement) (1994), 19th edition (1995), and 20th edition (1998). Any of these three editions may be used.

Other required analytical test procedures germane to the conduct of these analyses are contained in "Technical Notes on Drinking Water Methods," EPA/600/R-94-173, October 1994.

EPA Methods 515.3 and 549.2

ASTM Method D 5317-93 is available in the Annual Book of ASTM Standards, (1999), Vol. 11.02, ASTM International, or in any edition published after 1993.

EPA Method 515.4 is in "Determination of Chlorinated Acids in Drinking Water by Liquid-Liquid Microextraction, Derivatization and Fast Gas Chromatography with Electron Capture Detection," Revision 1.0, April 2000, EPA /815/B-00/001.

The Syngenta AG-625, "Atrazine in Drinking Water by Immunoassay", February 2001, is available from Syngenta Crop Protection, Inc.

EPA Method 531.2 is in "Measurement of N-methylcarbamoyloximes and N-methylcarbamates in Water by Direct Aqueous Injection HPLC with Postcolumn Derivatization," Revision 1.0, EPA 815/B/01/002, September 2001.

Table 10-7 Organic Chemical Contaminants Analytical Methods

.	**Contaminant**	**EPA METHOD**	**Standard methods**	**ASTM**	**Other**
(1)	Benzene	502.2 524.2	.	.	.
(2)	Carbon tetrachloride	502.2 524.2 551.1	.	.	.
(3)	Chlorobenzene	502.2 524.2	.	.	.
(4)	1,2-Dichlorobenzene	502.2 524.2	.	.	.
(5)	1,4-Dichlorobenzene	502.2 524.2	.	.	.
(6)	1,2-Dichloroethane	502.2 524.2	.	.	.
(7)	cis-Dichloroethylene	502.2 524.2	.	.	.
(8)	trans-Dichloroethylene	502.2 524.2	.	.	.
(9)	Dichloromethane	502.2 524.2	.	.	.
(10)	1,2-Dichloropropane	502.2 524.2	.	.	.
(11)	Ethylbenzene	502.2 524.2	.	.	.
(12)	Styrene	502.2 524.2	.	.	.

(13)	Tetrachloroethylene	502.2 524.2 551.1	.	.	.
(14)	1,1,1-Trichloroethane	502.2 524.2 551.1	.	.	.
(15)	Trichloroethylene	502.2 524.2 551.1	.	.	.
(16)	Toluene	502.2 524.2	.	.	.
(17)	1,2,4-Trichlorobenzene.	502.2 524.2	.	.	.
(18)	1,1-Dichloroethylene	502.2 524.2	.	.	.
(19)	1,1,2-Trichloroethane	502.2 524.2 551.1	.	.	.
(20)	Vinyl chloride	502.2 524.2	.	.	.
(21)	Xylenes (total)	502.2 524.2	.	.	.
(22)	2,3,7,8-TCDD (dioxin)	1613	.	.	.
(23)	2,4-D [3] (as acid, salts and esters)	515.1 515.2 515.3 515.4 555	.	D5317-93	.
(24)	2,4,5-TP [3] (Silvex)	515.1 515.2 515.3 515.4 555	.	D5317-93	.
(25)	Alachlor [1]	505 507 508.1 525.2 551.1	.	.	.
(26)	Atrazine [1]	505 507 508.1 525.2 551.1	.	.	Syngenta AG-625
(27)	Benzo(a)pyrene	525.2 550 550.1	.	.	.
(28)	Carbofuran	531.1 531.2	6610	.	.
(29)	Chlordane	505 508 508.1 525.2	.	.	.

(30)	Dalapon	515.1 515.3 515.4 552.1 552.2	.	.	.
(31)	Di(2-ethylhexyl)adipate	506 525.2	.	.	.
(32)	Di(2-ethylhexyl)phthalate.	506 525.2	.	.	.
(33)	Dibromochloropropane (DBCP)	504.1 551.1	.	.	.
(34)	Dinoseb [3]	515.1 515.2 515.3 515.4 555	.	.	.
(35)	Diquat	549.2	.	.	.
(36)	Endothall	548.1	.	.	.
(37)	Endrin	505 508 508.1 525.2 551.1	.	.	.
(38)	Ethylene dibromide (EDB)	504.1 551.1	.	.	.
(39)	Glyphosate	547	6651	.	.
(40)	Heptachlor	505 508 508.1 525.2 551.1	.	.	.
(41)	Heptachlor Epoxide	505 508 508.1 525.2 551.1	.	.	.
(42)	Hexachlorobenzene	505 508 508.1 525.2 551.1	.	.	.
(43)	Hexachlorocyclopentadiene	505 508 508.1 525.2 551.1	.	.	.
(44)	Lindane	505 508 508.1 525.2 551.1	.	.	.

(46)	Methoxychlor	505 508 508.1 525.2 551.1	.	.	.
(46)	Oxamyl	531.1 531.2	6610	.	.
(47)	PCBs [2] (as decachlorobiphenyl)	508A	.	.	.
(48)	PCBs [2] (as Aroclors)	508 508.1 525.2 505	.	.	.
(49)	Pentachlorophenol	515.1 515.2 515.3 515.4 525.2 555	.	D5317-93	.
(50)	Picloram [3]	515.1 515.2 515.3 515.4 555	.	D5317-93	.
(51)	Simazine [1]	505 507 508.1 525.2 551.1	.	.	.
(52)	Toxaphene	505 508 508.1 525.2	.	.	.
(53)	Total Trihalomethanes	502.2 524.2 551.1	.	.	.

1 Substitution of the detector specified in EPA Methods 505, 507, 508 or 508.1 for the purpose of achieving lower detection limits is allowed as follows. Either an electron capture or nitrogen phosphorous detector may be used provided all regulatory requirements and quality control criteria are met.

2 PCBs are qualitatively identified as Aroclors and measured for compliance purposes as decachlorobiphenyl. Users of EPA Method 505 may have more difficulty in achieving the required detection limits than users of EPA Methods 508.1, 525.2 or 508.

3 Accurate determination of the chlorinated esters requires hydrolysis of the sample as described in EPA Methods 515.1, 515.2, 515.3, 515.4 and 555 and ASTM Method D5317-93.

10.3.2 PCB Analysis

(a) Analysis for PCBs shall be conducted as follows using the methods in section 10.3.1(a):

(1) Each system which monitors for PCBs shall analyze each sample using either EPA Methods 508.1, 525.2, 508 or 505. Users of EPA Method 505 may have more difficulty in achieving the required Aroclor detection limits than users of EPA Methods 508.1, 525.2 or 508.

(2) If PCBs (as one of seven Aroclors) are detected (as designated in this paragraph) in any sample analyzed using EPA Methods 505, 508 or 525.2, the system shall reanalyze the sample using Method 508A to quantitate PCBs (as decachlorobiphenyl).

Table 10-8 Cited Detection Limit for Aroclor

Aroclor	Cited Detection Limit (mg/L)
1016	0.00008
1221	0.02
1232	0.0005
1242	0.0003
1248	0.0001
1254	0.0001
1260	0.0002

(3) Compliance with the PCB MCL shall be determined based upon the quantitative results of analyses using EPA Method 508A.

10.3.3 Cited Detection for Organic Chemical Contaminants

(a) Detection as used in this section shall be defined as greater than or equal to the following concentrations for each chemical contaminant.

Table 10-9 Cited Detection Limits for Synthetic Organic Chemical Contaminants

Contaminant	Cited Detection Limit (mg/L)
Alachlor	0.0002
Aldicarb	0.0005
Aldicarb sulfoxide	0.0005
Aldicarb sulfone	0.0008
Atrazine	0.0001
Benzo[a]pyrene	0.00002
Carbofuran	0.0009
Chlordane	0.0002
Dalapon	0.001
1,2-Dibromo-3-chloropropane (DBCP)	0.00002

Di(2-ethylhexyl)adipate	0.0006
Di(2-ethylhexyl)phthalate	0.0006
Dinoseb	0.0002
Diquat	0.0004
2,4-D	0.0001
Endothall	0.009
Endrin	0.00001
Ethylene dibromide (EDB)	0.00001
Glyphosate	0.006
Heptachlor	0.00004
Heptachlor epoxide	0.00002
Hexachlorobenzene	0.0001
Hexachlorocyclopentadiene	0.0001
Lindane	0.00002
Methoxychlor	0.0001
Oxamyl	0.002
Picloram	0.0001
Polychlorinated biphenyls (PCBs) (as decachlorobiphenyl)	0.0001
Pentachlorophenol	0.00004
Simazine	0.00007
Toxaphene	0.001
2,3,7,8-TCDD (Dioxin)	0.000000005
2,4,5-TP (Silvex)	0.0002

Table 10-10 Cited Detection Limits for Volatile Organic Chemical Contaminants

Contaminant	**Cited Detection Limit (mg/L)**
Vinyl chloride	0.0005

Benzene	0.0005
Carbon tetrachloride	0.0005
1,2-Dichloroethane	0.0005
Trichloroethylene	0.0005
Para-Dichlorobenzene	0.0005
1,1-Dichloroethylene	0.0005
1,1,1-Trichloroethane	0.0005
cis-1,2 Dichloroethylene	0.0005
1,2-Dichloropropane	0.0005
Ethylbenzene	0.0005
Monochlorobenzene	0.0005
o-Dichlorobenzene	0.0005
Styrene	0.0005
Tetrachloroethylene	0.0005
Toluene	0.0005
Trans-1,2 Dichloroethylene	0.0005
Xylenes (total)	0.0005
Dichloromethane (methylene chloride)	0.0005
1,2,4-Trichlorobenzene	0.0005
1,1,2-Trichloroethane	0.0005

10.4 Radionuclide Analytical Requirements

10.4.1 Sampling and Analytical Requirements

(a) Analysis for the following Chemical contaminants shall be conducted to determine compliance with section 2.6 in accordance with the methods in the following table, or the alternative methods listed in Table 10-30 or their equivalent as determined by EPA in accordance with sections 10.9.1(a) and (b).

Table 10-11 Sampling and Analytical Requirements for Radionuclides

Contaminant	**Methodology**	**Reference (method or page number)**								
		EPA[1]	**EPA[2]**	**EPA[3]**	**EPA[4]**	**SM[5]**	**ASTM[6]**	**USGS[7]**	**DOE[8]**	**Other**
Naturally occurring:										

Gross alpha [11] and beta	Evaporation	900.0	p 1	00–01	p 1	302, 7110 B		R–1120–76		
Gross alpha [11]	Co-precipitation			00–02		7110 C				
Radium 226	Radon emanation	903.1	p 16	Ra-04	p 19	305, 7500-Ra C	D 3454–97	R–1141–76	Ra-04	N.Y.[9]
	Radiochemical	903.0	p 13	Ra-03		304, 7500-Ra B	D 2460-97	R-1140-76		
Radium 228	Radiochemical	904.0	p 24	Ra-05	p 19	7500-Ra D		R–1142–76		N.Y.[9] N.J.[10]
Uranium[12]	Radiochemical	908.0				7500-U B				
	Fluorometric	908.1				7500-U C (17th Ed.)	D2907-97	R-1180-76, R-1181-76	U-04	
	ICP-MS	200.8[13]				3125	D5673-03			
	Alpha spectrometry			00–07	p 33	7500-U C (18th, 19th, or 20th Ed.)	D 3972–97	R-1182-76	U-02	
	Laser Phosphorimetry						D 5174–97			
Man-made:										
Radioactive cesium	Radiochemical	901.0	p 4			7500-Cs B	D 2459–72	R-1111-76		
	Gamma ray spectrometry	901.1			p 92	7120	D 3649–91	R-1110-76	4.5.2.3	
Radioactive iodine	Radiochemical	902.0	p 6, p 9			7500-I B, 7500-I C, 7500-I D	D3649-91			
	Gamma ray spectrometry	901.1			p 92	7120	D 4785–93		4.5.2.3	
Radioactive Strontium 89, 90	Radiochemical	905.0	p 29	Sr-04	p. 65	303, 7500-Sr B		R-1160-76	Sr-01, Sr-02	
Tritium	Liquid scintillation	906.0	p 34	H–02	p. 87	306, 7500–3H B	D 4107–91	R-1171-76		
Gamma emitters	Gamma ray	901.1			p92	7120	D 3649–91	R-1110-76	Ga-01-R	
	Spectrometry	902.0, 901.0				7500-Cs B, 7500-I B	D 4785–93			

The procedures shall be done in accordance with the documents listed below.

1 'Prescribed Procedures for the Measurement of Radioactivity in Drinking Water,'' EPA 600/4–80–032, August 1980. Method 200.8, "Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry," Revision 5.4 is published in "Methods for the Determination of Metals in Environmental Samples—Supplement I," EPA 600-R-94-111, May 1994.

2 ''Interim Radiochemical Methodology for Drinking Water,'' EPA 600/4–75–008(revised), March 1976.

3 ''Radiochemistry Procedures Manual,'' EPA 520/5–84–006, December, 1987.

4 ''Radiochemical Analytical Procedures for Analysis of Environmental Samples'', March 1979.

5 The American Public Health Association's ''Standard Methods for the Examination of Water and Wastewater,'' 13th, 17th, 18th, 19th, or 20th edition, 1971, 1989, 1992, 1995, 1998, respectively. Methods 302, 303, 304, 305 and 306 are only in the 13th edition. Methods 7110B, 7500–Ra B, 7500–Ra C, 7500–Ra D, 7500–U B, 7500–Cs B, 7500–I B, 7500–I C, 7500–I D, 7500–Sr B, 7500–3H B are in the 17th, 18th, 19th and 20th editions. Method 7110 C is in the 18th, 19th and 20th editions. Method 7500–U C Fluorometric Uranium is only in the 17th Edition, and 7500–U C Alpha spectrometry is only in the 18th, 19th and 20th editions. Method 7120 is only in the 19th and 20th editions. Methods 302, 303, 304, 305 and 306 are only in the 13th edition. Method 3125 is only in the 20th edition.

6 ASTM International's Annual Book of ASTM Standards, Vol. 11.01 and 11.02 (1999). Any year containing the cited version of the method may be used.

7 The U.S. Geological Survey's ''Methods for Determination of Radioactive Substances in Water and Fluvial Sediments,'' Chapter A5 in Book 5 of "Techniques of Water-Resources Investigations of the United States Geological Survey," 1977.

8 The U.S. Department of Energy's ''EML Procedures Manual,'' 28th edition (1997) or 27th edition (1990), Volumes 1 and 2. Either of the cited editions may be used. In the 27th edition, Method Ra–04 is listed as Ra–05 and Method Ga–01–R is listed as Sect. 4.5.2.3.

9 ''Determination of Ra–226 and Ra–228 (Ra–02),'' January 1980, Revised June 1982, Radiological Sciences Institute for Laboratories and Research, New York State Department of Health.

10 ''Determination of Radium 228 in Drinking Water,'' August 1980, State of New Jersey, Department of Environmental Protection, Division of Environmental Quality, Bureau of Radiation and Inorganic Analytical Services.

11 Natural uranium and thorium-230 are approved as gross alpha calibration standards for gross alpha with co-precipitation and evaporation methods; americium-241 is approved with co-precipitation methods.

12 If uranium (U) is determined by mass, a 0.67 pCi/µg of uranium conversion factor must be used. This conversion factor is based on the 1:1 activity ratio of U–234 and U–238 that is characteristic of naturally occurring uranium.

13 "Determination of Trace Elements in Waters and Wastes By Inductively Coupled Plasma-Mass Spectrometry," Revision 5.4, which is published in "Methods for the Determination of Metals in Environmental Samples—Supplement I," EPA 600-R-94-111, May 1994.

(b) When the identification and measurement of radionuclides other than those listed in section 2.6 is required, the following references are to be used, except in cases where alternative methods have been approved in accordance with sections 10.9.1(a) and (b).

(1) "Procedures for Radiochemical Analysis of Nuclear Reactor Aqueous Solutions," H. L. Krieger and S. Gold, EPA-R4-73-014, USEPA, May 1973.

(2) "HASL Procedure Manual," John H. Harley. HASL 300, ERDA Health and Safety Laboratory, New York, NY (1973).

10.4.2 Cited Detection Limits for Radionuclides

(a) For the purpose of monitoring radioactivity concentrations in drinking water, the required sensitivity of the radioanalysis is defined in terms of a detection limit. The detection limit shall be that concentration which can be counted with a precision of plus or minus 100 percent at the 95 percent confidence level (1.96σ where σ is the standard deviation of the net counting rate of the sample).

(1) To determine compliance with section 2.6 the detection limit shall not exceed the concentrations in Table 10-12 to this section 10.4.2(a).

Table 10-12 Cited Detection Limits for Gross Alpha Particle Activity, Radium 226, Radium 228, and Uranium

.	**Contaminant**	**Cited Detection limit**
(1)	Gross alpha particle activity	3 pCi/L.
(2)	Radium 226	1 pCi/L.
(3)	Radium 228	1 pCi/L.
(4)	Uranium	1 µg/L

(2) To determine compliance with section 6.5.1(d) the detection limits shall not exceed the concentrations listed in Table 10-12 to this section 10.4.2(a).

Table 10-13 Cited Detection Limits for Man-Made Beta Particle and Photon Emitters

.	**Radionuclide**	**Cited Detection limit**
(1)	Tritium	1,000 pCi/L
(2)	Strontium–89	10 pCi/L
(3)	Strontium–90	2 pCi/L
(4)	Iodine–131	1 pCi/L

(5)	Cesium–134	10 pCi/L
(6)	Gross beta	4 pCi/L.
(7)	Other radionuclides	$^{1}/_{10}$ of the regulatory limit.

10.5 Turbidity and Disinfectant Analytical Requirements

10.5.1 Turbidity, Heterotrophic Plate Count (HPC) and Disinfectant Testing Requirements

(a) Only the analytical method(s) specified in this section 10.5, or otherwise approved by EPA, may be used to demonstrate compliance with sections 7.1.1, 7.1.2 and 7.1.3. Measurements for pH, turbidity, temperature and residual disinfectant concentrations must be conducted by a operator that has been certified in accordance with Regulation 100, 5 C.C.R. 100-3-2. Measurement for HPC must be conducted by a laboratory certified by the Department to do such analysis. Until laboratory certification criteria are developed for the analysis of HPC, any laboratory certified for total coliforms analysis by the Department is deemed certified for fecal coliforms and HPC analysis. The following procedures shall be conducted in accordance with the publications listed in section 10.5. Copies of the Indigo Method as set forth in the article "Determination of Ozone in Water by the Indigo Method" (Bader and Hoigne), may be obtained from Ozone Science & Engineering, Pergamon Press Ltd.

(1) Public water systems must conduct analysis of pH and temperature in accordance with one of the methods listed in Table 10-5. Public water systems must conduct analysis of heterotrophic bacteria and turbidity in accordance with one of the following analytical methods or one of the alternative methods listed in Table 10-30 and by using analytical test procedures contained in the U.S. Environmental Protection Agency's "*Technical Notes on Drinking Water Methods,*" EPA-600/R-94-173, October 1994.

Table 10-14 Turbidity and HPC Analytical Methods

Organism	**Methodology**	**Methods[1]**
Heterotrophic bacteria[2]	Pour Plate Method	9215 B
Turbidity	Nephelometric Method	2130 B
	Nephelometric Method	180.1[3]
	Great Lakes Instruments	Method 2[4]
	Hach FilterTrak	10133[5]

The procedures shall be done in accordance with the documents listed below.

1 Except where noted, all methods refer to the American Public Health Association's "Standard Methods for the Examination of Water and Wastewater," 18th edition (1992), 19th edition(1995) and 20th edition (1998). The cited methods published in any of these three editions may be used.

2 The time from sample collection to initiation of analysis may not exceed 8 hours. Systems must hold samples below 10 deg. C during transit.

3 U.S. Environmental Protection Agency's "Methods for the Determination of Inorganic Substances in Environmental Samples," EPA/600/R-93/100, August 1993.

4 GLI Method 2, "Turbidity," November 2, 1992, Great Lakes Instruments, Inc.

5 A description of the Hack FilterTrak Method 10133, "Determination of Turbidity by Laser Nephelometry," January 2000, Revision 2.9, is also available from Hack Co.

(2) Public water systems must measure residual disinfectant concentrations with one of the analytical methods in the following table or one of the alternative methods listed in Table 10-30. If approved by the Department, residual disinfectant concentrations for free chlorine and combined chlorine also may be measured by using DPD colorimetric test kits. In addition the Department may approve the use of the ITS free chlorine test strip for

the determination of free chlorine. Use of the test strips is described in Method D99–003, "Free Chlorine Species (HOCl−and OCl−) by Test Strip," Revision 3.0, November 21, 2003, available from Industrial Test Systems, Inc., 1875 Langston St., Rock Hill, SC 29730. Free and total chlorine residuals may be measured continuously by adapting a specified chlorine residual method for use with a continuous monitoring instrument provided the chemistry, accuracy, and precision remain the same. Instruments used for continuous monitoring must be calibrated with a grab sample measurement at least every five days, or with a protocol approved by the Department.

Table 10-15 Disinfection Residual Analytical Methods

Residual	Methodology	SM[1]	SM Online[2]	Other
Free Chlorine	Amperometric Titration	4500–Cl D	4500–Cl D–00	D1253–03[3]
	DPD Ferrous Titrimetric	4500–Cl F	4500–Cl F–00	
	DPD Colorimetric	4500–Cl G	4500–Cl G–00	
	Syringaldazine (FACTS)	4500–Cl H	4500–Cl H–00	
	Test Strips			Method D99-003
Total Chlorine	Amperometric Titration	4500–Cl D	4500–Cl D–00	D1253–03[3]
	Amperometric Titration (low level measurement)	4500–Cl E	4500–Cl E–00	
	DPD Ferrous Titrimetric	4500–Cl F	4500–Cl F–00	
	DPD Colorimetric	4500–Cl G	4500–Cl G–00	
	Iodometric Electrode	4500–Cl I	4500–Cl I–00	
Chlorine Dioxide	Amperometric Titration	4500–ClO2 C	4500–ClO2 C–00	
	DPD Method	4500–ClO2 D		
	Amperometric Titration	4500–ClO2 E	4500–ClO2 E–00	
	Spectrophotometric			327.0, Revision 1.1[4]
Ozone	Indigo Method	4500–O3 B	4500–O3 B–97	

1 All the listed methods are contained in the 18th, 19th, and 20th editions of *Standard Methods for the Examination of Water and Wastewater,* 1992, 1995, and 1998; the cited methods published in any of these three editions may be used.

2 Standard Methods Online are available at *http://www.standardmethods.org.* The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only Online versions that may be used.

3 *Annual Book of ASTM Standards,* Vol. 11.01, 2004 ; ASTM International; any year containing the cited version of the method may be used. Copies of this method may be obtained from ASTM International, 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken, PA 19428–2959.

4 EPA Method 327.0, Revision 1.1, "Determination of Chlorine Dioxide and Chlorite Ion in Drinking Water Using Lissamine Green B and Horseradish Peroxidase with Detection by Visible Spectrophotometry," USEPA, May 2005, EPA 815–R–05–008. Available online at *http://www.epa.gov/safewater/methods/sourcalt.html.*

10.6 Calculating Contact Time (CT) Values

10.6.1 CT Calculations

(a) The total inactivation ratio is determined based on the CT99.9 values in Tables 10-15 through 10-22 of this section 10.6, as appropriate. The parameters necessary to determine the total inactivation ratio must be monitored as follows:

(1) The temperature of the disinfected water must be measured at least once per day at each residual disinfectant concentration sampling point.

(2) If the system uses chlorine, the pH of the disinfected water must be measured at least once per day at each chlorine residual disinfectant concentration sampling point.

(3) The disinfectant contact time(s) ("T") must be determined for each day during peak hourly flow.

(i) Disinfectant contact time in pipelines must be calculated based on "plug flow" by dividing the internal volume of the pipe by the maximum hourly flow rate through that pipe. Disinfectant contact time within mixing basins and storage reservoirs must be determined by tracer studies or an equivalent demonstration or by baffling factor estimates.

(4) The residual disinfectant concentration(s) ("C") of the water before or at the first customer must be measured each day during peak hourly flow.

Table 10-16 CT Values (CT99.9) for 99.9 Percent Inactivation of Giardia Lamblia Cysts by Free Chlorine at 0.5°C or Lower [1]

Free Residual (mg/L)	**pH**	**.**	**.**	**.**	**.**	**.**	**.**
.	**≤6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**≤9.0**
≤0.4	137	163	195	237	277	329	390
0.6	141	168	200	239	286	342	407
0.8	145	172	205	246	295	354	422
1.0	148	176	210	253	304	365	437
1.2	152	180	215	259	313	376	451
1.4	155	184	221	266	321	387	464
1.6	157	189	226	273	329	397	477
1.8	162	193	231	279	338	407	489
2.0	165	197	236	286	346	417	500
2.2	169	201	242	297	353	426	511
2.4	172	205	247	298	361	435	522
2.6	175	209	252	304	368	444	533
2.8	178	213	257	310	375	452	543
3.0	181	217	261	316	382	460	552

1 These CT values achieve greater than a 99.99 percent inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperatures of different tables may be determined by linear interpolation. If no interpolation is used, use the $CT_{99.9}$ value at the lower temperature and at the higher pH.

Table 10-17 CT Values (CT99.9) for 99.9 Percent Inactivation of Giardia Lamblia Cysts by Free Chlorine at 5.0°C or Lower [1]

Free Residual (mg/L)	pH	.	.	.	.	.	.
.	≤6.0	6.5	7.0	7.5	8.0	8.5	≤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
1.0	105	125	149	179	216	260	312
1.2	107	127	152	183	221	267	320
1.4	109	130	155	187	227	274	329
1.6	111	132	158	192	232	281	337
1.8	114	135	162	196	238	287	345
2.0	116	138	165	200	243	294	353
2.2	118	140	169	204	248	300	361
2.4	120	143	172	209	253	306	368
2.6	122	146	175	213	258	312	375
2.8	124	148	178	217	263	318	382
3.0	126	151	182	221	268	324	389

1 These CT values achieve greater than a 99.99 percent inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperatures of different tables may be determined by linear interpolation. If no interpolation is used, use the $CT_{99.9}$ value at the lower temperature and at the higher pH.

Table 10-18 CT Values (CT99.9) for 99.9 Percent Inactivation of Giardia Lamblia Cysts by Free Chlorine at 10.0°C or Lower [1]

Free Residual (mg/L)	pH	.	.	.	.	.	.
.	≤6.0	6.5	7.0	7.5	8.0	8.5	≤9.0
≤0.4	73	88	104	125	149	177	209
0.6	75	90	107	128	153	183	218
0.8	78	92	110	131	158	189	226
1.0	79	94	112	134	162	195	234
1.2	80	95	114	137	166	200	240

1.4	82	98	116	140	170	206	247
1.6	83	99	119	144	174	211	253
1.8	86	101	122	147	179	215	259
2.0	87	104	124	150	182	221	265
2.2	89	105	127	153	186	225	271
2.4	90	107	129	157	190	230	276
2.6	92	110	131	160	194	234	281
2.8	93	111	134	163	197	239	287
3.0	95	113	137	166	201	243	292

1 These CT values achieve greater than a 99.99 percent inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperatures of different tables may be determined by linear interpolation. If no interpolation is used, use the $CT_{99.9}$ value at the lower temperature and at the higher pH.

Table 10-19 CT Values (CT99.9) for 99.9 Percent Inactivation of Giardia Lamblia Cysts by Free Chlorine at 15.0°C or Lower [1]

Free Residual (mg/L)	**pH**	**.**	**.**	**.**	**.**	**.**	**.**
.	**≤6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**≤9.0**
≤0.4	49	59	70	83	99	118	140
0.6	50	60	72	86	102	122	146
0.8	52	61	73	88	105	126	151
1.0	53	63	75	90	108	130	156
1.2	54	64	76	92	111	134	160
1.4	55	65	78	94	114	137	165
1.6	56	66	79	96	116	141	169
1.8	57	68	81	98	119	144	173
2.0	58	69	83	100	122	147	177
2.2	59	70	85	102	124	150	181
2.4	60	72	86	105	127	153	184
2.6	61	73	88	107	129	156	188

2.8	62	74	89	109	132	159	191
3.0	63	76	91	111	134	162	195

1 These CT values achieve greater than a 99.99 percent inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperatures of different tables may be determined by linear interpolation. If no interpolation is used, use the $CT_{99.9}$ value at the lower temperature and at the higher pH.

Table 10-20 CT Values ($CT_{99.9}$) for 99.9 Percent Inactivation of Giardia Lamblia Cysts by Free Chlorine at 20.0°C [1]

Free Residual (mg/L)	**pH**	**.**	**.**	**.**	**.**	**.**	**.**
.	**≤6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**≤9.0**
≤0.4	36	44	52	62	74	89	105
0.6	38	45	54	64	77	92	109
0.8	39	46	55	66	79	95	113
1.0	39	47	56	67	81	98	117
1.2	40	48	57	69	83	100	120
1.4	41	49	58	70	85	103	123
1.6	42	50	59	72	87	105	126
1.8	43	51	61	74	89	108	129
2.0	44	52	62	75	91	110	132
2.2	44	53	63	77	93	113	135
2.4	45	54	65	78	95	115	138
2.6	46	55	66	80	97	117	141
2.8	47	56	67	81	99	119	143
3.0	47	57	68	83	101	122	146

1 These CT values achieve greater than a 99.99 percent inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperatures of different tables may be determined by linear interpolation. If no interpolation is used, use the $CT_{99.9}$ value at the lower temperature and at the higher pH.

Table 10-21 CT Values ($CT_{99.9}$) for 99.9 Percent Inactivation of Giardia Lamblia Cysts by Free Chlorine at 25°C[1] and Higher

Free Residual (mg/L)	**pH**	**.**	**.**	**.**	**.**	**.**	**.**
.	**≤6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**≤9.0**

≤0.4	24	29	35	42	50	59	70
0.6	25	30	36	43	51	61	73
0.8	26	31	37	44	53	63	75
1.0	26	31	37	45	54	65	78
1.2	27	32	38	46	55	67	80
1.4	27	33	39	47	57	69	82
1.6	28	33	40	48	58	70	84
1.8	29	34	41	49	60	72	86
2.0	29	35	41	50	61	74	88
2.2	30	35	42	51	62	75	90
2.4	30	36	43	52	63	77	92
2.6	31	37	44	53	65	78	94
2.8	31	37	45	54	66	80	96
3.0	32	38	46	55	67	81	97

1 These CT values achieve greater than a 99.99 percent inactivation of viruses. CT values between the indicated pH values may be determined by linear interpolation. CT values between the indicated temperatures of different tables may be determined by linear interpolation. If no interpolation is used, use the $CT_{99.9}$ value at the lower temperature and at the higher pH.

Table 10-22 CT Values ($CT_{99.9}$) for 99.9 Percent Inactivation of Giardia Lamblia Cysts by Chlorine Dioxide and Ozone [1]

	Temperature					
	≤1°C	**5°C**	**10°C**	**15°C**	**20°C**	**25°C**
Chlorine dioxide	63	26	23	19	15	11
Ozone	2.9	1.9	1.4	0.95	0.72	0.48

1 These CT values achieve greater than 99.99 percent inactivation of viruses. CT values between the indicated temperatures may be determined by linear interpolation. If no interpolation is used, use the $CT_{99.9}$ value at the lower temperature for determining $CT_{99.9}$ values between indicated temperatures

Table 10-23 CT Values ($CT_{99.9}$) for 99.9 Percent Inactivation of Giardia Lamblia Cysts By Chloramines [1]

	Temperature					
	≤1°C	**5°C**	**10°C**	**15°C**	**20°C**	**25°C**
Chloramines	3,800	2,200	1,850	1,500	1,100	750

1 These values are for pH values of 6 to 9. These CT values may be assumed to achieve greater than 99.99 percent inactivation of viruses only if chlorine is added and mixed in the water prior to the addition of ammonia. If this condition is not met, the system must demonstrate, based on on-site studies or other information, as approved by the State, that the system is achieving at least 99.99 percent inactivation of viruses. CT values between the indicated temperatures may be determined by linear interpolation. If no interpolation is used, use the CT99.9 value at the lower temperature for determining CT99.9 values between indicated temperatures.

(b) The total inactivation ratio must be calculated as follows:

(1) If the system uses only one point of disinfectant application, the system may determine the total inactivation ratio based on either of the following two methods:

(i) One inactivation ratio ($CTcalc/CT_{99.9}$) is determined before or at the first customer during peak hourly flow and if the $CTcalc/CT_{99.9} \geq 1.0$, the 99.9 percent *Giardia lamblia* inactivation requirement has been achieved; or

(ii) Successive $CTcalc/CT_{99.9}$ values, representing sequential inactivation ratios, are determined between the point of disinfectant application and a point before or at the first customer during peak hourly flow. Under this alternative, the following method must be used to calculate the total inactivation ratio:

(A) Determine ($CTcalc/CT_{99.9}$) for each sequence

(B) Add the ($CTcalc/CT_{99.9}$) values together $\sum (CTcalc/CT_{99.9})$

(C) If $\sum (CTcalc/CT_{99.9}) \geq 1.0$, the 99.9 percent *Giardia lamblia* inactivation requirement has been achieved.

(2) If a public water system applies disinfectants at more than one point prior to the first customer, it must determine the CT of each disinfectant sequence before or at the first customer to determine the total percent inactivation or "total inactivation ratio." In determining the total inactivation ratio, the public water system must determine the residual disinfectant concentration of each disinfection sequence and corresponding contact time before any subsequent disinfection application point(s). "$CT_{99.9}$" is the CT value required for 99.9 percent (3-log) inactivation of *Giardia lamblia* cysts. $CT_{99.9}$ for a variety of disinfectants and conditions appear in section 10.6.1(Tables 1-8). ($CTcalc/CT_{99.9}$) is the inactivation ratio. The sum of the inactivation ratios, or total inactivation ratio, shown as the sum of ($(CTcalc)/CT_{99.9}$), is calculated by adding together the inactivation ratio for each disinfection sequence. A total inactivation ratio equal to or greater than 1.0 is assumed to provide a 3-log inactivation of *Giardia lamblia* cysts.

10.7 Disinfectants, Disinfection Byproducts and Disinfection Byproduct Precursor Analytical Requirements

10.7.1 General Analytical Requirements

(a) General

(1) Systems shall use only the analytical methods specified in this section, or their equivalent to demonstrate compliance with the requirements of this section and with the requirements of sections 7.7 and 7.8. These methods are effective for compliance monitoring February 16, 1999, unless a different effective date is specified in this section or by the Department.

(2) The following documents are incorporated herein by reference:

EPA Method 552.1 is in Methods for the Determination of Organic Compounds in Drinking Water-Supplement II, U.S. EPA, August 1992, EPA/600/R-92/129

EPA Methods 502.2, 524.2, 551.1, and 552.2 are in “Methods for the Determination of Organic Compounds in Drinking Water-Supplement III,” U.S. EPA, August 1995, EPA/600/R-95/131.

EPA Method 300.0 is in "Methods for the Determination of Inorganic Substances in Environmental Samples," USEPA, August 1993, EPA/600/R-93/100.

EPA Methods 300.1 and 321.8 are in "Methods for the Determination of Organic and Inorganic Compounds in Drinking Water," Volume 1, USEPA, August 2000, EPA 815–R–00–014.

EPA Method 317.0, Revision 2.0, "Determination of Inorganic Oxyhalide Disinfection By-Products in Drinking Water Using Ion Chromatography with the Addition of a Postcolumn Reagent for Trace Bromate Analysis," USEPA, July 2001, EPA 815–B–01–001.

EPA Method 326.0, Revision 1.0, "Determination of Inorganic Oxyhalide Disinfection By-Products in Drinking Water Using Ion Chromatography Incorporating the Addition of a Suppressor Acidified Postcolumn Reagent for Trace Bromate Analysis," USEPA, June 2002, EPA 815–R–03–007.

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

EPA Method 552.3, Revision 1.0, "Determination of Haloacetic Acids and Dalapon in Drinking Water by Liquid-liquid Microextraction, Derivatization, and Gas Chromatography with Electron Capture Detection," USEPA, July 2003, EPA–815–B–03–002.

EPA Method 415.3, Revision 1.1, "Determination of Total Organic Carbon and Specific UV Absorbance at 254 nm in Source Water and Drinking Water," USEPA, February 2005, EPA/600/R–05/055.

Standard Methods 4500-Cl D, 4500-Cl E, 4500-Cl F, 4500-Cl G, 4500-Cl H, 4500-Cl I, 4500-ClO_2 D, 4500-ClO_2 E, 6251 B, and 5910 B shall be followed in accordance with the American Public Health Association's "Standard Methods for the Examination of Water and Wastewater," 19th and 20th editions, 1995 and 1998 respectively. The cited methods published in either edition may be used.

Standard Methods 5310 B, 5310 C, and 5310 D shall be followed in accordance with the Supplement to the 19th Edition of "Standard Methods for the Examination of Water and Wastewater," or the Standard Methods for the Examination of Water and Wastewater, 20th Edition, American Public Health Association, 1996 and 1998, respectively. The cited methods published in either edition may be used. Copies may be obtained from the American Public Health Association, 1015 Fifteenth Street, NW, Washington, DC 20005.

Standard Methods 4500–Cl D–00, 4500–Cl E–00, 4500–Cl F–00, 4500–Cl G–00, 4500–Cl H–00, 4500–Cl I–00, 4500–ClO_2 E–00, 6251 B–94, 5310 B–00, 5310 C–00, 5310 D–00 and 5910 B–00 are available at *http://www.standardmethods.org* or at EPA's Water Docket. The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only Online versions that are IBR-approved.

ASTM Method D 1253-86 and D 1253–86 (Reapproved 1996) shall be followed in accordance with the Annual Book of ASTM Standards, Volume 11.01, American Society for Testing and Materials (1996), or any ASTM edition containing the IBR-approved version of the method may be used.

ASTM Method D1253–03 shall be followed in accordance with the Annual Book of ASTM Standards, Volume 11.01, American Society for Testing and Materials International

(2004), or any ASTM edition containing the IBR-approved version of the method may be used.

ASTM Method D 6581–00 shall be followed in accordance with the Annual Book of ASTM Standards, Volume 11.01, American Society for Testing and Materials International (2001), or any ASTM edition containing the IBR-approved version of the method may be used. .

10.7.2 Disinfection Byproduct Analytical Requirements

(a) Systems must measure disinfection byproducts by the methods (as modified by the footnotes) listed in Table 10-24 or one of the alternative methods listed in Table 10-30:

Table 10-24 Approved Methods for Disinfection Byproduct Compliance Monitoring

Contaminant and Methodology [1]	EPA method	Standard method[2]	SM online[9]	ASTM method[3]
TTHM				
P&T/GC/ElCD & PID	502.2 [4]			
P&T/GC/MS	524.2			
LLE/GC/ECD	551.1			
HAA5				
LLE/GC/ECD		6251 B[5]	6251 B-94	
SPE/GC/ECD	552.1[5]			
LLE/GC/ECD	552.2, 552.3			
Bromate				
IC	300.1			D 6581-00
IC & post column reaction	317.0 Rev 2.0 [6], 326.0[6]			
IC/ICP-MS	321.8[6,7]			
Chlorite				
Amperometric Titration		4500–ClO_2 E[8]	4500-ClO_2 E-00[8]	
Spectrophotometry	327.0 Rev 1.1[8]			
IC	300.0, 300.1, 317.0 Rev. 2.0, 326.0			D 6581-00

1 P&T = purge and trap; GC = gas chromatography; ElCD = electrolytic conductivity detector; PID = photoionization detector; MS = mass spectrometer; LLE = liquid/liquid extraction; ECD = electron capture detector; SPE = solid phase extraction; IC = ion chromatography; ICP-MS = inductively coupled plasma/mass spectrometer.

2 19th and 20th editions of the American Public Health Association's "Standard Methods for the Examination of Water and Wastewater," 1995 and 1998, respectively. Either of these editions may be used.

3 Annual Book of ASTM Standards (2001), or any year containing the cited version of the method, Vol 11.01.

4 If TTHMs are the only analytes being measured in the sample, then a PID is not required.

5 The samples shall be extracted within 14 days of sample collection.

6 Ion chromatography & post column reaction or IC/ICP-MS must be used for monitoring of bromate for purposes of demonstrating eligibility of reduced monitoring, as prescribed in Section 7.6.3(b)(3)(ii).

7 Samples shall be preserved at the time of sampling with 50 mg ethylenediamine (EDA)/L of sample and must be analyzed within 28 days.

8 Amperometric titration may be used for routine daily monitoring of chlorite at the entrance to the distribution system, as pre-scribed in section 7.6.3 (b)(2)(i)(A). Ion chromatography must be used for routine monthly monitoring of chlorite and additional monitoring of chlorite in the distribution system, as prescribed in section 7.6.3(b)(2)(i)(B) and (b)(2)(ii).

9 The Standard Methods Online version that is approved is indicated by the last two digits in the method number which is the year of approval by the Standard Method Committee. Standard Methods Online are available at http://www.standardmethods.org.

(b) Analysis under this section 10.7 for disinfection byproducts must be conducted by laboratories that have received certification by the EPA or the Department, except as specified under section 10.7.2(c) of this section. To receive certification to conduct analyses for the contaminants in sections 2.4, 7.6, 7.7 and 7.8, the laboratory must:

(1) Analyze Performance Evaluation (PE) samples that are acceptable to the Department at least once during each consecutive 12 month period by each method for which the laboratory desires certification.

(2) Beginning April 1, 2007, the laboratory must achieve quantitative results on the PE sample analyses that are within the following acceptance limits:

Table 10-25 Acceptance Limits for Quantitative Results on PE Sample Analyses

DBP	Acceptance limits (percent of true value)	Comments
TTHM		
Chloroform	±20	Laboratory must meet all 4 individual THM acceptance limits in order to successfully pass a PE sample for TTHM
Bromodichloromethane	±20	
Dibromochloromethane	±20	
Bromoform	±20	
HAA5		
Monochloroacetic Acid	±40	Laboratory must meet the acceptance limits for 4 out of 5 of the HAA5 compounds in order to successfully pass a PE sample for HAA5
Dichloroacetic Acid	±40	
Trichloroacetic Acid	±40	
Monobromoacetic Acid	±40	
Dibromoacetic Acid	±40	

Chlorite	±30	
Bromate	±30	

(3) Beginning April 1, 2007, report quantitative data for concentrations at least as low as the ones listed in the following table for all DBP samples analyzed for compliance with sections 2.4, 7.6, 7.7 and 7.8:

Table 10-26 Minimum Reporting Level for Quantitative Data for DBP Samples

DBP	Minimum reporting level (mg/L) [1]	Comments
TTHM [2]		
Chloroform	0.0010	
Bromodichloromethane	0.0010	
Dibromochloromethane	0.0010	
Bromoform	0.0010	
HAA5[2]		
Monochloroacetic Acid	0.0020	
Dichloroacetic Acid	0.0010	
Trichloroacetic Acid	0.0010	
Monobromoacetic Acid	0.0010	
Dibromoacetic Acid	0.0010	
Chlorite	0.020	Applicable to monitoring as prescribed in Section7.6.3(b)(2)(1)(B) and (b)(2)(ii).
Bromate	0.0050 or 0.0010	Laboratories that use EPA Methods 317.0 Revision 2.0, 326.0 or 321.8 must meet a 0.0010 mg/L MRL for bromate.

1 The calibration curve must encompass the regulatory minimum reporting level (MRL) concentration. Data may be reported for concentrations lower than the regulatory MRL as long as the precision and accuracy criteria are met by analyzing an MRL check standard at the lowest reporting limit chosen by the laboratory. The laboratory must verify the accuracy of the calibration curve at the MRL concentration by analyzing an MRL check standard with a concentration less than or equal to 110% of the MRL with each batch of samples. The measured concentration for the MRL check standard must be ±50% of the expected value, if any field sample in the batch has a concentration less than 5 times the regulatory MRL. Method requirements to analyze higher concentration check standards and meet tighter acceptance criteria for them must be met in addition to the MRL check standard requirement.

2 When adding the individual trihalomethane or haloacetic acid concentrations to calculate the TTHM or HAA5 concentrations, respectively, a zero is used for any analytical result that is less than the MRL concentration for that DBP, unless otherwise specified by the Department.

(c) A party approved by the Department must measure daily chlorite samples at the entrance to the distribution system.

10.7.3 Disinfectant Residual Analytical Requirements

(a) Systems shall measure residual disinfectant concentrations for free chlorine, combined chlorine (chloramines), and chlorine dioxide by the methods listed in Table 10-27 or one of the alternative methods listed in Table 10-30:

Table 10-27 Approved Methods For Disinfectant Residual Compliance Monitoring

Methodology	Standard method	SM Online [2]	ASTM method	Residual Measured [1]				
				EPA method	Free chlorine	Combined chlorine	Total chlorine	Chlorine dioxide
Amperometric Titration.	4500–Cl D	4500-C D-00	D 1253–86 (96), 03		X	X	X	
Low Level Amperometric Titration.	4500–Cl E	4500-C E-00					X	
DPD Ferrous Titrimetric.	4500–Cl F	4500-C F-00			X	X	X	
DPD Colorimetric.	4500–Cl G	4500-C G-00			X	X	X	
Syringaldazine (FACTS).	4500–Cl H	4500-C H-00			X			
Iodometric Electrode.	4500–Cl I	4500-C I-00					X	
DPD	4500–ClO_2 D							X
Amperometric Method II.	4500–ClO_2 E	4500-C O_2 E-00						X
Lissamine Green Spectrophotometric				327.0 Rev 1.1				X

1 X indicates method is approved for measuring specified disinfectant residual. Free chlorine or total chlorine may be measured for demonstrating compliance with the chlorine MRDL and combined chlorine, or total chlorine may be measured for demonstrating compliance with the chloramine MRDL.

2 The Standard Methods Online version that is approved is indicated by the last two digits in the method number which is the year of approval by the Standard Method Committee. Standard Methods Online are available at http://www.standardmethods.org.

(b) If approved by the Department, systems may also measure residual disinfectant concentrations for chlorine, chloramines, and chlorine dioxide by using DPD colorimetric test kits.

(c) A party approved by the Department must measure residual disinfectant concentration.

10.7.4 Additional Analytical Methods

Systems required to analyze parameters not included in Tables 10-24 and 10-27 must use the following methods or one of the alternative methods listed in Table 10-30. A party approved by the Department must measure these parameters.

(a) Alkalinity. All methods allowed in Table 10-5 for measuring alkalinity.

(b) Bromide. EPA Method 300.0 or EPA Method 300.1, 317.0 Revision 2.0, 326.0, or ASTM D 6581-00.

(c) Total Organic Carbon (TOC). The following analytical methods shall be used for measuring TOC. Standard Method 5310 B or 5310 B–00 (High-Temperature Combustion Method) or Standard Method 5310 C or 5310 C–00 (Persulfate-Ultraviolet or Heated-Persulfate Oxidation Method) or Standard Method 5310 D or 5310 D–00 (Wet-Oxidation Method) or EPA Method 415.3, Revision 1.1. Inorganic carbon must be removed from the samples prior to analysis. TOC samples may not be filtered prior to analysis. TOC samples must be acidified at the time of sample collection to achieve pH less than or equal to 2 with minimal addition of the acid specified in the method or by the instrument manufacturer. Acidified TOC samples must be analyzed within 28 days.

(d) Specific Ultraviolet Absorbance (SUVA). SUVA is equal to the UV absorption at 254nm (UV_{254}) (measured in m^{-1} divided by the dissolved organic carbon (DOC) concentration (measured as mg/L). In order to determine SUVA, it is necessary to separately measure UV_{254} and DOC. When determining SUVA, systems must use the methods stipulated in section 10.7.4 (d)(1) to measure DOC and the method stipulated in section 10.7.4 (d)(2) to measure UV_{254}. SUVA must be determined on water prior to the addition of disinfectants/oxidants by the system. DOC and UV_{254} samples used to determine a SUVA value must be taken at the same time and at the same location.

(1) Dissolved Organic Carbon (DOC). The following analytical methods shall be used for measuring DOC. Standard Method 5310 B or 5310 B–00 (High-Temperature Combustion Method) or Standard Method 5310 C or 5310 C–00 (Persulfate-Ultraviolet or Heated-Persulfate Oxidation Method) or Standard Method 5310 D or 5310 D–00 (Wet-Oxidation Method) or EPA Method 415.3, Revision 1.1. DOC samples must be filtered through the 0.45 µm pore-diameter filter as soon as practical after sampling, not to exceed 48 hours. After filtration, DOC samples must be acidified to achieve pH less than or equal to 2 with minimal addition of the acid specified in the method or by the instrument manufacturer. Acidified DOC samples must be analyzed within 28 days of sample collection. Inorganic carbon must be removed from the samples prior to analysis. Water passed through the filter prior to filtration of the sample must serve as the filtered blank. This filtered blank must be analyzed using procedures identical to those used for analysis of the samples and must meet the following criteria: DOC < 0.5 mg/L.

(2) Ultraviolet Absorption at 254 nm (UV_{254}). The following analytical methods shall be used for measuring Ultraviolet Absorption. Standard Method 5910 B or 5910 B–00 (Ultraviolet Absorption Method) or EPA Method 415.3 Revision 1.1. UV absorption must be measured at 253.7 nm (may be rounded off to 254 nm). Prior to analysis, UV_{254} samples must be filtered through a 0.45 µm pore-diameter filter. The pH of UV_{254} samples may not be adjusted. Samples must be analyzed as soon as practical after sampling, not to exceed 48 hours.

(e) pH. Any of the methods in Table 10-5 shall be used for measuring pH.

(f) Magnesium. Any of the methods in Table 10-5(15) shall be used for measuring magnesium.

10.8 Lead and Copper Analytical Requirements

10.8.1 Lead and Copper Analysis

(a) Analyses for lead, copper, pH, conductivity, calcium, alkalinity, orthophosphate, silica, and temperature shall be conducted with the methods in Table 10-5.

(1) Analyses for alkalinity, calcium, conductivity, orthophosphate, pH, silica, and temperature may be performed by any person acceptable to the Department. Analyses under this section for lead and copper shall only be conducted by laboratories that have been

certified by EPA or the Department. To obtain certification to conduct analyses for lead and copper, laboratories must:

(i) Analyze Performance Evaluation samples, which include lead and copper, provided by a third party, with approval by the Department, at least once a year by each method for which the laboratory desires certification; and

(ii) Achieve quantitative acceptance limits as follows:

(A) For Lead: ±30 percent of the actual amount in the Performance Evaluation sample when the actual amount is greater than or equal to 0.005 mg/L. The Practical Quantitation Level, or PQL for lead is 0.005 mg/L.

(B) For Copper: ±10 percent of the actual amount in the Performance Evaluation sample when the actual amount is greater than or equal to 0.050 mg/L. The Practical Quantitation Level, or PQL for copper is 0.050 mg/L.

(iii) Achieve the method detection limit for lead of 0.001 mg/L according to the procedures in Appendix B of 40 CFR Part 136, July 1, 2004. This need only be accomplished if the laboratory will be processing source water composite samples under section 8.4.

(iv) Be currently certified by EPA or the Department to perform analyses to the specifications described in section 10.8.1 (a)(1).

(2) The Department has the authority to allow the use of previously collected monitoring data for purposes of monitoring, if the data were collected and analyzed in accordance with the requirements of this Article 10.

(3) All lead and copper levels measured between the PQL and MDL must be either reported as measured or they can be reported as one-half the PQL specified for lead and copper in section 10.8.1(a)(1)(ii). All levels below the lead and copper MDLs must be reported as zero.

(4) All copper levels measured between the PQL and the MDL must be either reported as measured or they can be reported as one-half the PQL (0.025 mg/L). All levels below the copper MDL must be reported as zero.

10.9 Alternate Analytical Techniques

10.9.1 Use of Other Analytical Methods

(a) With the written permission of the Department, concurred in by the EPA Administrator, an alternate analytical technique from those listed in this Article 10 may be employed.

(b) An alternate technique shall be accepted only if it is substantially equivalent to the prescribed test in both precision and accuracy as it relates to the determination of compliance with any MCL. The use of the alternate analytical technique shall not decrease the frequency of monitoring required by the Colorado Primary Drinking Water Regulation.

10.10 Certified Laboratories and Laboratory Certification

10.10.1 Certified Laboratories

(a) Unless otherwise stated in Article 10, when determining compliance with Articles 5 through 8 and 13, samples may be considered only if they have been analyzed by a laboratory certified by the Department except that measurements for alkalinity, calcium, conductivity, disinfectant residual, orthophosphate, pH, silica, temperature and turbidity may be performed by an operator that has been certified in accordance with Regulation 100, 5 C.C.R. 1003-2.

(b) The Department laboratory certification program will certify laboratories in accordance with EPA requirements and/or those listed in this section 10.10.

10.10.2 Laboratory Certification for Inorganic Chemical Contaminants

(a) Analysis under section 6.1 shall only be conducted by laboratories that have been certified by the Department. To receive certification to conduct analyses for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, nitrate, nitrite and selenium and thallium, the laboratory must:

(1) Analyze Performance Evaluation samples provided by a third party (with the approval of the Department) at least once a year.

(2) For each chemical contaminant that has been included in the PE sample and for each method for which the laboratory desires certification achieve quantitative results on the analyses that are within the following acceptance limits:

Table 10-28 Acceptable Limits for Performance Evaluation Sample Analysis for Inorganic Chemical Contaminant Laboratory Certification

Contaminant	Acceptance limit
Antimony	±30 at ≥0.006 mg/L
Arsenic	±30 at ≥0.003 mg/L
Asbestos	2 standard deviations based on study statistics
Barium	±15% at ≥0.15 mg/L
Beryllium	±15% at ≥0.001 mg/L
Cadmium	±20% at ≥0.002 mg/L
Chromium	±15% at ≥0.01 mg/L
Cyanide	±25% at ≥0.1 mg/L
Fluoride	±10% at ≥1 to 10 mg/L
Mercury	±30% at ≥0.0005 mg/L
Nickel	±15% at ≥0.01 mg/L
Nitrate	±10% at ≥0.4 mg/L
Nitrite	±15% at ≥0.4 mg/L

Selenium	±20% at ≥0.01 mg/L
Thallium	±30% at ≥0.002 mg/L

10.10.3 Laboratory Certification for Volatile Organic Compounds (VOCs)

(a) Analysis under section 6.2.5 shall only be conducted by laboratories that are certified by the Department according to the following conditions:

(1) To receive certification to conduct analyses for the chemical contaminants in Table 2-1 (2) through (21) the laboratory must:

(i) Analyze Performance Evaluation samples provided by a third party (with the approval of the Department) at least once a year by each method for which the laboratory desires certification.

(ii) Achieve the quantitative acceptance limits under sections 10.10.3(a)(1)(iii) and (iv) for at least 80 percent of the regulated organic Chemical contaminants included in the Performance Evaluation sample.

(iii) Achieve quantitative results on the analyses performed under section 10.10.3(a)(1)(i) that are within ±20% of the actual amount of the substances in the Performance Evaluation sample when the actual amount is greater than or equal to 0.010 mg/L.

(iv) Achieve quantitative results on the analyses performed under section 10.10.3(a)(1)(i) that are within ±40 percent of the actual amount of the substances in the Performance Evaluation sample when the actual amount is less than 0.010 mg/L.

(v) Achieve a method detection limit of 0.0005 mg/L, according to the procedures in appendix B of 40 CFR Part 136.

(2) To receive certification to conduct analyses for vinyl chloride, the laboratory must:

(i) Analyze Performance Evaluation samples provided by a third party (with the approval of the Department) at least once a year by each method for which the laboratory desires certification.

(ii) Achieve quantitative results on the analyses performed under section 10.9.1 (a)(2)(i) that are within ±40 percent of the actual amount of vinyl chloride in the Performance Evaluation sample.

(iii) Achieve a method detection limit of 0.0005 mg/L, according to the procedures in appendix B of 40 CFR Part 136.

(iv) Obtain certification for the Chemical contaminants listed in Table 2-1(2) through (21).

(b) Each certified laboratory must determine the method detection limit (MDL), as defined in appendix B to 40 CFR Part 136, at which it is capable of detecting VOCs. The acceptable MDL is 0.0005 mg/L. This concentration is the detection concentration for purposes of this section.

10.10.4 Laboratory Certification for Synthetic Organic Chemiclas (SOCs)

10.10 Certified Laboratories and Laboratory Certification

(a) Analysis for SOCs under section 6.2.6 shall only be conducted by laboratories that have received certification by the Department and have met the following conditions:

(1) To receive certification to conduct analyses for the chemical contaminants in Table 2-2 the laboratory must:

(i) Analyze Performance Evaluation samples provided by a third party (with the approval of the Department) at least once a year by each method for which the laboratory desires certification.

(ii) For each chemical contaminant that has been included in the performance evaluation sample achieve quantitative results on the analyses that are within the following acceptance limits:

Table 10-29 Acceptable Limits for PE Sample Analysis for SOC Laboratory Certification

Contaminant	**Acceptance limits (%-percent)**
DBCP	±40
EDB	±40.
Alachlor	±45.
Atrazine	±45.
Benzo[a]pyrene	2 standard deviations.
Carbofuran	±45.
Chlordane	±45.
Dalapon	2 standard deviations.
Di(2-ethylhexyl)adipate	2 standard deviations.
Di(2-ethylhexyl)phthalate	2 standard deviations.
Dinoseb	2 standard deviations.
Diquat	2 standard deviations.
Endothall	2 standard deviations.
Endrin	±30.
Glyphosate	2 standard deviations.
Heptachlor	±45.
Heptachlor epoxide	±45.
Hexachlorobenzene	2 standard deviations.

Hexachlorocyclopentadiene	2 standard deviations.
Lindane	±45.
Methoxychlor	±45.
Oxamyl	2 standard deviations.
PCBs (as Decachlorobiphenyl)	0-200.
Picloram	2 standard deviations.
Simazine	2 standard deviations.
Toxaphene	±45.
Aldicarb	2 standard deviations.
Aldicarb sulfoxide	2 standard deviations.
Aldicarb sulfone	2 standard deviations.
Pentachlorophenol	±50.
2,3,7,8-TCDD (Dioxin)	2 standard deviations.
2,4-D	±50.
2,4,5-TP (Silvex)	±50.

10.10.5 Laboratory Certification for *Cryptosporidium* and E. *coli*

(a) Cryptosporidium. Systems must have Cryptosporidium samples analyzed by a laboratory that is approved under EPA's Laboratory Quality Assurance Evaluation Program for Analysis of Cryptosporidium in Water or a laboratory that has been certified for Cryptosporidium analysis by an equivalent Department laboratory certification program.

(b) E. *coli*. Any laboratory certified by the EPA, the National Environmental Laboratory Accreditation Conference or the Department for total coliform or fecal coliform analysis under section 10.10.1 is approved for E. *coli* analysis under this section when the laboratory uses the same technique for E. *coli* that the laboratory uses for Turbidity. Measurements of turbidity must be made by a party approved by the Department.

10.11 Laboratory Compositing

10.11.1 Compositing of Samples by the Laboratory

(a) Compositing of samples must be done in the laboratory and analyzed within 14 days of sample collection.

(b) Compositing samples prior to GC analysis.

(1) Add 5 mL or equal larger amounts of each sample (up to 5 samples are allowed) to a 25 mL glass syringe. Special precautions must be made to maintain zero headspace in the syringe.

(2) The samples must be cooled at 4°C during this step to minimize volatilization losses.

(3) Mix well and draw out a 5 mL aliquot for analysis.

(4) Follow sample introduction, purging, and desorption steps described in the method.

(5) If less than five samples are used for compositing, a proportionately small syringe may be used.

(c) Compositing samples prior to GC/MS analysis.

(1) Inject 5 mL or equal larger amounts of each aqueous sample (up to 5 samples are allowed) into a 25 mL purging device using the sample introduction technique described in the method.

(2) The total volume of the sample in the purging device must be 25 mL.

(3) Purge and desorb as described in the method.

10.12 Alternative Testing Methods Approved for Analyses

Only the editions stated in the following table are approved.

Table 10-30

Alternative testing methods for contaminants listed in Section 10.1.1(a)			
Organism	Methodology	SM 21st Edition [1]	Other
Total Coliforms	Total Coliform Fermentation Technique	9221 A, B	
	Total Coliform Membrane Filter Technique	9222 A, B, C	
	Presence-Absence (P-A) Coliform Test	9221 D	
	ONPG-MUG Test	9223	
	Colitag™		Modified Colitag™ [13]

Alternative testing methods for contaminants listed in Section 10.1.3(a)					
Organism	Methodology	SM 20th Edition [6]	SM 21st Edition [1]	SM Online [3]	Other
E.coli	ONPG-MUG Test	9223B	9223 B	9223 B-97	
					Modified Colitag™ [13]

Alternative testing methods for contaminants listed in Section 10.2.2(a)						
Contaminant	Methodology	EPA Method	SM 21st Edition [1]	SM Online [3]	ASTM [4]	Other
Alkalinity	Titrimetric		2320 B			
Antimony	Hydride – Atomic Absorption				D 3697-07	

	Atomic Absorption; Furnace		3113 B			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]				
Arsenic	Atomic Absorption; Furnace		3113 B		D 2972-08 C	
	Hydride Atomic Absorption		3114 B		D 2972-08 B	
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Barium	Inductively Coupled Plasma		3120 B			
	Atomic Absorption; Direct		3111 D			
	Atomic Absorption; Furnace		3113 B			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Beryllium	Inductively Coupled Plasma		3120 B			
	Atomic Absorption; Furnace		3113 B		D 3645-08 B	
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Cadmium	Atomic Absorption; Furnace		3113 B			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Calcium	EDTA titrimetric		3500-Ca B		D 511-09 A	
	Atomic Absorption; Direct Aspiration		3111 B		D 511-09 B	
	Inductively Coupled Plasma		3120 B			

	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Chromium	Inductively Coupled Plasma		3120 B			
	Atomic Absorption; Furnace		3113 B			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Copper	Atomic Absorption; Furnace		3113 B		D 1688-07 C	
	Atomic Absorption; Direct Aspiration		3111 B		D 1688-07 A	
	Inductively Coupled Plasma		3120 B			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Conductivity	Conductance		2510 B			
Cyanide	Manual Distillation followed by				D2036-06 A	
	Spectrophotometric, Amenable		4500-CN^- G		D2036-06 B	
	Spectrophotometric Manual		4500-CN^- E		D2036-06 A	
	Selective Electrode		4500-CN^- F			
	Gas Chromatography/Mass Spectrometry Headspace					ME355.01 [7]
Fluoride	Ion Chromatography		4110 B			
	Manual Distillation; Colorimetric SPADNS		4500-F^- B, D			
	Manual Electrode		4500-F^- C		D1179-04 B	
	Automated Alizarin		4500-F^- E			
Lead	Atomic Absorption; Furnace		3113 B		D 3559-08 D	

	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Magnesium	Atomic Absorption		3111 B		D 511-09 B	
	Inductively Coupled Plasma		3120 B			
	Complexation Titrimetric Methods		3500-Mg B		D 511-09 A	
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Mercury	Manual, Cold Vapor		3112 B			
Nickel	Inductively Coupled Plasma		3120 B			
	Atomic Absorption; Direct		3111 B			
	Atomic Absorption; Furnace		3113 B			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Nitrate	Ion Chromatography		4110 B			
	Automated Cadmium Reduction		4500-NO_3^- F			
	Manual Cadmium Reduction		4500-NO_3^- E			
	Ion Selective Electrode		4500-NO_3^- D			
	Reduction/Colorimetric					Systea Easy (1-Reagent) [8]
Nitrite	Ion Chromatography		4110 B			
	Automated Cadmium Reduction		4500-NO_3^- F			
	Manual Cadmium Reduction		4500-NO_3^- E			
	Spectrophotometric		4500-NO_2^- B			
	Reduction/Colorimetric					Systea Easy (1-Reagent)

						[8]
Orthophosphate	Ion Chromatography		4110 B			
	Colorimetric, ascorbic acid, single reagent		4500-P E	4500-P E-99		
	Colorimetric, Automated, Ascorbic Acid		4500-P F	4500-P F-99		
pH	Electrometric		4500-H^+ B			
Selenium	Hydride-Atomic Absorption		3114 B		D 3859-08 A	
	Atomic Absorption; Furnace		3113 B		D 3859-08 B	
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Silica	Colorimetric				D859-05	
	Molybdosilicate		4500-SiO_2 C			
	Heteropoly blue		4500-SiO_2 D			
	Automated for Molybdate-reactive Silica		4500-SiO_2 E			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
	Inductively Coupled Plasma		3120 B			
Sodium	Atomic Absorption; Direct Aspiration		3111 B			
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2				
Temperature	Thermometric		2550			

Alternative testing methods for contaminants listed in Section 10.3

Contaminant	Methodology	EPA Method	SM 21st Edition [1]	SM Online [3]

Benzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3 [9]		
Carbon tetrachloride	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Chlorobenzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
1,2-Dichlorobenzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
1,4-Dichlorobenzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
1,2-Dichloroethane	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
cis-Dichloroethylene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Trans-Dichloroethylene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Dichloromethane	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
1,2-Dichloropropane	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Ethylbenzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Styrene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Tetrachloroethylene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
1,1,1-Trichloroethane	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Trichloroethylene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Toluene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
1,2,4-Trichlorobenzene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
1,1-Dichloroethylene	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		

1,1,2-Trichlorethane	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Vinyl chloride	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Xylenes (total)	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Carbofuran	High-performance liquid chromatography (HPLC) with post-column derivatization and fluorescence detection		6610 B	6610 B-04
Dibromochloropropane (DBCP)	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Ethyl dibromide (EDB)	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		
Oxamyl	High-performance liquid chromatography (HPLC) with post-column derivatization and fluorescence detection		6610 B	6610 B-04
Total Trihalomethanes	Purge &Trap/Gas Chromatography/Mass Spectrometry	524.3		

Alternative testing methods for contaminants listed in Section 10.4.1(a)

Contaminant	Methodology	SM 21st Edition [1]	ASTM [4]
Naturally Occurring:			
Gross alpha and beta	Evaporation	7110 B	
Gross alpha	Coprecipitation	7110 C	
Radium 226	Radon emanation	7500-Ra C	
	Radiochemical	7500-Ra B	
Radium 228	Radiochemical	7500-Ra D	
Uranium	Radiochemical	7500-U B	
	ICP-MS		D5673-05
	Alpha spectrometry	7500-U C	
Man-Made:			
Radioactive Cesium	Radiochemical	7500-Cs B	
	Gamma Ray Spectrometry	7120	
Radioactive Iodine	Radiochemical	7500-I B 7500-I C 7500-I D	
	Gamma Ray Spectrometry	7120	
Radioactive Strontium 89, 90	Radiochemical	7500-Sr B	

Tritium	Liquid Scintillation	7500-^{3}H B	
Gamma Emitters	Gamma Ray Spectrometry	7120 7500-Cs B 7500-I B	

Alternative testing methods for contaminants listed in Section 10.5.1(a)(1)

Organism	Methodology	SM 21st Edition [1]	Other
Heterotrophic bacteria	Pour Plate Method	9215 B	
Turbidity	Nephelometric Method	2130 B	
	Laser Nephelometry (on-line)		Mitchell M5271 [10]
	LED Nephelometry (on-line)		Mitchell M5331 [11]
	LED Nephelometry (on-line)		AMI Turbiwell [15]
	LED Nephelometry (portable)		Orion AQ4500 [12]

Alternative testing methods for disinfectant residuals listed in Section 10.5.1(a)(2)

Residual	Methodology	SM 21st Edition [1]	ASTM [4]	Other
Free Chlorine	Amperometric Titration	4500-Cl D	D 1253-08	
	DPD Ferrous Titrimetric	4500-Cl F		
	DPD Colorimetric	4500-Cl G		
	Syringaldazine (FACTS)	4500-Cl H		
	On-line Chlorine Analyzer			EPA 334.0 [16]
	Amperometric Sensor			ChloroSense [17]
Total Chlorine	Amperometric Titration	4500-Cl D	D 1253-08	
	Amperometric Titration (Low level measurement)	4500-Cl E		
	DPD Ferrous Titrimetric	4500-Cl F		
	DPD Colorimetric	4500-Cl G		
	Iodometric Electrode	4500-Cl I		
	On-line Chlorine Analyzer			EPA 334.0 [16]
	Amperometric Sensor			ChloroSense [17]
Chlorine Dioxide	Amperometric Titration	4500–ClO_2 C		
	Amperometric Titration	4500–ClO_2 E		
Ozone	Indigo Method	4500–O_3 B		

Alternative testing methods for contaminants listed in Section 10.7.2(a)

Contaminant	Methodology	EPA Method	ASTM [4]	SM 21st Edition [1]
TTHM	P&T/GC/MS	524.3 [9]		
HAA5	LLE (diazomethane)/GC/ECD			6251 B

	Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI-MS/MS)	557 [14]		
Bromate	Two-Dimensional Ion Chromatography (IC)	302.0 [18]		
	Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI-MS/MS)	557 [14]		
	Chemically Suppressed Ion Chromatography		D 6581-08 A	
	Electrolytically Suppressed Ion Chromatography		D 6581-08 B	
Chlorite	Chemically Suppressed Ion Chromatography		D 6581-08 A	
	Electrolytically Suppressed Ion Chromatography		D 6581-08 B	
Chlorite – daily monitoring as prescribed in 7.6.3(b)(2)(i)(A)	Amperometric Titration			4500–ClO_2 E

Alternative testing methods for disinfectant residuals listed in Section 10.7.3(a)

Residual	Methodology	SM 21st Edition [1]	ASTM [4]	Other
Free Chlorine	Amperometric Titration	4500-Cl D	D 1253-08	
	DPD Ferrous Titrimetric	4500-Cl F		
	DPD Colorimetric	4500-Cl G		
	Syringaldazine (FACTS)	4500-Cl H		
	Amperometric Sensor			ChloroSense [17]
	On-line Chlorine Analyzer			EPA 334.0 [16]
	Test Strips			Method D99-003 [5]
Combined Chlorine	Amperometric Titration	4500-Cl D	D 1253-08	
	DPD Ferrous Titrimetric	4500-Cl F		
	DPD Colorimetric	4500-Cl G		
Total Chlorine	Amperometric Titration	4500-Cl D	D 1253-08	
	Low level Amperometric Titration	4500-Cl E		
	DPD Ferrous Titrimetric	4500-Cl F		
	DPD Colorimetric	4500-Cl G		
	Iodometric Electrode	4500-Cl I		
	Amperometric Sensor			ChloroSense [17]
	On-line Chlorine Analyzer			EPA 334.0 [16]
Chlorine Dioxide	Amperometric Method II	4500–ClO_2 E		

Alternative testing methods for parameters listed in Section 10.7.4

Parameter	Methodology	SM 21st Edition [1]	EPA
Total Organic Carbon (TOC)	High Temperature Combustion	5310 B	415.3, Rev 1.2 [19]
	Persulfate-Ultraviolet or Heated Persulfate Oxidation	5310 C	415.3, Rev 1.2
	Wet Oxidation	5310 D	415.3, Rev 1.2
Specific Ultraviolet Absorbance (SUVA)	Calculation using DOC and UV_{254} data		415.3, Rev 1.2

Dissolved Organic Carbon (DOC)	High Temperature Combustion	5310 B	415.3, Rev 1.2
	Persulfate-Ultraviolet or Heated Persulfate Oxidation	5310 C	415.3, Rev 1.2
	Wet Oxidation	5310 D	415.3, Rev 1.2
Ultraviolet absorption at 254 nm (UV_{254})	Spectrophotometry	5910 B	415.3, Rev 1.2

Alternative testing methods with MRL ≤ 0.0010 mg/L for monitoring listed in Section 7.6.3(b)(3)(ii)(A)

Contaminant	Methodology	EPA Method
Bromate	Two-Dimensional Ion Chromatography (IC)	302.0 [18]
	Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI-MS/MS)	557 [14]

Alternative testing methods for contaminants listed in Section 10.1.5(b)

Methodology	SM 20th Edition [6]	SM 21st Edition [1]	SM Online [3]
Colilert		9223 B	9223 B-97
Colisure		9223 B	9223 B-97
Colilert-18	9223 B	9223 B	9223 B-97
Multiple-Tube Technique			9230 B-04

Alternative testing methods for contaminants listed in Section 10.1.3(c)

Organism	Methodology	SM 20th Edition [6]
E. coli	Membrane Filtration, Two Step	9222 D/9222 G

Alternative testing methods for contaminants listed in Section 3.4

Contaminant	Methodology	EPA Method	ASTM [4]	SM 21st Edition [1]	SM Online [3]
Aluminum	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 [2]			
	Atomic Absorption; Direct			3111 D	
	Atomic Absorption; Furnace			3113 B	
	Inductively Coupled Plasma			3120 B	
Chloride	Silver Nitrate Titration		D 512-04 B	4500-Cl^- B	
	Ion Chromatography			4110 B	
	Potentiometric Titration			4500-Cl^- D	
Color	Visual Comparison			2120 B	
Foaming Agents	Methylene Blue Active Substances (MBAS)			5540 C	
Iron	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
	Atomic Absorption; Direct			3111 B	

	Atomic Absorption; Furnace			3113 B	
	Inductively Coupled Plasma			3120 B	
Manganese	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
	Atomic Absorption; Direct			3111 B	
	Atomic Absorption; Furnace			3113 B	
	Inductively Coupled Plasma			3120 B	
Odor	Threshold Odor Test			2150 B	
Silver	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
	Atomic Absorption; Direct			3111 B	
	Atomic Absorption; Furnace			3113 B	
	Inductively Coupled Plasma			3120 B	
Sulfate	Ion Chromatography			4110 B	
	Gravimetric with ignition of residue			4500-SO_4^{-2} C	4500-SO_4^{-2} C-97
	Gravimetric with drying of residue			4500-SO_4^{-2} D	4500-SO_4^{-2} D-97
	Turbidimetric method		D 516-07	4500-SO_4^{-2} E	4500-SO_4^{-2} E-97
	Automated methylthymol blue method			4500-SO_4^{-2} F	4500-SO_4^{-2} F-97
Total Dissolved Solids	Total Dissolved Solids Dried at 180 deg C			2540 C	
Zinc	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
	Atomic Absorption; Direct Aspiration			3111 B	
	Inductively Coupled Plasma			3120 B	

1 Standard Methods for the Examination of Water and Wastewater, 21st edition (2005). Available from American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

2 EPA Method 200.5, Revision 4.2. "Determination of Trace Elements in Drinking Water by Axially Viewed Inductively Coupled Plasma-Atomic Emission Spectrometry." 2003. EPA/600/R-06/115. (Available at http://www.epa.gov/nerlcwww/ordmeth.htm.)

3 Standard Methods Online are available at http://www.standardmethods.org. The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

4 Available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or http://astm.org. The methods listed are the only alternative versions that may be used.

5 Method D99-003, Revision 3.0. "Free Chlorine Species (HOCl- and OCl-) by Test Strip," November 21, 2003. Available from Industrial Test Systems, Inc., 1875 Langston St., Rock Hill, SC 29730.

6 Standard Methods for the Examination of Water and Wastewater, 20th edition (1998). Available from American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

7 Method ME355.01, Revision 1.0. "Determination of Cyanide in Drinking Water by GC/MS Headspace," May 26, 2009. Available at http://www.nemi.gov or from James Eaton, H & E Testing Laboratory, 221 State Street, Augusta, ME 04333. (207) 287-2727.

8 Systea Easy (1-Reagent). "Systea Easy (1-Reagent) Nitrate Method," February 4, 2009. Available at http://www.nemi.gov or from Systea Scientific, LLC., 900 Jorie Blvd., Suite 35, Oak Brook, IL 60523.

9 EPA Method 524.3, Version 1.0. "Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry," June 2009. EPA 815-B-09-009. Available at http://epa.gov/safewater/methods/analyticalmethods_ogwdw.html.

10 Mitchell Method M5271, Revision 1.1. "Determination of Turbidity by Laser Nephelometry," March 5, 2009. Available at http://www.nemi.gov or from Leck Mitchell, Ph.D., PE, 656 Independence Valley Dr., Grand Junction, CO 81507.

11 Mitchell Method M5331, Revision 1.1. "Determination of Turbidity by LED Nephelometry," March 5, 2009. Available at http://www.nemi.gov or from Leck Mitchell, Ph.D., PE, 656 Independence Valley Dr., Grand Junction, CO 81507.

12 Orion Method AQ4500, Revision 1.0. "Determination of Turbidity by LED Nephelometry," May 8, 2009. Available at http://www.nemi.gov or from Thermo Scientific, 166 Cummings Center, Beverly, MA 01915, http://www.thermo.com.

13 Modified Colitag™ Method. "Modified Colitag™ Test Method for the Simultaneous Detection of *E. coli* and other Total Coliforms in Water (ATP D05-0035)," August 28, 2009. Available at http://www.nemi.gov or from CPI, International, 580 Skylane Boulevard, Santa Rosa, CA 95403.

14 EPA Method 557. "Determination of Haloacetic Acids, Bromate, and Dalapon in Drinking Water by Ion Chromatography Electrospray Ionization Tandem Mass Spectrometry (IC-ESI-MS/MS)," August 2009. EPA 815-B-09-012. Available at http://epa.gov/safewater/methods/analyticalmethods_ogwdw.html.

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Article 11 Sanitary Surveys and Composite Correction Program

11.1 Sanitary Surveys

(a) Public water systems must provide the Department, at the Department's request, any existing information that will enable the Department to conduct a sanitary survey.

(b) A sanitary survey includes but is not limited to, an onsite review of the water source(s) (identifying sources of contamination by using results of source water assessments or other relevant information where available), facilities, equipment, operation, maintenance, and monitoring compliance of a public water system to evaluate the adequacy of the system, its sources and operations and the distribution of safe drinking water.

(c) Sanitary surveys must be performed by the Department or by a third party approved by the Department in accordance with section 1.7. The public water system is responsible for ensuring the survey takes place. In the event that a sanitary survey has not been performed within the time-period specified in section 11.2, the system must notify the Department and schedule the survey prior to the end of the time period.

11.2 Sanitary Survey Frequency

A sanitary survey must be completed for all public water systems at a frequency as follows:

Prior to December 1, 2009, public water systems must comply with sections 11.2(a) through 11.2(c). Beginning on December 1, 2009, public water systems must comply with sections 11.2(d) through 11.2(e).

(a) A sanitary survey must be completed for all community and non-community groundwater systems every five years; except for non-community water systems using only disinfected and protected groundwater as determined by the Department, in which case a sanitary survey must be completed at least every 10 years.

(b) A sanitary survey must be completed for all community systems using surface water or groundwater under the direct influence of surface water every three years. For systems determined by the Department to have outstanding performance based on prior sanitary surveys, the frequency of conducting subsequent sanitary surveys may be extended to no less frequently than every five years.

(c) A sanitary survey must be completed for all non-community systems using surface water or groundwater under the direct influence of surface water every five years.

(d) A sanitary survey must be completed no less frequently than every three years for community water systems, except as provided in 11.2(e), and every five years for non-community water systems.

(e) For community systems that provide at least 4-log treatment of viruses before or at the first customer for all sources and have an outstanding performance record, as determined by the Department and documented in previous sanitary surveys, and have no history of total coliform MCL or monitoring violations since the last sanitary survey, the frequency of conducting subsequent surveys may be extended to no less frequently than every five years.

11.3 Sanitary Survey Components

A sanitary survey is composed of, but not limited to, eight components:

(1) Source(s),

(2) Treatment,

(3) Distribution system,

(4) Finished water storage,

(5) Pumps, pump facilities, and controls,

(6) Monitoring, reporting, and data verification,

(7) System management and operation, and

(8) Operator compliance with all requirements of the *Colorado Primary Drinking Water Regulations*, Certified Operator Requirements of Regulation 100 and any other mandated requirements.

11.4 Response to Significant Deficiencies or Violations of Colorado Primary Drinking Water Regulations in a Sanitary Survey Written Notice

Prior to December 1, 2009, public water systems must comply with section 11.4(e). Beginning on December 1, 2009, public water systems must comply with sections 11.4(a) though 11.4(d).

(a) If the Department, or authorized party, detects significant deficiencies or violations of the Colorado Primary Drinking Water Regulations, then the Department, or authorized party, must issue written notice to the public water systems within 30 days of completing site visit activities. If the Department, or authorized party fails to issue the notice within this timeframe, the public water system must still meet all the requirements of the remainder of section 11.4.

(b) A public water system must consult with the Department regarding appropriate corrective action and a schedule for implementing corrective action within 30 days of receiving written notice from the Department, or authorized party, of significant deficiencies or violations, as defined in sections 1.5.2. This consultation may take the form of a telephone conversation, electronic mail, meeting, or other mechanism agreed to by the Department. Groundwater systems with significant deficiencies must implement one or more of the following corrective actions:

(1) Correct all significant deficiencies

(2) Provide an alternate source of water;

(3) Eliminate the source of contamination; or

(4) Provide treatment that reliably achieves at least 4-log treatment of viruses before or at the first customer for the groundwater source.

(c) Within 45 days of receiving notice of significant deficiencies or violations, the system must submit a written response to the Department indicating the corrective actions the system will take to address the significant deficiencies or violations, and include a proposed schedule for completing those actions. The Department will review this response. If approved, this response shall constitute a Department approved corrective action plan as referenced below in section 11.4(d)(2).

(d) Within 120 days (or earlier if directed by the Department) of receiving notification from the Department of significant deficiencies or violations, a public water system must either:

(1) Have completed corrective action in accordance with applicable Department plan review processes including section 1.11 or other Department direction, if any, including Department specified interim measures; or

(2) Be in compliance with a Department approved corrective action plan and schedule subject to the conditions specified in sections 11.4(d)(2)(i) and (d)(2)(ii).

(i) Any subsequent modifications to a Department approved corrective action plan and schedule must also be approved by the Department.

(ii) If the Department specifies interim measures for protection of the public health pending Department approval of the corrective action plan and schedule or pending the completion of the corrective action plan, the system must comply with these interim measures as well as with any schedule specified by the Department.

(e) A public water system must respond in writing to significant deficiencies and violations, as defined in sections 1.5.2, outlined in the sanitary survey report no later than 45 days after receipt of the report. The system must submit a response to the Department indicating the actions the system will take to address the significant deficiencies and violations noted in the survey and include a proposed schedule for completing those corrective actions and achieving compliance.

11.5 Composite Correction Program

A composite correction program consists of two elements, a Comprehensive Performance Evaluation (CPE) and Comprehensive Technical Assistance (CTA).

(a) Comprehensive Performance Evaluation

(1) The CPE, as defined in section 1.5.2(20), must be performed by the Department or by a third party approved by the Department.

(2) A CPE must be completed following individual filter turbidity exceedances as outlined in Article 7.

(3) Anytime a CPE is required to be conducted, the public water system is responsible for ensuring the evaluation takes place within the specified time frames outlined in Article 7.

(4) For purposes of compliance, the CPE must consist of the following:

(i) Assessment of plant performance;

(ii) Evaluation of major unit processes;

(iii) Identification and prioritization of performance limiting factors;

(iv) Assessment of the applicability of Comprehensive Technical Assistance (CTA); and

(v) Preparation of a CPE report.

(b) Comprehensive Technical Assistance (CTA)

(1) The CTA, as defined in section 1.5.2(21), must be completed by the public water system following the CPE if the CPE results indicate the potential for improved performance by the public water system.

(2) During the CTA phase, the public water system must identify and systematically address plant-specific factors as outlined in the CPE and include them in a report to the Department within 90 days of the completion of the CPE.

Article 12 Hazardous Cross-Connection

12.1 Control of Hazardous Cross-Connections

(a) A public water system or a consecutive distribution system of a public water system shall have no uncontrolled cross-connections to a pipe, fixture, or supply, any of which contain water not meeting all applicable provisions of the *Colorado Primary Drinking Water Regulations*.

(b) A supplier of water shall protect the public water system from contamination in the following manner:

(1) Identify potentially uncontrolled hazardous service cross connections.

(2) Require system users to install and maintain containment devices on any uncontrolled hazardous service cross connections, provided the Department has determined that the device is consistent with the degree of hazard posed by the uncontrolled cross connection.

(3) Installation of containment devices shall be approved by the public water system upon installation.

(4) All containment devices shall be tested and maintained as necessary on installation and at least annually thereafter, by a Certified Cross-Connection Control Technician.

(c) Public water systems shall retain maintenance records of all containment devices. Section 1.6.3 requires these records to be available for inspection by Department personnel. All maintenance records shall be kept for three years.

(d) A public water system shall notify the Department of any cross-connection, as defined in section 1.5.2(29), within 10 calendar days of its discovery. The cross-connection shall be corrected within 10 days of being ordered in writing by the Department to correct the problem. Failure to do so may result in an enforcement order.

(e) Violations shall be subject to the provisions and penalties prescribed by sections 25.1.114 and 25.1.114.1, Colorado Revised Statutes, and to such other actions as provided by law.

12.2 Cross-Connection Control Technician Certification

(a) A Certified Cross-Connection Control Technician must possess a valid certification from the American Society of Sanitary Engineering (ASSE), the American Backflow Prevention Association (ABPA), or the Association of Boards of Certification (ABC). The process for certification must include successful completion of an examination administered by one of the approved organizations. Certifications that are not renewed on or before their expiration date shall not be valid after such date.

(b) Cross-Connection Control Technicians certified prior to January 1, 2003 under the program administered by the Colorado Water and Wastewater Collection Systems Certification Council, Inc. shall be considered compliant with the certification requirements of this provision through the scheduled expiration date of their certification except as noted below. Individuals whose certification would otherwise expire between January 1, 2003, and December 31, 2004, will have until December 31, 2004, to obtain certification from one of the organizations approved in 12.1(a) or the certification will lapse as of January 1, 2005.

(c) The Department shall, no less often than once every two years, conduct an evaluation of the certification process of each organization referenced in section 12.2(a) and report the results to the Water Quality Control Commission. The Department shall ensure that the certification processes, including the examination requirement, are adequate to protect public water systems as referenced in section 12.1(b). If the Department concludes, based upon the available facts, that an organization's certification process no longer meets the standards necessary for the purposes of this article, it may request that the Water Quality Control Commission, after notice and comment rulemaking, revoke the organization's standing under Article 12.

Article 13 Groundwater Rule

13.1 General requirements and applicability

(a) *General Requirements and Applicability.* Article 13 applies to all public water systems that use groundwater except that it does not apply to public water systems that combine all of their groundwater with surface water or with groundwater under the direct influence of surface water prior to treatment under Article 7. For the purposes of Article 13, "groundwater system" is defined as any public water system meeting this applicability statement, including consecutive systems receiving finished groundwater.

13.1 General requirements and applicability

(1) **All groundwater systems:** All groundwater systems must comply with the requirements of sections 13.2(a-c) with the following exceptions:

(i) Groundwater systems operating pursuant to a disinfection waiver must comply with section 13.2(d).

(ii) Groundwater systems that have only hand pumped wells must comply with section 13.2(e).

(iii) Groundwater systems that have hand pumped wells and other sources must comply with 13.2(a-c) for groundwater sources that are not hand pumped wells. These systems must comply with section 13.2(e) for groundwater sources that are hand pumped wells.

(iv) Consecutive systems that only serve finished groundwater to the public must comply with sections 13.2(a)(2)(ii), 13.2(b)(2), 13.2(b)(3) and 13.2(c)(2).

(2) **All groundwater systems:** In addition to sections 1.6.3 and 1.6.4, all groundwater systems must comply with the recordkeeping and reporting requirements of sections 13.5 and 13.6.

(3) **All groundwater systems:** All groundwater systems must comply with the sanitary survey information requirements for all groundwater systems as described in section 11.1(a).

(4) **Groundwater systems that do not treat all of their groundwater to at least 4-log treatment:** Groundwater systems must comply with the microbial source water monitoring requirements for groundwater systems that do not treat all of their groundwater to at least 99.99 percent (4-log) treatment of viruses before or at the first customer as described in section 13.3.

(5) **Groundwater systems that have fecally contaminated source waters:** Treatment technique requirements, described in section 13.4, apply to groundwater systems that have fecally contaminated source waters, as determined by source water monitoring conducted under section 13.3. A groundwater system with fecally contaminated source water must implement one or more of the following corrective actions: correct all significant deficiencies; provide an alternate source of water; eliminate the source of contamination; or provide treatment that reliably achieves at least 4-log treatment of viruses before or at the first customer.

(6) **Groundwater systems that provide at least 4-log treatment of viruses before or at the first customer:** Groundwater systems that provide at least 4-log treatment of viruses before or at the first customer are required to conduct compliance monitoring to demonstrate treatment effectiveness, as described in section 13.4(c).

(7) **Groundwater systems that chemically disinfect all groundwater sources:** Groundwater systems that chemically disinfect all groundwater sources must comply with sections 13.2(b)(1) and 13.2(c)(1) by July 1, 2011.

(8) **Groundwater systems that have an approved ultra violet light treatment system as their only means of treatment:** Groundwater systems that have an approved ultra violet light treatment system as their only means of treatment must comply with sections 13.2(a-c) by July 1, 2012.

(9) **Non-community groundwater systems that serve susceptible populations:** Non-community groundwater systems that meet one or both of the following definitions, or non-community groundwater systems that the Department has determined predominantly serve populations susceptible to microbial illness, may no longer operate pursuant to a disinfection waiver and must comply with sections 13.2(a-c) by July 1, 2012:

(i) Schools: Any facility (public, proprietary, parochial, denominational, or eleemosynary) which is maintained for preschool, elementary or secondary educational purposes.

(ii) Child care facilities licensed by the Colorado Department of Human Services under provisions of Sections 26-6-102(1.5), (2.5)(a), (5), (5.1), (8), (9), (10)(a), C.R.S.

(10) Only transient non-community groundwater systems may operate hand pumped wells.

(11) For the purposes of Article 13, “detectable”, in regards to a residual disinfectant concentration, is considered at or above the detection limit of the approved methods in section 10.5.1(a)(2).

(12) If requested by the Department, groundwater systems must provide the Department with any existing information that will enable the Department to perform a hydrogeologic sensitivity assessment.

(13) Community and non-transient non-community groundwater systems using chemical treatment must comply with sections 7.6, 7.7 and 7.8.

(14) Effective November 30, 2010, the Department will no longer approve waivers from disinfection requirements.

13.2 Minimum Treatment Technique Requirements

(a) Groundwater systems must comply with the following treatment technique requirements:

(1) A groundwater source must be disinfected at all times that it is used to serve water to the public. The groundwater system must use disinfection methods that are approved by the Department. Groundwater source disinfection methods may include physical treatment methods but must include at least one chemical treatment method.

(2) The groundwater system must maintain a residual disinfectant concentration whenever serving water from a groundwater source to the public.

(i) For water entering the distribution system at the entry points, maintaining a residual disinfectant concentration means chemical treatment must provide a residual disinfectant concentration at the entry points which cannot be below 0.2 mg/L for longer than a 72 hour period.

(ii) For water throughout the distribution system, maintaining a residual disinfectant concentration means chemical treatment must provide a residual disinfectant concentration in the water throughout the distribution system that cannot be undetectable in more than 5 percent of the samples taken each monitoring period, for any two consecutive monitoring periods that the groundwater system serves water to the public.

(b) Groundwater systems must monitor the effectiveness and reliability of the disinfection treatment required in section 13.2(a):

(1) For water entering the distribution system, the residual disinfection concentration must be measured at the entry point at least once in every week that water from the groundwater source is served to the public.

(i) If any entry point sample measurement falls below 0.2 mg/L residual disinfectant concentration, then the groundwater system must measure the residual disinfectant concentration at that entry point at least every 24 hours from the time of discovery until the residual disinfectant concentration is equal to or greater than 0.2 mg/L.

(2) The residual disinfectant concentration in the distribution system must be measured at least at the same points and at the same time as total coliforms are sampled.

(3) For sections 13.2(b)(1-2), the groundwater system must measure residual disinfectant concentrations as total chlorine, free chlorine or chlorine dioxide using analytical methods specified in section 10.5.1(a)(2). The Department may specify which residual disinfectant the system must measure.

(c) The following constitute treatment technique violations:

(1) Groundwater systems that fail to maintain at least 0.2 mg/L residual disinfectant concentration as required in section 13.2(a)(2)(i) are in violation of the treatment technique if the failure is not corrected within 72 hours of discovery of the failure. In the event of a violation the system must do the following:

(i) The groundwater system must determine and resolve the problems that resulted in the treatment technique violation.

(ii) The groundwater system must document the date, time and duration of the failure, the source of the failure, the steps taken to correct the failure, and what steps will be taken to prevent future failures. The documentation must be available within 48 hours of the resolution of the failure and be provided to the Department upon request.

(iii) The groundwater system must notify the Department as required in section 13.6(a)(1).

(iv) The groundwater system must provide public notice as required in section 9.2.3.

(2) Groundwater systems that fail to maintain a detectable residual disinfectant concentration in the distribution system, as required in section 13.2(a)(2)(ii), are in violation of the treatment technique if the residual disinfectant concentration is undetectable in more than 5 percent of the samples taken each monitoring period, for any two consecutive monitoring periods that the groundwater system serves water to the public. In the event of a violation the system must do the following:

(i) The groundwater system must provide public notice as required in section 9.2.3.

(d) Groundwater systems operating pursuant to a disinfection waiver are waived from the requirements of sections 13.2(a-c) and the following provisions apply:

(1) General Requirements:

(i) The groundwater system must only serve water from groundwater sources.

(ii) The groundwater system must provide publication of a special notice regarding the waiver as required in section 9.2.12.

(iii) The groundwater system must be operated by qualified personnel who meet the requirements of Regulation 100, 5 CCR 1003-2, Water and Wastewater Facility Operators Certification Requirements, and are included in a State register of qualified operators.

(iv) The groundwater system must have the ability to provide an emergency disinfectant residual concentration. The groundwater system must submit for Department approval the plans and specifications for emergency disinfection equipment by October 1, 2011 and have Department approved emergency disinfection equipment by May 1, 2012 or submit for Department approval an emergency operating plan by October 1, 2011 and operate in accordance with the Department approved emergency operating plan by May 1, 2012.

(v) The groundwater system must keep records of all chlorination activities. At a minimum, the records must include the following:

(A) The date, duration, locations and purpose of each chlorination event.

(B) The maximum and minimum chlorine dose in mg/L the groundwater system applied during each chlorination event and the results of any and all residual measurements taken during each chlorination event.

(vi) The groundwater system must have a Monitoring Plan that meets the requirements of section 1.12. The groundwater system must submit for Department approval a Monitoring Plan by October 1, 2011 and operate in accordance with the Department approved Monitoring Plan by May 1, 2012.

(vii) Distribution System Protection Plan: The groundwater system must submit for Department approval a Distribution System Protection Plan by October 1, 2011 and operate in accordance with the Department approved Distribution System Protection Plan by May 1, 2012. The Distribution System Protection Plan must describe protection measures designed to reduce public health risks for water provided through the storage and distribution system. At a minimum, the Distribution System Protection Plan must include:

(A) Description of distribution system operation and maintenance practices (e.g., flushing schedules, scheduled upgrades, disinfection schedules etc.).

(B) Description of a hazardous cross-connection control program that meets the requirements of Article 12.

(C) Identification of each potential point of entry for hazards and/or contaminants into the storage and distribution system and a description of the hazard and/or contaminant control measures to be used to mitigate the potential public health risks.

(D) Description of monitoring locations and parameters that will be used to verify and document that the hazard and/or contaminant control measures are effective.

(E) Description of incident response procedures to be followed in the case of a distribution system breach, hazard condition and/or contamination event. The procedure must at least include confirmation and repeat sampling protocols and flushing procedures.

(viii) Source Water Protection Plan: The groundwater system must submit for Department approval a Source Water Protection Plan by October 1, 2011 and operate in accordance with the Department approved Source Water Protection Plan by May 1, 2012. The Source Water Protection Plan must describe protection measures designed to reduce public health risks for water provided from groundwater sources. At a minimum, the Source Water Protection Plan must include:

(A) Delineation of source water protection areas.

(B) An inventory of potential sources of contamination.

(C) Plan for management of potential contaminant sources.

(D) Well failure emergency and contingency plans.

(E) Capacity development plan for new wells.

(F) Description of the methods to be used to involve and educate the public during the source water protection planning and implementation process.

(2) The Department may evaluate a groundwater system's wells and storage systems to determine if there are potential health risks from these sources. The Department will conduct the evaluation based on criteria found in:

(i) Well construction and location criteria outlined in the Rules and Regulations and Colorado Statutes Governing Construction of Water Wells and the Installation of Pumping Equipment as enforced by the State Board of Examiners of Water Well and Pump Installation Contractors.

(ii) Design criteria developed by the Department. Copies of the "State of Colorado Design Criteria for Potable Water Systems" are available electronically on the Department's web site at www.cdphe.state.co.us

(3) Existing sources. The Department may require assessment source water monitoring as specified in section 13.3(b) and/or additional testing and/or additional information to establish that the water being supplied to the public is from a groundwater source determined to be free from microbial contamination.

(4) New sources. New groundwater sources are subject to the requirements of section 13.3(f). The Department may require additional testing and/or additional information to establish that the water being supplied to the public is from a groundwater source determined to be free from microbial contamination. The Department may require that all testing and evaluation be completed before the source may begin supplying water to the public.

(5) The Department may at any time perform a full or partial sanitary survey pursuant to Article 11 to establish that the groundwater system is at low risk of contamination.

(6) If a groundwater system is not in compliance with 13.2(d)(1), or if based on the information obtained in sections 13.2(d)(2-5) and/or other information, it appears that the water being served to the public presents a potential public health risk, the Department may summarily withdraw the waiver, whereupon disinfection shall be required and the groundwater system must comply with sections 13.2(a-c).

(7) The following conditions may result in immediate waiver withdrawal, and if the waiver is withdrawn, the groundwater system must comply with sections 13.2(a-c):

(i) The groundwater system fails to correct significant deficiencies as required under section 11.4.

(ii) The groundwater system fails to comply with the provisions of Article 5 Microbial Contaminants.

(iii) The groundwater system fails to comply with the triggered source water monitoring and reporting requirements under section 13.3(a).

(iv) The groundwater system fails to comply with the provisions of Article 12 Hazardous Cross-Connection.

(v) There is an incidence of microbial disease, the source of which is reasonably identified by the Department as originating from consumption of drinking water from the groundwater system.

(vi) There is an occurrence of unforeseeable situations or conditions which are reasonably identified by the Departement as having the potential to contribute to a microbial disease incidence.

(vii) The groundwater system is in violation of the Colorado Drinking Water Regulations.

(8) A groundwater system with a source that has been determined to be fecally contaminated or is required to comply with 13.4(c)(3) shall no longer operate pursuant to a disinfection waiver and must comply with sections 13.2(a-c).

(9) The groundwater system may request a hearing to contest the withdrawal of the waiver. Request for such a hearing must be filed in writing within 60 days after service of the Department’s withdrawal. Such hearing must be conducted pursuant to the procedures established by Article 4 of Title 24, Colorado Revised Statutes.

(e) Groundwater systems with hand pumped wells are subject to the following requirements unless otherwise determined by the Department.

(1) Groundwater systems must operate and maintain hand pumped wells in accordance with Department approved hand pumped well monitoring and operational criteria. Systems must submit criteria to the Department for approval unless the system uses the Department's 'Monitoring and Operational Guidance Handbook for Colorado Public Water Systems Utilizing Hand Pumped Wells Which Do Not Provide Continuous Disinfection,' which is considered pre-approved criteria.

(2) Groundwater systems must disinfect seasonally operated hand pumped wells no earlier than 30 days prior to opening for the season. Groundwater systems must disinfect hand pumped wells that operate year round at least once a year during the busiest month of operation.

(3) The groundwater system must monitor each hand pumped well for total coliform at least monthly during any period of operation as required in section 5.1.1(e)(6) and report results as required in section 1.6.4.

(4) If the result of any routine total coliform sample is positive for fecal coliforms or E. coli or a repeat total coliform sample is positive, then the groundwater system must close the hand pumped well until a total coliform sample is absent of bacteria. The groundwater system must disinfect the hand pumped well before resuming operation.

(5) The groundwater system must conduct special public notice as described in section 9.2.14.

13.3 Groundwater source microbial monitoring and analytical methods.

(a) Triggered source water monitoring

(1) General requirements. A groundwater system must conduct triggered source water monitoring if both the conditions identified in sections 13.3(a)(1)(i) and (a)(1)(ii) exist.

(i) The system does not provide at least 4-log treatment of viruses before or at the first customer for each groundwater source; and

(ii) The system is notified that a sample collected under section 5.1.1 is total coliform-positive and the sample is not invalidated under section 5.3.

(2) Sampling requirements. A groundwater system must collect, within 24 hours of notification of the total coliform-positive sample, at least one groundwater source sample from each groundwater source in use at the time the total coliform-positive sample was collected under section 5.1.1, except as provided in section 13.3(a)(2)(ii).

(i) The Department may extend the 24-hour time limit on a case-by-case basis if the system cannot collect the groundwater source water sample within 24 hours due to circumstances beyond its control. In the case of an extension, the Department must specify how much time the system has to collect the sample.

(ii) If approved by the Department, systems with more than one groundwater source may meet the requirements of section 13.3(a)(2) by sampling a representative groundwater source or sources. If directed by the Department, systems must submit for Department approval a triggered source water monitoring plan that identifies one or more groundwater sources that are representative of each monitoring site in the system's sample siting plan under section 5.1.1 and that the system intends to use for representative sampling under section 13.3(a)(2).

(iii) A groundwater system serving 1,000 people or fewer may use a repeat sample collected from a groundwater source to meet both the requirements of section 5.1.2 and to satisfy the monitoring requirements of section 13.3 (a)(2) for that groundwater source only if the Department approves the use of E. coli as a fecal indicator for source water monitoring under this section 13.3(a). If the repeat sample collected from the groundwater source is E.coli positive, the system must comply with section 13.3(a)(3).

(3) Additional requirements. If the Department does not require corrective action under section 13.4(a) for a fecal indicator-positive source water sample collected under section 13.3(a)(2) that is not invalidated under section 13.3(d), the system must collect five

additional source water samples from the same source within 24 hours of being notified of the fecal indicator-positive sample.

(4) Consecutive and wholesale systems

(i) In addition to the other requirements of section 13.3(a), a consecutive groundwater system that has a total coliform-positive sample collected under section 5.1.1 must notify the wholesale system(s) within 24 hours of being notified of the total coliform-positive sample.

(ii) In addition to the other requirements of section 13.3(a), a wholesale groundwater system must comply with sections 13.3 (a)(4)(ii)(A) and (a)(4)(ii)(B).

(A) A wholesale groundwater system that receives notice from a consecutive system it serves that a sample collected under section 5.1.1 is total coliform-positive must, within 24 hours of being notified, collect a sample from its groundwater source(s) under section 13.3(a)(2) of this section and analyze it for a fecal indicator under section 13.3(c).

(B) If the sample collected under section 13.3 (a)(4)(ii)(A) is fecal indicator-positive, the wholesale groundwater system must notify all consecutive systems served by that groundwater source of the fecal indicator source water positive within 24 hours of being notified of the groundwater source sample monitoring result and must meet the requirements of section 13.3(a)(3).

(5) Exceptions to the triggered source water monitoring requirements. A groundwater system is not required to comply with the source water monitoring requirements of section 13.3(a) if either of the following conditions exists:

(i) The Department determines, and documents in writing, that the total coliform-positive sample collected under section 5.1.1 is caused by a distribution system deficiency; or

(ii) The total coliform-positive sample collected under section 5.1.1 is collected at a location that meets Department criteria for distribution system conditions that will cause total coliform-positive samples.

(b) Assessment source water monitoring. If directed by the Department, groundwater systems must conduct assessment source water monitoring that meets Department determined requirements for such monitoring. A groundwater system conducting assessment source water monitoring may use a triggered source water sample collected under section 13.3(a)(2) to meet the requirements of section 13.3(b). Department-determined assessment source water monitoring requirements may include:

(1) Collection of a total of twelve (12) groundwater source samples that represent each month the system provides groundwater to the public,

(2) Collection of samples from each well unless the system obtains written Department approval to conduct monitoring at one or more wells within the groundwater system that are representative of multiple wells used by that system and that draw water from the same hydrogeologic setting,

(3) Collection of a standard sample volume of at least 100 mL for fecal indicator analysis regardless of the fecal indicator or analytical method used,

(4) Analysis of all groundwater source samples using one of the analytical methods listed in Table 10-3 for the presence of E. coli, enterococci, or coliphage,

(5) Collection of groundwater source samples at a location prior to any treatment of the groundwater source unless the Department approves a sampling location after treatment, and

(6) Collection of groundwater source samples at the well itself unless the system's configuration does not allow for sampling at the well itself and the Department approves an alternate sampling location that is representative of the water quality of that well.

(c) Analytical methods. A groundwater system must analyze all groundwater source samples collected under section 13.3(a) using one of the analytical methods listed in Table 10-3 for the presence of E. coli, enterococci, or coliphage.

(d) Invalidation of a fecal indicator-positive groundwater source sample.

(1) A groundwater system may obtain Department invalidation of a fecal indicator-positive groundwater source sample collected under section 13.3(a) only under the conditions specified in sections 13.3(d)(1)(i) and (ii).

(i) The system provides the Department with written notice from the laboratory that improper sample analysis occurred; or

(ii) The Department determines and documents in writing that there is substantial evidence that a fecal indicator-positive groundwater source sample is not related to source water quality.

(2) If the Department invalidates a fecal indicator-positive groundwater source sample, the groundwater system must collect another source water sample under section 13.3(a) within 24 hours of being notified by the Department of its invalidation decision and have it analyzed for the same fecal indicator using the analytical methods in Table 10-3. The Department may extend the 24-hour time limit on a case-by-case basis if the system cannot collect the source water sample within 24 hours due to circumstances beyond its control. In the case of an extension, the Department must specify how much time the system has to collect the sample.

(e) Sampling location.

(1) Any groundwater source sample required under section 13.3(a) must be collected at a location prior to any treatment of the groundwater source unless the Department approves a sampling location after treatment.

(2) If the system's configuration does not allow for sampling at the well itself, the system may collect a sample at a Department-approved location to meet the requirements of section 13.3(a) if the sample is representative of the water quality of that well. The Department has authority to require that sampling equipment be installed at the well itself.

(f) New sources. If directed by the Department, a groundwater system that places a new groundwater source into service after November 30, 2009, must conduct assessment source water monitoring under section 13.3(b). If directed by the Department, the system must begin monitoring before the groundwater source is used to provide water to the public.

(g) Public notification. A groundwater system with a groundwater source sample collected under sections 13.3 (a) or (b) that is fecal indicator-positive and that is not invalidated under section

13.3(d), including consecutive systems served by the groundwater source, must conduct public notification under section 9.2.2.

13.4 Additional Treatment Technique Requirements

(a) Groundwater systems with a fecal indicator positive source water sample collected under section 13.3(a)(3) must comply with the requirements of this section. Groundwater systems with a fecal indicator positive source water sample collected under 13.3(a)(2), 13.3(a)(4), or 13.3(b) must comply with the requirements of this section if directed by the Department.

(1) Groundwater systems that meet the conditions of sections 13.4(a) must implement one or more of the following corrective actions:

(i) Correct all significant deficiencies;

(ii) Provide an alternate source of water;

(iii) Eliminate the source of contamination; or

(iv) Provide treatment that reliably achieves at least 4-log treatment of viruses before or at the first customer for the groundwater source.

(2) Unless the Department directs the groundwater system to implement a specific corrective action, the groundwater system must consult with the Department regarding the appropriate corrective action within 30 days of receiving written notice from a laboratory or direction from the Department. This consultation may take the form of a telephone conversation, electronic mail, meeting, or other mechanism agreed to by the Department.

(3) Within 45 days of receiving this notice or direction, the system must submit a written response to the Department indicating the actions the system will take to address fecal indicator positive groundwater source sample(s), and include a proposed schedule for completing those actions. The Department will review this notice. If approved, this notice shall constitute a Department approved corrective action plan as referenced below in section 13.4(a)(4)(ii).

(4) Within 120 days (or earlier if directed by the Department) of receiving written notice from a laboratory or direction from the Department the groundwater system must either:

(i) Have completed corrective action in accordance with applicable Department plan review processes, including section 1.11, or other Department guidance or direction, if any, including Department-specified interim measures; or

(ii) Be in compliance with a Department-approved corrective action plan and schedule subject to the conditions specified in sections 13.4(a)(4)(ii)(A) and 13.4(a)(4)(ii)(B).

(A) Any subsequent modifications to a Department-approved corrective action plan and schedule must also be approved by the Department.

(B) If the Department specifies interim measures for protection of the public health pending Department approval of the corrective action plan and schedule or pending completion of the corrective action plan, the system must comply with these interim measures as well as with any schedule specified by the Department.

(b) A groundwater system subject to the requirements of 13.4(c)(3) that fails to maintain at least 4-log treatment of viruses before or at the first customer for a groundwater source is in violation of the treatment technique requirement if the failure is not corrected within four hours of determining the system is not maintaining at least 4-log treatment of viruses before or at the first customer.

(c) Compliance monitoring

(1) Existing groundwater sources. A groundwater system that is not required to meet the source water monitoring requirements of Article 13 for any groundwater source because it provides at least 4-log treatment of viruses before or at the first customer for any groundwater source before December 1, 2009, must notify the Department in writing that it provides at least 4-log treatment of viruses before or at the first customer for the specified groundwater source and begin compliance monitoring in accordance with section 13.4(c)(3) by December 1, 2009. Notification to the Department must include engineering, operational, or other information that the Department requests to evaluate the submission.

(2) New groundwater sources. A groundwater system that places a groundwater source in service after November 30, 2009, that is not required to meet the source water monitoring requirements of Article 13 because the system provides at least 4-log treatment of viruses before or at the first customer for the groundwater source must comply with the requirements of sections 13.4 (c)(2)(i), (c)(2)(ii) and 13.4(d).

(i) The system must notify the Department in writing that it provides at least 4-log treatment of viruses before or at the first customer for the groundwater source. Notification to the Department must include engineering, operational, or other information that the Department requests to evaluate the submission.

(ii) The system must conduct compliance monitoring as required under section 13.4(c)(3) within 30 days of placing the source in service.

(3) *Monitoring requirements.* A groundwater system subject to the requirements of sections 11.4(b), 13.4(a), (c)(1) or (c)(2) must monitor the effectiveness and reliability of treatment for that groundwater source before or at the first customer as follows:

(i) Chemical disinfection

(A) Groundwater systems serving greater than 3,300 people. A groundwater system that serves greater than 3,300 people must continuously monitor the residual disinfectant concentration using analytical methods specified in section 10.5.1(a)(2) at a location approved by the Department and must record the lowest residual disinfectant concentration each day that water from the groundwater source is served to the public. The groundwater system must maintain the Department-determined residual disinfectant concentration every day the groundwater system serves water from the groundwater source to the public. If there is a failure in the continuous monitoring equipment, the groundwater system must conduct grab sampling every four hours until the continuous monitoring equipment is returned to service. The system must resume continuous residual disinfectant monitoring within fourteen (14) days.

(B) Groundwater systems serving 3,300 or fewer people. A groundwater system that serves 3,300 or fewer people must monitor the residual disinfectant concentration using analytical methods specified in section 10.5.1(a)(2) at a location approved by the Department and record the

residual disinfection concentration each day that water from the groundwater source is served to the public. The groundwater system must maintain the Department-determined residual disinfectant concentration every day the groundwater system serves water from the groundwater source to the public. The groundwater system must take a daily grab sample during the hour of peak flow or at another time specified by the Department. If any daily grab sample measurement falls below the Department-determined residual disinfectant concentration, the groundwater system must take follow-up samples every four hours until the residual disinfectant concentration is restored to the Department-determined level. Alternatively, a groundwater system that serves 3,300 or fewer people may monitor continuously and meet the requirements of section 13.4(c)(3)(i)(A).

(ii) Membrane filtration. A groundwater system that uses membrane filtration to meet the requirements Article 13 must monitor the membrane filtration process in accordance with all Department-specified monitoring requirements and must operate the membrane filtration in accordance with all Department-specified compliance requirements. A groundwater system that uses membrane filtration is in compliance with the requirement to achieve at least 4-log removal of viruses when:

(A) The membrane has an absolute molecular weight cut-off (MWCO), or an alternate parameter that describes the exclusion characteristics of the membrane, that can reliably achieve at least 4-log removal of viruses;

(B) The membrane process is operated in accordance with Department-specified compliance requirements; and

(C) The integrity of the membrane is intact.

(iii) Alternative treatment. A groundwater system that uses a Department-approved alternative treatment to meet the requirements of Article 13 by providing at least 4-log treatment of viruses before or at the first customer must:

(A) Monitor the alternative treatment in accordance with all Department-specified monitoring requirements; and

(B) Operate the alternative treatment in accordance with all compliance requirements that the Department determines to be necessary to achieve at least 4-log treatment of viruses.

(d) Discontinuing compliance monitoring or treatment. A groundwater system may discontinue compliance monitoring if the system notifies the Department and the Department determines and documents in writing that compliance monitoring is no longer necessary for that groundwater source. A system that discontinues compliance monitoring is subject to the source water monitoring and analytical methods requirements of sections 13.3 and 10.1.5. A system discontinuing compliance monitoring is still subject to the applicable requirements of section 13.2.

13.5 Recordkeeping Requirements

(a) In addition to other recordkeeping requirements in section 1.6.3, systems must maintain records as described below.

(1) Records of residual disinfection concentration measurements as required in section 13.2(b) must be kept for a period of not less than 5 years and include the following information:

(i) The date, place, and time of sampling, and the name of the person(s) who collected/analyzed the sample;

(ii) The analytical technique/method used; and

(iii) The results of the analyses.

(2) Documentation relating to treatment technique violations as required in section 13.2(c)(1)(ii) must be kept for a period of not less than 5 years.

(3) A system operating pursuant to a waiver from disinfection requirements must keep all correspondence and documentation relating to the requirements of section 13.2(d) for as long as the system is operating pursuant to a waiver from disinfection requirements and for a period of not less than 5 years after waiver withdrawal.

(4) A system operating pursuant to a waiver from disinfection requirements must keep all chlorination activity records as required in section 13.2(d)(1)(v) for a period of not less than 5 years.

(5) Documentation of corrective actions must be kept for a period of not less than ten years.

(6) Documentation of notice to the public as required under sections 9.1.3(h) and 9.2.13 must be kept for a period of not less than three years.

(7) Records of decisions under section 13.3(a)(5)(ii) and records of invalidation of fecal indicator-positive groundwater source samples under section 13.3(d) must be kept for a period of not less than five years.

(8) For consecutive systems, documentation of notification to the wholesale system(s) of total-coliform positive samples that are not invalidated under section 5.3 must be kept for a period of not less than five years.

(9) For systems, including wholesale systems, that are required to perform compliance monitoring under section 13.4(c):

(i) Records of the Department-specified minimum disinfectant residual must be kept for a period of not less than ten years.

(ii) Records of the lowest daily residual disinfectant concentration and records of the date and duration of any failure to maintain the Department-prescribed minimum residual disinfectant concentration for a period of more than four hours must be kept for a period of not less than five years.

(iii) Records of Department-specified compliance requirements for membrane filtration and of parameters specified by the Department for Department-approved alternative treatment and records of the date and duration of any failure to meet the membrane operating, membrane integrity, or alternative treatment operating requirements for more than four hours must be kept for a period of not less than five years.

13.6 Reporting Requirements

(a) In addition to other reporting requirements in section 1.6.4, systems must provide the following information to the Department:

(1) A groundwater system conducting monitoring under section 13.2(b)(1) must notify the Department any time the system fails to maintain at least 0.2 mg/L residual disinfectant concentration as required in section 13.2(a)(2)(i) if the failure is not corrected within 72 hours of discovery of the failure. The groundwater system must notify the Department as soon as possible, but in no case later than the end of the next business day.

(2) A groundwater system conducting compliance monitoring under section 13.2(b)(2) must report sample results to the Department as required by 1.6.4(a).

(3) A groundwater system conducting compliance monitoring under section 13.4(c) must notify the Department any time the system fails to meet any Department-specified requirements including, but not limited to, minimum residual disinfectant concentration, membrane operating criteria or membrane integrity, and alternative treatment operating criteria, if operation in accordance with the criteria or requirements is not restored within four hours. The groundwater system must notify the Department as soon as possible, but in no case later than the end of the next business day.

(4) After completing any corrective action under section 13.4(a)(3) or 11.4, a groundwater system must notify the Department within 30 days of completion of the corrective action.

(5) If a groundwater system subject to the requirements of section 13.3(a) does not conduct source water monitoring under section 13.3(a)(5)(ii), the system must provide documentation to the Department within 30 days of the total coliform positive sample that it met the Department's criteria for distribution system conditions that will cause total coliform-positive samples.

Articles 14-19 Reserved

Article 20 <u>Statement of Statutory Authority and Basis and Purpose (July 9, 2007 Rulemaking, Effective September 30, 2007)</u>

Adoption of Section 7.4 – Enhanced Treatment for Cryptosporidium, Section 7.7 – Initial Distribution System Evaluations (IDSE) and Section 7.8 – Additional Requirements for Disinfection Byproducts Compliance with Amendments to Articles 1, 2, 7, 9, 10 and 12(c) of the Colorado Primary Drinking Water Regulations.

The provisions of the Colorado Revised Statutes (CRS), §25-1.5-202, provides specific statutory authority for adoption of these regulatory amendments. The Commission also adopted, in compliance with §24-4-103(4), CRS, the following statement of basis and purpose.

<u>Basis and Purpose</u>

All suppliers of drinking water in Colorado are subject to regulations adopted by the U.S. Environmental Protection Agency (EPA) under the Safe Drinking Water Act, (42 U.S.C. 300f et seq.) as well as by the Colorado Primary Drinking Water Regulations under the direction of the Water Quality Control Division (Division). Colorado has been granted primary enforcement responsibility (primacy) for the public water system supervision program under the federal Safe Drinking Water Act; however, in order to maintain primacy, states must promulgate regulations that are no less stringent than those adopted by the federal government. By retaining primacy, the Division is able to protect the public health by ensuring that public water systems provide safe drinking water to Colorado citizens and visitors and remains eligible both for program grants of $1.3 million and for federal revolving funds to assist water systems construct facility improvements of $13 million per year.

Basis and Purpose

The Commission amends Articles 1, 2, 7, 9, 10, and 12(c) of the Colorado Primary Drinking Water Regulations to include:

- The provisions of the federal regulations as published in the Federal Register, Volume 71, Number 2, January 4, 2006, pages 388 through 493, National Primary Drinking Water Regulations: Stage 2 Disinfectants and Disinfection Byproducts Rule incorporated as sections 7.7 and 7.8.

- The provisions of the federal regulations as published in the Federal Register, Volume 71, Number 3, January 5, 2006, pages 654 through 786, National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Rule incorporated as section 7.4.

- Changes referencing the Commission throughout the regulation instead of the Board of Health in accordance with §25-8-202(1)(n), C.R.S.

- Numerous minor changes removing obsolete references and definitions that are not used within the regulation, and correction of spelling and typographical errors, including a number of non-substantive amendments to Article 10 in an effort to provide clarity (such as spelling out abbreviations), and to provide consistency in the citing of materials incorporated by reference (i.e. EPA and other nationally-recognized test methods). Many of the references to these test methods contained unnecessary information about the places where copies could be obtained.

The Commission also updated the numbering of footnotes throughout the regulation for consistency.

Sections 7.7 and 7.8 amend the existing regulatory requirements for disinfection byproducts for all public water systems in Colorado that add a disinfectant to the water in any part of the drinking water treatment process. Section 7.4 amends existing treatment requirements for all public water systems in Colorado that use surface water or ground water under the direct influence of surface water as drinking water sources.

These amendments and additions provide for increased public health protection against the potential risks for cancer and adverse reproductive and developmental health effects associated with disinfection byproducts and they provide further public health protection against Cryptosporidium and other microbial pathogens in drinking water.

The provisions of sections 7.7 and 7.8, Stage 2 Disinfectants and Disinfection Byproducts Rule, are summarized as follows:

- Adds record keeping requirements for turbidity and monitoring plans.

- Establishes maximum contaminant level goals for chloroform, monochloroacetic acid and trichloroacetic acid.

- Finalizes maximum contaminant levels for disinfection byproducts.

- Changes compliance from system-wide running annual average to locational running annual average at each monitoring location.

- Revises the requirements for reduced monitoring for bromate.

- Specifies the best available technologies for control of disinfection byproducts in drinking water.

- Revises the public notification requirements for total trihalomethanes and haloacetic acids.

- Approves additional analytical methods for the determination of disinfectants and disinfection byproducts in drinking water.

The Stage 2 Disinfectants and Disinfection Byproducts Rule is designed to further minimize the formation of disinfection byproducts in the finished water in an effort to reduce the associated long-term cancer risks and reproductive and developmental health effects associated with disinfection byproducts while ensuring continued protection from microbiological contaminants that may pose an acute health threat.

The Commission is simultaneously amending the Colorado Primary Drinking Water Regulations to include the provisions of the National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule to ensure that drinking water is microbiologically safe while considering the limits set for disinfection byproducts.

The provisions of section 7.4, Long Term 2 Enhanced Surface Water Rule, are summarized as follows:

- Requires public water systems using surface water or ground water under the direct influence of surface water to monitor their source water to determine an average Cryptosporidium level.
    - Specifies criteria for sampling frequency and schedule, sampling location, use of previously collected data, providing treatment instead of monitoring, sampling by systems that use surface water for only part of the year, and monitoring of new plants and sources.
    - Establishes requirements for reporting monitoring results, using approved analytical methods, and using certified laboratories for all analysis.
- Supplements current regulations by establishing risk-targeted treatment technique requirements to control Cryptosporidium in public water systems using surface water or ground water under the direct influence of surface water. (Existing regulations remain in effect.)
- Based on the results of the source water Cryptosporidium monitoring, systems will be classified in one of four (4) treatment categories or “bins.” The bin classification determines the degree of additional Cryptosporidium treatment, if any, the system must provide.
- Adds the Microbial Toolbox options that systems must use if required to meet the additional Cryptosporidium treatment required based on bin classification.
- Adds recordkeeping requirements specific to the changes.
- Adds requirements for a “Special notice for repeated failure to conduct monitoring of the source water for Cryptosporidium and for failure to determine bin classification or mean Cryptosporidium level” to the Public Notification requirements.
- Specifies the Public Notification tier level of notice for violations related to these amendments.

Implementing the Long Term 2 Enhanced Surface Water Rule will substantially lower rates of endemic crytosporidiosis, the illness caused by Cryptosporidium, which can be severe and sometimes fatal in sensitive subpopulations (e.g., infants, people with weakened immune systems). In addition, the treatment technique requirements will increase protection against other microbial pathogens like Giardia lamblia.

In addition to the inclusion of sections 7.4, 7.7 and 7.8, the Colorado Primary Drinking Water Regulations are amended as follows:

Article 1

1. Sections 1.1, 1.3, and 1.4 are amended to replace references to the State Board of Health with the Water Quality Control Commission.

2. Section 1.3 is amended to remove references to Colorado State Board of Health regulations from 1950 and 1954. These references are obsolete and no longer applicable.

3. Section 1.5.2 is amended to correct the definition of initial compliance period, to change the definition of consecutive systems, integrated systems, deletes the definition of supply systems, and adds the definitions of dual sample set, emergency source/connection, GAC 20, Initial Distribution System Evaluation (IDSE), finished water, locational running annual average (LRAA), Water Quality Control Commission, and wholesale systems. The definitions for consecutive systems, integrated systems and supply systems were Colorado specific and conflicted with or were redundant to the EPA definitions of consecutive systems and wholesale systems added as part of the Stage 2 Disinfection Byproducts Rule.

4. Section 1.5.2 is amended to include definitions for Bag filters, Bank filtration, Cartridge filters, Flowing stream, Lake/reservoir, Membrane filtration, Membrane module, Plant intake, Presedimentation, Recycle, Two-stage lime softening, and Uncovered finished water storage facility added by the Long Term 2 Enhanced Surface Water Rule.

5. Section 1.5.2 is amended to adjust numbering of definitions because of additions and removal of definitions that are no longer used in the regulation.

6. Section 1.6.3 is amended to add the record keeping requirements specified by the Stage 2 Disinfection Byproducts Rule and the Long Term 2 Enhanced Surface Water Rule.

7. Sections 1.8, 1.9 and 1.10 are amended to reflect the changes in definition for consecutive systems and wholesale systems.

8. Section 1.14 is amended to include the Laboratory Services Division as a place where materials incorporated by reference could be examined.

Article 2

Section 2.4 is amended to include the new maximum contaminant level goals (MCLG) for chloroform, monochloroacetic acid and trichloroacetic acid.

Article 7

1. Section 7.3.7 was moved to section 1.6.3 for consistency.

2. Section 7.4 and 7.5 are renumbered to 7.5 and 7.6 respectively because of the addition of the requirements for Long Term 2 Enhanced Surface Water Rule as section 7.4.

3. Section 7.6.3(b)(1)(iv) has been amended to add the following language:

   > "Systems on a reduced monitoring schedule may remain on that reduced schedule as long as the average of all samples taken in the year (for systems which must monitor quarterly) or the result of the sample (for systems which must monitor no more frequently than annually) is no more than 0.060 mg/L and 0.045 mg/L for TTHMs and HAA5, respectively."

   This language was inadvertently omitted in the Federal Register when Stage 1 Disinfectants, Disinfection Byproducts Rule was printed. The Stage 2 Disinfection Byproducts Rule includes the reinstatement of this language to the Stage 1 DDBP Rule.

4. Section 7.6.3(b)(3)(ii) has been amended to change the requirements for reduced monitoring for bromate.

Article 9

1. Section 9.1.3(d)(iv) is amended to clarify reporting of results for the Stage 2 Disinfection Byproducts Rule in the community water system's annual Consumer Confidence Report.

2. Tables 9-7 and 9-8 with endnotes is amended to update the health effects language for public notifications and tier requirements for violations of the Stage 2 Disinfection Byproducts Rule.

3. Section 9.2.11 is amended to add the special notice requirements for repeated failure to conduct monitoring of the source water for Cryptosporidium and for failure to determine bin classification or mean Cryptosporidium level and to identify the public notification tier levels for violations of the Long Term 2 Enhanced Surface Water Rule.

Article 10

Article 10 is amended to include additional approved analytical methods for drinking water analyses for disinfection byproducts and disinfection byproduct precursors.

Article 12

Section 12.2(c) is amended to replace references to the State Board of Health with the Water Quality Control Commission.

Aspects of the Long Term 2 Enhanced Surface Water Rule that were not included in the Colorado Primary Drinking Water Regulations

1. Long Term 2 Enhanced Surface Water Rule, Section 40 CFR 141.712, and other CFR sections which allow systems to use unfiltered surface water were not incorporated in the regulation. Historically, the regulations promulgated by the Colorado State Board of Health have required all public water systems that use surface water or ground water under the direct influence of surface water to provide filtration.

2. Language from the Long Term 2 Enhanced Surface Water Rule, Section 40 CFR 141.714 that allows for the use of uncovered finished water storage facilities was not incorporated in the regulation. Historically, the regulations promulgated by the Colorado State Board of Health have required all public water systems to use only covered finished water storage facilities. There are currently no known uncovered finished water storage facilities in use and existing regulatory language prohibits the new construction of such a facility.

3. The federal rule includes requirements for systems to respond to significant deficiencies identified in sanitary surveys performed by EPA. Sanitary surveys of public water systems in Colorado are conducted by the Department and requirements for the system to respond in writing to significant deficiencies are already included in Article 11 of the Colorado Primary Drinking Water Regulations. Language from the federal rule that makes reference to sanitary surveys performed by EPA was not incorporated in the regulation.

Parties to Rulemaking Hearing

1. City of Boulder

Article 21 **STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY AND PURPOSE: July 14, 2008 Rulemaking Hearing; Effective Date September 30, 2008**

Adoption of Article 13 – Groundwater Rule, with Amendments to Articles 1, 5, 7, 9, 10 and 11 of the *Colorado Primary Drinking Water Regulations*.

The Colorado Revised Statutes (CRS), §25-1.5-202, provide specific authority for adoption of these regulatory amendments. The Commission also adopted, in compliance with §24-4-103(4), CRS, the following statement of basis and purpose.

BASIS AND PURPOSE

All suppliers of drinking water in Colorado are subject to regulations adopted by the U.S. Environmental Protection Agency (EPA) under the Safe Drinking Water Act, (42 U.S.C. 300f et seq.) as well as by the *Colorado Primary Drinking Water Regulations* under the direction of the Water Quality Control Division (Division). Colorado has been granted primary enforcement responsibility (primacy) for the public water system supervision program under the federal Safe Drinking Water Act. However, in order to maintain primacy, states must also promulgate new regulations that are no less stringent than those adopted by the federal government. By retaining primacy, the Division is able to protect the public health by ensuring that public water systems provide safe drinking water to Colorado citizens and visitors and remains eligible for program grants of $1.3 million and for federal revolving funds to assist public water systems construct facility improvements of $13 million per year.

The Commission adds Article 13, and amends Articles 1, 5, 7, 9, 10 and 11 of the *Colorado Primary Drinking Water Regulations* to include:

- The provisions of the federal regulations as published in the Federal Register, Volume 71, Number 216, November 8, 2006, pages 65574 through 65660, *National Primary Drinking Water Regulations: Ground Water Rule* incorporated as Article 13.

- Additional definitions and record keeping and reporting requirements.

- Moving Article 7 concerning Disinfection for Groundwater to Article 13.

- Additions to Consumer Notification requirements.

- Additions to Analytical Requirements and Laboratory Certification.

- Changes to Article 11 concerning requirements to correct significant deficiencies and violations detected during sanitary surveys to better align with new requirements in the *Groundwater Rule*. The changes in this section that will become effective after December 1, 2009 will ensure uniformity of requirements regardless of water system type or source.

- Numerous minor changes removing obsolete references and definitions that are not used within the regulation, and correction of spelling and typographical errors.

Article 13 amends and adds regulatory requirements for all public water systems in Colorado that use groundwater sources.

These amendments and additions provide for increased public health protection against microbial pathogens in public water systems that use groundwater sources.

The provisions of Articles 11 and 13 are summarized as follows:

- Increased frequency of sanitary surveys at groundwater systems to check for significant deficiencies in eight key operational areas.

- Specific requirements for public water systems to correct significant deficiencies in a timely fashion.

- A flexible program for identifying higher risk systems through existing Total Coliform Rule monitoring and State determinations.

- Groundwater source monitoring to detect fecal contamination at targeted groundwater systems that do not provide 4-log treatment of viruses.

- Treatment technique requirements to address fecal contamination in groundwater.

- Compliance monitoring to ensure that 4-log treatment (99.99 percent removal/inactivation) of viruses is maintained where it is used to comply with this rule.

The *Groundwater Rule* establishes a risk-targeted approach to identify groundwater systems that are susceptible to fecal contamination. The occurrence of fecal indicators in a drinking water supply is an indication of the potential presence of microbial pathogens that may pose a threat to public health. This rule requires groundwater systems with sources that are confirmed to contain indicators of fecal contamination to take corrective action to reduce potential cases of illnesses and deaths due to exposure to microbial pathogens.

In addition to the inclusion of Article 13, the *Colorado Primary Drinking Water Regulations* are amended as follows:

Article 1

1. Section 1.5.2 is amended to include definitions for 4-Log Treatment of Viruses, Assessment Source Water Monitoring, Compliance Monitoring, Groundwater System (GWS), Hydrogeologic Sensitivity Assessment (HAS), Inactivation, Triggered Source Water Monitoring, and Triggered Source Water Monitoring Plan added by the *Groundwater Rule*.

2. Section 1.5.2(119) is amended to include additional language for clarification.

3. Section 1.5.2 is amended to adjust numbering of definitions because of the added definitions.

4. Section 1.6.3 is amended to add the record keeping requirements specified by the *Groundwater Rule*.

5. Section 1.6.4 is amended to add the reporting requirements specified by the *Groundwater Rule*.

Article 5

1. Section 5.1.2 (e) and (h) were amended to remove language that was not consistent with federal drinking water requirements.

Article 7

1. Section 7.9 Disinfection for Groundwater was moved to section 13.2 for consistency.

Article 9

1. Section 9.1.3(h) is amended to include reporting requirements for the *Groundwater Rule* in the community water system's annual Consumer Confidence Report.

2. Section 9.1.3 is amended to adjust numbering because of additions.

3. Table 9-1 Table of Regulated Contaminants is amended to add Fecal Indicators.

4. Table 9-4 Violation Categories and Other Situations Requiring a Tier 1 Public Notice is amended to include requirements of the *Groundwater Rule*.

5. Table 9-5 Violation Categories and Other Situations Requiring a Tier 2 Public Notice is amended to include requirements of the *Groundwater Rul*e.

6. Table 9-6 Violation Categories and Other Situations Requiring a Tier 3 Public Notice is amended to include requirements of the *Groundwater Rule*.

7. Table 9-7 is amended to update language for public notification concerning waiver of disinfection.

8. Tables 9-7 and 9-8 with endnotes is amended to update the health effects language for public notifications and tier requirements for violations of the *Groundwater Rule*.

9. Special notice requirements for groundwater systems with a waiver of disinfection is added as section 9.2.12.

10. Section 9.2.12 List of Acronyms Used in Public Notification Regulation, is renumbered as Section 9.2.13 to adjust numbering because of previous addition and is amended to add the acronym GWR for the Groundwater Rule.

Article 10

1. Section 10.1.5 is added to include additional approved analytical methods for fecal indicators analyses in drinking water sources.

2. Article 10 is amended to adjust numbering because of additions.

Article 11

1. Section 11.2 is amended to increase the frequency of sanitary surveys at groundwater systems in accordance with the *Groundwater Rule*.

2. Section 11.3 is amended to adjust numbering.

3. Section 11.4 is amended to align with requirements concerning significant deficiencies in 13.4 of the *Groundwater Rule*.

Article 22 **STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY AND PURPOSE: October 14, 2008 Written Comment Only Rulemaking Hearing; Effective Date November 30, 2008**

Adoption of amendments to Articles 1, 7, 9, 10, 11 and 13 of the *Colorado Primary Drinking Water Regulations*.

The Colorado Revised Statutes (CRS), §25-1.5-202, provide specific authority for adoption of these regulatory amendments. The Commission also adopted, in compliance with §24-4-103(4), CRS, the following statement of basis and purpose.

BASIS AND PURPOSE

All suppliers of drinking water in Colorado are subject to regulations adopted by the U.S. Environmental Protection Agency (EPA) under the Safe Drinking Water Act, (42 U.S.C. 300f et seq.) as well as by the

Colorado Primary Drinking Water Regulations under the direction of the Water Quality Control Division (Division). Colorado has been granted primary enforcement responsibility (primacy) for the public water system supervision program under the federal Safe Drinking Water Act. However, in order to maintain primacy, states must also promulgate new regulations that are no less stringent than those adopted by the federal government. As required by 40 CFR 142.12, the Division submitted a drinking water program primacy revision application for the Long Term 2 Enhanced Surface Water Treatment Rule (LT2) and the Stage 2 Disinfectant and Disinfection Byproducts Rule (Stage 2). This application included the *Colorado Primary Drinking Water Regulations* effective 09/30/2007. EPA reviewed the Division's application and found instances where the *Colorado Primary Drinking Water Regulations* are less stringent than the federal language.

Additionally, Section 1.6.4(e) is a Colorado-specific requirement, not a provision of the federal regulation, nor is it a primacy requirement. 1.6.4(e) requires an original signature on all documents submitted to the Division and applies to paper documents as well as to information received electronically over the Internet. Eliminating this Colorado-specific provision will facilitate Colorado's implementation of Electronic Data Interchange (EDI) - the submission of laboratory results, required reports and other data from private laboratories and public water systems via the Internet. Among other benefits, the implementation of EDI will improve the accuracy of compliance data entered into the Division's compliance database, offer regulated entities a streamlined reporting tool, and reduce the management of paper-based reports for the Division, laboratories and public water systems.

The Commission amends Articles 1, 7, 9, 10, 11 and 13 of the *Colorado Primary Drinking Water Regulations* to include:

- Items identified by EPA during review of the Division's primacy application for LT2 and Stage 2.
- Removal of 1.6.4(e).
- Numerous minor changes to correct spelling, typographical errors and provide clarity.

These amendments present no significant controversy and are either required by EPA, assistive to public water systems, or are minor changes.

The *Colorado Primary Drinking Water Regulations* are amended as follows:

Article 1

1. Section 1.5.2 is amended to adjust the definitions of Compliance Monitoring and Triggered Source Water Monitoring to provide clarity.

2. Section 1.6.4(e) is struck from the *Colorado Primary Drinking Water Regulations*.

Article 7

1. Section 7.4.17 is amended to include the definition of "module" from the federal language.

2. Section 7.7.2 is amended to include record keeping requirements from the federal language.

Article 9

1. Section 9.2.11 is amended to strike "mean cryptosporidium". This provision applies only to unfiltered surface water systems which are not allowed in Colorado.

2. Table 9-7 *Table of CPDWR Violations and Other Situations Requiring Public Notice* is amended to correct public notice requirements regarding LT2 and include and adjust numbering of end notes from the federal language.

Article 10

1. Section 10.1.3 is amended to include requirements from the federal language for extended holding time for *E. coli* samples.

2. Section 10.7.4 is amended to correct a typographical error.

Article 11

1. Section 11.4 is amended for clarity.

Article 13

1. Section 13.2 is amended for clarity.

2. Section 13.4 is amended for clarity.

Article 23 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY AND PURPOSE: December 8, 2008; Effective Date January 30, 2009

The Colorado Revised Statutes (CRS), §25-1.5-202, provide specific authority for adoption of these regulatory amendments. The Commission also adopted, in compliance with §24-4-103(4), CRS, the following statement of basis and purpose.

BASIS AND PURPOSE

The Office of Legislative Legal Services (OLLS) raised concerns regarding subsections 4.6(c)(1), 4.6(c)(2), 4.6(c)(3)(iii)and 4.7(a) of Colorado's Primary Drinking Water Regulations. OLLS's concerns related to public meetings for small drinking water system variances. OLLS objected to language which provided for a meeting if there is "sufficient interest" in such a meeting. OLLS expressed the opinion that such language is vague, and may be inconsistent with and less stringent than corresponding federal requirements.

While the Commission and Division did not necessarily agree with OLLS's position, the Commission amended the cited subsections to resolve OLLS's concerns. The Commission deleted the "sufficient interest" language to address OLLS's vagueness concerns. New section 4.3(h) was added, which is identical to 40 CFR § 142.309(A), to address OLLS's concern that the regulations may contradict or be less stringent than the federal program. Subsection 4.7(a) was amended to include a provision that allows the Division to deny frivolous or insubstantial public meeting requests, consistent with 40 CFR § 142.44(c).

Article 24 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY AND PURPOSE: August 10, 2009 rulemaking; Effective Date December 1, 2009

Adoption of Revisions to Article 8 – Lead and Copper Control, with amendments to Articles 5, 6, 7, 9, 10 and 13 of the *Colorado Primary Drinking Water Regulations.*

The Colorado Revised Statutes (CRS), §25-1.5-202, provide specific authority for adoption of these regulatory amendments. The Commission also adopted, in compliance with §24-4-103(4), CRS, the following statement of basis and purpose.

BASIS AND PURPOSE

All suppliers of drinking water in Colorado are subject to regulations adopted by the U.S. Environmental Protection Agency (EPA) under the Safe Drinking Water Act, (42 U.S.C. 300f et seq.) as well as by the Colorado Primary Drinking Water Regulations under the direction of the Water Quality Control Division (Division). Colorado has been granted primary enforcement responsibility (primacy) for the public water system supervision program under the federal Safe Drinking Water Act. However, in order to maintain primacy, states must also promulgate new regulations that are no less stringent than those adopted by the federal government. By retaining primacy, the Division is able to protect the public health by ensuring that public water systems provide safe drinking water to Colorado citizens and visitors.

The Commission amended Article 8, with minor amendments to Article 9 of the Colorado Primary Drinking Water Regulations to include:

- The provisions of the federal regulations as published in the Federal Register, Volume 72, Number 195, October 10, 2007, pages 57782 through 57820, National Primary Drinking Water Regulations for Lead and Copper: Short-Term Regulatory Revisions and Clarifications.

These amendments to Article 8 and Article 9 are summarized as follows:

- Revision to the minimum number of samples required
  - 8.2(c)(1) - Language was added to clarify that systems that have less than five taps are required to sample twice at one or more taps to meet the required number of sites.
- Revision concerning definitions for compliance and monitoring periods
  - 8.2(d)(4)(vi)(B) - Language was added which states that a large system would trigger two six-month periods of sampling if a lead action level exceedance occurred as well as a water quality parameter failure.
- Revisions concerning reduced monitoring criteria
  - 8.2(d)(4) Language was added to clarify that systems start the annual sampling during the calendar year immediately following the end of the six month sampling.
  - 8.2(d)(4)(ii) Language was also added requiring systems serving >50,000 to meet the lead action level as well as maintain water quality ranges in order to move to a reduced schedule.
  - 8.2(d)(4)(iii) Language was added regarding the requirement that systems on a three year schedule must sample every three years.
- Revisions concerning consumer notice of lead tap water monitoring results
  - 8.9(d)(2) This section requires all systems (whether they exceeded the action levels or not) to send a consumer notice of tap water monitoring results to the individuals that had their tap water tested for lead and copper compliance monitoring.
  - 9.1.4(d) There is new required health information in every Consumer Confidence Report that contains mandatory language regarding lead.
- Revisions concerning public education requirements

- 8.9 The revision has struck most of the mandatory language and allows systems to author their own public education materials. The revision allows for Department pre-approval of public education materials before distribution. The revision requires submittal of the material to the Department before distribution.

- 8.9(b)(1) The Department must determine whether or not there is a large portion of non-English speaking persons within a system.

- 8.9(b)(2) Language was added specifying the end of the monitoring period as being the date from which the 60-day public education deadline starts.

- 8.9(b)(2)(ii) Systems must contact local health agencies, in person or by phone, in order to obtain a list of target organizations.

- 8.9(b)(3) Allowance for an extension for new public education delivery requirements. Extensions can be given if requested prior to the 60 day deadline.

- Revisions concerning public water system reporting requirements

  - 8.10 Requires that systems report all of their lead and copper tap water results by the 10th of the month following the monitoring period.

  - 8.10 Requires that changes in new sources and long term treatment changes to be reported to the Department as early as possible.

- Revisions concerning reevaluation of lead service lines

  - 8.8(b)(2) Language was added regarding a system resuming the lead service line replacement program. The system must reassess the number of lead lines to include lead lines that were opted out previously because of sampling results. It divides the number of lead lines left by the number of years left in the program to obtain the amount needed to be replaced per year.

These amendments provide more effective protection of public health by reducing exposure to lead in drinking water and by strengthening the implementation of lead and copper control in the following areas: monitoring, treatment processes, public education, customer awareness, and lead service line replacement.

Additionally, the public health is served by a rule that is clear and as easy to read and understand as possible. Therefore, the Commission further amended multiple Articles of the Colorado Primary Drinking Water Regulations to include:

- Revisions to Article 8 to rearrange the order and flow of the sections to provide clarity

- Revisions to Article 8 and Article 10 to update references and to include cross referencing titles where this provides clarity.

- Numerous minor changes removing obsolete references and definitions that are not used within the regulation, and correction of identified spelling and typographical errors. The removal of obsolete references includes the removal of section 13.1(d). The Commission adopted section 13.1(d) in the July 14, 2008 rulemaking hearing to delay the effective date of the new groundwater rule provisions contained in 13.1, 13.3 and 13.4. The Commission's actions during this hearing will become effective December 1, 2009; accordingly section 13.1(d) is no longer necessary as compliance with these provisions will be required upon that effective date.

- Other identified changes include the following:
  - 5.4(a) the words “have a certified laboratory” are added concerning fecal coliforms/escherichia coli (E. coli) testing
  - 6.1.3 is amended to clarify compliance with Maximum Contaminant Levels and Maximum Contaminant Level Goals for Inorganic Chemical Contaminants
  - 7.5.1 removes the reference to 7.5.4 since this section does not exist and adds the words “and the requirements of section 1.6.3(j)”
  - Sections 7.7 and 7.8 are amended to remove the word “you” and replace it with “the system”
  - 9.1.2 replaces the words “sells” with “delivers”, “buyer” with “consecutive”, “seller” with “wholesaler”, and “purchaser” with “consecutive”
  - 9.1.3(b)(1)(ii) adds the word “general”
  - “Table 10-10 Cited Detection Limits for Volatile Organic Chemical Contaminants” is added
  - Changes to Articles 1, 9, and 13 related to the Groundwater Rule. The following changes are required to assure that Colorado regulations are at least as stringent as the federal regulations in order to maintain primary enforcement authority:
    - 1.6.3(o)(2) corrects reference to public notification requirements to include 9.1.3(h) and 9.2.13.
    - 9.2.3(a)(4) Table 9-5 corrects Tier 2 public notice reference to include 13.4(b).
    - 9.2.4(a)(6) Table 9-6 corrects Tier 3 public notice reference to include all of 13.4 and 11.4.
    - 9.2.13 adds public notice requirements for non-community groundwater systems.
    - Table 9-7 I.A.11 corrects violation citations to include 13.4(a), 13.4(b) and 11.4 as treatment technique violations with Tier 2 public notice. Also corrects violation citations to include 11.4 as a monitoring violation with Tier 3 public notice.
    - 13.4(c)(3) adds reference to include 11.4(b).
    - 13.4(b) adds a requirement that systems that are subject to compliance monitoring requirements will incur a treatment technique violation when a failure to provide 4-log treatment of viruses is not corrected within four hours.

PARTIES TO THE RULEMAKING

1. City of Boulder
2. Board of Water Works of Pueblo, Colorado

Article 25 **STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY AND PURPOSE: August 9, 2010 rulemaking; Effective Date November 30, 2010**

Adoption of Amendments to Article 13 – Groundwater Rule, with amendments to Articles 1, 3, 5, 7, 9, and 10 of the Colorado Primary Drinking Water Regulations.

The Colorado Revised Statutes (CRS), §25-1.5-202, provide specific authority for adoption of these regulatory amendments. The Commission also adopted, in compliance with §24-4-103(4), CRS, the following statement of basis and purpose.

Basis and Purpose

All suppliers of drinking water in Colorado are subject to regulations adopted by the U.S. Environmental Protection Agency (EPA) under the Safe Drinking Water Act, (42 U.S.C. 300f et seq.) as well as by the Colorado Primary Drinking Water Regulations under the direction of the Water Quality Control Division (Division). Colorado has been granted primary enforcement responsibility (primacy) for the public water system supervision program under the federal Safe Drinking Water Act. However, in order to maintain primacy, states must also promulgate new regulations that are no less stringent than those adopted by the federal government. By retaining primacy, the Division is able to protect the public health by ensuring that public water systems provide safe drinking water to Colorado citizens and visitors.

Article 13 (Groundwater Rule) of the Colorado Primary Drinking Water Regulations was adopted on 12/08/2008. While the majority of the provisions in Article 13 were required to maintain primacy and are based on federal language, Section 13.2 does not contain federal requirements and Colorado's primary enforcement authority was not contingent upon its adoption. The substance of Section 13.2 covers Colorado rules on the disinfection of groundwater sources and the rules for granting public water systems a waiver from disinfection requirements.

The Center for Disease Control has called providing safe drinking water one of the greatest public health achievements of the 20th century. Prior to 1908, no U.S. municipal water systems chemically disinfected drinking water. Consequently, waterborne diseases exacted a heavy toll in illness and death. Without chlorination or other disinfection processes, the public is at great risk of contracting waterborne diseases. Meeting the goal of clean, safe drinking water requires a multi-barrier approach that includes protecting raw source water from contamination, appropriately treating raw water, and ensuring safe distribution of treated water to consumers' taps.

Water-borne disease outbreaks have been common in Colorado dating back to the 1800s. As a result, mandatory disinfection of all water served to the public, including groundwater sources, has long been recognized by both the Colorado Board of Health and subsequently the Water Quality Control Commission as necessary for the protection of public health. This recognition predates the federal Safe Drinking Water Act. Disinfection of groundwater sources has always been included in mandatory disinfection requirements and Colorado has a regulatory history that views untreated groundwater as a potentially significant health hazard.

In November 1967, the Colorado Board of Health recognized that mandatory disinfection of drinking water served to the public was necessary to protect public health and the Board amended then existing regulations to include the requirement that "a sufficient amount of chlorine shall be added to the water to maintain a measurable chlorine residual at all points in the distribution system." The Board also established, at that time, the ability of the Water Quality Control Division (WQCD) to grant groundwater systems a waiver from disinfection requirements if the system could demonstrate that their water was "reasonably safe and free from contamination."

In 1977, the Board further strengthened disinfection requirements by adopting amendments that required systems to maintain a "free available chlorine residual of at least 0.2 mg/L at the extremities of the distribution system." Amendments adopted in 1991, modified the requirement for maintaining a chlorine residual in the distribution system from 0.2 mg/L to maintaining a "detectable residual in at least 95% of the samples taken at the extremities of the distribution system." An amendment requiring a residual disinfectant concentration in the distribution system measured "at the same time as total coliforms are sampled" was also added.

Based on the regulatory authority established in the 1967 amendments, WQCD issued disinfection waivers dating back over several decades. Concerns with the ongoing appropriateness of some of these existing waivers prompted the initiation of a waiver review process in 2007. This process resulted in the withdrawal of a number of disinfection waivers due to concerns over the system's ability to provide safe drinking water to the public.

Recently, two disease outbreaks associated with groundwater systems occurred in Colorado - the 2008 salmonella outbreak in Alamosa and the Skyline Ranch norovirus outbreak in 2007. The Alamosa outbreak was particularly serious due to the large number of people who were sickened and one death associated with this particular disease outbreak. Alamosa had a disinfection waiver at the time of the outbreak (which has since been withdrawn) and, as a result, the city's drinking water was not being disinfected. An extensive report was developed in the wake of the Alamosa outbreak. This report outlined a combined failure of physical, regulatory and human infrastructure all of which contributed to the outbreak.

After careful consideration, in particular, of the history of disinfection in Colorado, of the historical issuance of disinfection waivers, of the reality of continued disease outbreaks, and of growing concerns with the clarity of regulatory language, the amendments as described in this article (Article 25) were developed and adopted. These amendments reflect several conclusions. Retention of waivers is not appropriate except for systems that have shown a consistent, long-term history of operating in a manner that is fully protective of public health without the barrier of disinfection and can demonstrate continuing adherence to high standards of source and distribution system protection. Increased requirements and oversight of systems that continue to operate under disinfection waivers is appropriate. The issuance of waivers to new water systems poses too high a risk to public health given that new systems cannot clearly demonstrate a long-term history of being able to successfully operate without disinfection. Furthermore, it is not appropriate for systems that are currently providing chemical disinfection to discontinue such disinfection thereby removing a demonstrably effective primary barrier to microbial contamination. Systems serving populations susceptible to microbial contamination, specifically schools and day care centers, are unsuitable to operate without chemical disinfection due to the increased health risks these types of populations face.

For those systems that are required to disinfect, further conclusions were reached. Clarification of continuous chemical disinfection requirements was needed. Clarification of entry point and distribution system monitoring and compliance requirements was needed. It was recognized that systems providing only ultraviolet treatment as a means of disinfection are not providing sufficiently protective disinfection due to the inability of ultraviolet treatment to maintain a disinfection residual. It was recognized that there are inherent difficulties requiring hand pumped wells to maintain continuous disinfection due to their typically remote locations. Therefore, there was a need to establish criteria for proper operation, maintenance and monitoring of such wells. Finally, it was concluded that amendments clarifying the recordkeeping, reporting and public notice requirements for groundwater systems were needed.

These amendments clarify and expand upon long standing requirements of the Colorado Primary Drinking Water Regulations, and are in line with requirements that are already part of existing guidance and/or policy. The overall goal of these amendments is to further protect the public from microbial contamination and to enhance Article 13 regarding specific regulations that apply to groundwater systems. These amendments primarily revise the previously adopted Section 13.2 and add a recordkeeping section (Section 13.5) and a reporting section (Section 13.6).

Summary

Groundwater Disinfection Amendments. The Commission has amended the Colorado Primary Drinking Water Regulations concerning minimum treatment technique requirements for groundwater systems in the following ways. Requirements in Article 1 were redesignated to Article 9, a requirement to Article 5 was added and requirements were revised and added to Articles 9 and 13.

Primary Enforcement Responsibility Amendments. The Commission adopted amendments to the Colorado Primary Drinking Water Regulations in order to remain consistent with provisions of the National Primary Drinking Water Regulations which were amended to include revisions concerning approved analytical methods and revisions concerning compliance monitoring requirements. The federal provisions were published in the following Federal Registers:

The federal regulations as published in the Federal Register, Volume 74, Number 123, June 29, 2009, pages 30953 through 30959, National Primary Drinking Water Regulations: Minor Correction to Stage 2 Disinfectants and Disinfection Byproducts Rule and Changes in References to Analytical Methods

The federal regulations as published in the Federal Register, Volume 74, Number 216, November 10, 2009, pages 57908 through 57918, Expedited Approval of Alternative Test Procedures for the Analysis of Contaminants Under the Safe Drinking Water Act; Analysis and Sampling Procedures

The federal regulations as published in the Federal Register, Volume 74, Number 230, December 2, 2009, pages 63069 through 63070, Expedited Approval of Alternative Test Procedures for the Analysis of Contaminants Under the Safe Drinking Water Act; Analysis and Sampling Procedures

The revised analytical methods concerned microbial contaminants, surface water minimum disinfectant residuals, maximum disinfectant residuals, disinfectant byproducts, disinfectant byproducts precursors, and secondary maximum contaminates. These amendments added language to sections 3.4, and multiple sections of Article 10.

The revised compliance monitoring requirements concerned stage 2 disinfection byproducts routine monitoring. These amendments had to be adopted to maintain primary enforcement authority. These amendments revised Tables 7-29 and 7-33.

Additionally, the Commission adopted amendments removing Section 1.9.1(b) concerning consecutive public water systems in order to remain consistent with and at least as stringent as regulations adopted by the federal government.

Other Amendments to the Colorado Primary Drinking Water Regulations. The Commission adopted amendments to the Colorado Primary Drinking Water Regulations that added, corrected, removed or revised obsolete references and dates, spelling, typographical and reference errors. This was done to provide clarity and accuracy.

Groundwater Disinfection Requirements.

The Commission amended Articles 1, 5, 9 and 13 of the Colorado Primary Drinking Water Regulations to include the following requirements as summarized below:

- Groundwater disinfection requirements
    - Groundwater Source (13.1(a)(7-8), 13.2(a)(1),13.2(a)(2)(i), 13.2(b)(1), 13.2(b)(3) and 13.2(c)(1))
        - Establishes minimum treatment techniques requiring groundwater systems to disinfect a groundwater source at all times that the source is serving water to the public. The disinfection must include chemical treatment resulting in at least 0.2 mg/L residual disinfectant concentration in water entering the distribution system at the entry points.
        - Establishes weekly residual disinfectant concentration monitoring at all entry points serving groundwater to the public. The monitoring

requirement increases to every 24 hours while the residual disinfectant concentration is below 0.2 mg/L.

- Establishes a timeframe of 72 hours to correct a residual disinfectant concentration that is discovered to be below 0.2 mg/L, otherwise a treatment technique violation occurs.
- Establishes that a groundwater system in violation of the treatment technique must resolve and document the situation, keep records, notify the Department and issue public notice.
- Establishes when a system that is chlorinating needs to begin compliance with monitoring requirements.
- Establishes when a system disinfecting with only ultra violet light must begin additional required chemical disinfection.

  - Groundwater distribution system (13.2(a)(2)(ii), 13.2(b)(2), 13.2(b)(3) and 13.2(c)(2))
    - Establishes at least a detectable residual disinfectant concentration throughout the distribution system to be measured at the same point and time as total coliform.
    - Establishes residual disinfectant concentration cannot be undetectable in more than 5 percent of the measurements taken each monitoring period for any two consecutive monitoring periods, otherwise a treatment technique violation occurs.
    - Establishes that a groundwater system in violation of the treatment technique must issue public notice.

- Groundwater disinfection waiver requirements (9.2.12, 13.1(a)(1)(i), 13.1(a)(9), 13.1(a)(14), 13.2(d) and 13.5(a)(3))
  - Establishes that groundwater systems with a disinfection waiver prior to November 30, 2010, will continue to have a disinfection waiver and are not subject to groundwater disinfection requirements in 13.2(a-c).
  - Establishes that a groundwater system with a disinfection waiver that is determined to be a school or a daycare center will no longer have a disinfection waiver.
  - Establishes Department authority to revoke disinfection waivers from groundwater systems with susceptible populations.
  - Establishes that the Department will no longer issue new disinfection waivers.
  - Establishes that a groundwater system with a disinfection waiver must comply with the following:
    - Provide public notice that the system operates under a disinfection waiver.
    - Ensure that the system is operated by a certified operator.

        - Have emergency disinfection or an emergency disinfection plan.
        - Keep records of all chlorination activities.
        - Have a Monitoring Plan.
        - Protect their distribution system (Distribution System Protection Plan).
        - Protect their groundwater sources (Source Water Protection Plan).
    - Establishes Department authority to:
        - Evaluate any groundwater source or storage system using Department Design Criteria and CRS Well Construction Criteria.
        - Require sampling of any groundwater source.
        - Require sampling and proof that new groundwater sources are not contaminated.
        - Perform a sanitary survey of the system at any time.
        - Review the violation history of the system.
        - Withdraw a waiver from a system with a fecally contaminated source.
        - Withdraw the disinfection waiver.
    - Establishes that the groundwater system has the right of appeal to a Department decision to withdraw a disinfection waiver.

- Groundwater systems with hand pumped well requirements (5.1.1(e)(6), 9.2.14, 13.1(a)(1)(ii-iii), 13.2(e))
    - Establishes that groundwater systems with hand pumped wells must comply with the following:
        - Operate according to Department guidance or Department approved alternative guidance.
        - Disinfect hand pumped wells before opening for the season.
        - Monitor for total coliform at least once a month.
        - Take a hand pumped well out of service if it is contaminated. The system must eliminate the contamination and disinfect the hand pumped well before the well can be put back into service.
        - Continuously post public notice whenever the hand pump well is available for public use. (9.2.14(b))

Primary Enforcement Responsibility Requirements.

The Commission amended Articles 1, 3, 7 and 10 of the Colorado Primary Drinking Water Regulations to revise or add the following requirements as summarized below:

- Consecutive System Requirements (1.9)
    - Removed Section 1.9.1(b). This section allowed for an exemption from regulation under the Colorado Primary Drinking Water Regulations for consecutive public water systems. This exemption made the Colorado Primary Drinking Water Regulations less stringent than regulations adopted by the federal government.
- Analytical methods (3.4, 10.1.3(c), 10.1.4(a))
    - Standard Methods 21st Addition approved for multiple methods.
    - Additional approved methods for residual chlorine analysis including On-Line Chlorine Analyzer EPA 334.0 and Test Strips Method D99-003.
- Stage 2 disinfection byproducts routine monitoring (Tables 7-29 and 7-33)
    - Community and non-transient non-community water systems that serve only groundwater with a population less than 500 may take individual TTHM and HAA5 samples. Community and non-transient non-community water systems that serve surface water with a population less than or equal to 3,300 may take individual TTHM and HAA5 samples. All others must take dual sample sets.

Other Requirements of the Colorado Primary Drinking Water Regulations.

The Commission amended the Colorado Primary Drinking Water Regulations to add, correct, remove or revise the following requirements as summarized below:

- Monitoring Plan (1.12)
    - Public water system must submit one copy of the monitoring plan instead of two.
- Additional Analytical Methods (Article 10)
    - Section 10.12 and Table 10-30 was added.
    - First paragraph reference to Tables10-23 and 10-24 is corrected to be 10-24 and 10-27
- Sanitary Survey Frequency and Response to Significant Deficiencies or Violations of Colorado Primary Drinking Water Regulations in a Sanitary Survey Written Notice (11.2 and 11.4)
    - Language referencing December 1, 2009 is now obsolete and is removed.

Discussion Items.

These amendments to the Colorado Primary Drinking Water Regulations were developed in consultation with stakeholders. Stakeholders were provided opportunities to express concerns regarding particular provisions of the amendments and today's amendments have addressed many of those comments. The discussion below reflects conclusions of major comments.

Entry Point Monitoring:

These amendments were intended to achieve several levels of public health protection and required that all groundwater sources be disinfected at all times that they are used to serve water to the public and required that disinfection at least include one chemical treatment method. As a means to verify sufficient disinfection of the source entry point monitoring has been established. Since the amendments require the use of chemical disinfection, measurement of residual disinfectant concentration at each entry point to the distribution system ensures that chemical disinfection is being provided. Additionally, monitoring is required at entry points that have served water to the public during the monitoring period, meaning when water from a groundwater source is available to a consumer in any way, sampling is required at that source's entry point. Conversely, when no water enters the distribution system from a source or a number of sources that combine before entering the distribution system, then no monitoring is required to confirm that treatment is being delivered.

It is recognized that some groundwater systems operate continuous chlorine analyzers at the entry points to the distribution system. With a minimum monitoring requirement of once per week per entry point, it is apparent that monitoring more frequently meets this requirement. The amendments require action on behalf of the groundwater system when the system discovers that the residual disinfectant concentration falls below the minimum disinfectant level and therefore the system must be aware of this event. At a minimum, these systems must make themselves aware of the residual disinfectant concentration once a week. Although this will meet the minimum monitoring requirement, systems are required to take proper follow up action any time they become aware of a residual disinfectant concentration measurement that falls below the minimum. Additionally, systems must keep records of entry point compliance monitoring. Chart recordings and data logs meet this requirement as long as they record all pieces of information required by the recordkeeping requirements of the amendments and make note of the recordings they will use for compliance.

Minimum Entry Point Residual Disinfectant Concentration:

The amendments identify a minimum level of disinfectant of 0.2 mg/L of chlorine that must be maintained at the entry points to the distribution system. This level is appropriate as demonstrated in the history of the Colorado Primary Drinking Water Regulations as well as in requirements of the Surface Water Treatment Rule of 1989. The Colorado Primary Drinking Water Regulations have previously required 0.2 mg/L of residual disinfectant concentration at all points in the distribution system. In addition, at least 7 other states require at a minimum 0.2 mg/L residual disinfectant concentration throughout the entire distribution system. Additionally, given that a large percentage of groundwater sources contain known chlorine measurement interferences, establishing an entry point free chlorine residual requirement that is well above method detection limits, ensures that systems will be providing an actual free chlorine residual at least at the entry points to the distribution system.

Entry Point Treatment Technique Violation:

The amendments establish the point at which a system has violated the groundwater source treatment technique. Upon discovery of the insufficient residual disinfectant concentration the system must begin sampling the entry point every 24 hours until the residual disinfectant concentration is restored to at least 0.2 mg/L. Additionally, upon observing a measurement of the residual disinfectant concentration below 0.2 mg/L the system has 72 hours to restore the residual to at least 0.2 mg/L before the system incurs a treatment technique violation. It is the system's responsibility to notify the Water Quality Control Division when a treatment technique violation has occurred. Regular reporting of weekly entry point sampling data is not required unless the Water Quality Control Division identifies the need to collect and maintain this information (pursuant to Section 1.6.4).

Considering that treatment technique violations require Tier 2 public notification, it is considered burdensome to require that level of notification when disinfection has failed for only a short period of time if the water has not been identified as contaminated. However, extended periods where disinfection is not being applied (longer than 72 hours) does constitute an elevated level of public health risk that warrants a Tier II public notification. The 72 hour time period does allow for the system to make progress

towards resolving the issue concerning the insufficient level of disinfectant as well as time to contact the Water Quality Control Division to request assistance and guidance.

Waivered Systems Introducing New sources:

Systems that have maintained a waiver from disinfection, just like many other water systems in Colorado, face issues of water scarcity and growing populations and therefore may require the addition of new sources to the system. Although, the amendments identify that issuing new waivers is not appropriate, systems that have shown a history of operating in a manner that is fully protective of public health without the barrier of disinfection may continue that operation with the addition of new groundwater sources that are shown to be free of contamination and properly constructed.

Systems that wish to maintain a waiver from disinfection cannot add a groundwater source that is contaminated or comes from a well that has been improperly constructed. Furthermore, the addition of a source that is a surface water source or is identified as a groundwater under the direct influence of surface water source will result in immediate waiver withdrawal.